YASKAWA ELECTRIC

TOE-S676-1-3B
INSTRUCTIONS

Before initial operation read these instructions thoroughly, and retain for future reference.

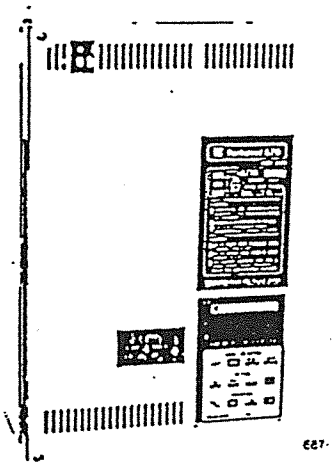
TRANSISTOR INVERTER
Varispeed-676™
FOR SINGLE-SYSTEM DRIVES
200 V CLASS 1 TO 80 kVA
400 V CLASS 1.5 TO 400 kVA
INSTRUCTION MANUAL

The Varispeed-676 (VS-676) is a high performance transistor inverter using vector control to drive a squirrel-cage induction motor.

The VS-676 for a single system (VS-676A series) is a series capable of running by analog input and relay sequence input. This series provides a drive without PG (VS-676A) and a drive with PG (VS-676AP).

Before using the Varispeed-676, read this instruction manual thoroughly. This manual will be necessary for daily maintenance and inspection, and troubleshooting and corrective measures.

For details on the motor, digital monitor, refer to Instruction Manual for Digital Monitor (TOE-S676-1.2).



Type CIMR-3.7WA
200V, 5kVA

CONTENTS

1. ACCEPTANCE INSPECTION

Check the following items upon receipt of the VS-676. In the event of any damage, missing parts, variation in specification, etc. Contact your YASKAWA representative.

- Verify the product and the contents of the invoice (voltage, capacity, external view, etc.)

When the unit must be stored before installation, do not store the unit under the following conditions.

- Ambient temperature is 60°C or more or -20°C or less.
- Humidity is high and may cause condensation.
- Corrosive gases, dust, iron powder, etc. exist.

2. PRECAUTIONS

(1) The VS-676 must always be used in combination with the specified motor.

(2) Never reverse the connections of supply (R, S, T) and the output (U, V, W) main circuits.

(3) CCMOS IC is used on the control circuit board. As it is very sensitive to static electricity, be very careful when handling.

(4) Connection terminal E must always be grounded.

(5) Do not touch the live part before the CHARGE indicator goes off, even after the main circuit power supply is turned OFF.
(Voltage still remains in the smoothing capacitor.)

(6) Never change the function selection switches (1S - 4S) or the shunt connectors while the power is on. Also, never insert or extract the connectors while the power is on.

(7) The variable resistors and constant setting values are set at each appropriate value before delivery from the factory. Do not change the values unnecessarily.

(8) Do not perform unnecessary signal checks during operation.

(9) The VS-676 is an electric control unit of semiconductor application. Do not perform withstand voltage tests.

(10) When performing insulation resistance test (megger test), always follow the procedures listed in Fig. 4.3, "Main circuit megger test procedure".

3. INSTALLATION

Install the VS-676 at an optimum position, to maintain normal operation.

3.1 NOTES ON INSTALLATION

Install the VS-676 where the following conditions are satisfied.

(1) The ambient temperature is 0 to 45°C. (When installing the VS-676 within the controller, design the cabinet taking into consideration of the heat generated from the unit and other devices.)

(2) The humidity is relatively low (where the relative humidity is 90% or less, and where there is no condensation).

(3) It is not exposed to rain or other moisture.

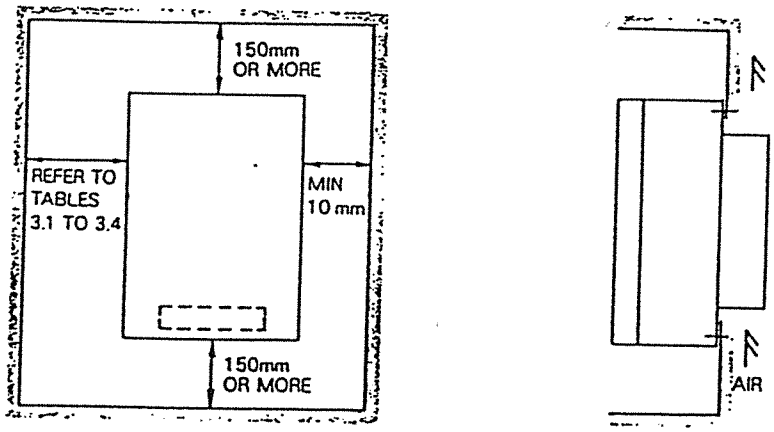
(4) It is not exposed to direct sunlight.

(5) There is no dust, metallic powder, corrosive gases, etc.

(6) There is minimum vibration (less than the value indicated by the specifications.)

3.2 POSITION OF INSTALLATION, INSTALLATION SPACE

Install the VS-676 vertically, with the external wiring side down. Also ensure that the cooling space and maintenance requirements are considered as shown in Fig. 3.1.



