SERVICE MANUAL FOR

Varispeed-626MTII Drive

AC Adjustable Speed Drives for Machine Tools

SIE-S626-1.1

September 1982

REV ① July, 1983

This service manual covers Types CIMR-MT-7.5K through 22K of our machine tool spindle AC drive units VARISPEED-626MTII (VS-626MTII).

The VS-626MTII comprises a squirrel cage AC induction motor controlled by a vector-controlled inverter, making its performance comparable to a DC drive system. The VS-626MTII is designed to operate at high reliability in factory atmosphere, and requires only minimum maintenance service, which is described in this manual.

YASKAWA Electric Mfg. Co., Ltd./Japan

CONTENTS

1. GENERAL REQUIREMENTS

1.1 OPERATING CONDITIONS

Operate the VS-626MTII under the following conditions.

- Ambient temperature: -10 to +55°C
- Relative humidity: 10 to 95% (non-condensing)
- Elevation: up to 1000 meters above sea level
- Frequency fluctuation: ±1% max.
- Power supply: See Table 1.1

Table 1.1 Permissible Voltage

Nominal voltage (V)	Frequency (Hz)	Permissible voltage (V)
200	50 or 60	180 to 220
220	50 or 60	187 to 242
240	60	192 to 252

Note: When the power supply voltage is in the 400 V range (nominal), use a transformer (optional).

1.2 PERIODIC INSPECTION

To maintain the VS-626MTII in good operating order, check it approximately once every 6 months, in accordance with Table 1.2.

Table 1.2 Periodic Inspection Items and Description

State		Item	Procedure	Criteria	Action
Run	Stop				
○		Power transistor cooling fan	Check for noise and vibration	Noise or vibration not present before	Contact Yaskawa representative.
	○*	Power transistor cooling fan and adjacent area	Visual check of parts around power transistor fan	Deposited dust	Clean with vacuum cleaner.
	○*	Terminal screws in VS-626MTII controller	Manual check of all mutual wiring terminal screws with Phillips screwdriver	Loose screws	Tighten.

Check marked with * should be made approx. 10 minutes after turning off the power supply.

1.3 GROUNDING

- Connect the grounding wires for the power supply lines and the power lines connected to the controller to terminal E.
- Connect the grounding bolt of the controller to a single ground pole. Observe the following provisions of the official standards.

  For 200 V circuit: Class 3 grounding

1.4 INSTRUMENTS AND TOOLS REQUIRED FOR MAINTENANCE

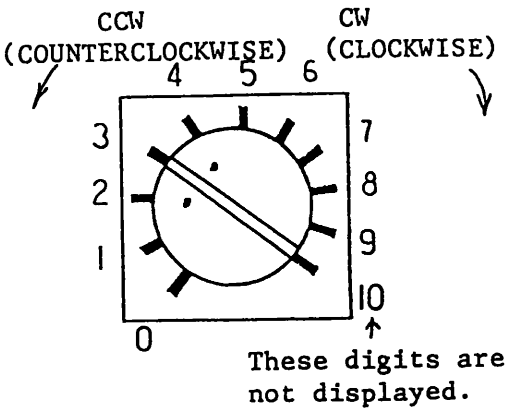
Table 1.3 Instruments and Tools for Maintenance

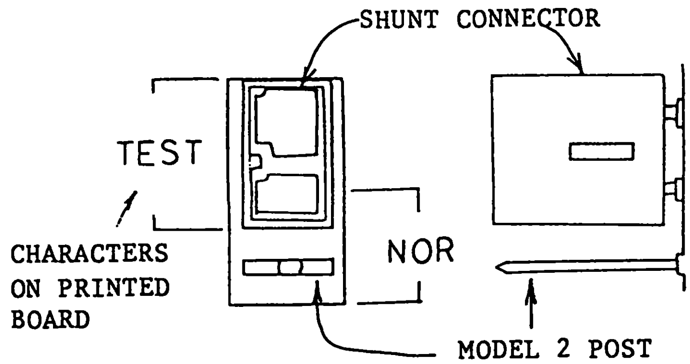
Type	Specification	Usage	
		Adjustment	Troubleshooting
Multimeter	—	○	○
Screwdriver and Phillips type screwdriver	Large, medium, small	○	○
Roundnose pliers	—	—	○
Socket wrench	13 mm	—	○

1.5 REPLACING PRINTED CIRCUIT BOARD

- Do not replace the printed circuit boards or plug or unplug the connectors with the power supply on, as this may damage circuit members. For the replacing producers, refer to APPENDIX 10 - 13.

1.6 HANDLING POTENTIOMETER AND SHUNT CONNECTOR





Adjustment of Potentiometer (Setting to "3" in shown)

Note: Do not adjust potentiometer locked with red enamel, as they are adjusted at the factory.

Selective setting of shunt connector (Setting to TEST is shown)

Note: Do not change the setting of shunt connectors for which setting has been specified before shipment. Set only those listed in Table 3.3 on page 10.

2. CONFIGURATION

2.1 SYSTEM CONFIGURATION

With the VS-626MTII, a machine tool spindle AC drive system is configured as shown in Fig. 2.1.

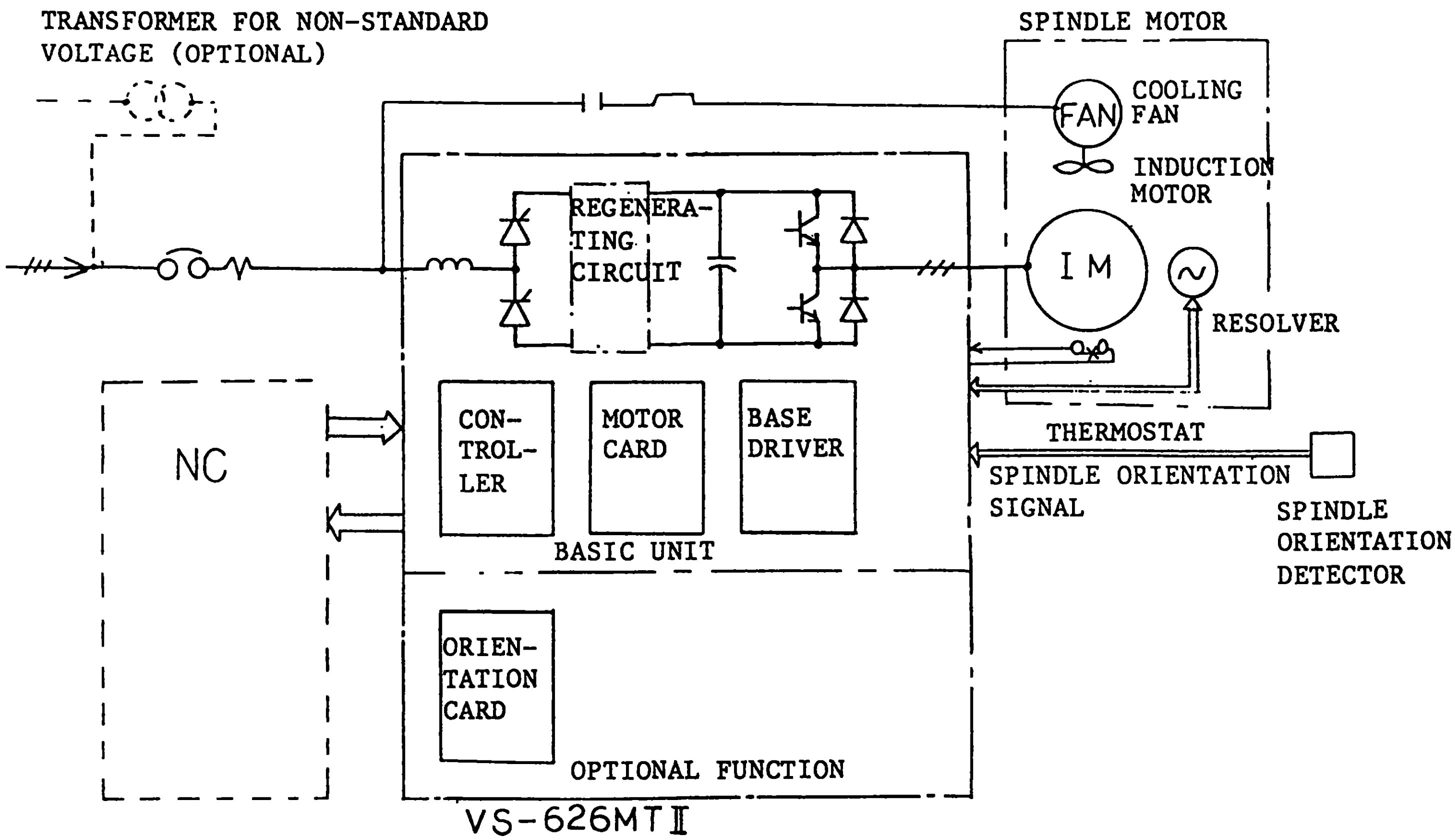


Fig. 2.1 VS-626MTII System Configuration

2.2 INTERCHANGEABILITY OF CONTROL CIRCUIT

The control circuit of the VS-626MTII is configured with printed circuit boards. Even if faulty boards are replaced, an adjusted control circuit does not need readjustment after board replacement. Adjustment is required only with potentiometers (Table 3.1) which are designed to be adapted to the usages by proper adjustment. Replace the printed circuit boards in accordance with Table 2.1.

Table 2.1 Printed Circuit Board

VS-626MTII Type CIMR-MT-	Usage	Controller	Base driver	Motor card	Orientation card	Note
		Type	Type	Type	Type	
		(Code No.)	(Code No.)	(Code No.)	(Code No.)	
5.5 K	L	JPAC-C061 (ETC005812)	JPAC-C062 (ETC005820)	JPAC-C079 (ETC005990)	JPAC-C063 (ETC005830) (Option)	
5.5 K	MC			JPAC-C070 (ETC005900)		
7.5K	L			JPAC-C071 (ETC005910)		
7.5K	MC			JPAC-C072 (ETC005920)		
11K	L MC			JPAC-C073 (ETC005930)		
15K	L			JPAC-C074 (ETC005940)		
15K	MC			JPAC-C075 (ETC005950)		
18.5K	L MC			JPAC-C076 (ETC005960)		
22K	L MC			JPAC-C077 (ETC005970)		
26 K	L MC			JPAC-C078 (ETC005980)		

Note: L: Lathe (for foot-mounted motors)
MC: Machining center (for flange-mounted motors)

3. ADJUSTING POTENTIOMETERS AND SETTING SHUNT CONNECTORS

3.1 ADJUSTMENT POTENTIOMETERS

Table 3.1 shows the potentiometers which are designed for adjustment to adapt to the operation specifications. For option, refer to Table 5.2 on page 25.

Table 3.1 Adjustable Potentiometers

Printed circuit board	Code	Description	Adjusting & characteristics
Controller	NREV	Reverse speed compensation	See APPENDIX 18.
	NADJ	Speed adjustment	
	NGAIN	Speed loop gain adjustment	See APPENDIX 14.
	TLIM	Torque limit level setting	See APPENDIX 15.
	SMADJ	Speedometer amplitude adjustment	See APPENDIX 19.
	LMADJ	Load meter amplitude adjustment	See APPENDIX 20.
	NDET	Speed coincidence detection level	See APPENDIX 16.
	TDET	Torque detection level	See APPENDIX 17.

3.2 POTENTIOMETER PRESET AT FACTORY

Table 3.2 gives the potentiometers preset at the factory. They require special instruments for correct adjustment. Do not tamper with them unless under emergency conditions. They are marked by red enamel for distinction from other potentiometers.

Table 3.2 Potentiometer Preset at Factory

Printed circuit board	Code	Description	Standard setting value	Note
	TMAX	Max. torque limit	See APPENDIX 22.	
	1RH	Slip frequency setting	Frequency of CH18 = 7.5 kHz ±15Hz	• 1 V at terminal ⑦, 2FC • 3 V at terminal ⑨, 2FC • Shunt connector I
	2RH	Regeneration power limit	Voltage of CH5 ≒ -3.6 to -11 V	See APPENDIX 15.
	3RH	Exciting current command level	CH5 or CH8 voltage of motor card = 2.5 Vp-p	Resolver detection frequency = 18.9 kHz Field weakening command = 0 V
	4RH	Regeneration voltage detection level	CH8 voltage = 3.15 V ±0.1 V/340 VDC	DC main circuit voltage: VDC
Con-trol-ler	5RH	Current calculation carrier amplitude adjustment	CH6 voltage = Vp-p - 3 V ±0.5 14 - 16.5 kHz	CH6 voltage wave-form: triangular wave
	6RH	KIP pulse angle setting	Thyristor gate pulse control lag angle = 165° ±4°	Regeneration state
	7RH	Regeneration voltage limit level	See APPENDIX 23.	
	8 - 10RH	Phase shifter lamp signal adjustment	Control lag angle α = (20° ±7°) - (165° ±4°)	Thyristor gate pulse observation
	11RH	Speed command offset	|CH19 voltage| ≦ 3 mV	Speed command = 0 V
	12RH	Speed command limit level	|CH19 voltage| ≦ (10.5 ±0.2 V)	During override
	13RH	Acceleration/ Deceleration time setting	CH19 voltage by 10 V step input to CH23 ≒ 2 ±0.2S	1DS: 2 sec selec-tion
	14RH	Speed loop offset	|CH4 voltage| ≦ 10 mV	Speed command: 0 NGAIN: max.
	15RH	Primary frequency amplitude adjustment	CH1, CH2 voltage peak = 3 ±0.1 V	———
	16RH	Speed detection level	CH22 voltage = -10 V ±10 mV/6000rpm	Resolver detection frequency: 21.6 kHz

Table 3.2 Potentiometer Preset at Factory (Cont'd)

Printed circuit board	Code	Description	Standard setting value	Note
Con-troller	17RH	Speed detection offset	|CH22 voltage| = 10 mV	Resolver detection frequency: 18 kHz
	18RH	Resolver excition balance adjustment	CH37 voltage = CH39 voltage	CH35, CH36 frequency = 18 kHz
Motor card	1RH	Overload operation level	Integration start current	Motor rated current (30 min) x 1.05
	2RH	Overload operation time	See APPENDIX 24.	
	3RH	Current loop offset (α phase)	Motor DC current: 0.3 A or below	——
	4RH	Current loop offset (β phase)	Motor DC current: 0.3 A or below	——

3.3 SELECTABLE SHUNT CONNECTOR

Table 3.3 shows the selectable shunt connectors. Select them to suit required specifications.

Table 3.3 Selectable Shunt Connector

Printed circuit board	Function	Description				Note
Con-troller	Speed standard selection	A	6000rpm	B	4500 rpm	Select in accordance with motor max. speed. Unformly select for group of A, D, K and O, and group of B, C, L and P.
	Overspeed operation level	D	6000rpm	C	4500 rpm	
	Overspeed operation level	K	6000rpm	L	4500 rpm	
	Speed standard selection	O	6000rpm	P T	4500 rpm	
	50/60 Hz selection	M	50 Hz	N	60 Hz	Select by supply frequency.
	Fault display mode selection	G	In fault, 33 - 34 conductive in 1CN	H	In fault, 34 - 35 conductive in 1CN	Selection between normally on and normally off.

Table 3.3 Selectable Shunt Connector (Cont'd)

Printed circuit board	Function	Description				Note
Con-trol-ler	Speed command selection	Q	D/A output signal	R	Analog signal	Selection by speed command type

3.4 NON-SELECTABLE SHUNT CONNECTOR

Table 3.4 shows the shunt connectors which are preselected before shipment. They can not be reselected.

Table 3.4 Non-selectable Shunt Connectors

Printed circuit board	Function	Description				Note
Con-trol-ler	Low voltage operation level	E	Low	F	HI	——
	Slip frequency compensation	I	Speed compensa-tion	J	Field weakening compensa-tion	——
Motor card	PWM carrier modula-tion	A	Impossi-ble	B	Possible	——
Base-driver	OC detection level	A	Low	B	HI	——
	+18 V level	C	HI	D	Low	——
	-18 V level	E	HI	F	Low	——

4. TROUBLESHOOTING

Paragraphs 4.1 and 4.2 describe the troubleshooting processes for VS-626MTII controller.

4.1 CHECKING SUPPLY VOLTAGE AND CAUTIONS IN TROUBLESHOOTING

Before starting to troubleshoot check the supply voltage in accordance with Table 4.1. If the AC supply voltage is outside the permissible range, change the power supply. If the DC supply voltage is outside the permissible range, replace the controller.

The items in [- - -] in the troubleshooting charts in paragraph 4.2 and subsequent paragraphs are adjusted before shipment, and should not be tampered with.

Table 4.1 Power Supply Voltage

Power supply		Permissible voltage range	Check point	Note
AC		See Table 1.1 on page 3.	R, S, T terminals	——
DC	+15 V	14.25 to 15.75 V	Across CH27 - CH29	See stabilized power supply, APPENDIX 3.
	-15 V	-14.25 to -15.75 V	Across CH31 - CH29	
	+8 V	7.6 to 8.4 V	Across CH28 - CH29	
	-8 V	-7.6 to-8.4 V	Across CH30 - CH29	
	-8 V	-7.6 to -8.4 V	Across CH33 - CH29	
	-3 V	-2.35 to -3.65 V	Across CH32 - CH29	
	+30 V	25 to 29/V = 200 V 28 to 32/V = 220 V	Across CH25 - CH29	Non-stabilized power supply, VAC = Supply voltage
	-30 V	-25 to -29/V = 200 V -29 to -32/V = 220 V	Across CH34 - CH29	

Note: Check terminals CHs are provided on the controller.

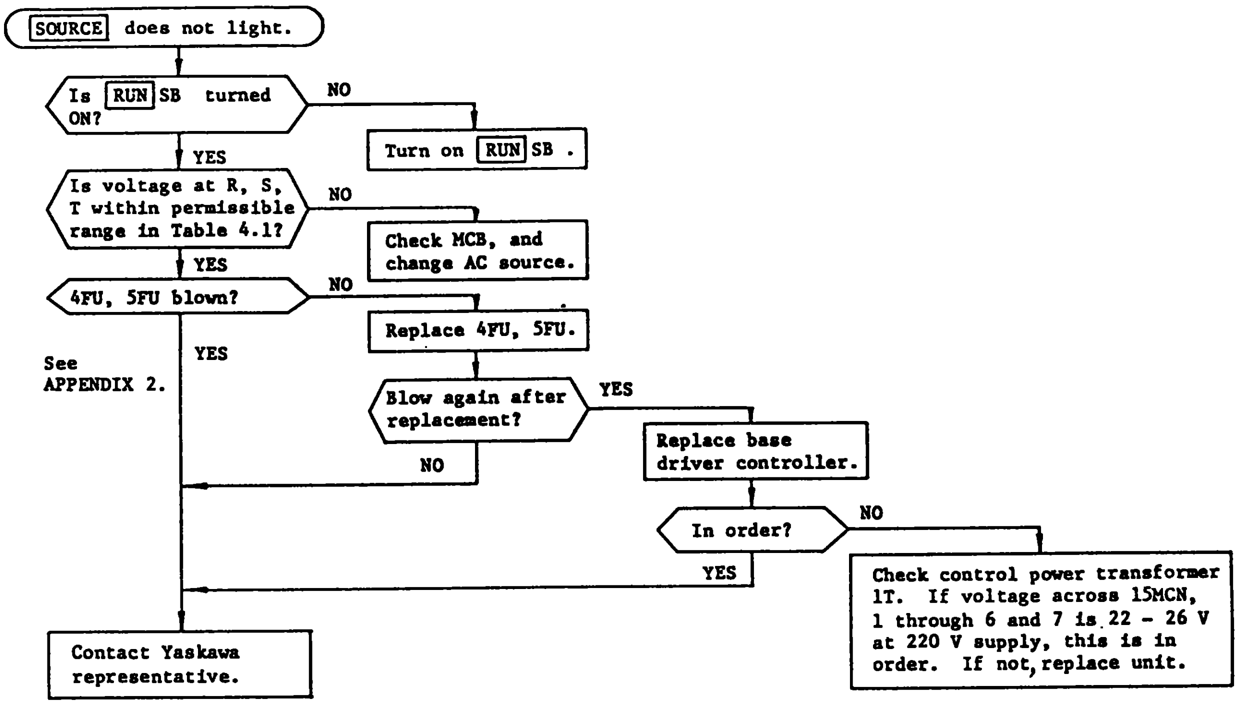
4.2 TROUBLESHOOTING FLOW CHART

Table 4.2 shows a list of trouble symptoms and the corresponding flow chart Nos.

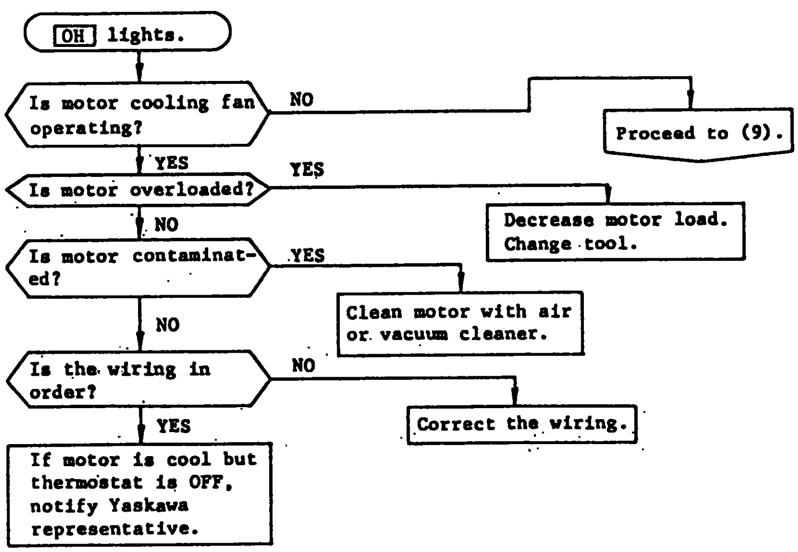
Table 4.2 Trouble Symptoms

Trouble Symptom	Chart Ref.	Trouble Symptom	Chart Ref.
SOURCE does not light.	(1) on page 14.	OS lights.	(10) on page 19.
OH lights.	(2) on page 14.	UV lights.	(11) on page 20.
FANM lights.	(9) on page 18.	DEV lights.	(12) on page 20.
FANC lights.	(3) on page 15.	ZSP does not light.	(13) on page 21.
OV lights.	(4) on page 15.	AGREE does not light.	(14) on page 21.
OC lights.	(5) on page 16.	Motor does not run or does not accelerate.	(15) on page 22.
ACFU lights.	(6) on page 17.	Motor speed overshoots or fluctuates.	(16) on page 23.
DCFU lights.	(7) on page 17.	Excessive vibration and noise while running.	(17) on page 23.
OL lights.	(8) on page 18.	Too long acceleration. deceleration time.	(18) on page 24.
Orientation malfunctioned	See paragraph 5.7.	——	——

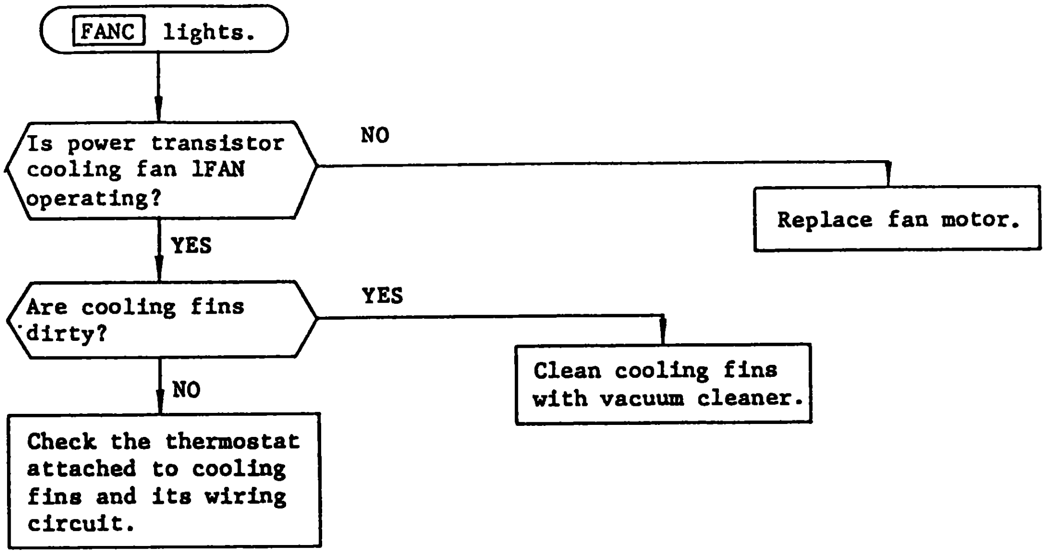
(1) SOURCE does not light.



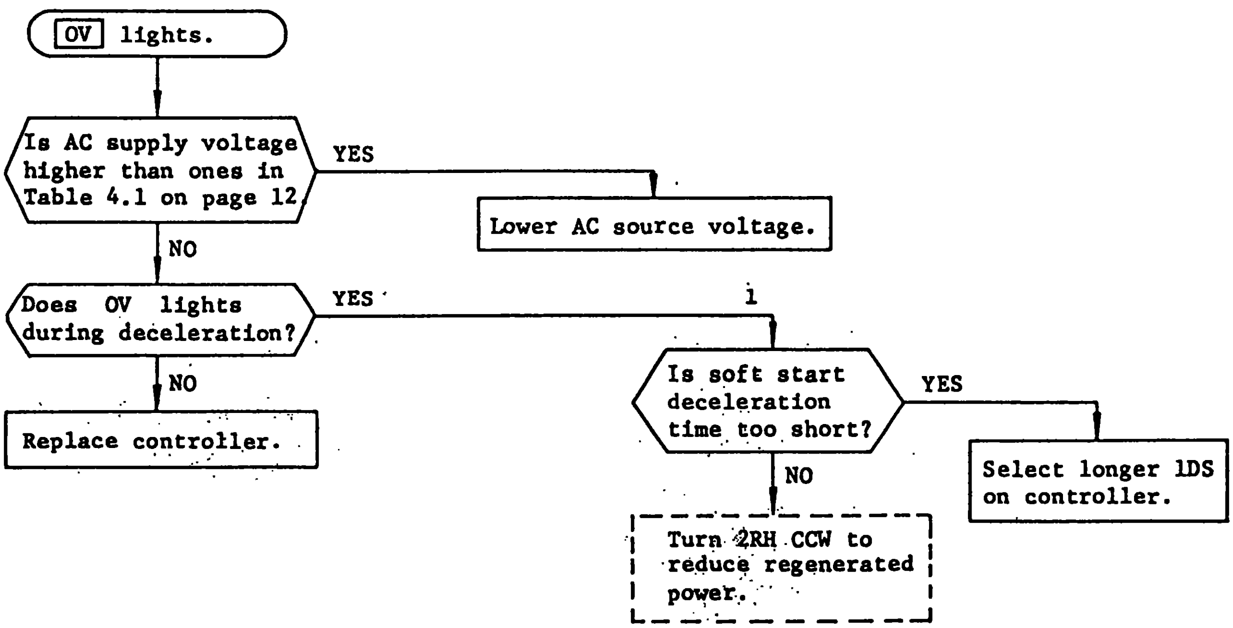
(2) OH lights.



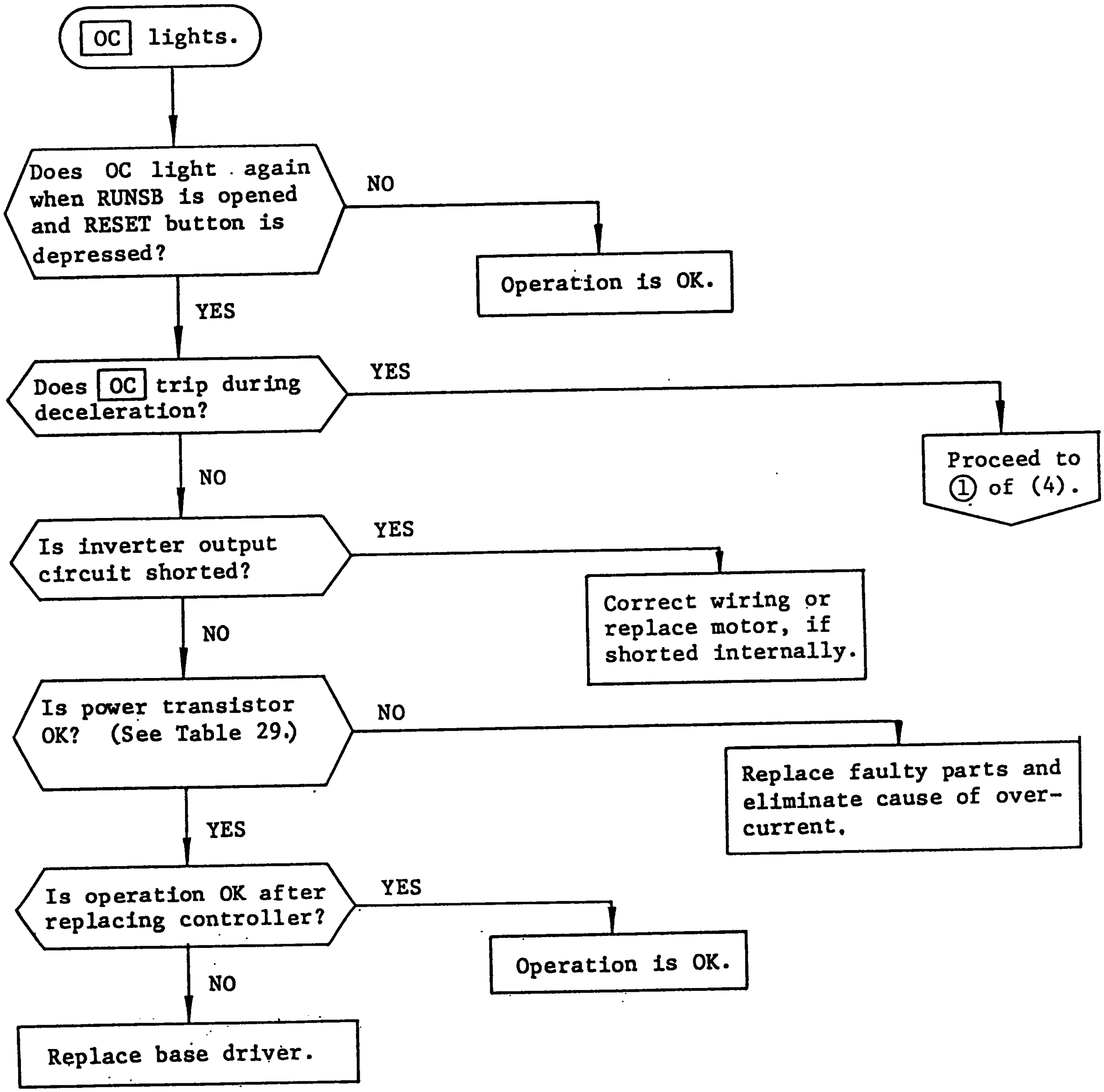
(3) FANC lights.



(4) OV lights.

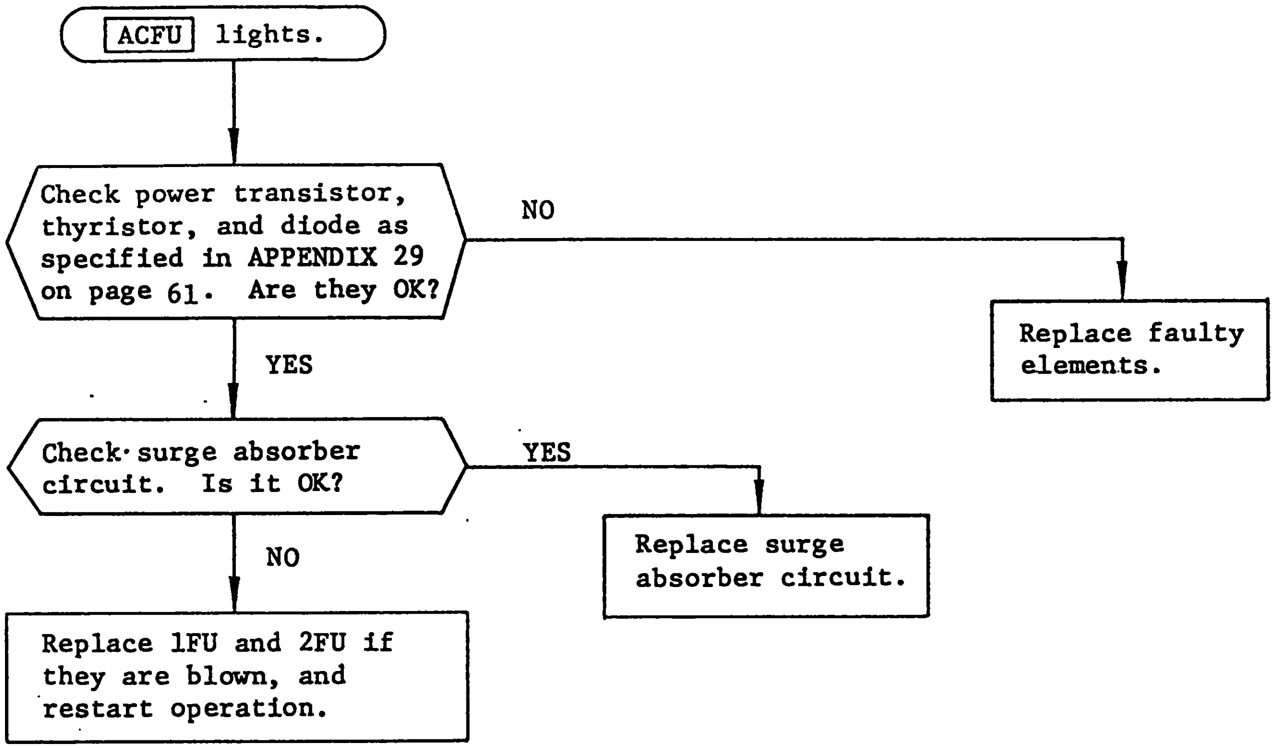


(5) OC lights.

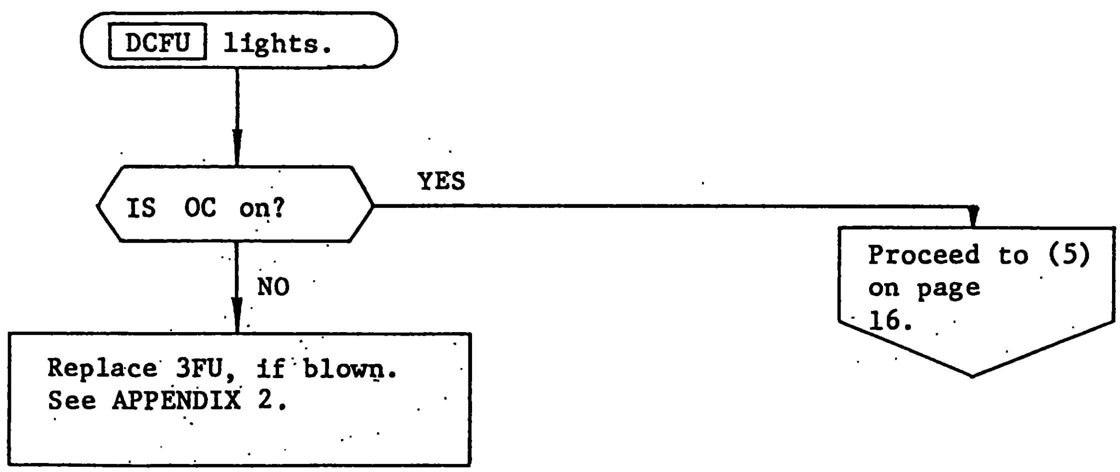


OC lights.
Does OC light again when RUNSB is opened and RESET button is depressed?
NO
Operation is OK.
YES
Does OC trip during deceleration?
YES
Proceed to ① of (4).
NO
Is inverter output circuit shorted?
YES
Correct wiring or replace motor, if shorted internally.
NO
Is power transistor OK? (See Table 29.)
NO
Replace faulty parts and eliminate cause of over-current.
YES
Is operation OK after replacing controller?
YES
Operation is OK.
NO
Replace base driver.

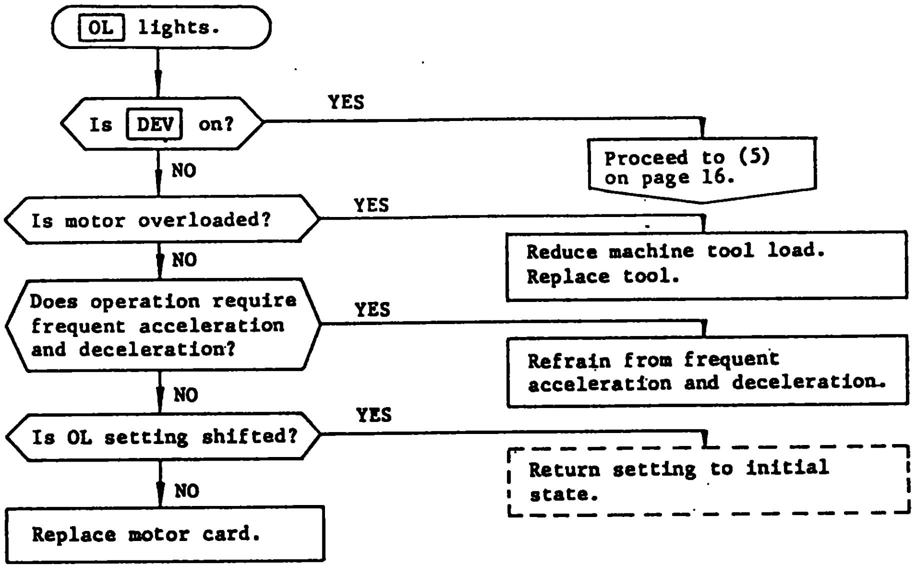
(6) ACFU lights.



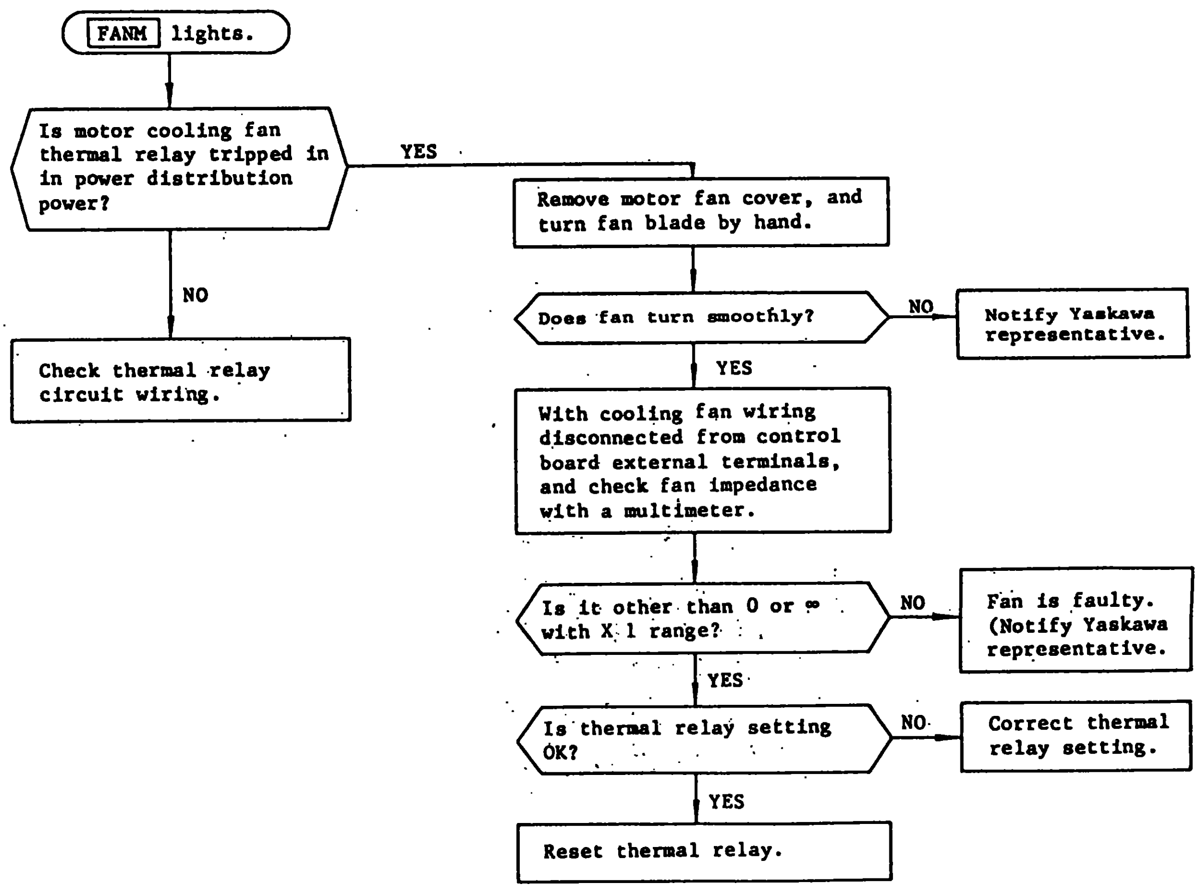
(7) DCFU lights.



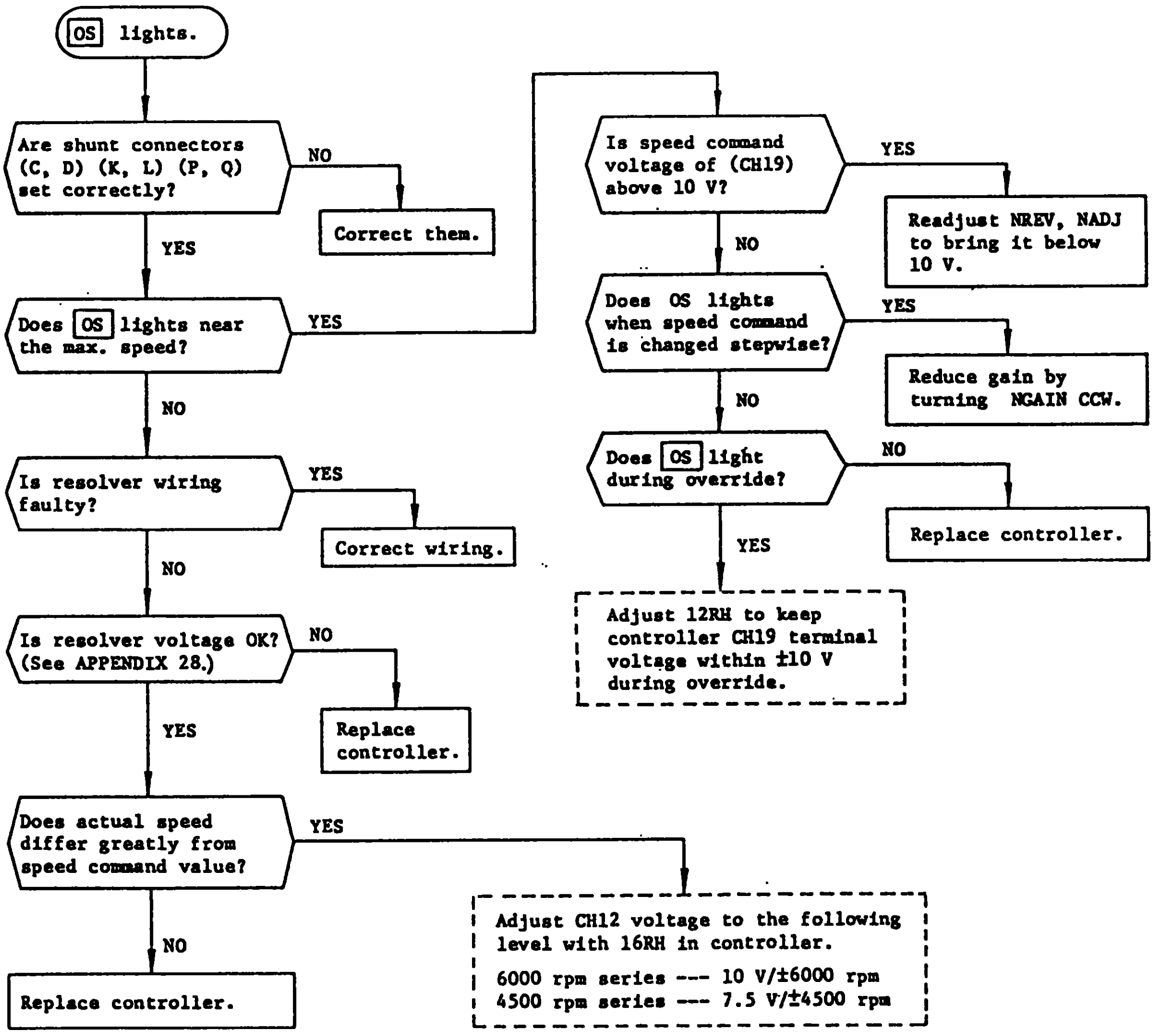
(8) OL lights.



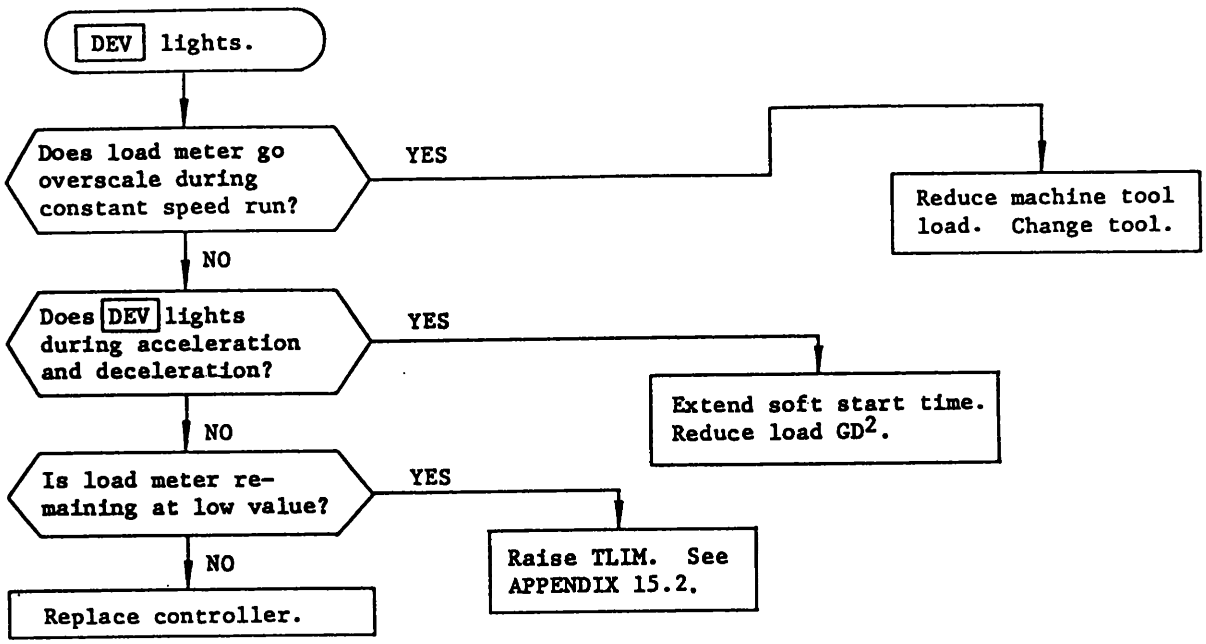
(9) FANM lights.



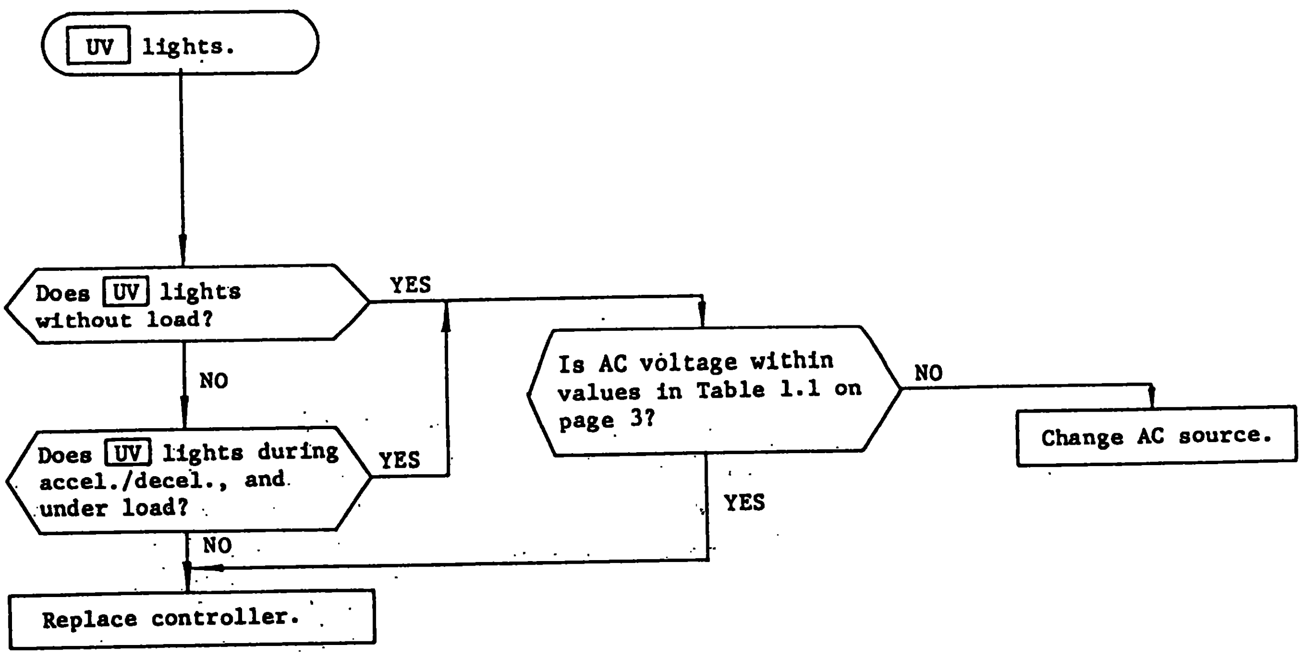
(10) OS lights.


OS lights.
Are shunt connectors (C, D) (K, L) (P, Q) set correctly?
NO
Correct them.
YES
Does OS lights near the max. speed?
YES
NO
Is resolver wiring faulty?
YES
Correct wiring.
NO
Is resolver voltage OK? (See APPENDIX 28.)
NO
Replace controller.
YES
Does actual speed differ greatly from speed command value?
YES
NO
Replace controller.
Is speed command voltage of (CH19) above 10 V?
YES
Readjust NREV, NADJ to bring it below 10 V.
NO
Does OS lights when speed command is changed stepwise?
YES
Reduce gain by turning NGAIN CCW.
NO
Does OS light during override?
NO
Replace controller.
YES
Adjust 12RH to keep controller CH19 terminal voltage within ±10 V during override.
Adjust CH12 voltage to the following level with 16RH in controller.
6000 rpm series --- 10 V/±6000 rpm
4500 rpm series --- 7.5 V/±4500 rpm

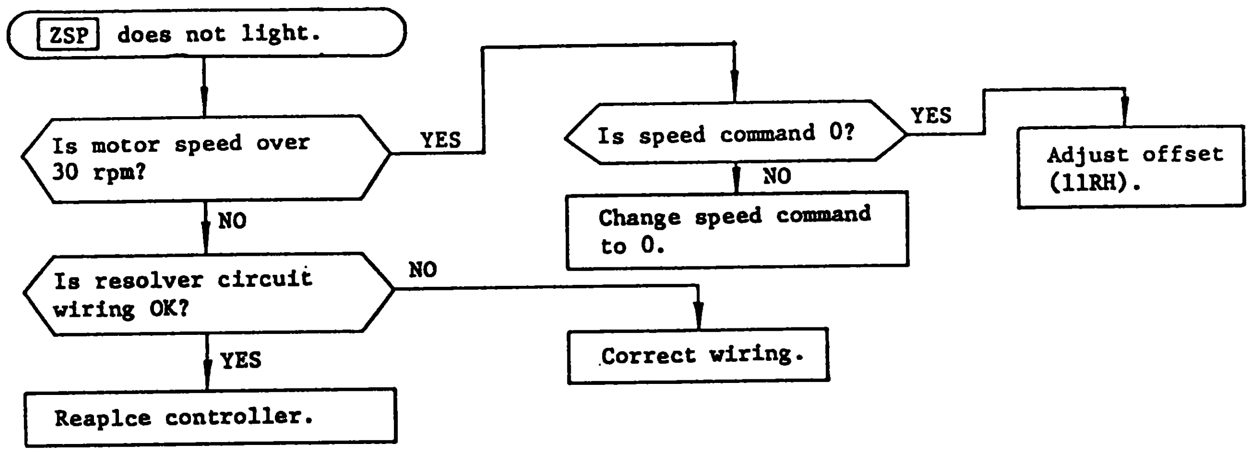
(11) UV lights.