Ensure that there is adequate clearance for opening the panel to mount control printed circuit board, opening the face plate, and for connection with the terminals.

Fig. 3.1 VS-676 Installation Space

3.3 STANDARD EXTERNAL DRAWING

Table 3.1 Dimensions: VS-676 200 V Series (Without Fan)

Capacity (kVA)	Model CIMR-	Dimensions in mm (inch)														Main Circuit Terminal	Weight kg (lb)
		W	W1	W2	W3	H	H1	H2	H3	H4	H5	D1	D2	D3	d		
1 5	0.75 WA	300 (11.81)	265 (10.43)	288 (11.34)	76 (2.99)	475 (18.70)	465 (18.31)	5 (0.20)	437.5 (17.22)	7.5 (0.30)	20 (0.79)	230 (9.06)	40 (1.57)	445 (17.52)	M6	M4	19 (41.94)
3	2.2 WA																
5	3.7 WA																
10	7.5 WA	300 (11.81)	265 (10.43)	288 (11.34)	76 (2.99)	475 (18.70)	465 (18.31)	5 (0.20)	437.5 (17.22)	7.5 (0.30)	20 (0.79)	247 (9.72)	63 (2.48)	462 (18.19)	M6	M6	21 (46.36)
15	11 WA	300 (11.81)	265 (10.43)	288 (11.34)	76 (2.99)	475 (18.70)	465 (18.31)	5 (0.20)	437.5 (17.22)	7.5 (0.30)	20 (0.79)	230 (9.06)	80 (3.15)	445 (17.52)	M6	M6	21 (46.36)
20	15 WA	325 (12.80)	285 (11.22)	305 (12.01)	76 (2.99)	550 (21.65)	535 (21.06)	7.5 (0.30)	515 (20.28)	10 (0.39)	10 (0.39)	224 (8.82)	84 (3.31)	461 (18.15)	M6	M6 M8 (NPPI)	23 (50.77)
30	22 WA	325 (12.80)	285 (11.22)	305 (12.01)	76 (2.99)	600 (23.62)	585 (23.03)	7.5 (0.30)	565 (22.24)	10 (0.39)	10 (0.39)	224 (8.82)	84 (3.31)	461 (18.15)	M6	M8	29 (64.02)
40	30 WA	425 (16.73)	390 (15.35)	405 (15.94)	70 (2.76)	675 (26.57)	650 (25.59)	12.5 (0.49)	625 (24.61)	12.5 (0.49)	12.5 (0.49)	233 (9.17)	84 (3.31)	581 (22.87)	M10	M8	39 (86.09)
60	45 WA	500 (19.69)	450 (17.72)	480 (18.90)	81 (3.19)	850 (33.46)	825 (32.48)	12.5 (0.49)	800 (31.50)	12.5 (0.49)	12.5 (0.49)	233 (9.17)	84 (3.31)	642 (25.28)	M10	M10	65 (143.49)
80	55 WA	500 (19.69)	450 (17.72)	480 (18.90)	81 (3.19)	925 (36.42)	900 (35.43)	12.5 (0.49)	875 (33.45)	12.5 (0.49)	12.5 (0.49)	233 (9.17)	84 (3.31)	642 (25.28)	M10	M10	73 (161 15)