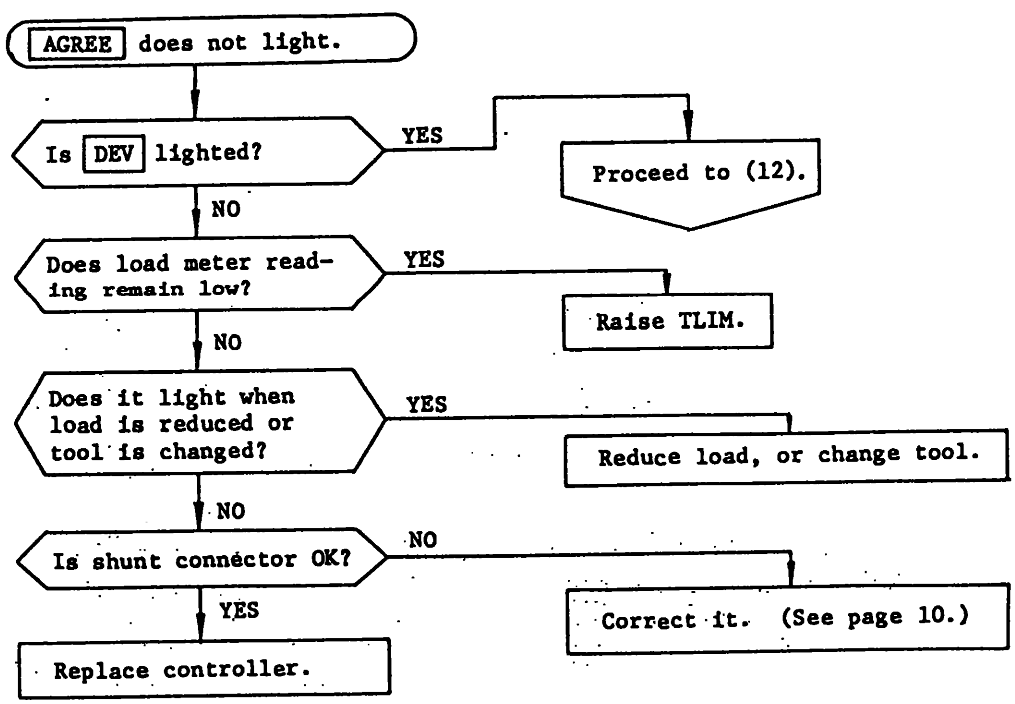
(12) DEV lights.



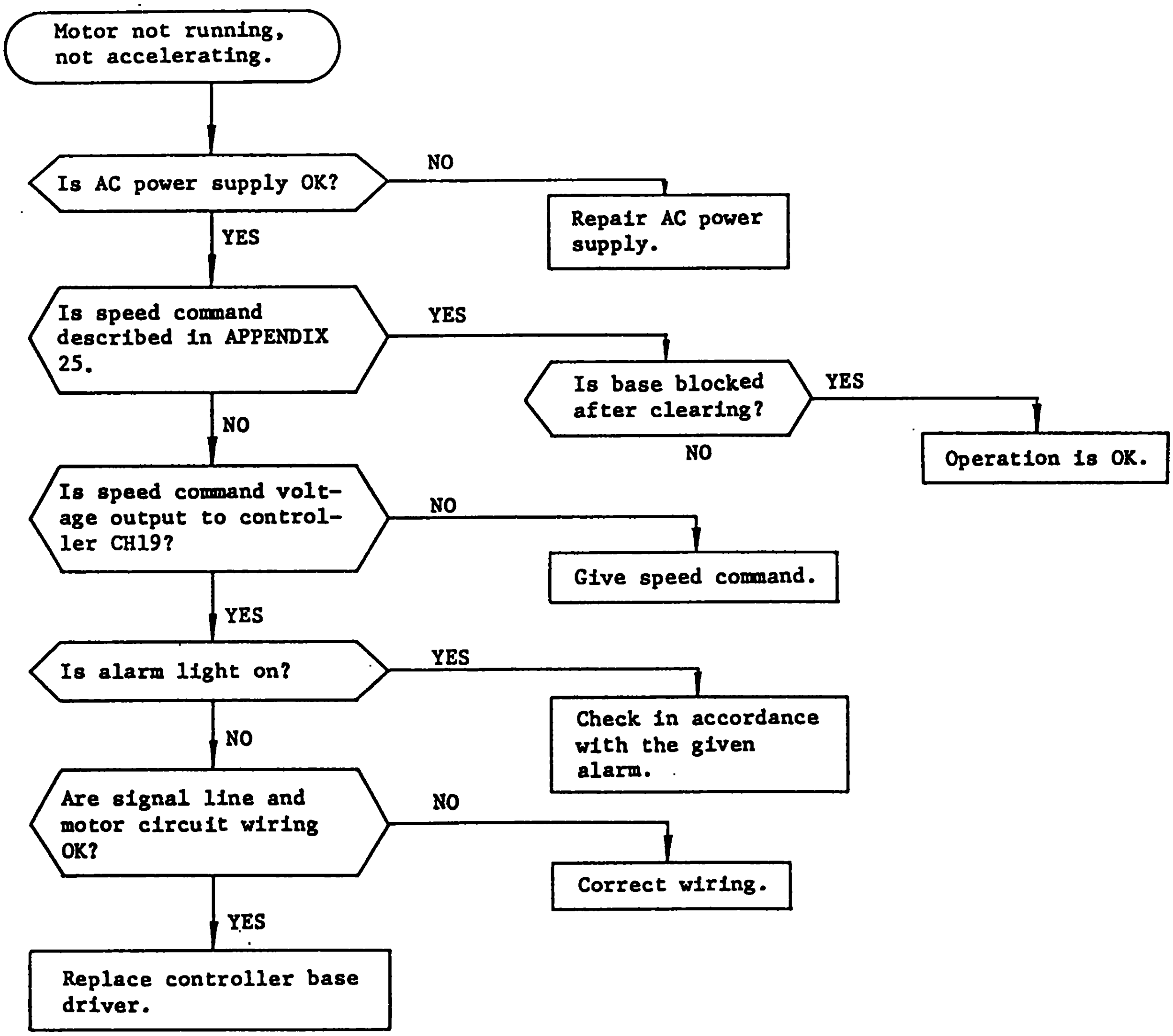
(13) ZSP does not light.



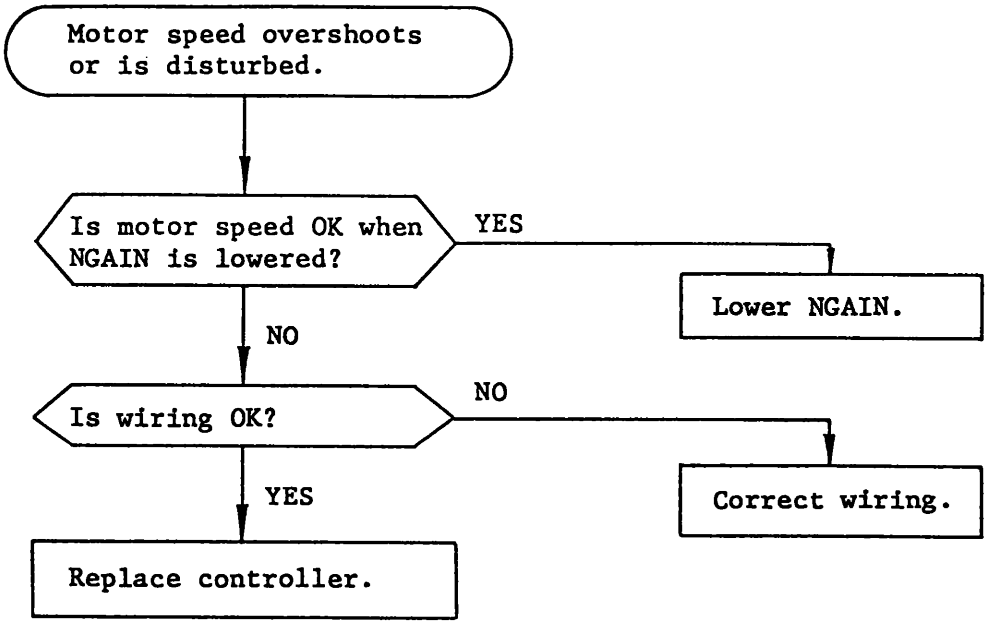
(14) AGREE does not light.



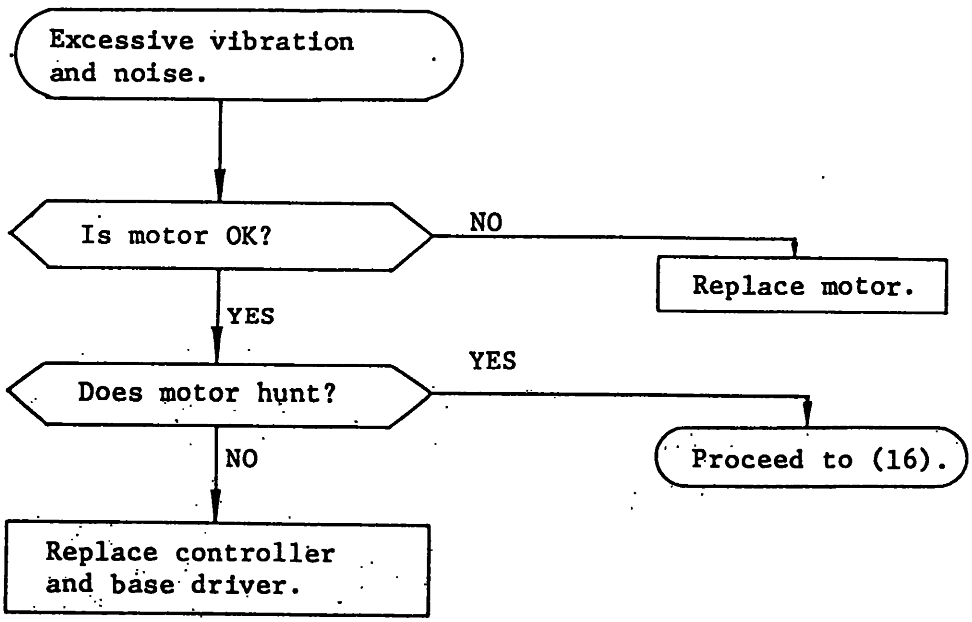
(15) Motor does not run, or does not accelerate.



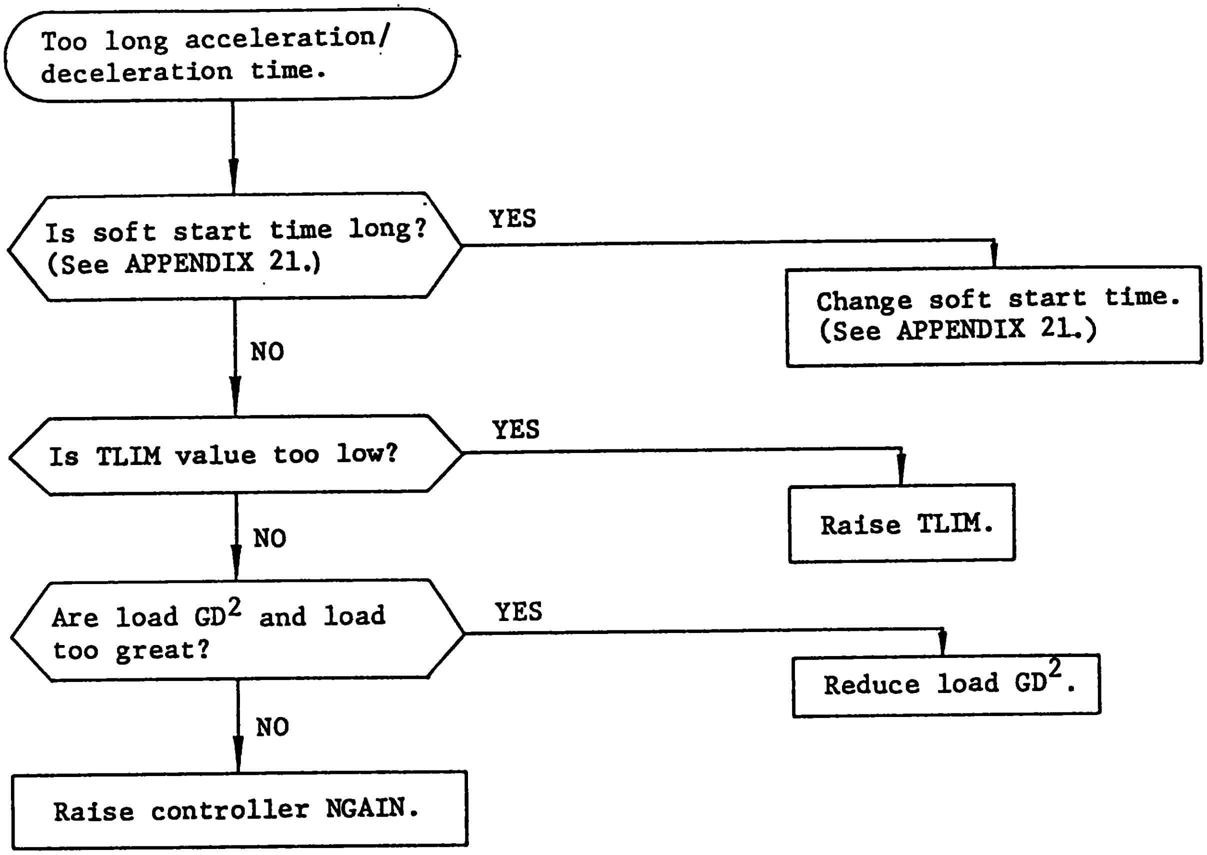
(16) Motor speed overshoots or is disturbed.



(17) Excessive vibration and noise while running



(18) Too long acceleration/deceleration time



5. ORIENTATION (MAGNETIC SENSOR SYSTEM)

5.1 OUTLINE

When the orientation card (JPAC-C063) and the spindle orientation detector (both options) are incorporated, the VS-626MTII is capable of controlling the angular position of the spindle. In this chapter, the adjustment and maintenance of the magnetic sensor type orientation system are described.

5.2 CONFIGURATION

Fig. 5.1 shows the configuration of the orientation system. Use the commercially available magneto and the magnetic sensors given in Table 5.1.

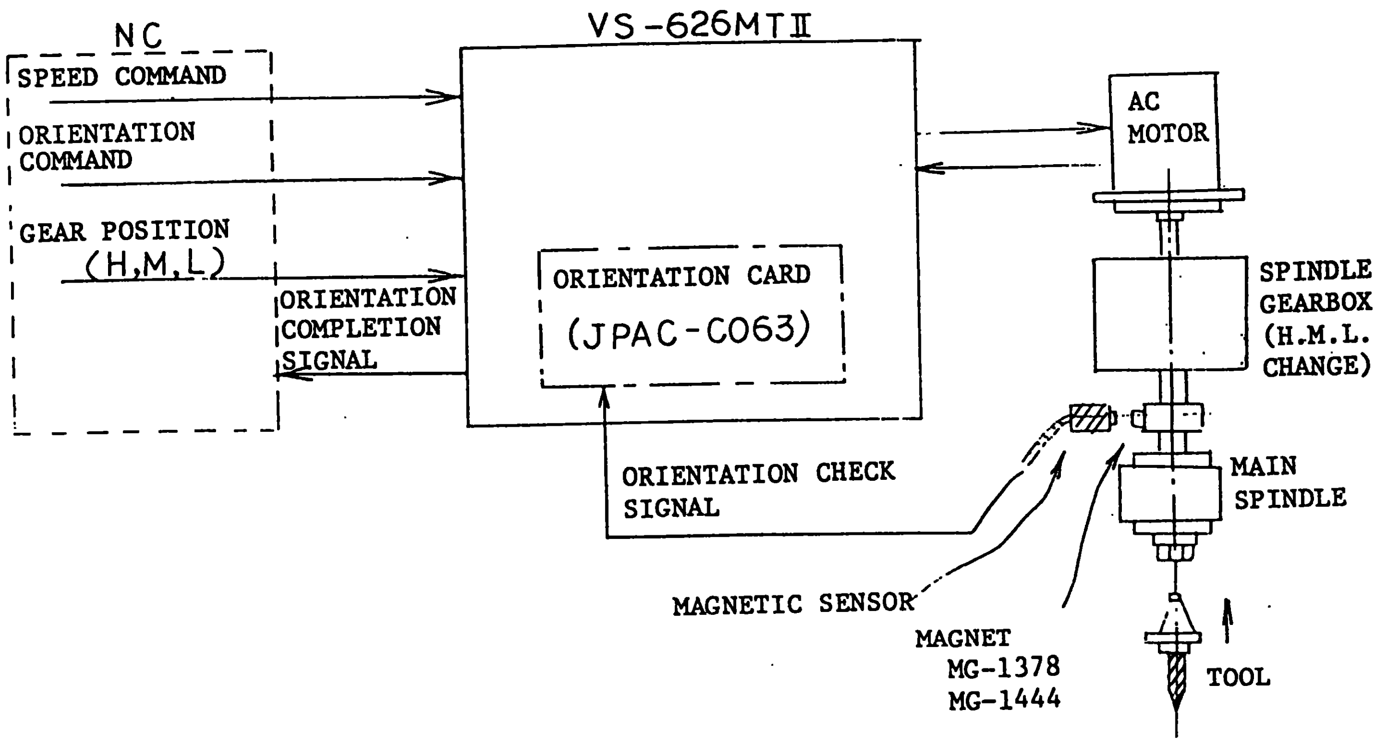


Fig. 5.1 Hardware Composition of Spindle Orientation System

Table 5.1 Magneto and Magnetic Sensor

Part Name	Type	Maker	Mounting Method
Magnet	MG-1378B MG-1378BS	Makome corporation	See APPENDIX 30 on page62
Magnet	MG-14444	Makome corporation	
Magnetic sensor	FSH-1378	Makome corporation	
Amplifier	FSD-1378	Makome corporation	
Magnetic sensor + amplifier	FS-200	Makome corporation	

5.3 FUNCTION OF POTENTIOMETERS AND SHUNT CONNECTOR

5.3.1 Adjustable Potentiometers

Table 5.2 shows the potentiometers. Adjust them when adjusting the orientation performance.

Table 5.2 Adjustable Potentiometers

Printed circuit board	Code	Description	Adjusting method and characteristics
Orien-tation card	LEVEL	Adjustment of magnetic sensor output detection level	APPENDIX 32 on page 64.
	BIAS	Adjustment of stop position	APPENDIX 33 on page 65.
	H-GAIN	Adjustment of loop gain at H gear	APPENDIX 34 on page 66.
	M-GAIN	Adjustment of loop gain at M gear	APPENDIX 34 on page 66.
	L-GAIN	Adjustment of loop gain at L gear	APPENDIX 34 on page 66.
	H-TIME	Adjustment of deceleration time from orientation speed to creep speed at H-gear	APPENDIX 35 on page 66.
	L-TIME	Adjustment of deceleration time from orientation speed to creep speed at L gear	APPENDIX 36 on page 67.
	M-SPD	Adjustment of orientation speed at M gear	APPENDIX 38 on page 68.

Table 5.2 Adjustable Potentiometers (Cont'd)

Printed circuit board	Code	Description	Adjusting method and characteristics
Orien-tation card	L-SPD	Adjustment of orientation speed at L gear	APPENDIX 37 on page 67.
	FLD	Adjustment of field weakening command during orientation	APPENDIX 39 on page 69.

5.3.2 Potentiometers Adjusted Before Shipment

Table 5.3 shows the potentiometers which are adjusted before shipment. Do not tamper with these potentiometers as their adjustment require special instruments.

Table 5.3 Potentiometers Adjusted Before Shipment

Printed circuit board	Code	Description	Standard setting value	Condition
Orien-tation card	F-OFS	Forward run offset adjustment	Orientation card CH6 voltage = 0 V	Magnetic sensor output = 0 V BIAS = 0 V
	R-OFS	Reverse run offset adjustment		

5.3.3 Selection of Shunt Connector Setting

Table 5.4 shows the selectable shunt connectors. Set them to the setting positions which are selected to suit to the specifications.

Table 5.4 Selectable Shunt Connector

Printed circuit board	Name	Description		Remarks
Orien-tation card	Run-test selection	TEST (Testing)	NORM (running)	
	Orientation speed selection	OR SPEED 1	Motor speed = 200 rpm	For selecting method, see APPENDIX 40 on page 70.
		OR SPEED 2	Motor speed = 300 rpm	
		OR SPEED 3	Motor speed = 400 rpm	

5.4 DISPLAY OF LED

Table 5.5 shows the information displayed by the LED lamps.

Table 5.5 Information Displayed by LED

Code	Color	Information
TEST MODE	Red	Keep lighting during test mode
LEVEL 1	Green	Lights when magnetic sensor output exceed set LEVEL 
LEVEL 2	Green	Lights when magnetic sensor output is below set LEVEL. 
CREEP	Green	Lights after running at creep speed for 200 ms, until LEVEL LED lights.
OR-END	Green	Lights when approx. 300 ms has lapsed after the entry of the spindle into INPOSITION FINE (for approx. ±100 μm).

Note: ±100 μm is measured on 120 mm dia. circumference.

5.5 OUTLINE OF OPERATION

5.5.1 Outline of Orientation Control

Fig. 5.2 shows the outline of orientation control system.

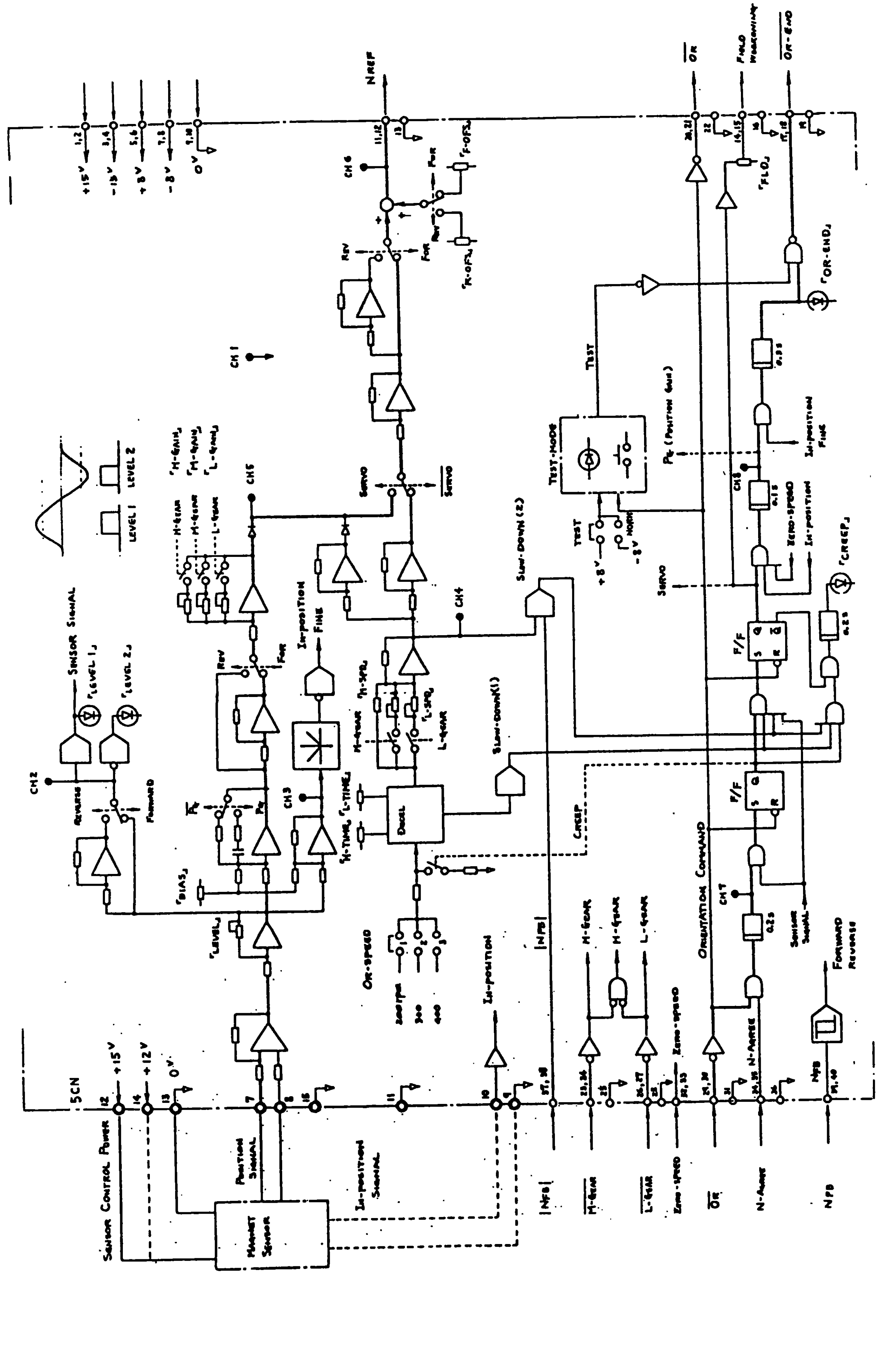

SENSOR SIGNAL
LEVEL 1
LEVEL 2
SERVO
TEST-MODE
TEST
ORIENTATION COMMAND
IN-POSITION
CREEP
DECEL
F/F
SLOW-DOWN (1)
SLOW-DOWN (2)
FORWARD
REVERSE
MAGNET SENSOR
POSITION SIGNAL
IN-POSITION SIGNAL
SENSOR CONTROL POWER
5CN
NREF
CH1
CH2
CH3
CH4
CH5
CH6
CH7
CH8
M-GEAR
L-GEAR
ZERO-SPEED
N-AGREE
OR-SPEED
IN-POSITION FINE
FIELD WEAKENING
OR-END
+15V
-15V
+8V
-8V
+12V
0V

Fig. 5.2

5.5.2 Outline of Orientation Operation

Fig. 5.3 shows a time chart of orientation process.

The orientation operation is performed in the following seuqence.

[WHEN NC GIVES ORIENTATION COMMAND]

(1) At an orientation command, the speed controller shifts from PI to P position, and the spindle is decelerated (accelerated) to the orientation speed.

(2) When the spindle speed becomes within ±15% of the orientation speed, a speed coincidence signal is generated, and then, in 100 ms, a"LEVEL 1"signal is outputted and the soft starter in the orientation card decelerates spindle speed to the creep speed.

(3) The spindle speed becomes lower than the creep speed, and 200 ms after, "CREEP" lamp is lighted to indicate the normal creep speed running condition.

(4) At a"LEVEL 1"signal, "CREEP"goes out, and the control enters the orientation control mode, simultaneously outputting a field weakening command.

(5) A zero speed signal is outputted near the stopping position, and in approximately 100 ms, the position gain is shifted from P to Pl.

(6) In 200 ms after the generation of an"INPOSITION FINE"signal, "OR-END"lights, and simultaneously, creep speed is cleared.

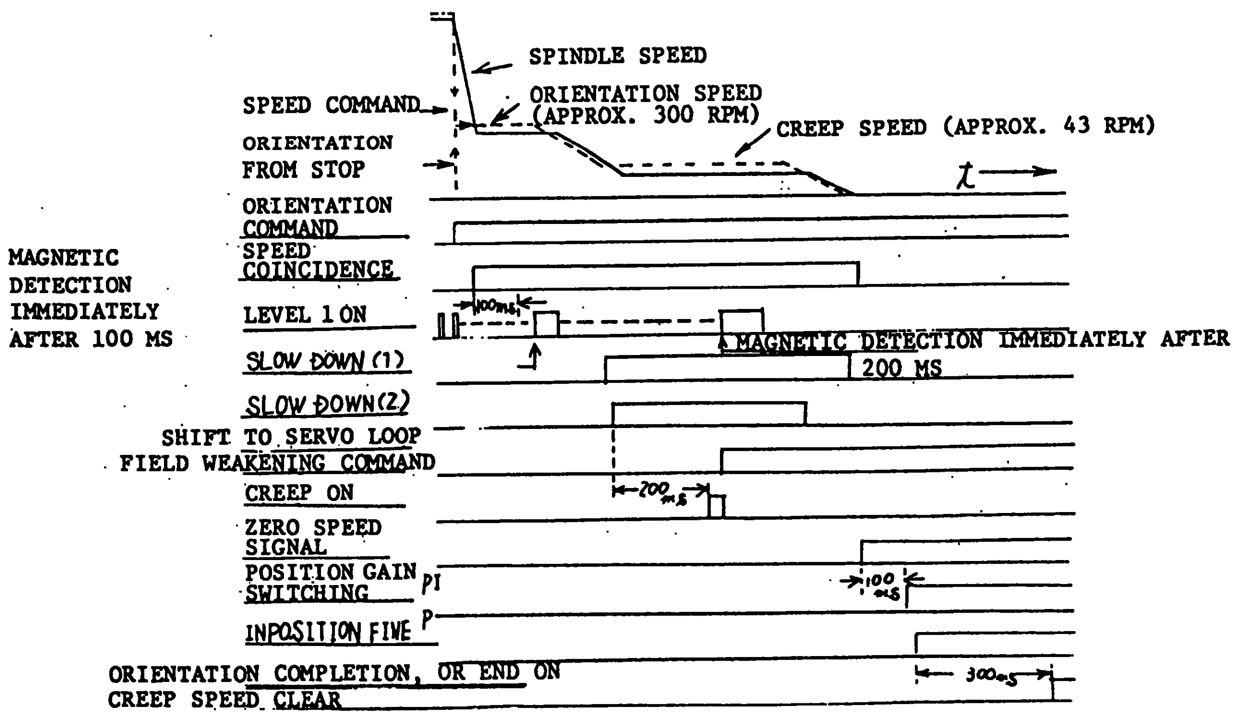


Fig. 5.3 Operation Time Chart

While OREND is on, the control is in the servo-clamp mode, and the speed remains within the IN POSITION FINE range even when external force is applied. If the speed goes out of this speed range, OREND goes out.

[TEST MODE]

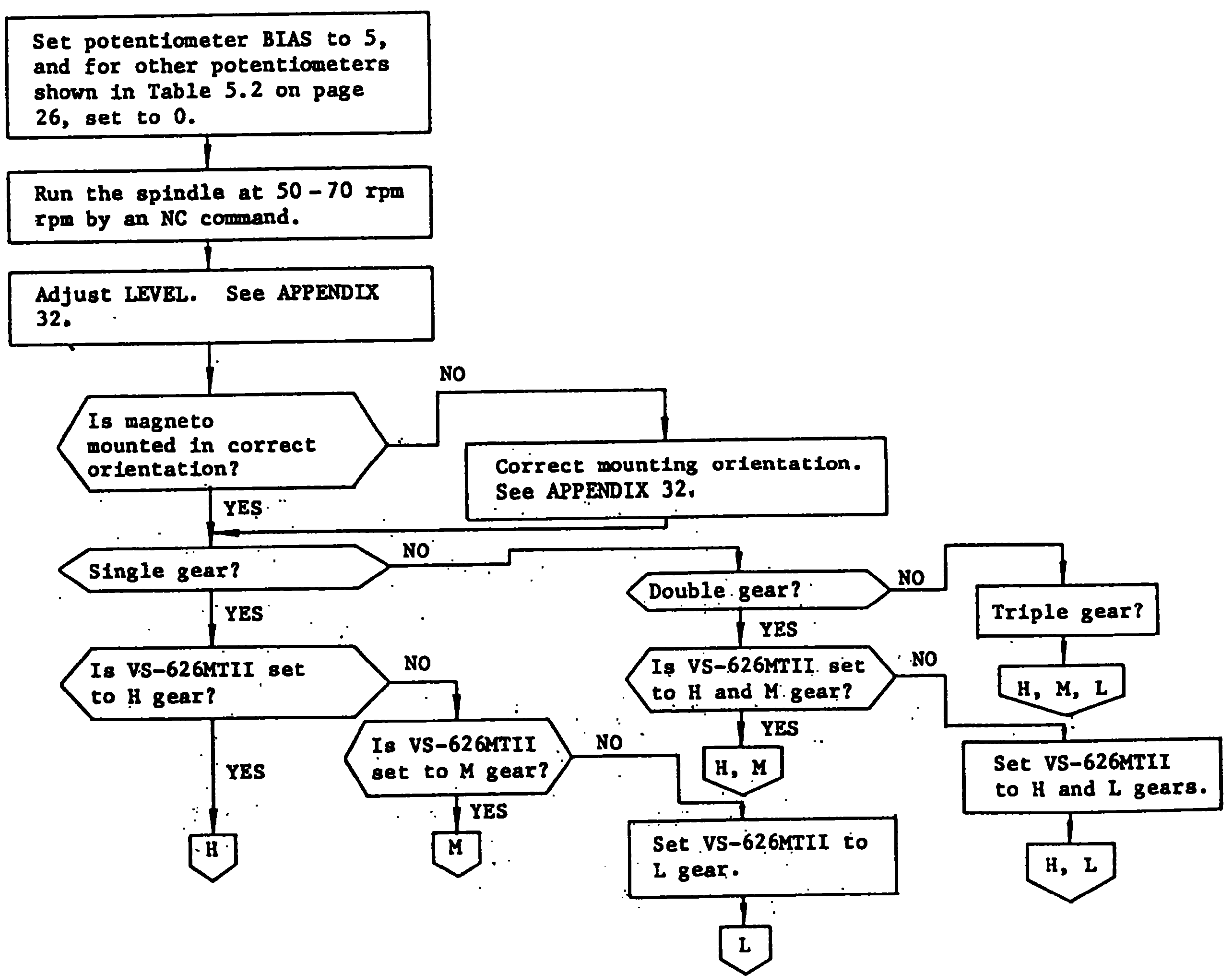
(1) At an orientation command from the NC, the spindle stops (zero speed).

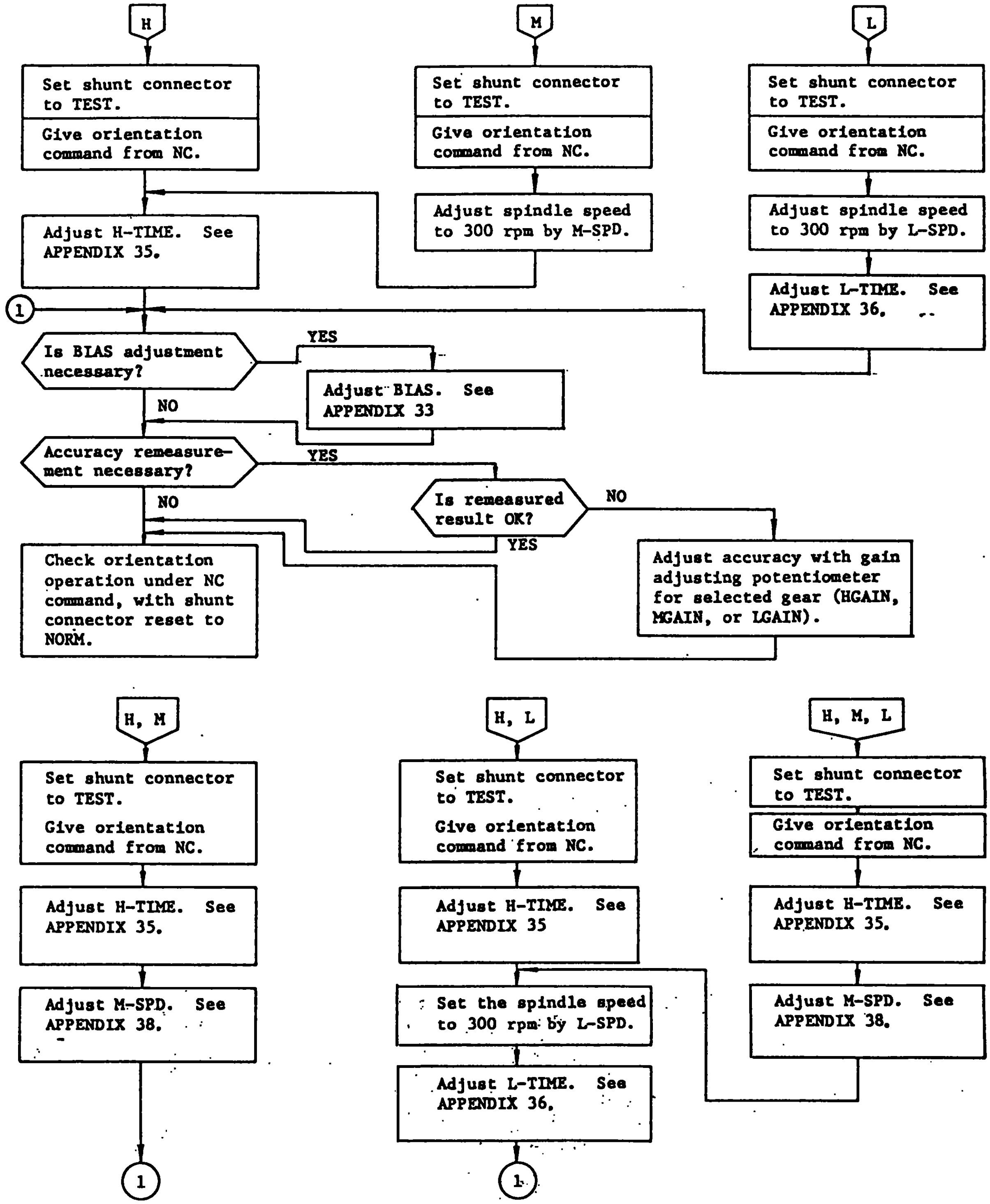
(2) When the TEST MODE button is pushed, the spindle starts to run at the orientation speed.

(3) When the button is released, the same operation as [WHEN NC GIVES ORIENTATION COMMAND] is performed.

5.6 ADJUSTMENT

Adjust the system in accordance with the flow chart below.

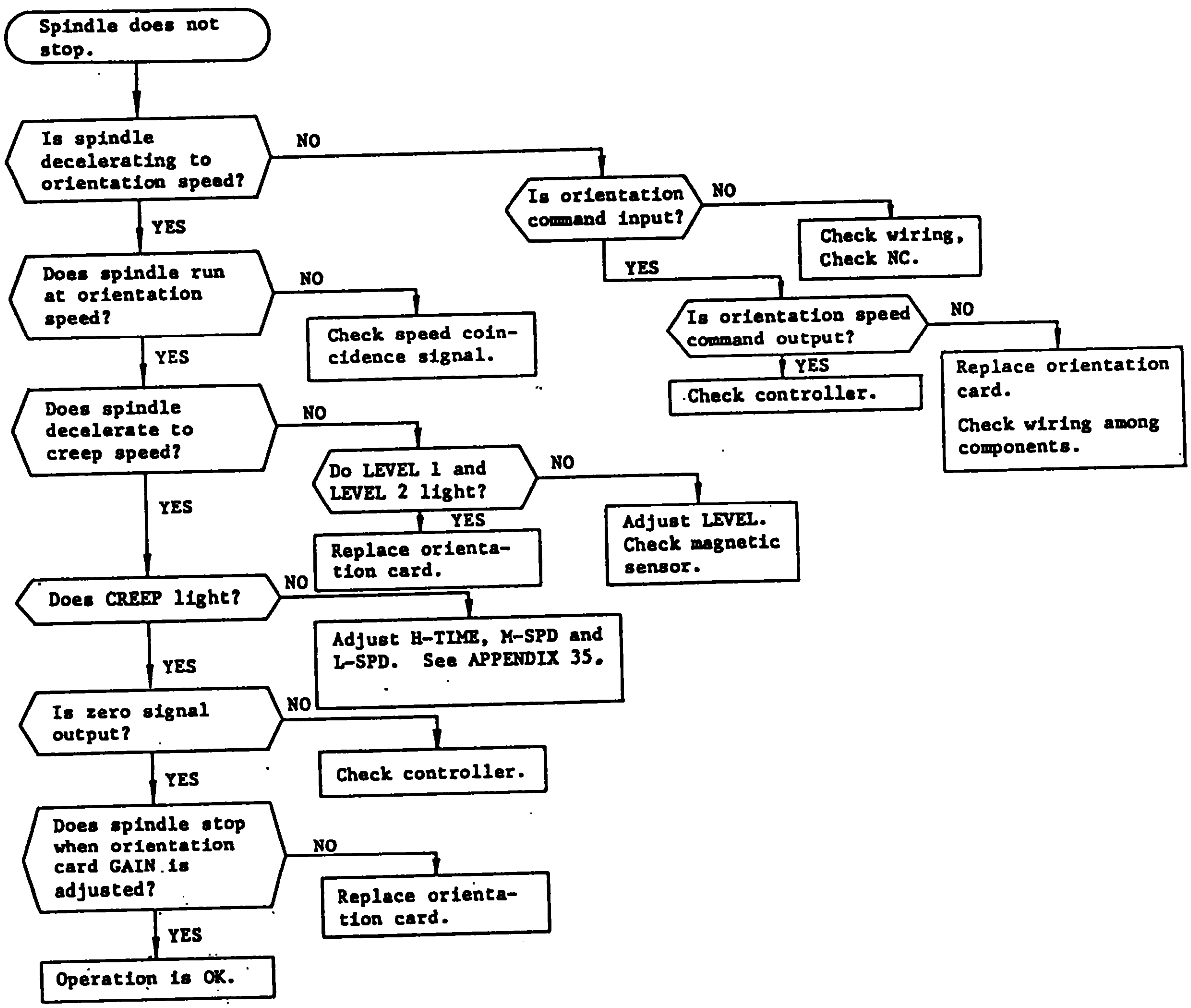



H
Set shunt connector to TEST.
Give orientation command from NC.
Adjust H-TIME. See APPENDIX 35.
M
Set shunt connector to TEST.
Give orientation command from NC.
Adjust spindle speed to 300 rpm by M-SPD.
L
Set shunt connector to TEST.
Give orientation command from NC.
Adjust spindle speed to 300 rpm by L-SPD.
Adjust L-TIME. See APPENDIX 36.
1
Is BIAS adjustment necessary?
YES
Adjust BIAS. See APPENDIX 33
NO
Accuracy remeasurement necessary?
YES
Is remeasured result OK?
NO
YES
Adjust accuracy with gain adjusting potentiometer for selected gear (HGAIN, MGAIN, or LGAIN).
NO
Check orientation operation under NC command, with shunt connector reset to NORM.
H, M
Set shunt connector to TEST.
Give orientation command from NC.
Adjust H-TIME. See APPENDIX 35.
Adjust M-SPD. See APPENDIX 38.
1
H, L
Set shunt connector to TEST.
Give orientation command from NC.
Adjust H-TIME. See APPENDIX 35
Set the spindle speed to 300 rpm by L-SPD.
Adjust L-TIME. See APPENDIX 36.
1
H, M, L
Set shunt connector to TEST.
Give orientation command from NC.
Adjust H-TIME. See APPENDIX 35.
Adjust M-SPD. See APPENDIX 38.

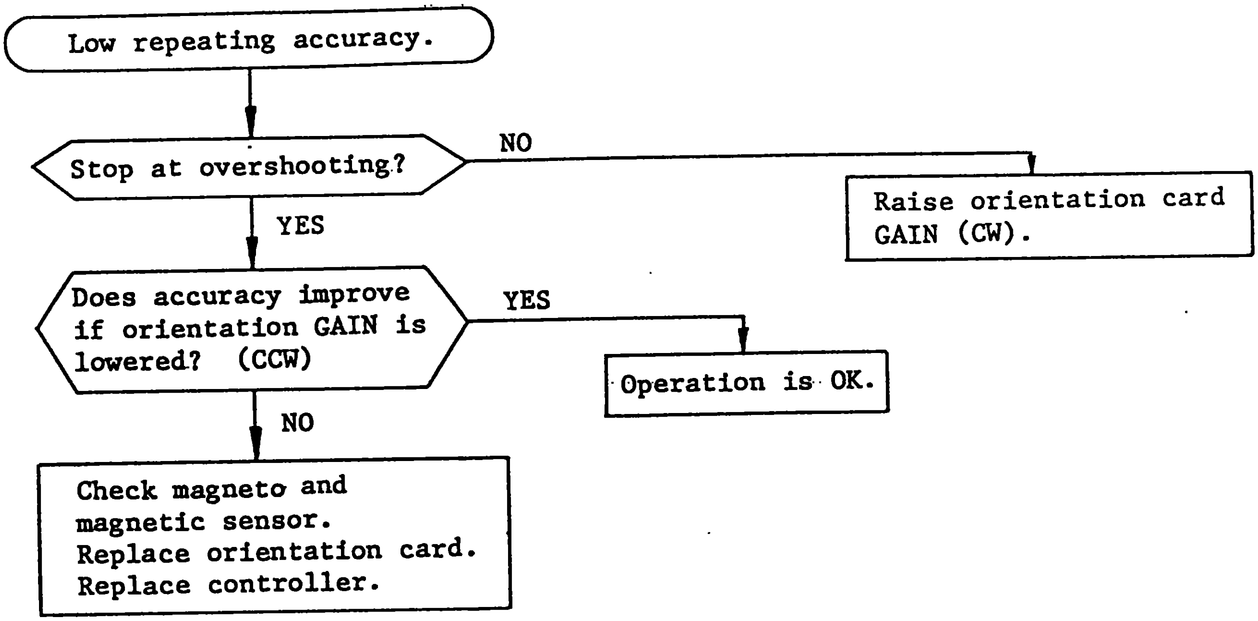
5.7 ORIENTATION TROUBLESHOOTING

Here, main troubles and their causes are described. Locate and remedy troubles in accordance with the following flow chart.

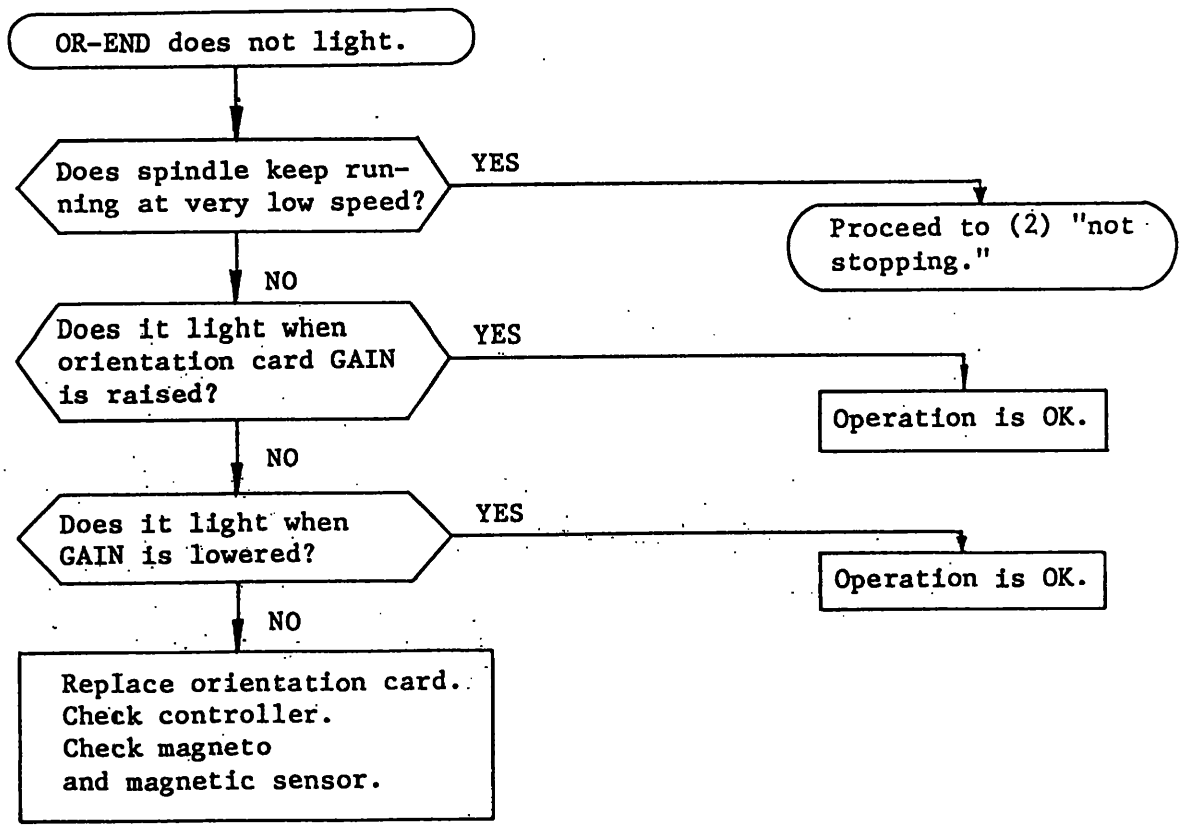
(1) Spindle does not stop.



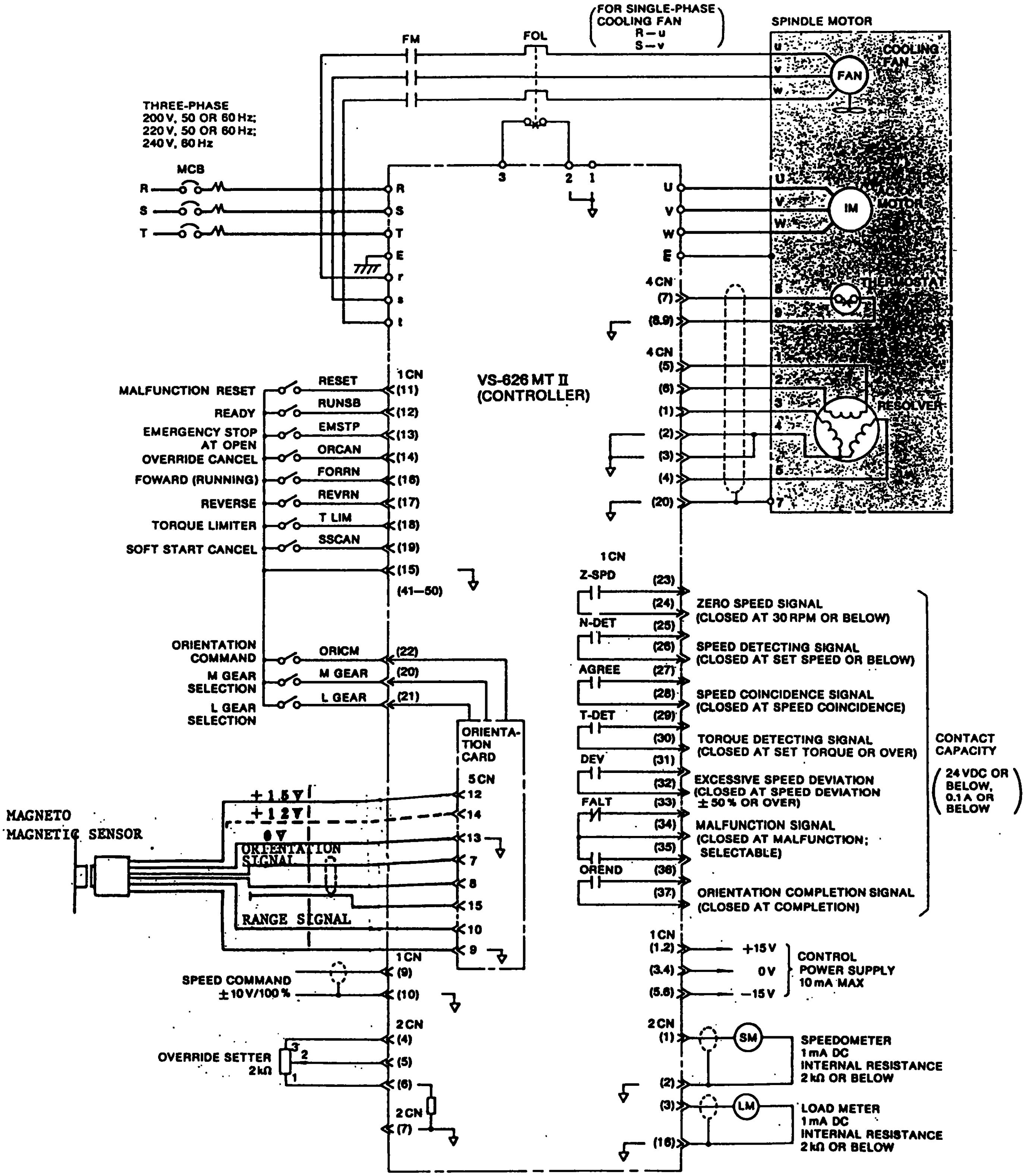
(2) Spindle stops, but repeating accuracy is low.