Unit Dimension Diagram

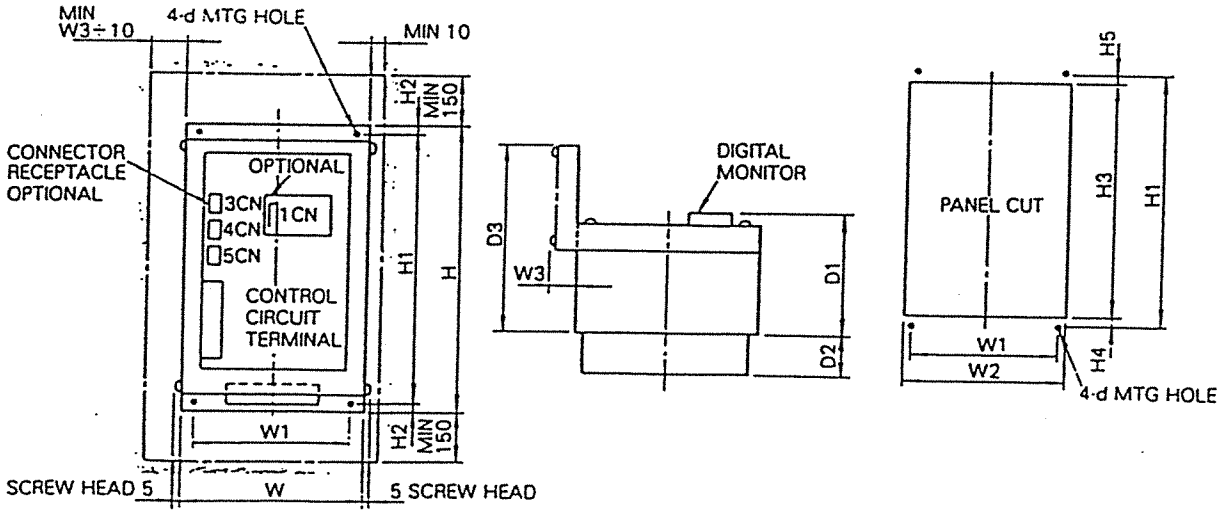
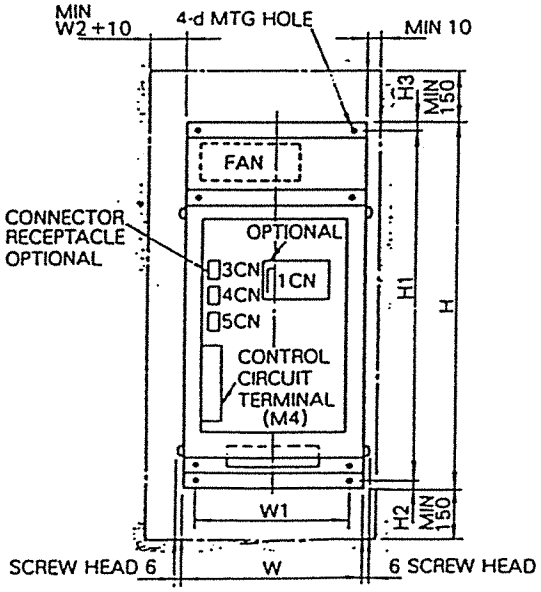
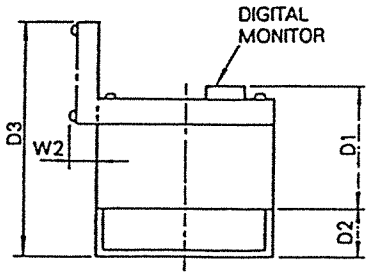


Table 3.2 Dimensions: VS-676 200 V Series (With Fan)

Capacity (kVA)	Model CIMR-	Dimensions in mm (inch)											Main Circuit Terminal	Weight kg (lb)	Applicable FAN	Specified Air Inlet Temp (°C)	FAN Unit Code No.
		W	W1	W2	H	H1	H2	H3	D1	D2	D3	d					
1.5	0.75 WA	300 (11.81)	265 (10.43)	76 (2.99)	475 (18.70)	465 (18.31)	5 (0.20)	5 (0.20)	230 (9.06)	40 (1.57)	485 (19.09)	M6	M4	22 (48.6)	Self-Cooled	55	–
3	2.2 WA																
5	3.7 WA																
10	7.5 WA	300 (11.81)	265 (10.43)	76 (2.99)	600 (23.62)	585 (23.03)	5 (0.20)	10 (0.39)	247 (9.72)	66 (2.60)	528 (20.79)	M6	M6	26 (57.4)	THAIR-HS4556 (FAN109)×1	55	EUX 002960
15	11 WA	300 (11.81)	265 (10.43)	76 (2.99)	600 (23.62)	585 (23.03)	5 (0.20)	10 (0.39)	9.0 (9.06)	83 (3.27)	528 (20.79)	M6	M6	27 (59.6)	THAIR-7556X (FAN101)×1		EUX 002970
20	15 WA	325 (12.80)	285 (11.22)	76 (2.99)	675 (26.57)	660 (25.98)	5 (0.20)	10 (0.39)	224 (8.82)	87 (3.43)	548 (21.57)	M6	M6 M8 (N.P.P.I)	30 (66.2)			EUX 002980
30	22 WA	325 (12.80)	285 (11.22)	76 (2.99)	725 (28.54)	710 (27.95)	5 (0.20)	10 (0.39)	224 (8.82)	87 (3.43)	548 (21.57)	M6	M8	36 (79.5)		45	002990
40	30 WA	425 (16.73)	325 (12.80)	70 (2.76)	800 (31.50)	775 (30.51)	12.5 (0.49)	12.5 (0.49)	233 (9.17)	87 (3.43)	668 (26.30)	M10	M8	48 (106.0)			EUX 003000
60	45 WA	500 (19.69)	450 (17.72)	81 (3.19)	1025 (40.35)	1000 (39.37)	12.5 (0.49)	12.5 (0.49)	233 (9.17)	87.5 (3.44)	729 (28.70)	M10	M10	79 (174.4)	THAIR-7556X (FAN103)×2		EUX 003010
80	55 WA	500 (19.69)	450 (17.72)	81 (3.19)	1100 (43.31)	1075 (42.32)	12.5 (0.49)	12.5 (0.49)	233 (9.17)	87.5 (3.44)	729 (28.70)	M10	M10	88 (194.3)			EUX 003020

Unit Dimension Diagram





Note. Models less than of 5 kVA is not provided with fan unit as they are of non-ventilated cooling type

3.3 STANDARD EXTERNAL DRAWING (Cont'd)

Table 3.3 Dimensions: VS-676 400 V Series (Without Fan)