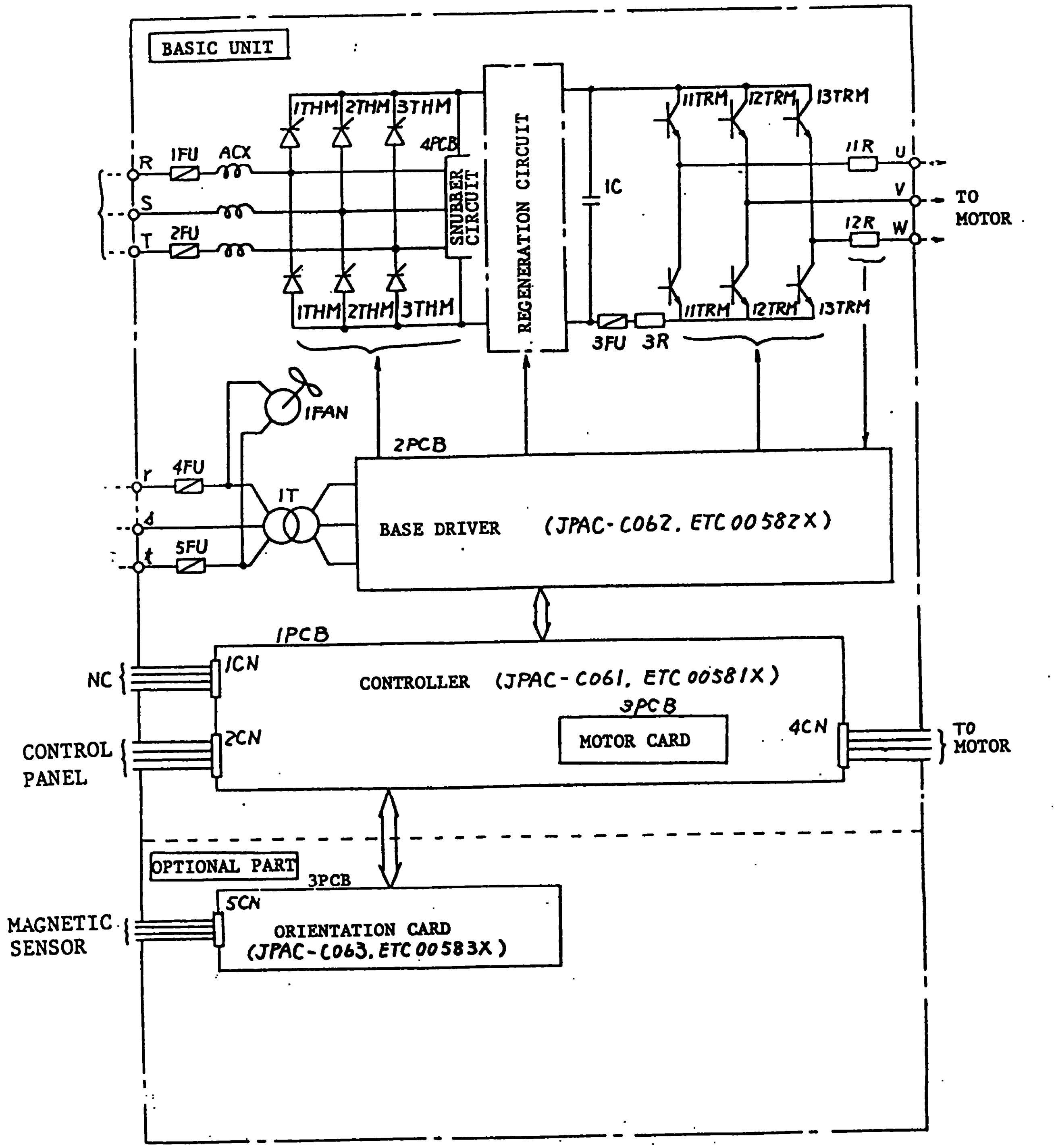


(3) "OR-END" does not light.

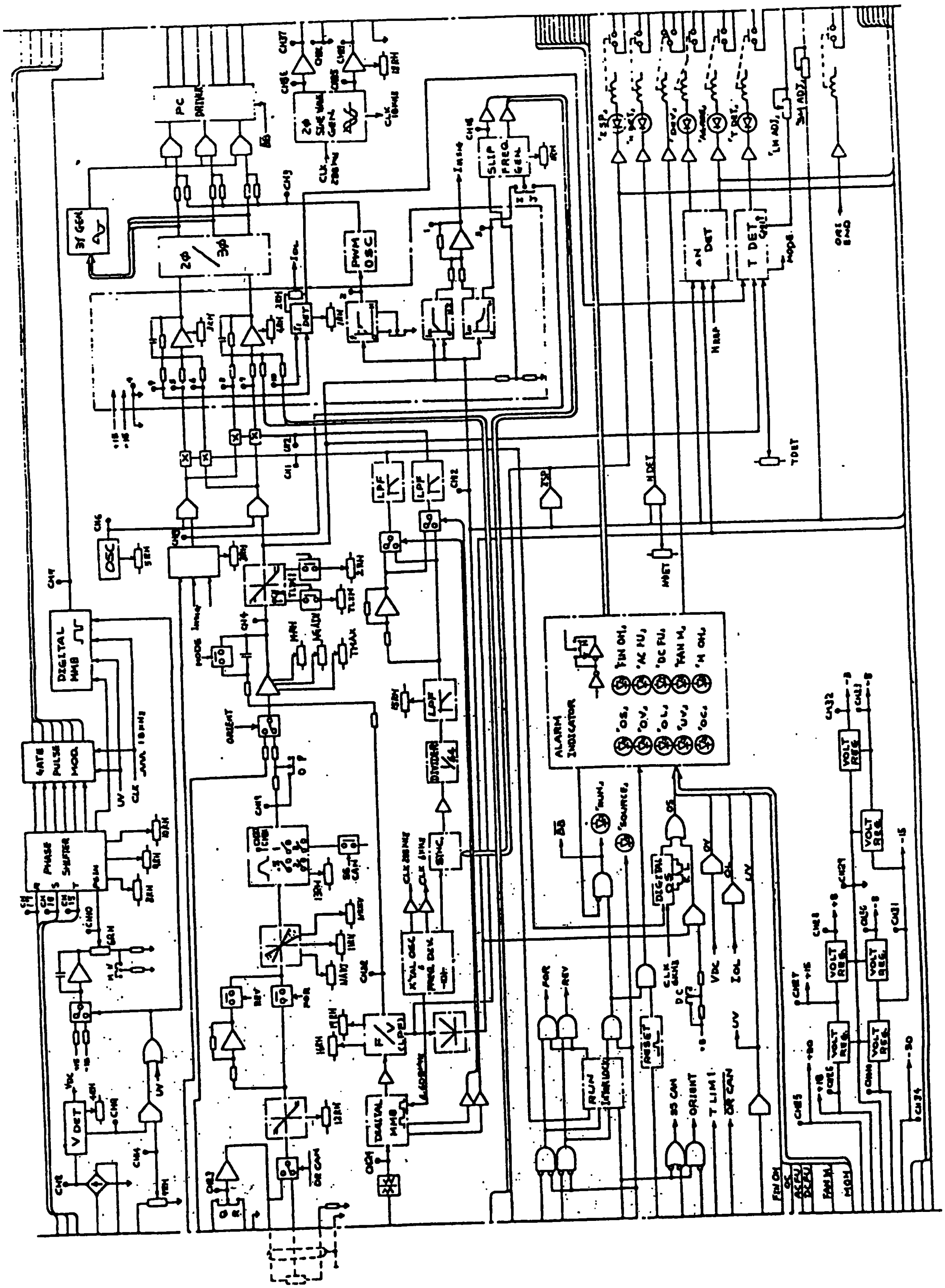


APPENDIX 1 COMPONENT INTERCONNECTION DIAGRAM




BASIC UNIT
R
S
T
1FU
2FU
ACX
1THM 2THM 3THM
4PCB
SNUBBER CIRCUIT
REGENERATION CIRCUIT
1C
3FU 3R
11TRM 12TRM 13TRM
11R
12R
U
V
W
TO MOTOR
1FAN
r
s
t
4FU
5FU
1T
2PCB
BASE DRIVER (JPAC-C062, ETC 00582X)
1PCB
NC
1CN
CONTROLLER (JPAC-C061, ETC 00581X)
3PCB
MOTOR CARD
CONTROL PANEL
2CN
4CN
TO MOTOR
OPTIONAL PART
3PCB
MAGNETIC SENSOR
5CN
ORIENTATION CARD
(JPAC-C063, ETC 00583X)

APPENDIX 3 VS-626MTII CONTROL SCHEMATIC DIAGRAM

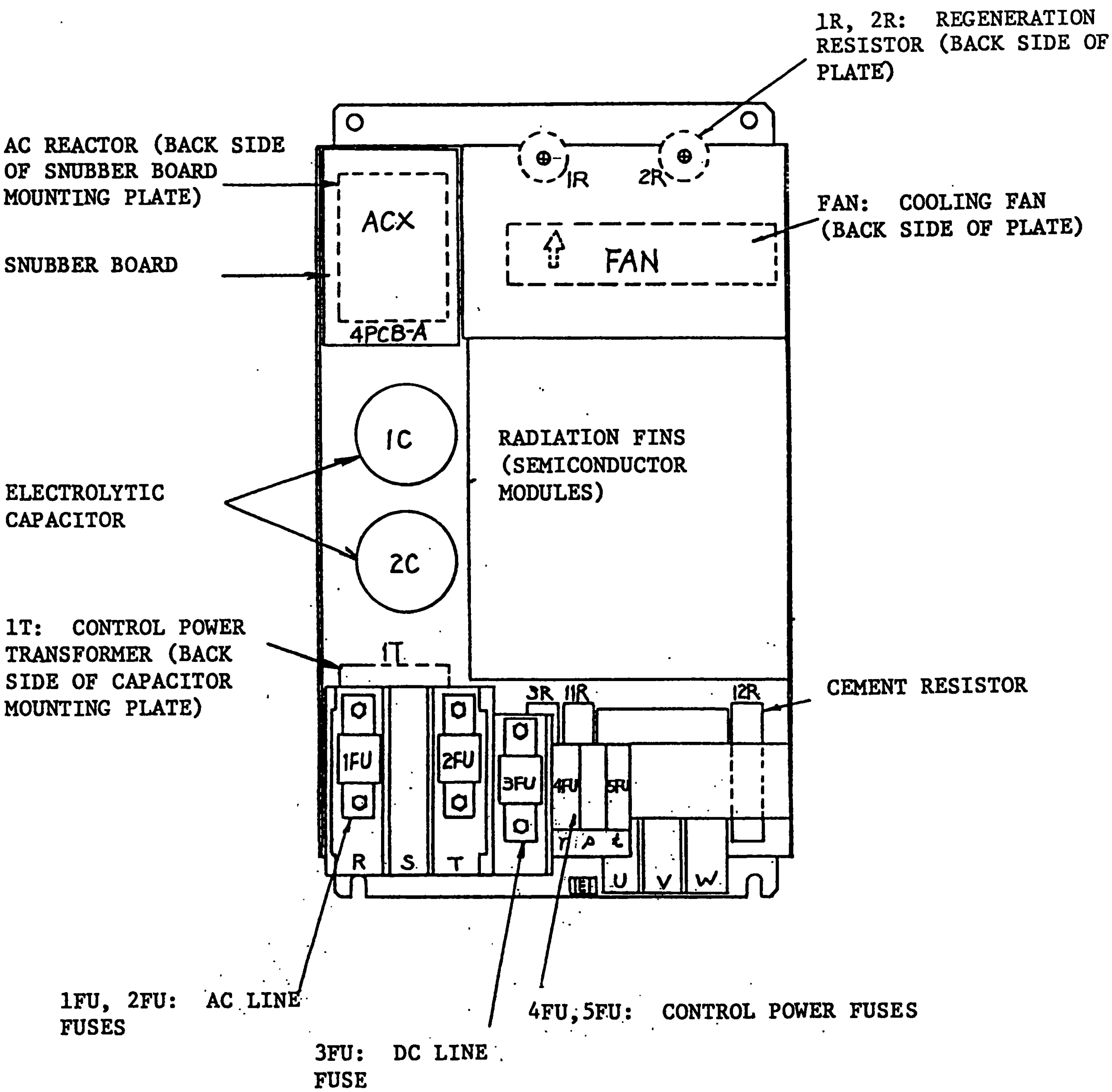


Parts \ Type	CIMR-MTII -5.5K, -7.5K	CIMR-MTII -11K	CIMR-MTII -15K	CIMR-MTII -18.5K	CIMR-MTII -22K
Transistor module (11 - 13TRM)	MG100G1AL2	EVK71-050			EVL31-050
	STR141	STR142			STR143
Transistor module (17, 27, 37TRM)	EVK71-050	EVL31-050	—	EVK71-050	
	STR142	STR143	—	SCR142	
Thyristor module (1 - 3THM)	TM55DZ-H			TM90DZ-H	
	SCR197			SCR198	
Diode module (11 - 22DM)	RM60C2Z-H				
	SID304				
Fuse (1FU, 2FU)	25SH75	25SH100		25SH150	
	FU696	FU697		FU699	
Fuse (3FU)	25SH75	25SH100	25SH125	25SH150	25SH200
	FU696	FU697	FU698	FU699	FU700
Fuse (4FU, 5FU)	F-7161				
	FU383				
Capacitor (1 - 4C)	PWM2A2W222A				
	C2615				
AC reactor (ACX)	UZBA-B	UZBA-B	UZBA-B	UZBA-B	UZBA-B
	X 2468	X 2469	X 2470	X 2471	X 2472
Resistor (1R, 2R)	—	—	—		—
	R 2378	R 2383	R 2382		R 2381
Resistor (3R)	40SHS	40SHS	40SHS		
	R 2386	R 2385	R 2384		
Resistor (11R, 12R)	40SHS	40SHS	40SHS		40SHS
	R 2388	R 2389	R 2388		R 2387
Surge absorber (1 - 3SA)	TNR-15G471K				
	XX139				
Control power transformer (1T)	ZBC-20				
	CPT5767				
Cooling fan (1FAN)	EP145E				
	FAN93				
Snubber card (4PCB)	—				
	ETX193X				
Controller (1PCB)	JPAC-C061				
	ETC581X				
Base driver (2PCB)	JPAC-C062				
	ETC582X				
Motor card* (3PCB)	—				
	—				

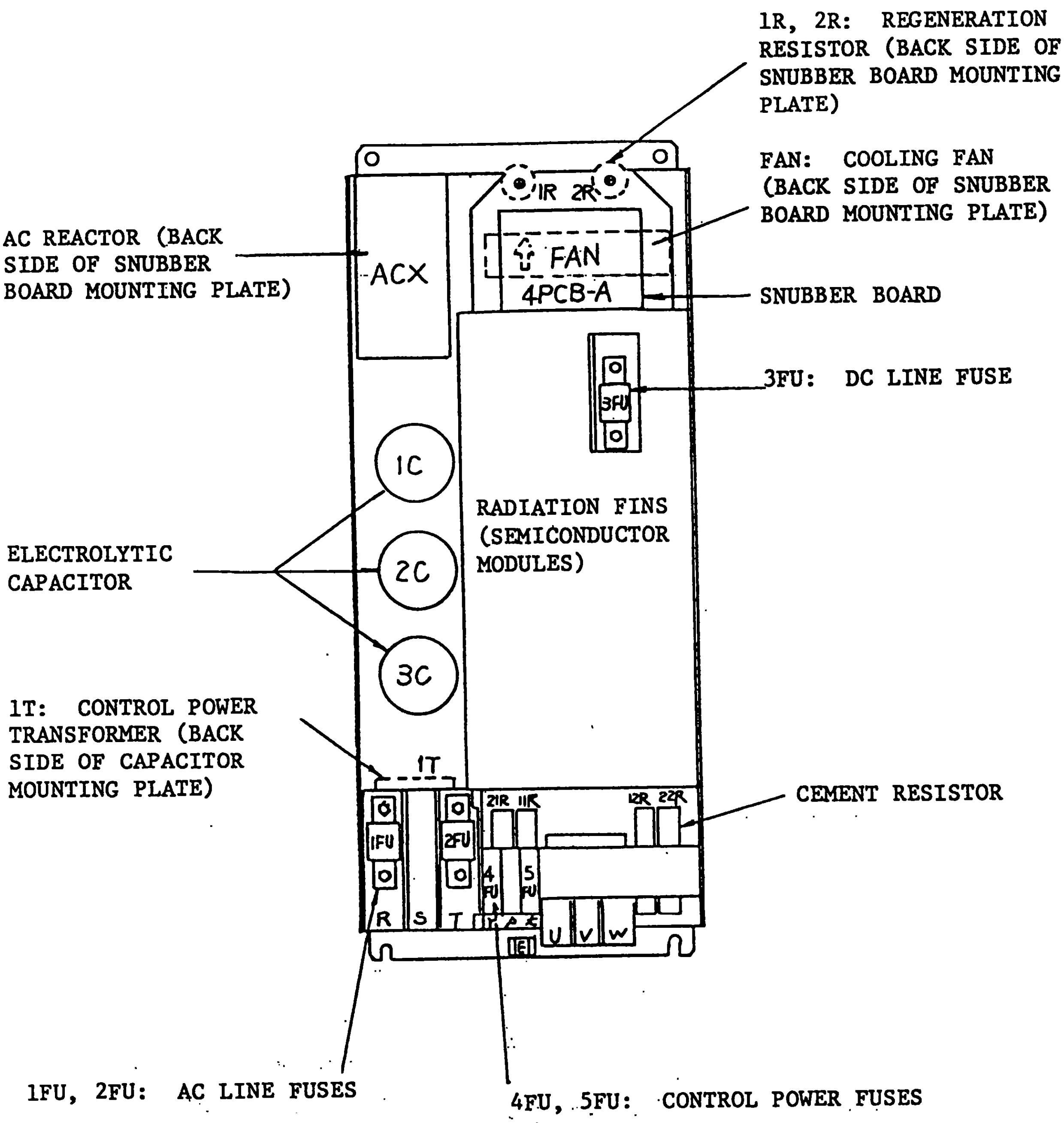
* Motor card varies with motor type and capacities. See Table 2.1 on page 7.