Capacity (kVA)	Type CIMR-	Dimensions in mm (inch)														Main-Circuit Terminal	Weight kg (lb)
		W	W1	W2	W3	H	H1	H2	H3	H4	H5	D1	D2	D3	d		
1.5	H0.75WA	300 (11.81)	265 (10.43)	288 (11.34)	76 (2.99)	475 (18.70)	465 (18.31)	5 (0.20)	437.5 (17.22)	7.5 (0.30)	20 (0.79)	260 (10.24)	40 (1.57)	472.5 (18.60)	M6	M4	24 (53.0)
3	H2.2WA																
5	H3.7WA																
10	H7.5WA																
20	H15WA	325 (12.80)	290 (11.42)	305 (22.01)	76 (2.99)	500 (19.69)	485 (19.10)	7.5 (0.30)	465 (18.31)	10 (0.39)	10 (0.39)	256 (10.08)	63 (2.48)	497 (19.57)	M6	M6	26 (57.40)
30	H22WA*																
40	H30WA	375 (14.76)	325 (12.80)	355 (13.98)	76 (2.99)	750 (29.53)	725 (28.54)	12.5 (0.49)	700 (27.56)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	84 (3.31)	540 (21.26)	M8	M6 M8 (NPPI)	40 (88.30)
60	H45WA	375 (14.76)	325 (12.80)	355 (13.98)	76 (2.99)	800 (31.50)	775 (30.51)	12.5 (0.49)	750 (29.53)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	84 (3.31)	540 (21.26)	M8	M8	50 (110.4)
80	H55WA	475 (18.70)	425 (16.73)	455 (17.91)	76 (2.99)	900 (35.43)	875 (34.45)	12.5 (0.49)	850 (33.46)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	84 (3.31)	640 (25.20)	M10	M10	56 (123.6)
120	H75WA	575 (22.64)	525 (20.67)	555 (21.85)	82 (3.23)	1050 (41.34)	1025 (40.35)	12.5 (0.49)	1000 (39.37)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	84 (3.31)	731 (28.78)	M12	M10	98 (216.3)
140	H110WA	575 (22.67)	525 (20.67)	555 (21.85)	82 (3.23)	1175 (46.26)	1150 (45.28)	12.5 (0.49)	1125 (44.29)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	84 (3.31)	731 (28.78)	M12	M10	105 (231.8)

*Separate estimation required according to your specifications

Unit Dimension Diagram

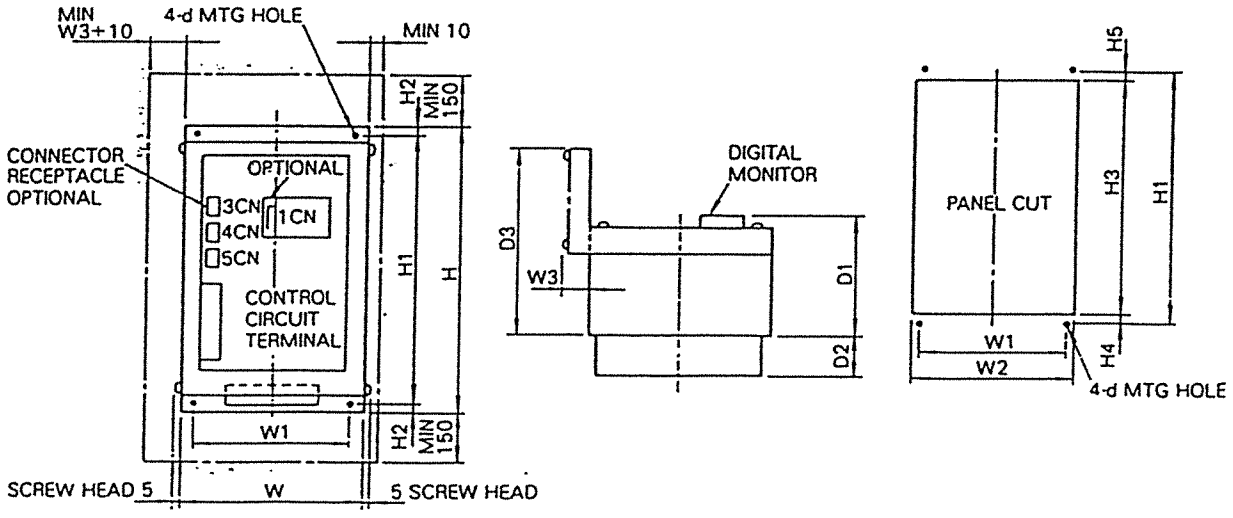
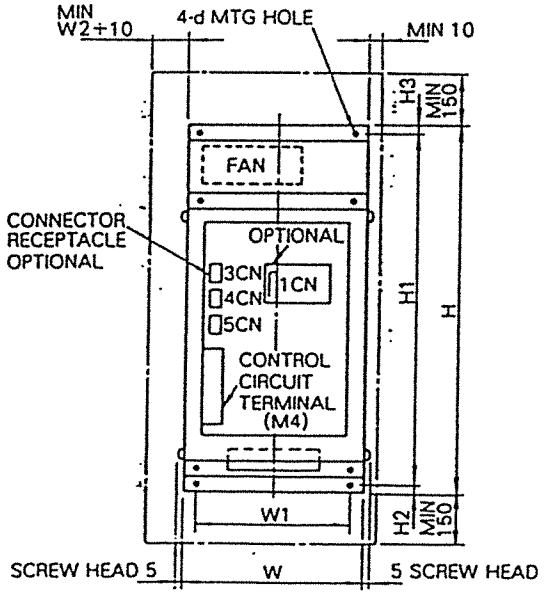


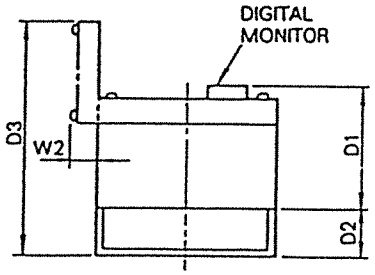
Table 3.4 Dimensions: VS-676 200 V Series (With Fan)

Capacity (kVA)	Model CIMR-	Dimensions in mm (inch)											Main Circuit Terminal	Weight kg (lb)	Applicable FAN	Specified Air Inlet Temp °C	FAN Unit Code No.
		W	W1	W2	H	H1	H2	H3	D1	D2	D3	d					
1.5	H0.75WA	300 (11.81)	265 (10.43)	76 (2.99)	475 (18.70)	465 (18.31)	5 (0.20)	5 (0.20)	260 (10.23)	40 (1.57)	515 (20.28)	M6	M4	27 (59.6)	Self-Cooled	55	—
3	H2.2WA																
5	H3.7WA																
10	H7.5WA																
20	H15WA	325 (12.80)	290 (11.42)	76 (2.99)	600 (23.62)	585 (20.03)	7.5 (0.30)	7.5 (0.30)	256 (10.08)	66 (2.60)	563 (22.17)	M6	M6	31 (68.4)	THAIR-HS4556 (FAN109)×1	55	EUX 00303X
30	H22WA*														THAIR-7556X (FAN108)×1		EUX 00304X
40	H30WA	375 (14.76)	325 (12.80)	76 (2.99)	900 (35.43)	875 (34.45)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	87.5 (3.44)	628 (24.72)	M8	M6 M8 (NPPI)	55 (121.4)			EUX 00305X
60	H45WA	375 (14.76)	325 (12.80)	76 (2.99)	950 (37.40)	925 (36.42)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	87.5 (3.44)	628 (24.72)	M8	M8	61 (134.7)	THAIR-7556X (FAN101)×2	45	EUX 00306X
80	H55WA	475 (18.70)	425 (16.73)	76 (2.99)	1125 (44.29)	1100 (43.31)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	87.5 (3.44)	728 (28.66)	M10	M8	74 (163.4)	MRW-180TA (FAN108)		EUX 00307X
120	H75WA	575 (22.64)	475 (18.70)	81 (3.19)	1250 (49.21)	1225 (48.23)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	87.5 (3.44)	818 (32.20)	M12	M10	121 (267.1)	MRW-180TA (FAN108)×2		EUX 00309X
140	H110WA	575 (22.64)	475 (18.70)	81 (3.19)	1375 (54.13)	1350 (53.15)	12.5 (0.49)	12.5 (0.49)	246 (9.69)	87.5 (3.44)	818 (32.20)	M12	M10	132 (291.4)			EUX 00311X

*Separate estimation required according to your specifications.