APPENDIX 5 UNIT LAYOUT

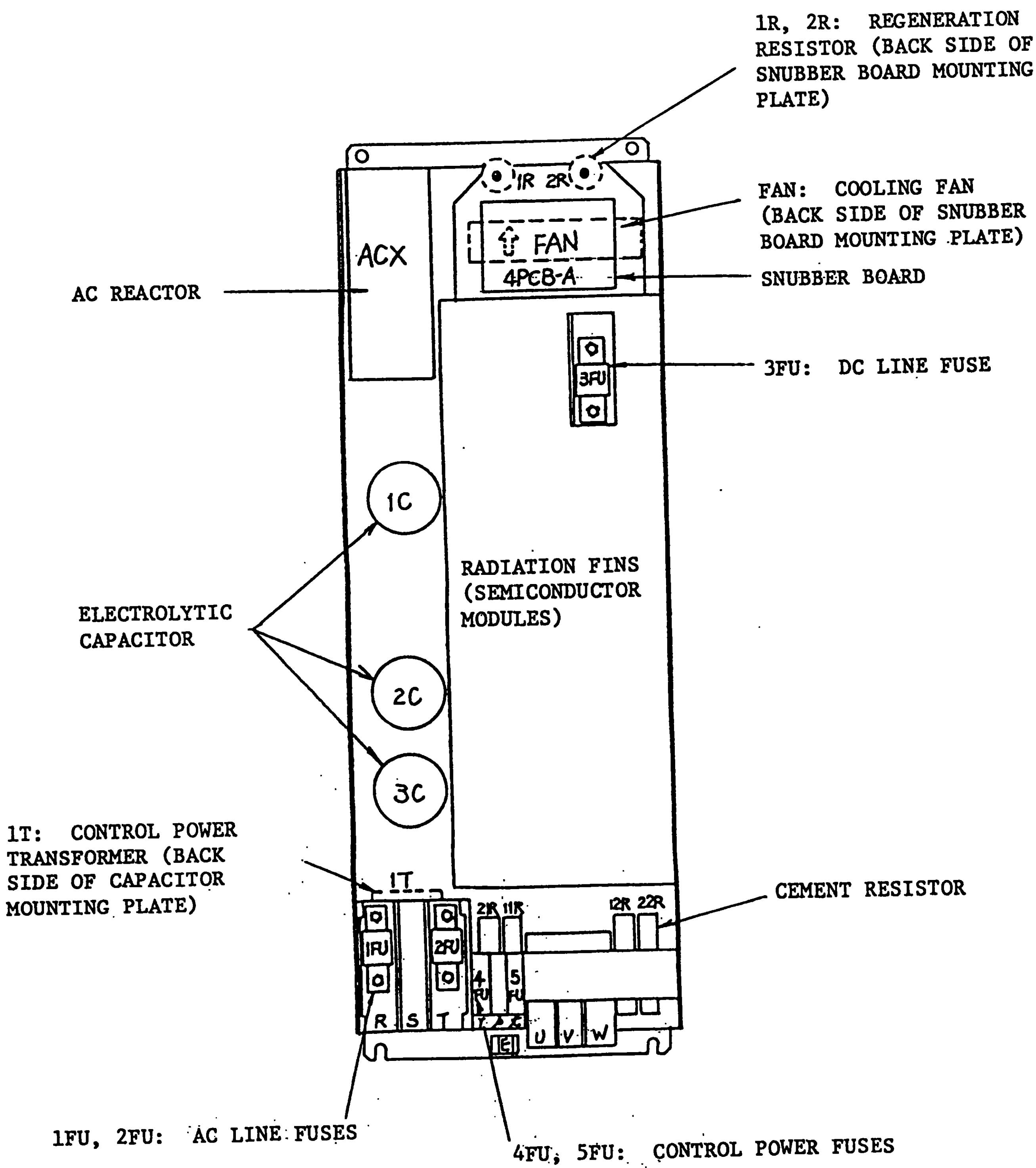
5-1) CIMR-MTII-7.5K



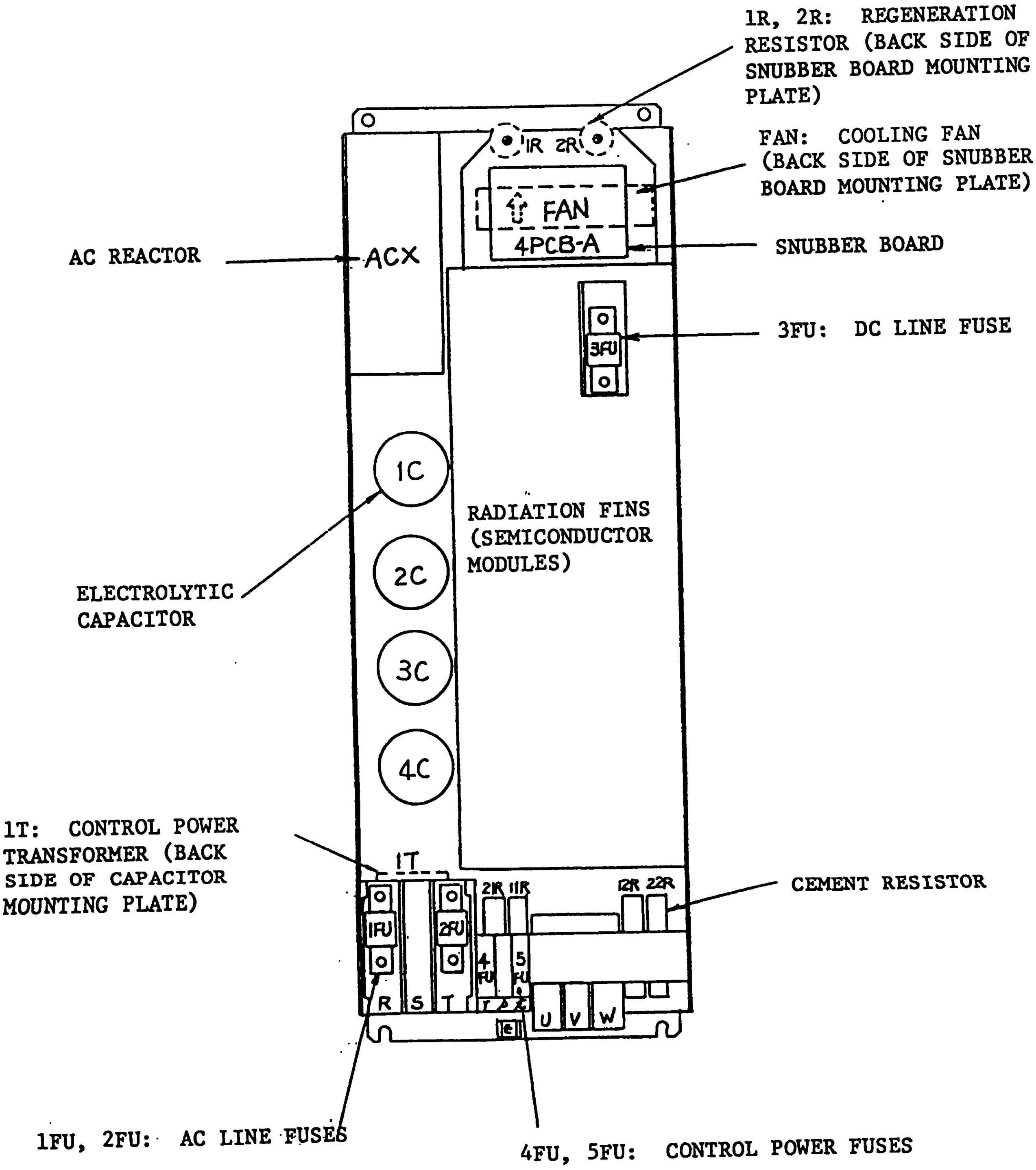
5-2) CIMR-MTII-11K



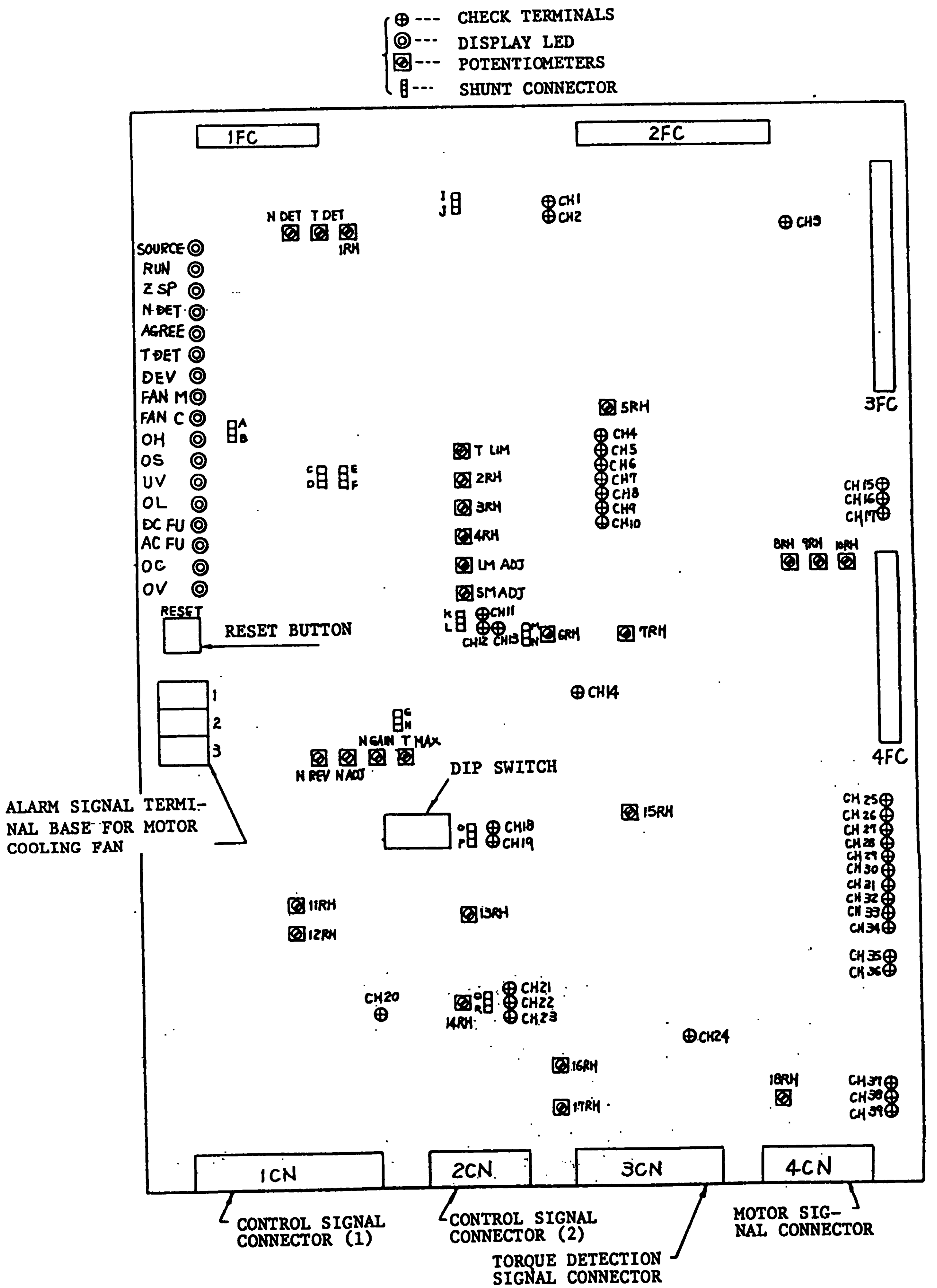
5-3) CIMR-MTII-15K



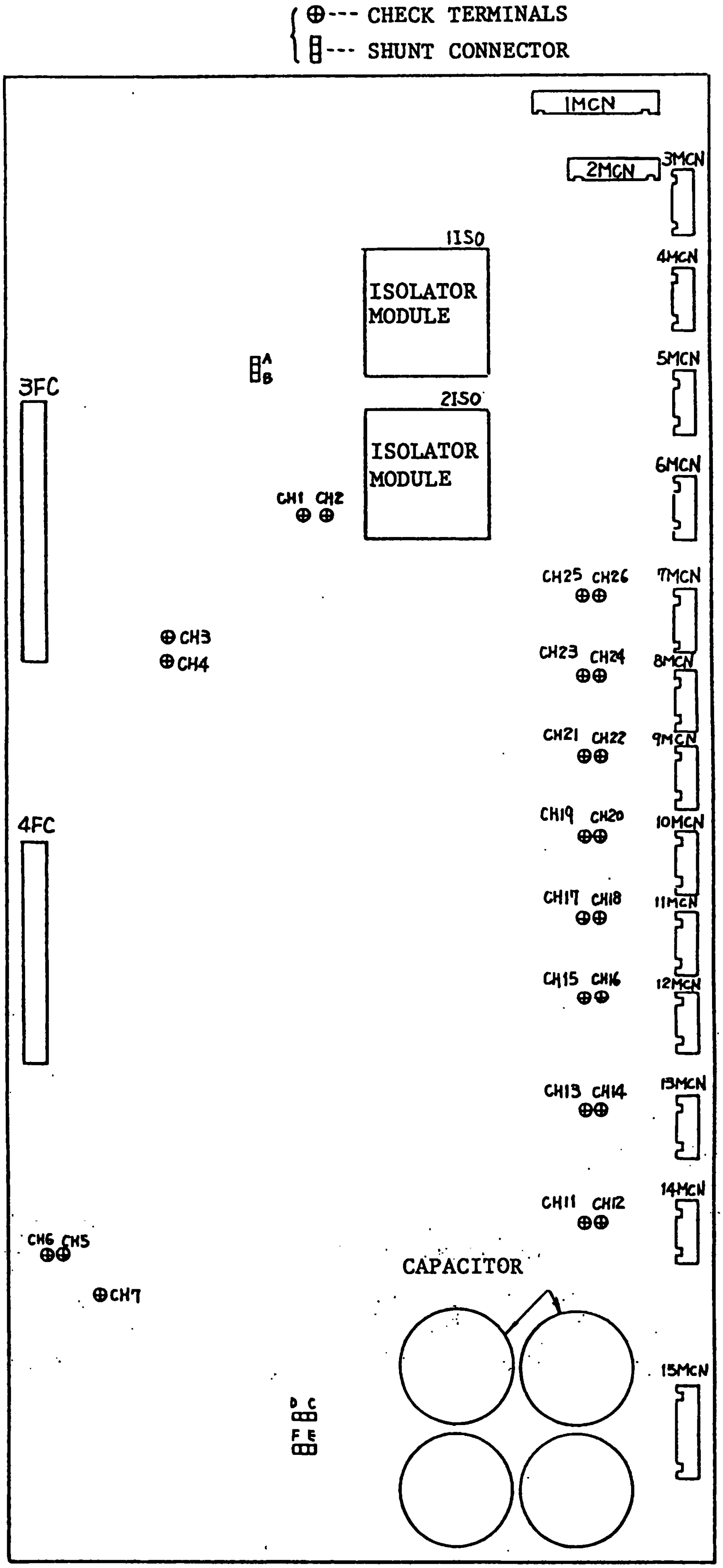
5-4) CIMR-MTII-18.5K, CIMR-MTII-22K



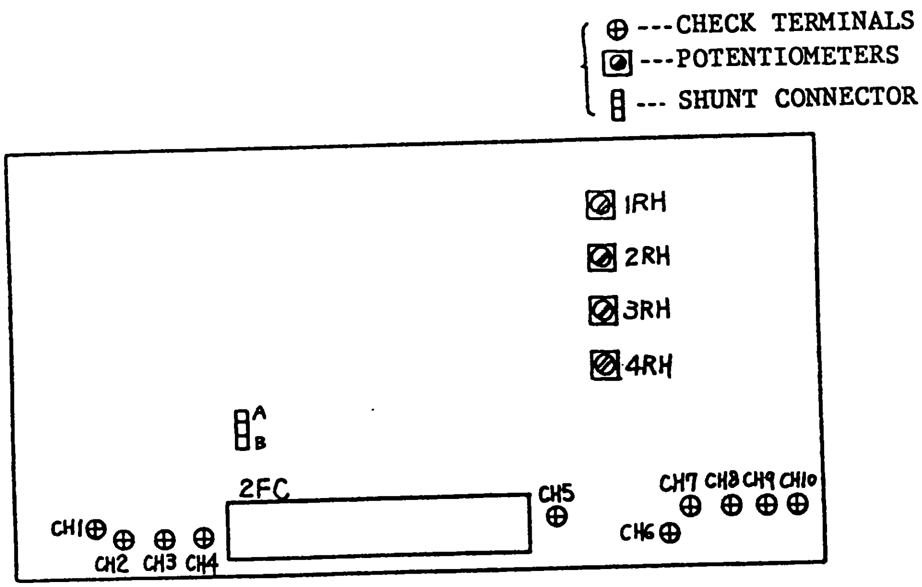
APPENDIX 6 CONTROL BOARD PARTS LAYOUT



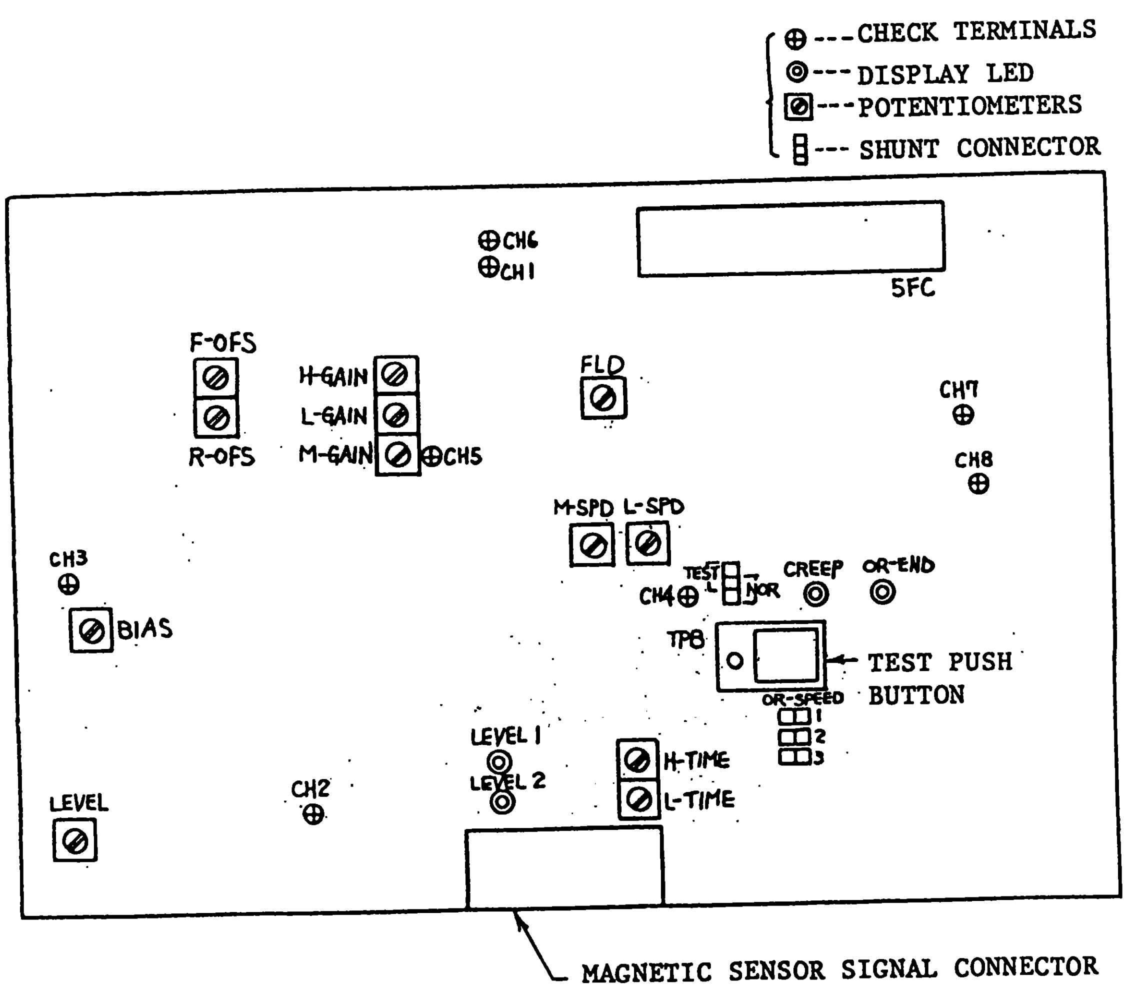
APPENDIX 7 BASE DRIVE BOARD PARTS LAYOUT



APPENDIX 8-1 MOTOR CARD BOARD PARTS LAYOUT



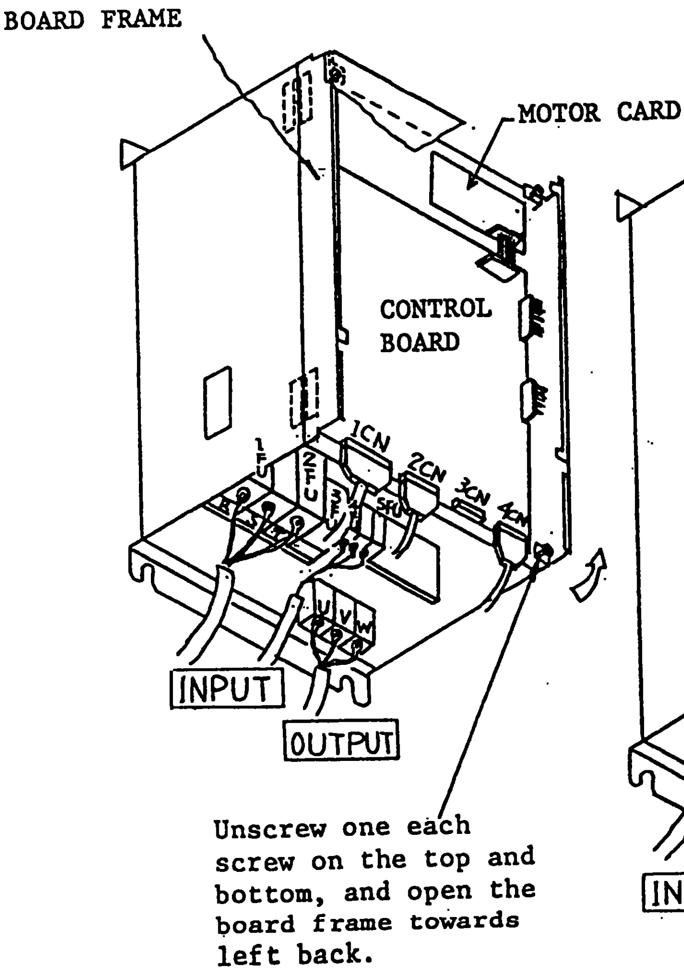
APPENDIX 8-2 ORIENTATION BOARD PARTS LAYOUT



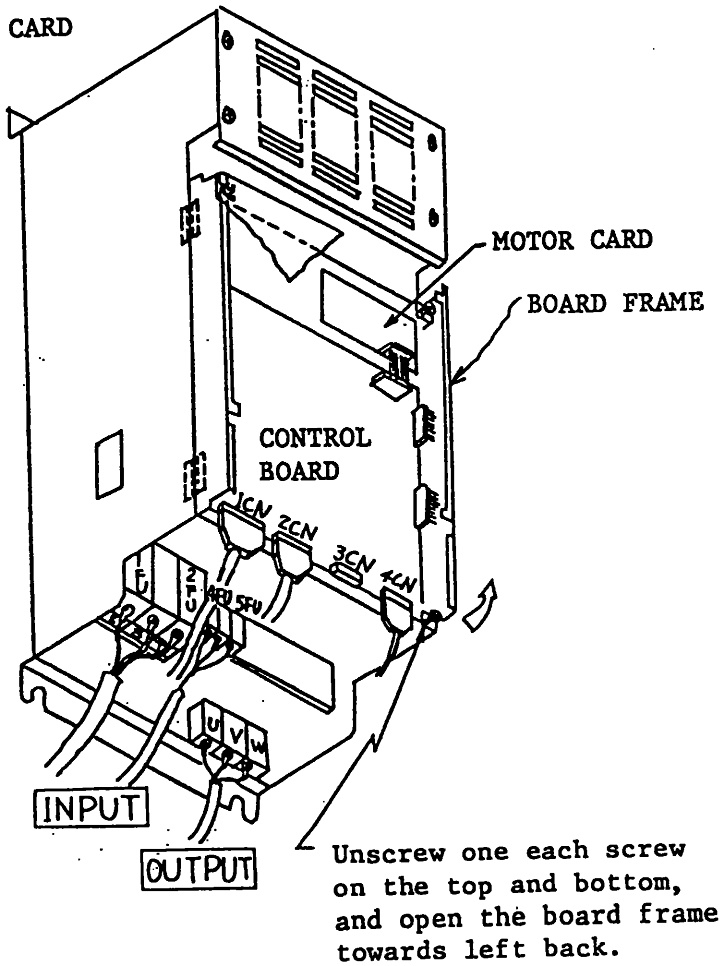
APPENDIX 9 FUSE REPLACEMENT PROCEDURE

To replace fuses 1FU, 2FU, 3FU, 4FU, and 5FU in the unit, the board frame of the unit must be opened, as shown below.

CIMR-MTII-7.5K



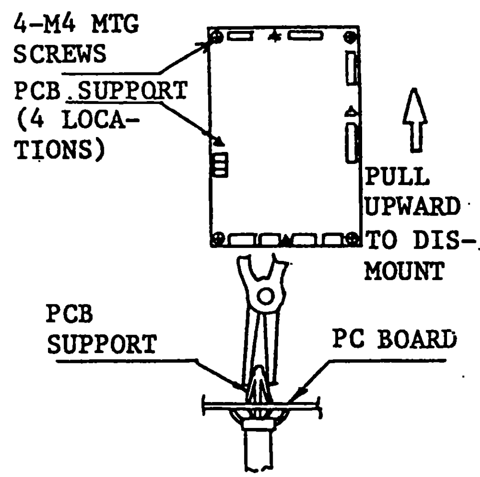
CIMR-MTII-11K CIMR-MTII-22K



APPENDIX 10 REPLACING CONTROL BOARD (PCB)

(1) Dismounting printed circuit board

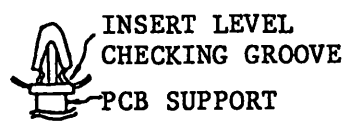
Procedures	Description
1	Turn off the power supply and disconnect the cable from the board.
2	Unscrew four screws mounting the printed circuit board (PCB), hold the heads of the four PCB supports with round-nose pliers, and remove the supports from the guide holes in the PCB.
3	Holding the PCB at the top and the bottom by hand, lift it and dismount it.



Note: Where the orientation board is mounted, dismount it by the orientation dismounting procedure (APPENDIX 13), and then, dismount the control board as described above.

(2) Remounting printed circuit board

Procedures	Description
1	Push the four PCB supports through the guide holes in the PCB until it comes fully to the checking groove in the supports.
2	Secure the PCB to the board frame with screws at 4 positions.
3	Connect the cables to the connectors.
4	Check the setting of the PCB, and start operation.



APPENDIX 11 REPLACING BASE DRIVE BOARD (The board is mounted on the reverse side of the board frame.)

(1) Dismounting board

Procedures	Description
1	Turn off the power supply and disconnect the cables from the board, by opening the board frame.
2	Dismount the board in the same way as for the control board.

(2) Remounting board

Remount the base drive board in the same way as with the control board.

APPENDIX 12 REPLACING MOTOR CARD BOARD

(1) Dismounting board

Procedures	Description
1	Turn off the power supply, and disconnect the cables (flat cables) from the board.
2	Holding the heads of the four PCB supports with a suitable tool such as round nose pliers, remove the supports from the guide holes in the board, and dismount the board.

(2) Remounting board

Procedures	Description
1	Insert the PCB supports through the guide holes in the board. Insert them to the same depth as for APPENDIX 10, (2), procedure 1.
2	Reconnect the cables to the connectors.
3	Check the setting of the board, and start operation.

APPENDIX 13 REPLACING ORIENTATION BOARD

(1) Dismounting board

Procedures	Description
1	Turn off the power supply, and disconnect the cables from the board.
2	Unscrew the five mounting screws.

(2) Remounting board

Remount the board by reversing the dismounting procedure (1), check the setting, and start operation.

APPENDIX 14 ADJUSTING NGAIN

ADJUSTMENT OBJECTIVE: Adjusting loop gain of speed control system

ADJUSTMENT PROCEDURE: The more the setting is brought near the 0 graduation, the lower and stabler the gain becomes, but the slower becomes response. The nearer the setting is adjusted, the quicker becomes response, but larger becomes speed overshooting.
Adjust it to the optimum gain taking into consideration of the load conditions.

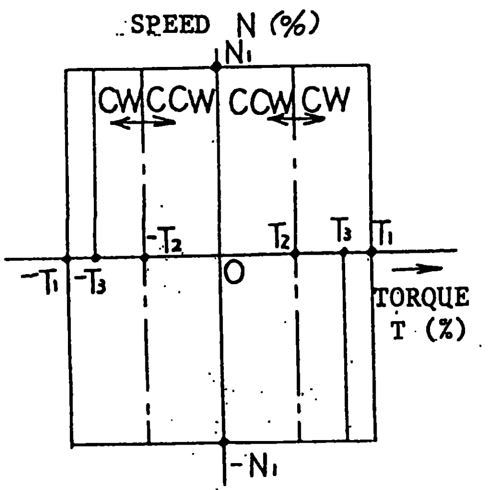
ADJUSTMENT BEFORE SHIPMENT: Graduation 5

APPENDIX 15 ADJUSTING TLIM

ADJUSTMENT OBJECTIVE: Adjusting maximum torque of motor

In this case, the motor operates at the lowest torque among max. torque limit T1, limit value T2 by TLIM, and torque limit T3 for regeneration braking, as shown in Fig. 15.1. In the case of Fig. 15.1, the motor operates at T2.

ADJUSTMENT PROCEDURE: The TLIM characteristics are as shown in Fig. 15.2. Set the potentiometer by the graduations using Fig. 15.2, or set it by means of the CH5 voltage.



N1: Max. speed 100%: 4500 rpm
100%: 6000 rpm

T1: Max. torque limit = 120% (fixed)
100% = 30 minute rated output torque

T2: Adjustment by TLIM, see Fig. 15.2.

T3: Regeneration torque limit (fixed)

Fig. 15.1 Speed-torque Limit Characteristics

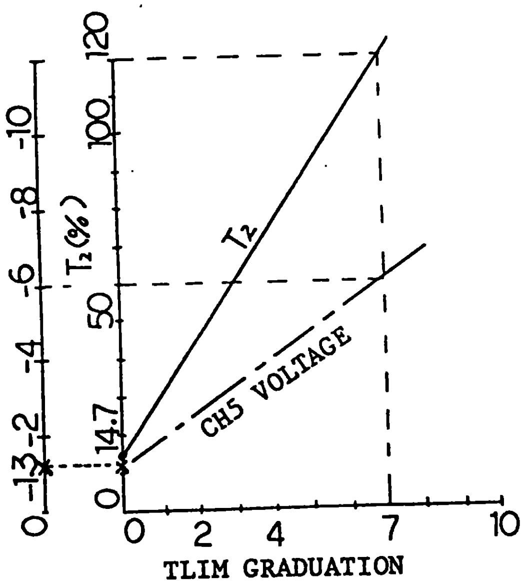


Fig. 15.2 TLIM Characteristics

APPENDIX 16 ADJUSTING NDET

ADJUSTMENT OBJECTIVE: Adjustment of speed coincidence detection level

ADJUSTMENT PROCEDURE: While the motor speed is adjusted with speed commands, NDET lights at a certain speed which is adjusted with the NDET potentiometer. Adjust the NDET potentiometer so that the NDET LED lights at the intended goal speed, by referring to Fig. 16.

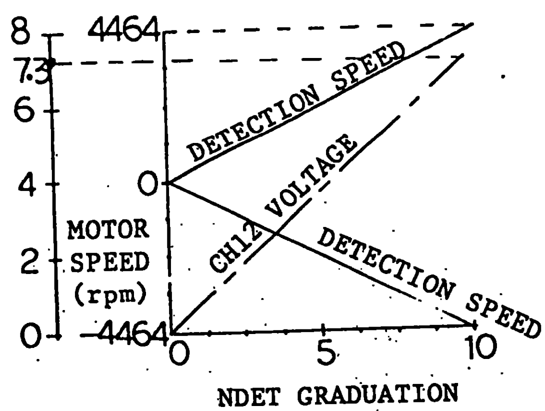
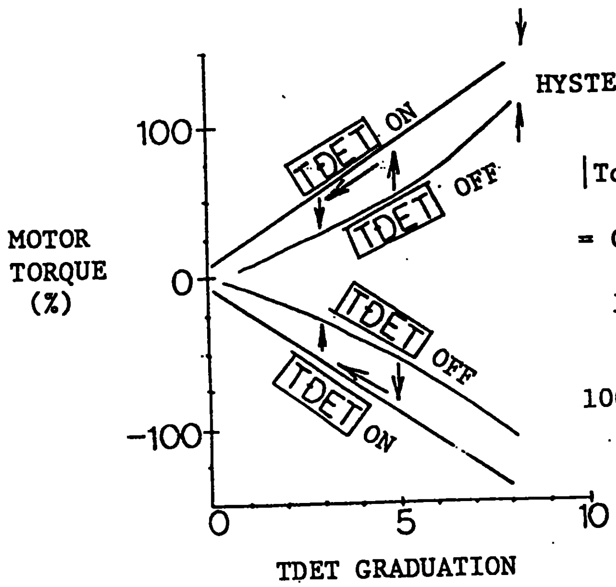


Fig. 16 NDET Characteristics

APPENDIX 17 ADJUSTING TDET

ADJUSTMENT OBJECTIVE: Setting torque detection level

ADJUSTMENT PROCEDURE: Adjust the TLIM potentiometer by the method described in APPENDIX 15 to the torque detection level. Then, while accelerating the motor, adjust the TDET potentiometer so that the TDET LED lights at the required level.



|Torque detection level|

= Controller CH11 voltage at TDET lighting $\times \frac{100}{3.92}$ (%)

100% torque = torque at 30-minute rated output

Fig. 17 TDET Characteristics

APPENDIX 18 ADJUSTING NADJ AND NREV

ADJUSTMENT OBJECTIVE: Coincidence between speed command input (CH23 voltage) and motor speed (speed command level).