Unit Dimension Diagram



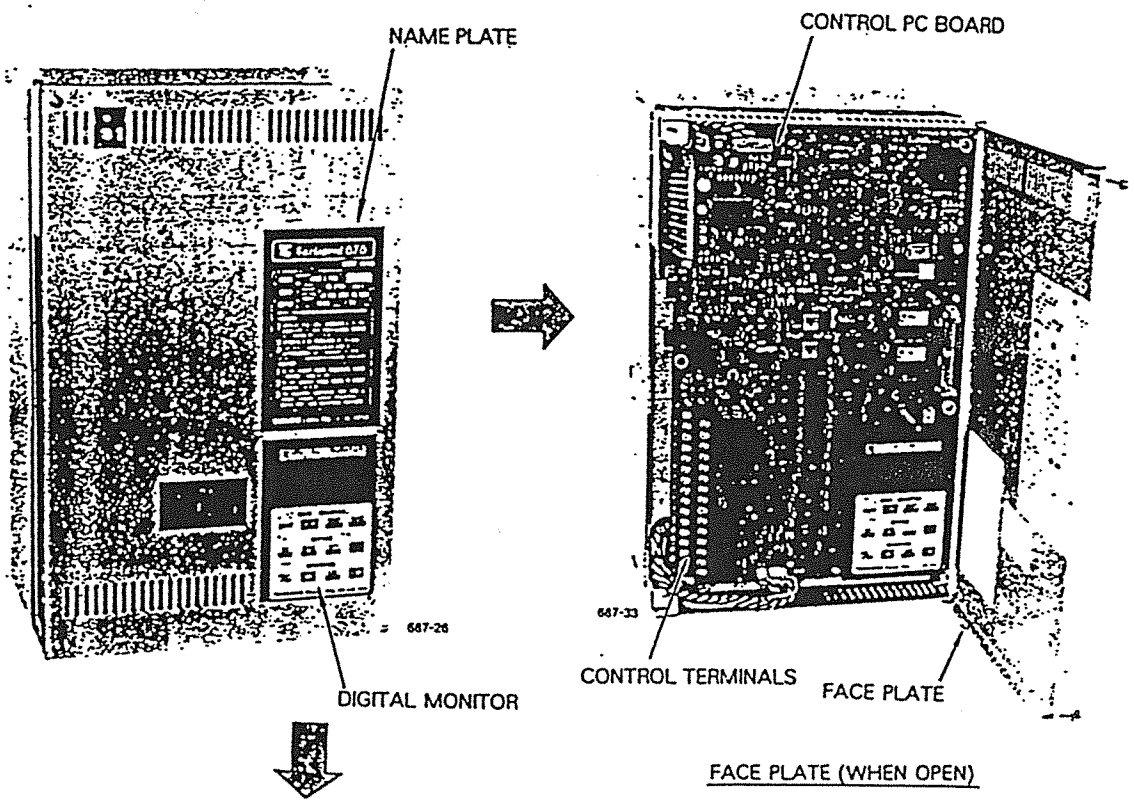


Note.
1. Models less than of 10 kVA is not provided with fan unit as they are of non-ventilated cooling type
2. 10 kVA Model can be loaded with only one unit in the single-system. Fan is needed when units more than one are loaded
3. Model of 80 kVA single unit has THAIR-HS4556 in the unit

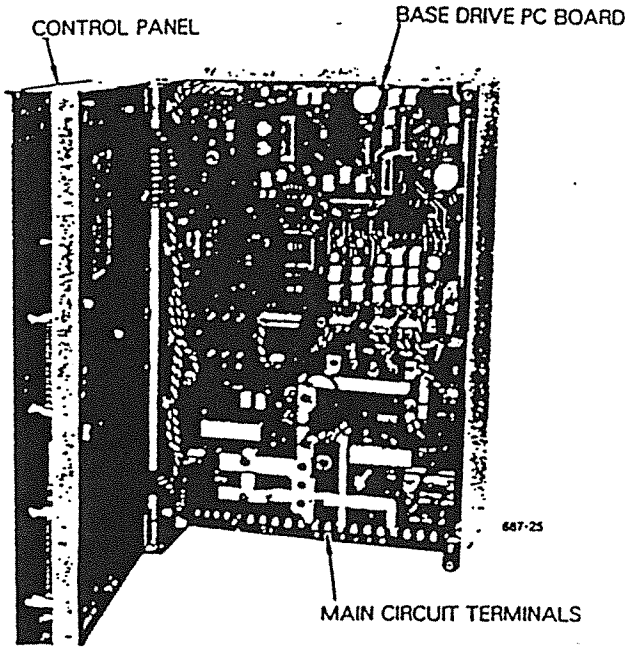
4. CONFIGURATION AND WIRING

4.1 CONFIGURATION

The following is an example of the VS-676 unit configuration (200V class, 5kVA).



FACE PLATE (WHEN OPEN)



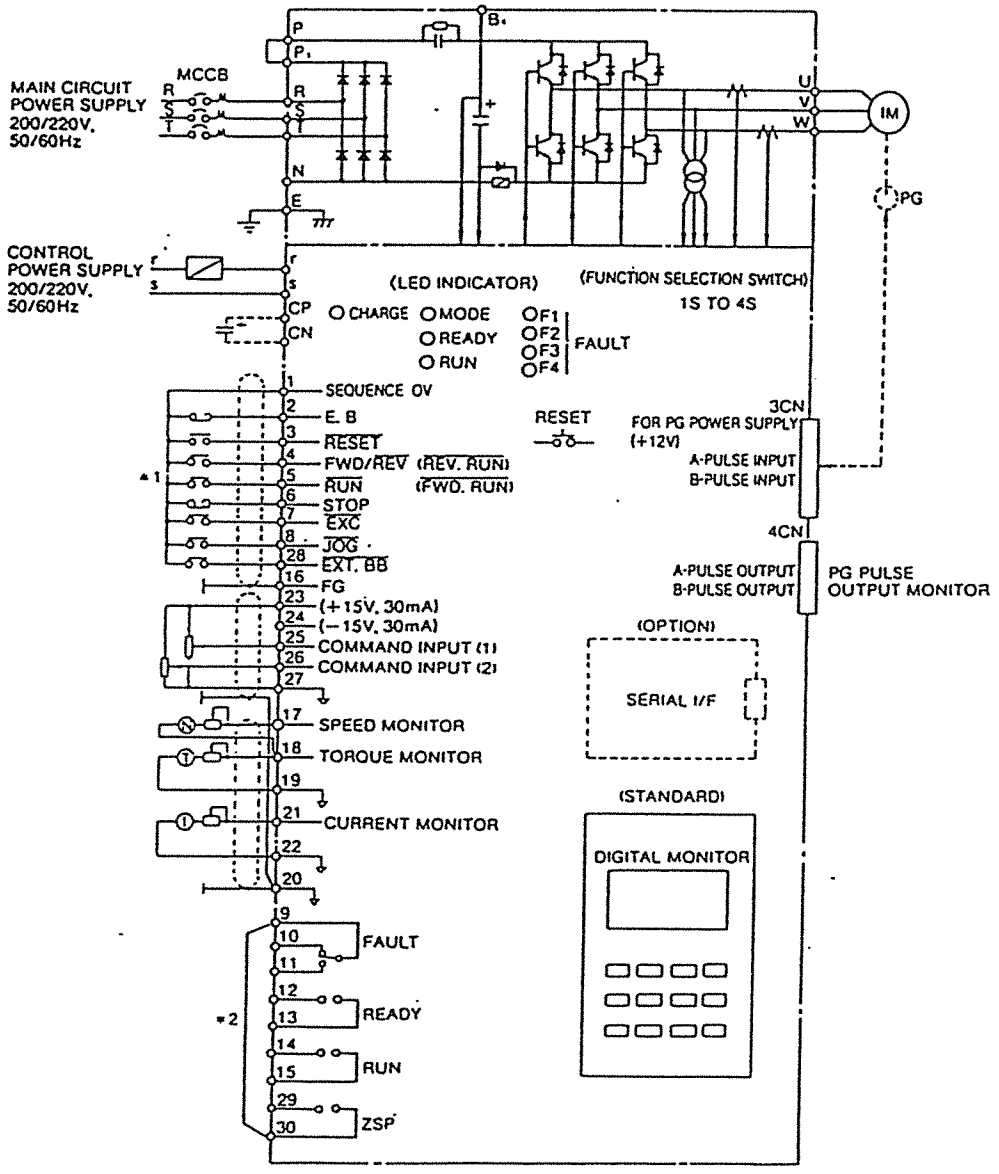
CONTROL PANEL (WHEN OPEN)

4.2 WIRING

Ensure that connection is accomplished correctly, referring to the following figure.

Connection Precautions

Always connect a surge absorber on the coils of the electro-magnetic contactor, control relay, electro-magnetic valve, electro-magnetic brake, etc.



Note: 1 Necessary so that the main circuit power supply and the control circuit power supply can be turned on or off independently.

2 When not using the external trouble (EB) short-circuit terminals 1 and 2.

3 1* Use small current contactors. (Contactors that can be used with 24VDC, 10mA or less.)

4 2* The capacity of the contactors are 250VAC 1A, 30VDC 1A.

4.3 MAIN CIRCUIT BREAKER, ELECTRO-MAGNETIC CONTACTORS

Always connect a circuit breaker (MCCB) between the AC main circuit power supply and the VS-676 input terminals ⓇⓈⓉ. Also connect electro-magnetic contactors as necessary.

When applying the leakage breaker, select a model in which the sensitive current is 200mA or more and operation time 0.2 second or more, so as to avoid abnormal operation.

4.4 SURGE ABSORBER

Always connect a surge absorber on the electro-magnetic contactors or coils of control relays, electro-magnetic valves, electro-magnetic brakes. The application of the surge absorber is shown in Table 4.1.

Table 4.1 Application of Surge Absorber

Devices \ Surge Absorber		Model	Specifications	Code No.
200 V to 230 V	Large capacity coil other than relays	DCR2-50A22E	250 VAC 0.5 μF + 200 Ω	C002417
	Control relay LY-2, -3 (Manufactured by Tateishi Denki) HH-22, -23 (Manufactured by Fuji Denki) MM-2, -4 (Manufactured by Tateishi Denki)	DCR2-10A25C	250 VAC 0.1 μF + 100 Ω	C002482
380 V to 460 V		DCR2-50D10GB	1000 VDC 0.5 μF + 220 Ω	C002630

Note The surge absorber is manufactured by Marucon Denshi.

4.5 WIRING PRECAUTIONS AND PROCEDURES

Note the following on external wiring. Always check the wiring diagram after the wiring has been completed. Do not check the buzzer of the control circuit.

4.5.1 Control Circuit Wiring

(1) The control circuit (terminals ① to ⑮, ⑰ to ㉚) must be wired separately from the main circuit (Ⓡ Ⓢ Ⓣ Ⓝ Ⓟ Ⓤ Ⓥ Ⓦ ⓡ ⓢ Ⓑ) and other power lines.

(2) When using an individual power supply for the control circuit terminals ⑨ to ⑮, ㉙ ㉚ (contactor output) separate ① to ⑧ and ⑰ to ㉘.