ADJUSTMENT PROCEDURE I:

1. Cancell the override mode.
2. Supply 10 V input voltage to the CH23 terminal by analog speed command voltage (with the shunt connector of the controller set to R) or a D/A converter output (with the shunt connector of the controller set to Q).
3. Give a forward run command.
4. Set the NADJ potentiometer so that the CH19 voltage becomes the standard level of 10±0.01 V. or other required level.
5. Cancell the forward run command, and give a reverse run command.
6. Adjust the NREV potentiometer until the CH19 voltage becomes the standard level of -10±0.01 V.

ADJUSTMENT PROCEDURE II: Where the speed command input voltage is in both polarities, make adjustment as PROCEDURE I above, using only a forward run command.

ADJUSTMENT PROCEDURE III: When setting the motor speed, make adjustment as described in I and II above so that with no-load and with the speed command input voltage at 10 V, the standard command input voltage at 10 V, the standard speeds of 4500±45 rpm and 6000±60 rpm become the required speeds.

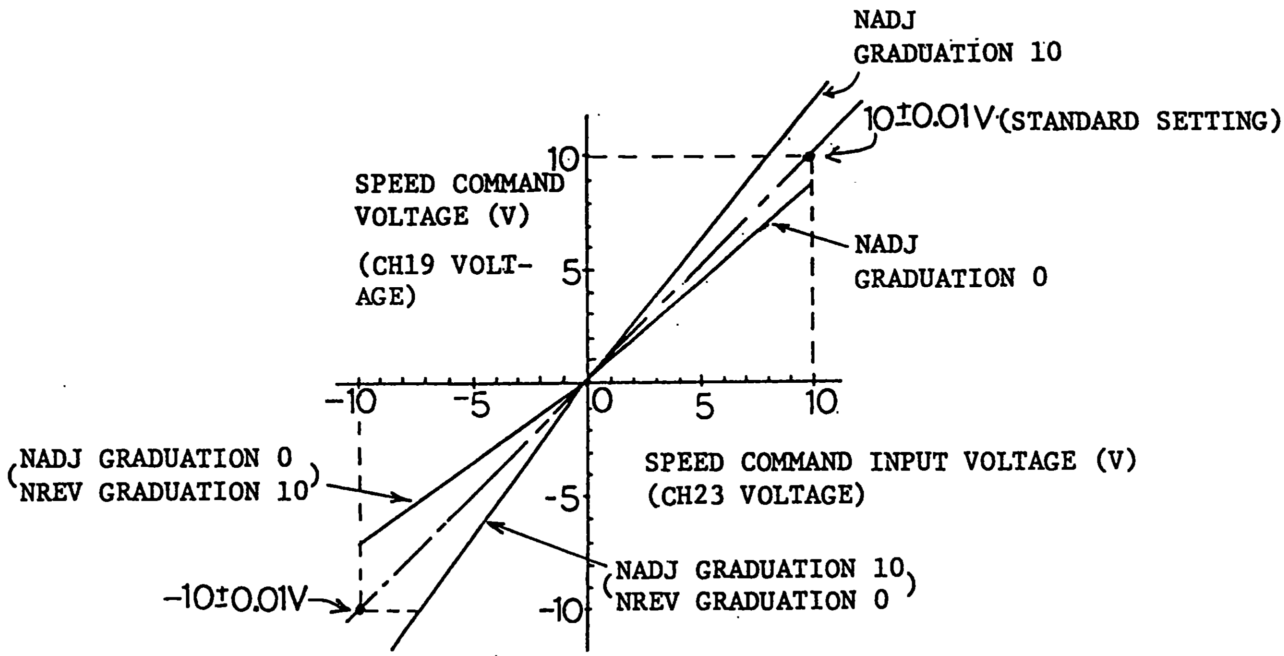


Fig. 18 NADJ, NREV Adjustment Characteristics

APPENDIX 19 ADJUSTING SMADJ

ADJUSTMENT OBJECTIVE: Coincidence between speedometer reading and actual speed

ADJUSTMENT PROCEDURE: With the motor driven at the maximum speed, detect the speed with a tachometer, and adjust the speedometer pointer to the tachometer reading.

APPENDIX 20 ADJUSTING LMADJ

ADJUSTMENT OBJECTIVE: Conformance between torque command voltage and load meter reading.

ADJUSTMENT PROCEDURE: At the factory, the LMADJ potentiometer is adjusted so that at a motor output of 120% of the 30-minute rated power, 1 mA flowed through a load meter (ammeter) with an internal resistance of 2 kΩ. Therefore, no readjustment is required for a load meter with a scale graduated up to 1 mA. When adjusting the LMADJ potentiometer for some reasons, first cancel TLIM, and adjust the load meter reading to 120% of the 30-minute rated power during acceleration.

APPENDIX 21 SOFT START CHARACTERISTICS

The soft start time is the sum of the numerals indicated by the DIP switches in seconds.

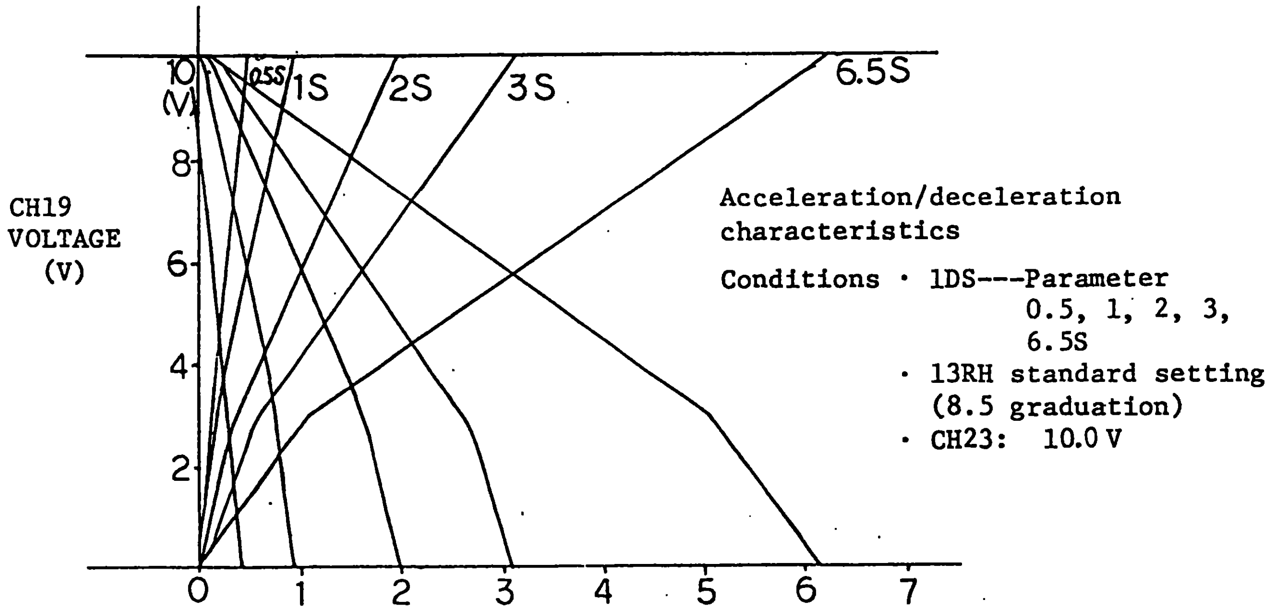


Fig. 21 Soft Start Characteristics

APPENDIX 22 ADJUSTING TMAX

ADJUSTMENT OBJECTIVE: Setting the maximum torque command level to 120% of the 30-minute rating

ADJUSTMENT PROCEDURE: With the motor and the resolver disconnected, five the maximum speed command, and adjust the CH4 voltage as shown in Fig. 22.

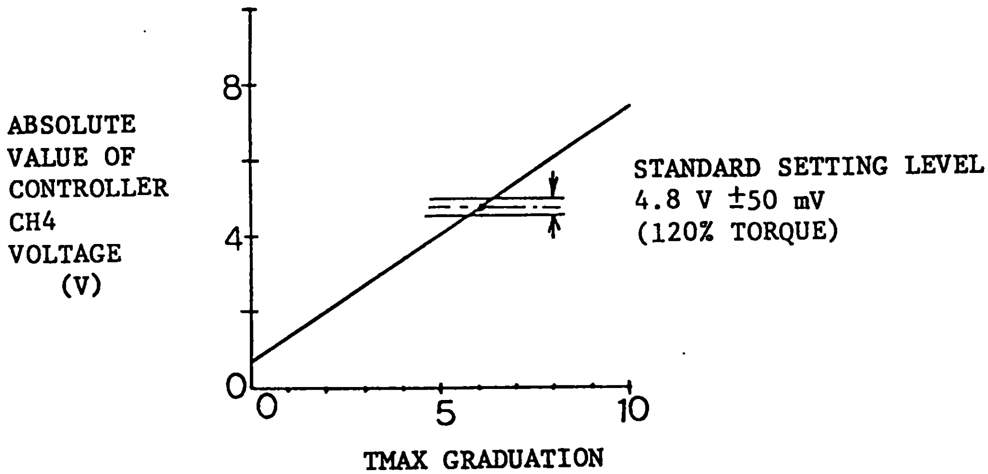


Fig. 22 TMAX Characteristic

APPENDIX 23 SETTING 7RH

ADJUSTMENT OBJECTIVE: Setting regeneration starting voltage

ADJUSTMENT PROCEDURE: With the supply voltage at 220 V, set the CH14 voltage to 2.68 V

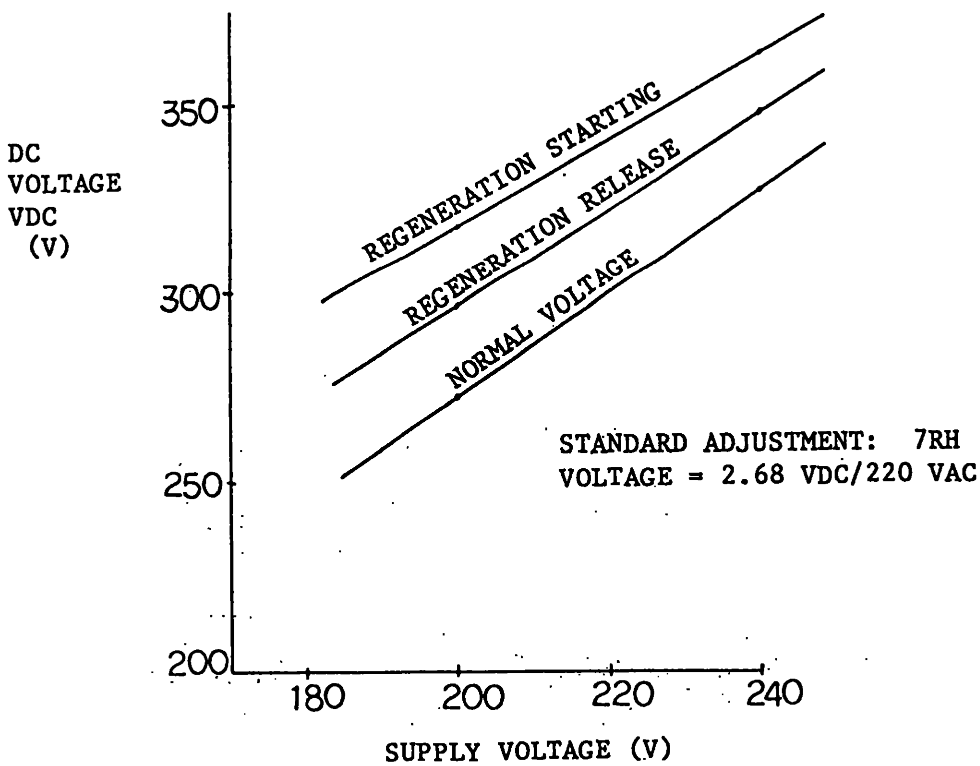


Fig. 23 Regeneration Characteristics

APPENDIX 24 ADJUSTING MOTOR CARD 2RH

ADJUSTMENT OBJECTIVE: Setting time limit characteristics of OL

ADJUSTMENT PROCEDURE: Set the OL operation time with 2RH of the motor card.

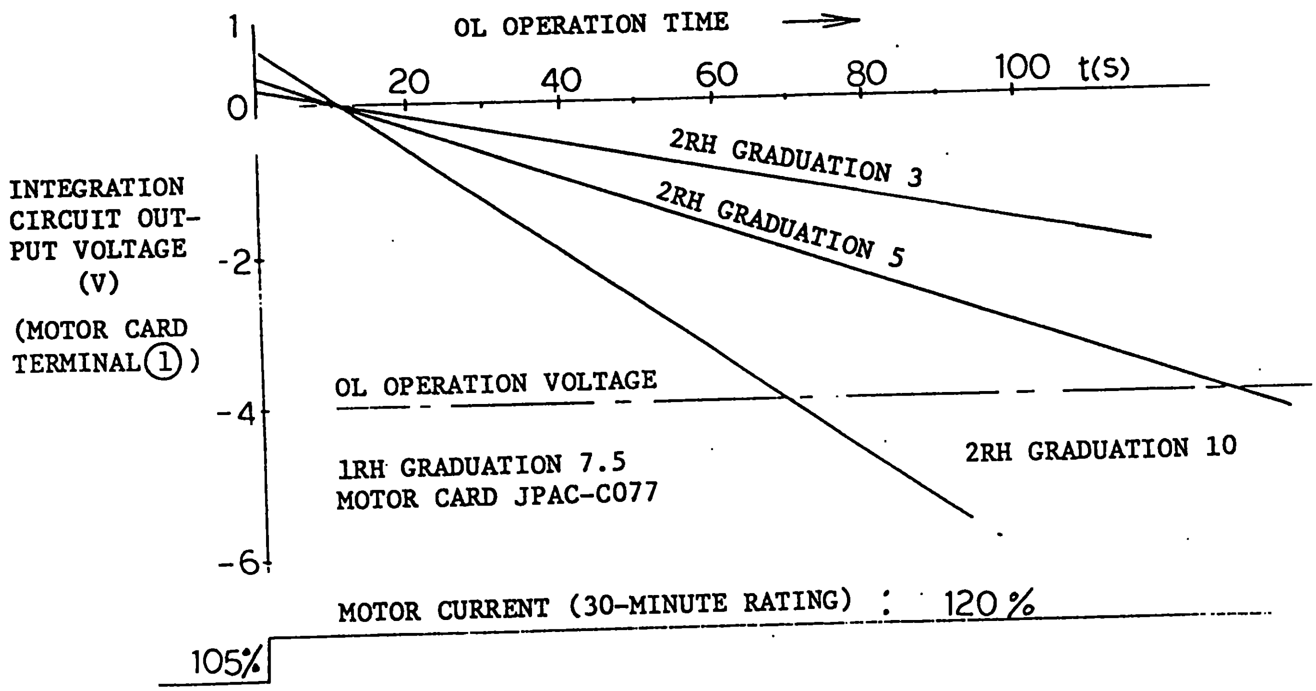


Fig. 24 OL Operation Time Example

APPENDIX 25 BASE BLOCKED CONDITIONS

Case	Description
1	Alarm red LED lights. (If OH, FANM, FANC, OV, OC, ACFU, DCFU, OL, OS, or UV operates.)
2	READY signal (RUNSB) is off.
3	Emergency stop signal (EMSTP) is on and motor standing still.
4	Forward run signal (FORRN) and reverse signal (REVRN) are both fed simultaneously, and the motor is standing still.

Table 26 Lighting Conditions of SOURCE and RUN LEDs

Operation ready (STB)	Forward run command (FRN)	Reverse run command (RRN)	Emergency stop (EST)	LED		Note
				SOURCE	RUN	
X	X	X	X	X	X	During emergency stop
O	X	X	X	O	X	During emergency stop
X	O	X	X	X	X	During emergency stop
O	O	X	X	O	X	During emergency stop
X	X	O	X	X	X	During emergency stop
O	X	O	X	O	X	During emergency stop
X	O	O	X	X	X	During emergency stop
O	O	O	X	O	X	During emergency stop
X	X	X	O	X	X	—
O	X	X	O	O	X	Operation ready
X	O	X	O	X	X	—
O	O	X	O	O	O	Forward run
X	X	O	O	X	X	—
O	X	O	O	O	O	Reverse run
X	O	O	O	X	X	—
O	O	O	O	O	X	With forward and reverse commands are simultaneous fed, motor stops.

O: LED on

X: LED off

APPENDIX 27 LIGHTING CONDITIONS FOR LEDS ON CONTROLLER

LED code	Color	Lighting conditions
NDET	Green	Attaining goal speed
ZSP	Green	Zero speed
AGREE	Green	Speed coincidence
DEV	Red	Excessive speed deviation
TDET	Green	Torque detection
SOURCE	Green	Power supply on
RUN	Green	Motor running
OH	Red	Tripping of built-in thermostat, and base blocked.
FANM	Red	Tripping of cooling fan thermal relay, base blocked.
FANC	Red	Malfunction of control cooling fan, and base blocked.
OV	Red	DC bus overvoltage and base blocked.
OC	Red	Transistor instantaneous overcurrent and base blocked.
ACFU	Red	AC fuse blowing and base blocked.
DCFU	Red	DC circuit fuse blowing and base blocked.
OL	Red	60 seconds 120% of 30-minute rated current, and base blocked.
OS	Red	110% (±5%) rated speed or above and base blocked.
UV	Red	Supply voltage below 165 V (±10 V) and base blocked.

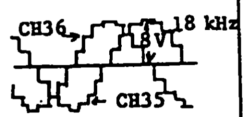
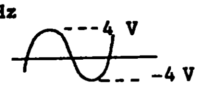
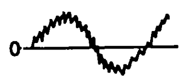
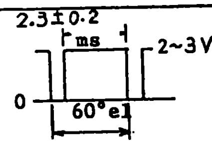
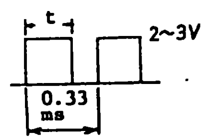
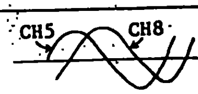
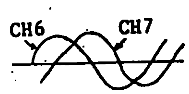
Note: When any of the LEDs OH through UV is on, the state is kept until the reset button on the controller is pushed, or reset by an external signal.

APPENDIX 28 CHECK TERMINALS AND THEIR SIGNALS

Table 28 Check Terminals and Their Signals

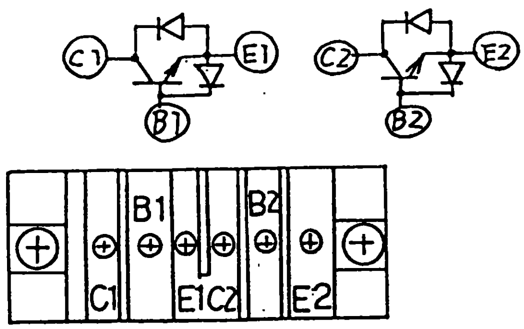
Printed circuit board	Check terminal	Content	Signal: At stop command (Ready ON)	Signal: In operation	Note
Controller	Across CH1-CH29	Primary frequency command (α)	0 Hz	Frequency = (motor speed/30) + (3 to 4) Hz	—
	Across CH2-CH29	Primary frequency command (β)	Peak = 3±0.1 V	Peak = 3±0.1 V	
	Across CH3-CH29	PWM carrier	3 kHz ±0.3KHz, 0, 3 V ±0.3V, -3 V ±0.3V	Same as left	—
	Across CH4-CH29	Secondary current command	Within ±10mV DC	DC, proportional to torque	TMAX = ±4 V/±100%
	Across CH5-CH29	Torque limit level	-1.4 to -7.53 V	Same as left	Change by TLIM setting
	Across CH6-CH29	Current calculation carrier	0, 3 V ±1.5V, $15^{+1.5}_{-1}$ kHz, -3 V±0.5V	Same as left	—
	Across CH7-CH29	Regeneration transistor base signal	0, 2.3 mS ±0.2mS, 60°el	Same as left	60°el: DC source electric angle
	Across CH8-CH29	DC voltage	0 V	VDC x 0.09 V	VDC: Main circuit DC voltage
	Across CH9-CH29	DC voltage	0 V	(-6±0.06) V/356 VDC	
	Across CH10-CH29	Phase shifter command	Kip: 5.6 V α limit: 0.5 V	Same as left	—
	Across CH11-CH29	Torque monitor	0 V	3.92 V/100% torque	CH11 voltage = 0 when motor current = 0
	Across CH12-CH29	Speed detection level (absolute)	0 V	10 V/±6000 rpm	—
	Across CH13-CH29	Field current command	3 V	0 V	Max. weakening at 3 V (weak during stop)
	Across CH14-CH29	Regeneration voltage standard	(2.68±0.03) V/220 VAC	Same as left	VDC = AC source voltage
	Across CH15-CH29	Synchronous power supply (T phase)	24±0.5V/220 VAC	Same as left	
	Across CH16-CH29	Synchronous power supply (S phase)			
	Across CH17-CH29	Synchronous power supply (R phase)			
	Across CH18-CH29	Slip frequency	+8 V, -8 V, 0.95 kHz	+8 V, -8 V	Changing with torque command
	Across CH19-CH29	Soft start output	0 V	See APPENDIX 21.	—
	Across CH20-CH29	Acceleration/deceleration level	0 V	±8 V during acceleration/deceleration	—
	Across CH21-CH29	Acceleration deceleration signal	0 V		—

Table 28 Check Terminals and Their Signals (Cont'd)

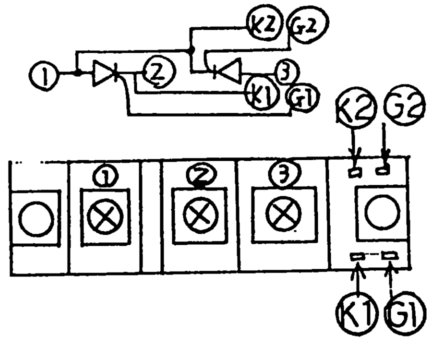
Printed circuit board	Check terminal	Content	Signal		Note
			At stop command (Ready ON)	In operation	
Con-trol-ler	Across CH22-CH29	Speed detection	0 V	-10 V/6000 rpm	—
	Across CH23-CH29	Speed command	Equal to external speed command level		10 V/4500 rpm, 10 V/6000 rpm
	Across CH24-CH29	Resolver output	18 kHz ±0.67 V	Frequency changes with speed	Sinusoidal
	Across CH35-CH29	Resolver exciting command (β phase)		Same as left	—
	Across CH36-CH29	Resolver exciting command (α phase)			
	Across CH37-CH38	Resolver excita-tion (α phase)	18 kHz 	Same as left	—
	Across CH39-CH38	Resolver excita-tion (β phase)			
Base driver	Across CH1-CH7	Current detection (U phase)	±60 mV or below		Frequency and amplitude change with operation condition.
	Across CH2-CH7	Current detection (W phase)			
	Across CH12-CH11	Regeneration transistor base signal input	-2 V		Generated during regeneration braking.
	Across CH14-CH13				
	Across CH16-CH15	Voltage between base of main transistor base current amplify-ing transistor and emitter of main transistor	-2 V		t changes with output current.
	Across CH18-CH17				
	Across CH20-CH19				
	Across CH22-CH21				
	Across CH24-CH23				
	Across CH26-CH22				
Motor card	Across CH1-CH4	Field weakening command	1.7±0.1 V	Changing with speed.	—
	Across CH2-CH4	PWM carrier command	3.0±0.15V		—
	Across CH3-CH4	Slip frequency (amplitude)	3.0±0.15V		3 V/100%
	Across CH5-CH4	Field current command (α phase)	0 V		Changing with speed.
	Across CH8-CH4	Field current command (β phase)			
	Across CH6-CH4	Torque current command (α phase)	0 V		Changing with speed and tor-que. Phase depends on tor-que direction.
	Across CH7-CH4	Torque current command (β phase)			
	Across CH9-CH4	Primary current detection(W phase)	±60mV or below	Same as CH1, CH2 of base driver.	—
	Across CH10-CH4	Primary current detection(U phase)			

APPENDIX 29 CHECKING POWER SEMICONDUCTOR ELEMENTS

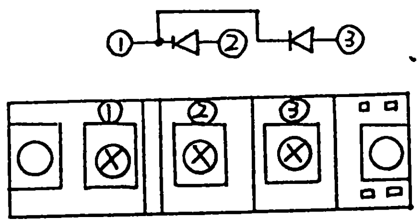
Turn off the AC power supply, and disconnect the motor leads from the inverter output terminals U, V and W. Disconnect lead wires from the respective transistor modules, thyristor modules, and diode modules, and measure their resistance with a multimeter. Evaluate these elements by the resistance values by comparing them with the values given in Table 29-1, 29-2 and 29-3.



Transistor Module



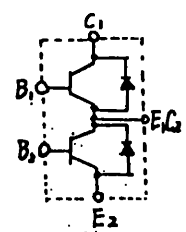
Thyristor Module



Diode Module

Fig. 29 Terminal Layout of Power Modules

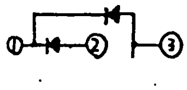
Table 29-1 Resistance of Transistor Modules

Transistor Module Terminals: Tester Terminal ⊖	Transistor Module Terminals: Tester Terminal ⊕	Reference Resistance	Abnormal Resistance	Transistor Module
E1C2	C1	*	0 Ω	
C1	E1C2	†	0 Ω	
B1	E1C2	*	#	
E1C2	B1	‡	0 Ω or ∞	
E2	E1C2	*	0 Ω	
E1C2	E2	†	0 Ω	
B2	E2	*	#	
E2	B2	‡	0 Ω or ∞	

* Approximate multiple of 10 Ω
† Several hundred of 1 kΩ
# Approximate multiple of 10 kΩ
‡ Several hundred Ω to several kΩ

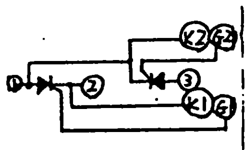
Note: Use the tester set at x 1 Ω range.

Table 29-2 Resistance of Diode Module

Tester Terminals	⊖	⊕	Reference Resistance	Abnormal Resistance
Diode Module Terminals	①	②	∞	Approximate multiple of 10 Ω or below
	①	③		
	②	①	Approximate multiple of 10 Ω or below	∞
	③	①		

Note: Use the tester set at x 1 Ω range.

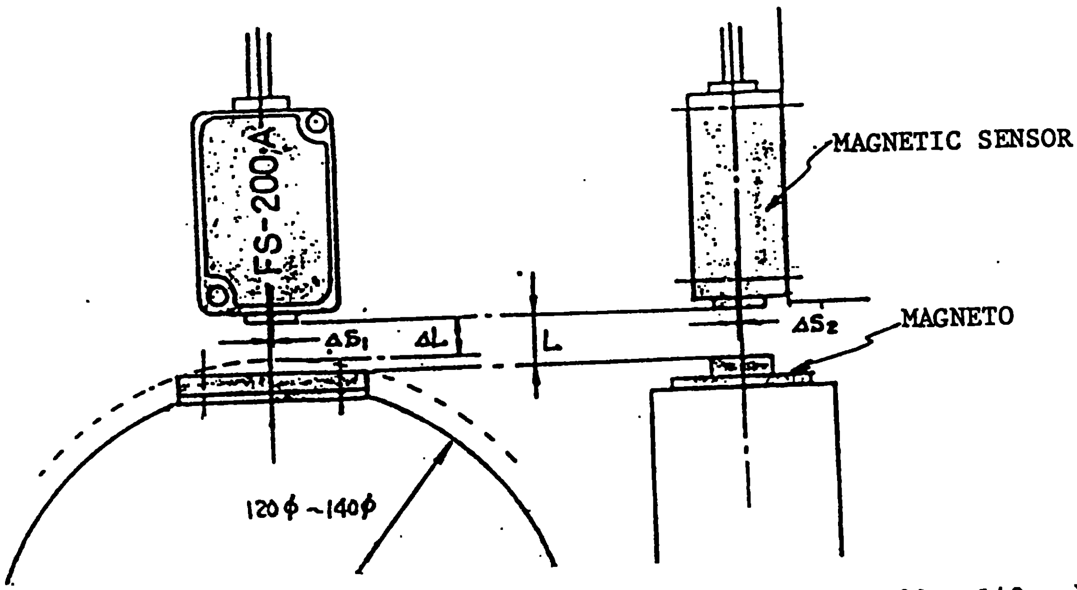
Table 29-3 Resistance of Thyristor Module

Tester Terminals	⊖	⊕	Reference Resistance	Abnormal Resistance
Thyristor Module Terminals	①	②	∞	Approximate multiple of 10 Ω or below
	③	①		
	②	①		
	①	③		
	②	G1	*	Other than *
	①	G2		
	G1	②	†	Other than †
	G2	①		

* Approximate multiple of 10 Ω to several hundred Ω
† Several Ω to two hundred Ω

APPENDIX 30 INSTALLING MAGNETO AND MAGNETIC SENSOR

Install magneto directly on the spindle as shown below. Install magnetic sensors on a stationary member, in such a way that at the tool change orientation of the spindle (fixed orientation), the center line of the magnetic sensor is aligned with the center line of the magneto.



Gap L: Varies with type of magneto (Spindle diameter: 120 - 140 mm)

Type	Recommended value	Permissible range (Approx. value)	
MG-1378	6 ± 0.5 mm	6 - 8 mm	Range within which orientation detection signal level can be adjusted.
MG-1444	5 ± 0.5 mm	3 - 7 mm	

Gap ΔL: Should be 1 mm or above.

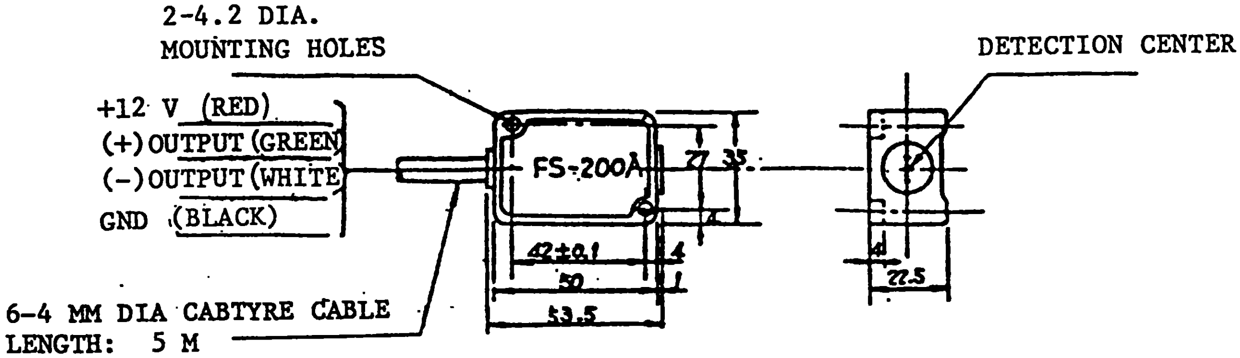
Misalignment between magneto and magnetic sensor ΔS1, ΔS2: 0.5 mm or below

Fig. 30 Installing Magneto and Magnetic Sensor

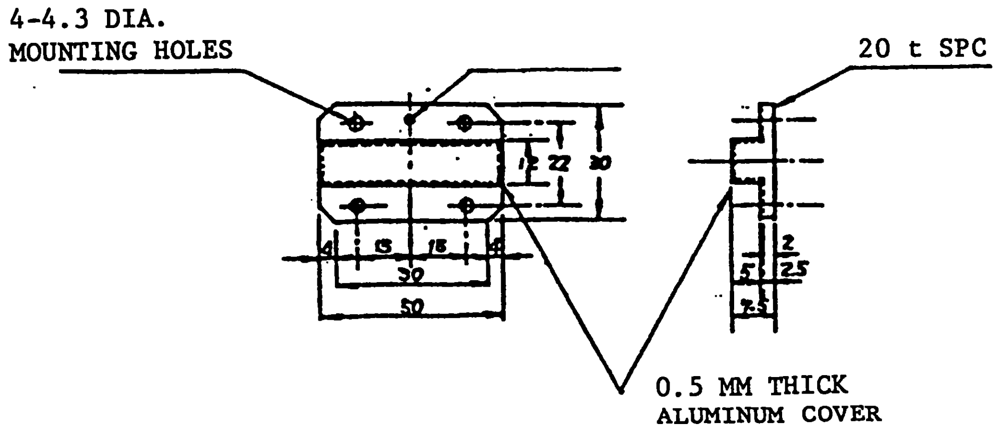
CAUTIONS IN INSTALLATION

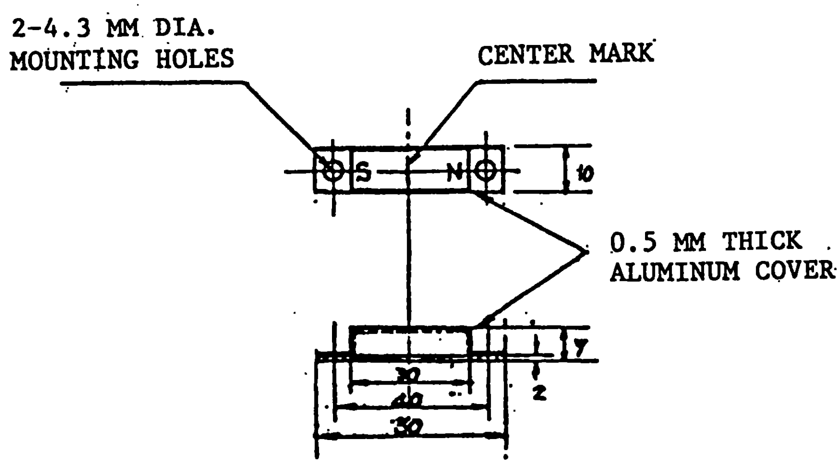
1. The spindle diameter must be 120 to 140 mm.
2. Do not bring units that generate magnetic fields such as solenoids and magnets near the magneto.
3. Take care to prevent iron powder from depositing on magneto.
4. Take care not to mechanically damage magnetic sensor heads and magneto.

MAGNETIC SENSOR Type: FS-200.A (Made by MAKOME Corporation.)



MAGNETO Type: MG-1378 (Made by MAKOME Corporation)





APPENDIX 31 ORIENTATION CARD CHECK TERMINALS AND THEIR SIGNALS

Table 31 Orientation Card Check Terminals

Check terminal No.	Content	Signal level
CH1	OV (power supply)	——
CH2	Sensor position signal	Peak: ±10 V
CH3	Position deviation	0.4 V/100 μm (on 12 mm diameter circumference)
CH4	Motor speed command (1)	-1 V/300 rpm
CH5	Motor speed command (2) (Switching from orientation speed to creep speed)	1 V/300 rpm
CH6	Motor speed command (Final stage)	0.5 V/300 rpm
CH7	Orientation signal and speed coincidence signal	H: +8 V L: -8 V
CH8	Position gain switching	H: +8 V L: -8 V

Note: For check terminal positions, see APPENDIX 8-2.

APPENDIX 32 ADJUSTING LEVEL

ADJUSTMENT OBJECTIVE: Adjusting magnetic sensor output detection level

ADJUSTMENT PROCEDURE: Set the LEVEL potentiometer to the 0 graduation. With the spindle running, turn the LEVEL potentiometer clockwise and set it where both LEVEL 1 and LEVEL 2 LEDs start to light distinctly. Do not turn the LEVEL potentiometer further, because doing so will cause overadjustment. If the LEVEL 1 and LEVEL 2 LEDs do not light in this sequence, reverse the mounting direction of the magneto.

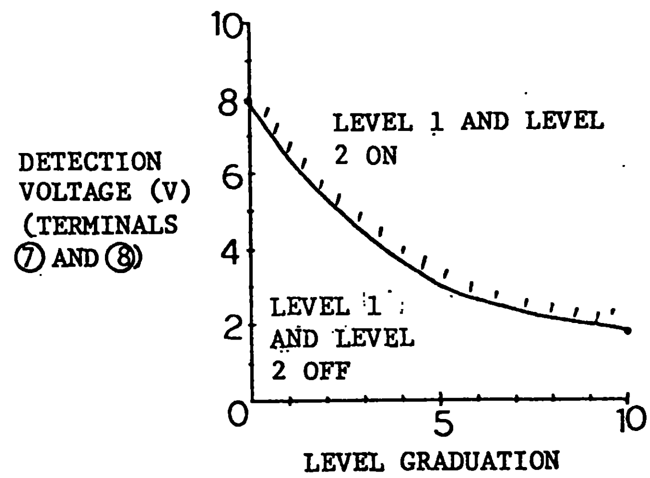
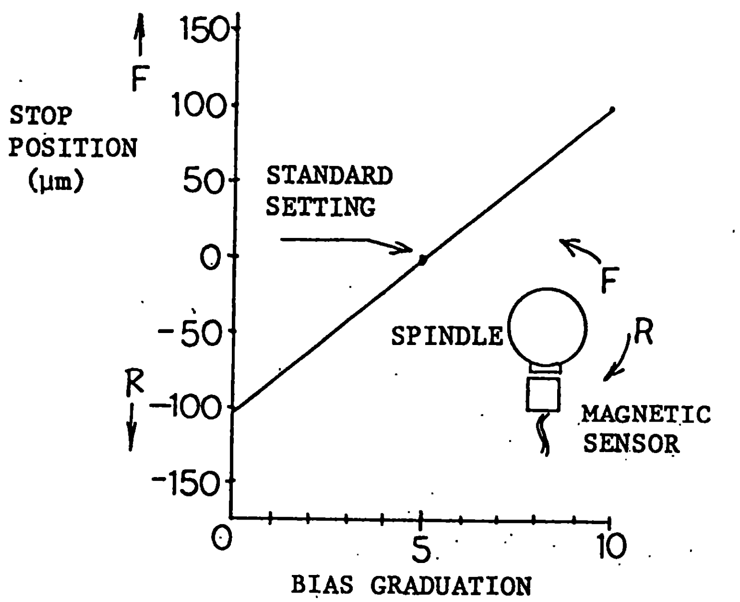


Fig. 32 LEVEL Characteristics

APPENDIX 33 ADJUSTING BIAS

ADJUSTMENT OBJECTIVE: Stop position fine adjustment

ADJUSTMENT PROCEDURE: See Fig. 33.



Note: Stop position is on 120 mm diameter circumference

Fig. 33 BIAS Characteristics

APPENDIX 34 ADJUSTING H-GAIN, M-GAIN, L-GAIN

ADJUSTMENT OBJECTIVE: Adjustment of loop gain for orientation control

ADJUSTMENT PROCEDURE: Adjust the gain high as long as position control does not hunt. (CW turning)

APPENDIX 35 ADJUSTING H-TIME

ADJUSTMENT OBJECTIVE: Adjustment of orientation time with VS-626MTII gear set to H or M.

ADJUSTMENT PROCEDURE: Set the H TIME potentiometer to 0 graduation. Push the button for approximately 3 seconds in the test mode, and then release it. While turning the H TIME potentiometer clockwise, repeat the orientation operation until the CREEP LED lights distinctly and the lighting time becomes shortest.

Note: When the gear is set to M, first adjust the spindle speed to 300 rpm with the M-SPD potentiometer, and then, adjust H TIME potentiometer.

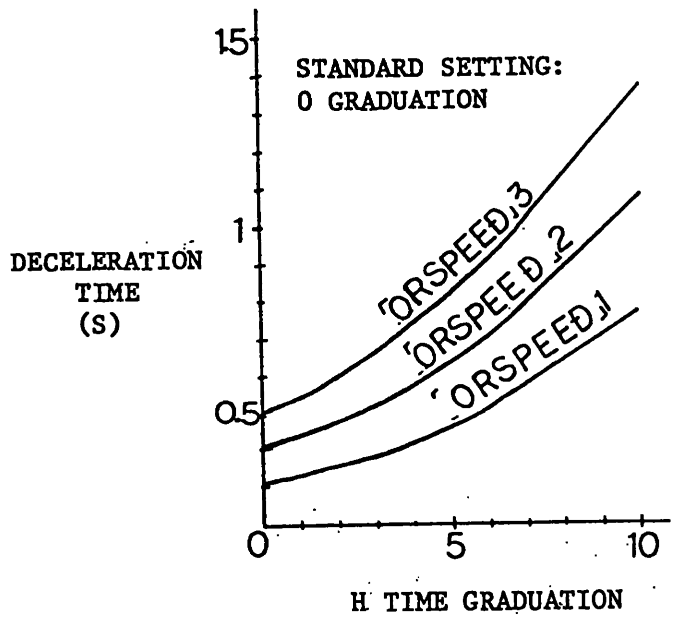


Fig. 35 H TIME Adjusting Characteristics

APPENDIX 36 ADJUSTING L TIME

ADJUSTMENT OBJECTIVE: Adjustment of orientation time when VS-626MTII is set to L gear.

ADJUSTMENT PROCEDURE: After setting the L TIME potentiometer to 0 graduation, adjust the spindle speed to 300 rpm with L-SPD. While turning the L TIME potentiometer clockwise in the test mode, push the button for approximately 3 seconds, and release, and repeat the orientation operation until the CREEP LED lights distinctly, and the lighting time becomes shortest.

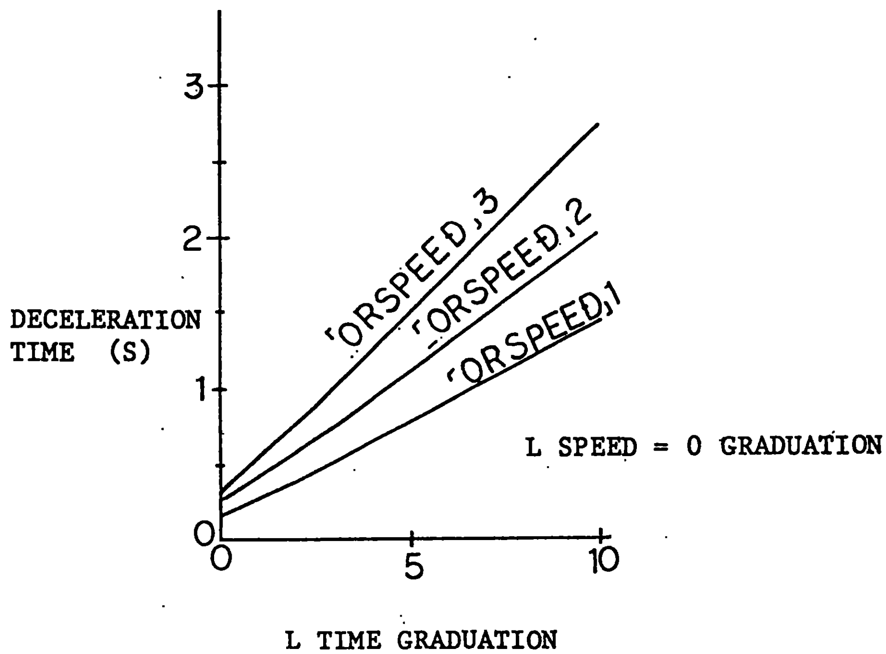


Fig. 36 L TIME Characteristics

APPENDIX 37 ADJUSTING L-SPD

ADJUSTMENT OBJECTIVE: Adjustment of orientation speed when VS-626MTII is set to L gear

ADJUSTMENT PROCEDURE: Set the L-SPD potentiometer to 0 graduation. With the VS-626MTII gear selection at L GEAR and in the test mode, push the button, and set L-SPD potentiometer until the spindle speed becomes 300 rpm at a CH4 voltage below 5.5 V. If the CH4 voltage is above 5.5 V, change the gear selection of VS-626MTII.

Note: Spindle speed (rpm) = $\frac{\text{CH4 voltage (V)} \times 300}{\text{L gear ratio}}$

Gear ratio = $\frac{\text{Spindle speed}}{\text{Motor speed}}$

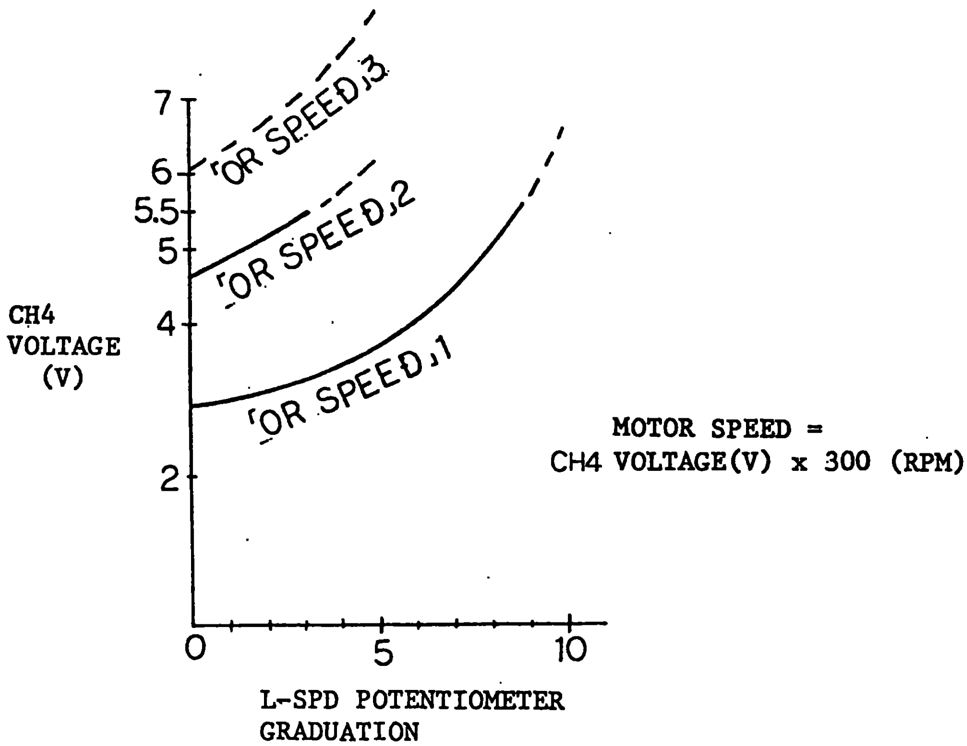


Fig. 37 L-SPD Characteristics

APPENDIX 38 ADJUSTING M-SPD

ADJUSTMENT OBJECTIVE:

(1) Adjustment of orientation when VS-626MTII gear selection is H and M

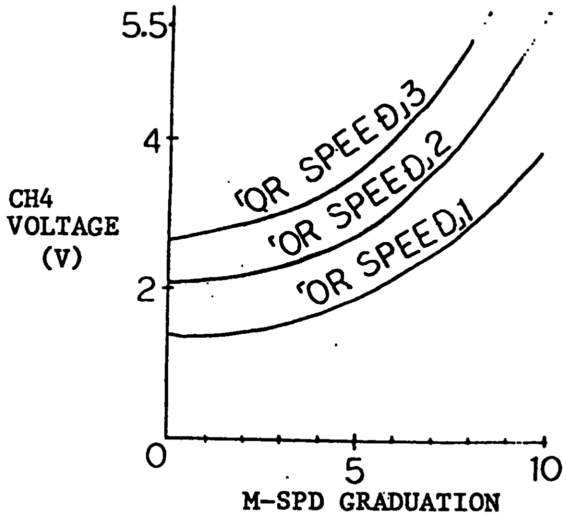
(2) Orientation when VS-626MTII gear selection is only M

ADJUSTMENT PROCEDURE:

(1) Adjusting speed

After adjusting H TIME, set the M-SPD potentiomemter to the 0 graduation. With VS-626MTII gear selection at M GEAR and in the test mode, push the button for 3 or so seconds and release, and then, repeat orientation operation until while turning M-SPD clockwise until the CREEP LED lights distinctly and the lighting time becomes the shortest. Push the button upon the final setting to make sure that the CH4 voltage does not exceed 5.5 V. If it is above 5.5 V, change the gear selection of VS-626MTII.

(2) With VS-626MTII gear selection at M GEAR and in the test mode, push the button, and adjust the spindle speed to 300 rpm with the M-SPD potentiometer.



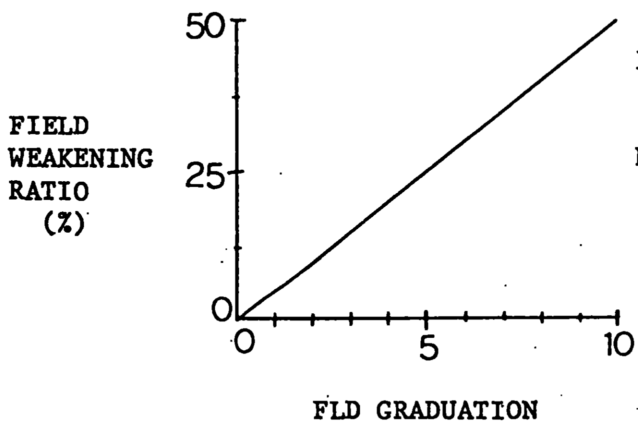
MOTOR SPEED =
CH4 VOLTAGE (V) x 300 (RPM)

Fig. 38 M-SPD Characteristics

APPENDIX 39 ADJUSTING FLD

ADJUSTMENT OBJECTIVE: Depressing gear noise and smoothen low speed running by controlling the motor field current during orientation control.

ADJUSTMENT PROCEDURE: If gear noise is large and motor running is not smooth during orientation operation, turn the FLD potentiometer clockwise to reduce the field current.



100%: RATED FIELD CURRENT FOR SPEEDS BELOW BASE SPEED

Note: When the controller command is above FLD weaking ratio, the controller command has the priority.

Fig. 39 FLD Characteristics

APPENDIX 40 ORIENTATION SPEED SELECTION METHOD

Select the orientation speed (OR SPEED) as shown in Tables 40.1 through 40.3 in accordance with the gear ratio and the gear stage. Apply the same method when the spindle is driven by belts.

(1) Stage 1st gear

Table 40.1 OR SPEED Selection for Stage 1st Gear

Gear ratio = Spindle speed / Motor speed	OR SPEED selection	VS-626MTII gear selection (Wiring)
1.5 - 1.2	1	H GEAR (M GEAR OFF, L GEAR OFF on page 35)
1.1 - 0.9	2	
0.8 - 0.6	3	
0.6 - 0.15	2	M GEAR (M GEAR ON on page 35)
0.2 - 0.05	1	L GEAR (L GEAR ON on page 35)

(2) Stage 2nd gear

Table 40.2 OR SPEED Selection for Stage 2nd Gear

H gear ratio = Spindle speed / Motor speed	OR SPEED selection	VS-626MTII gear selection (Wiring)
1.5 - 1.2	1	If L gear ratio = 0.15 - 0.6, select M GEAR (M GEAR ON on page 34). If L gear ratio = 0.05 - 0.2, select L GEAR (L GEAR ON on page 35).
1.1 - 0.9	2	
0.8 - 0.6	3	

[EXAMPLE; Stage 2nd gear]

H gear ratio = 1.3, L gear ratio = 0.5

In this case, select OR SPEED 1 and select VS-626MTII gear at M GEAR.

(3) Stage 3rd gear

Table 40.3 OR SPEED Selection for Stage 3rd Gear

Gear ratio = Spindle speed / Motor speed	OR SPEED selection	VS-626MTII gear selection (Wiring)
H gear ratio 1.5 - 1.2	1	H GEAR (M GEAR OFF / L GEAR OFF on page 35)
H gear ratio 1.1 - 0.9	2	
H gear ratio 0.8 - 0.6	3	
M gear ratio 0.6 - 0.15	Value selected at H gear ratio	M GEAR (M GEAR ON on page 35)
L gear ratio 0.2 - 0.05		L GEAR (L GEAR ON on page 35)

[EXAMPLE: Stage 3rd gear]

When H gear ratio = 1.2, M gear ratio = 0.4, and L gear ratio = 0.1.

Select OR SPEED by H gear ratio, and select VS-626MTII gear at M GEAR for M gear and L GEAR for L gear.

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