(3) Use twisted shielded cables and twisted pair shielded cables for the control circuit. Modify the ends a shown in Fig. 4.1 (to avoid interference caused by noise). The cable must be 50m or less.

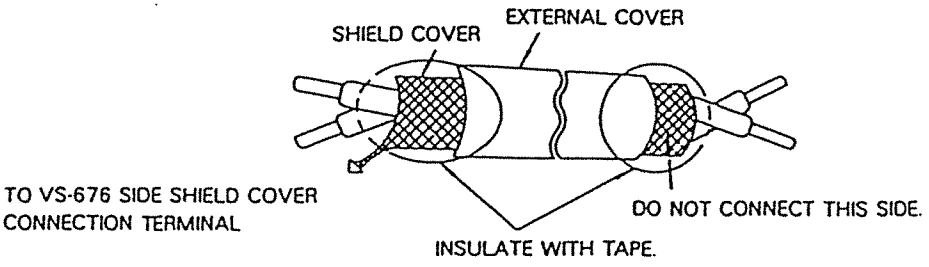


Fig. 4.1 Modification of the end of the twisted shielded cables

4.5.2 Main Circuit Input Cables

(1) The direction of the input terminal ⓇⓈⓉ phase rotation is optional.

(2) Do not connect AC main circuit power to output terminals ⓊⓋⓌ.

(3) Connect the matching VS-676 output terminals ⓊⓋⓌ and the motor terminals ⓊⓋⓌ. A forward rotation command will rotate the motor in the counter clockwise direction (viewed from the drive end).

(4) Be careful that the output cables do not touch the case. It may cause grounding short-circuit or short cicuit.

(5) Do not connect phase advancer capacitance or LC, RC noise filters to the VS-676 output side.

4.5.3 Grounding Cable

(1) Perform grade 3 grounding (100Ω or less) on the grounding terminal Ⓔ using a cable of 2mm² or thicker.

(2) Never share the grounding cable or grounding pole with welding machines, motors, or any other magnetic sequencers. Separate the grounding cable wiring with the wiring of magnetic sequencers.

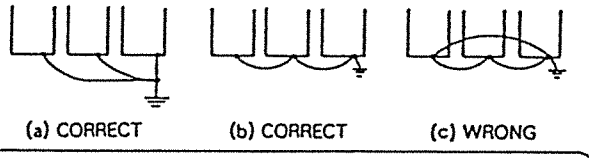
(3) Use grounding cables of the size predetermined in the electric equipment technical standard and make the cable as short as possible.

(4) Always ground from the VS-676 grounding terminal Ⓔ. For example, even when grounding is made with the channel base or iron plate.

(5) When there are multiple VS-676s, ground as shown in Fig. 4-2(a) or (b). Do not loop as shown in (c).

(6) When using motors with PG, always ground the motor. (Grade 3 grounding or higher)

Fig. 4.2 How to Ground Multiple VS-676s



HOW TO PERFORM MAIN CIRCUIT MEGGER TEST

Perform the main circuit insulation resistance test (megger test) using a 500V megger.

As shown in Fig. 4.3, share a line to connect the VS-676 AC main circuit I/O terminals ⓡⓢⓇⓈⓉⓃⓅ①Ⓟ②Ⓟ③ⓊⓋⓌ. Also, connect the control circuit terminals ① to ⑮, ⑰ to ㉚ with another common line, and perform the megger test only between the main circuit common line and the ground (grounding terminal Ⓔ).

Never perform the megger test on circuits other than the main circuit.

It is normal if the megger points 1MΩ or more.

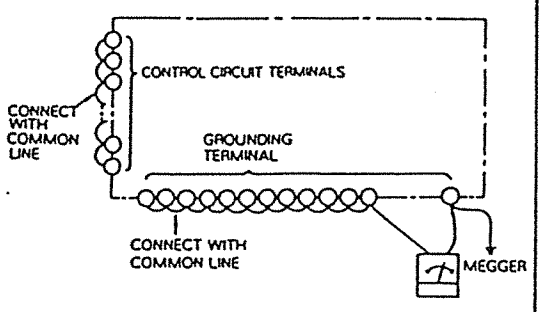


Fig. 4.3 Wiring for Megger Test

5. TEST OPERATION

5.1 PREPARATION

Check the following items before performing test operation.

(1) Are the main circuit power and control power within the rated value?

(2) Are the main circuit I/O connected correctly?

Inverter input side (Power supply side) --- ⓇⓈⓉ

Inverter output side (Motor side) --- ⓊⓋⓌ

(3) Is the connection between the speed detector (PG) correct?

(4) Are the main circuit and control circuit grounded? Are there no short-circuits?

(5) Separate the motor from the inverter, and check if the motor is grounded, if it is not short-circuited, and if the insulation resistance is sufficient.

(6) Have the function selections been correctly made?

(7) Is the operation of the external sequence circuit normal?

(8) Is the cooling fan rotating in the correct direction?

5.2 TEST OPERATION

For safety, remove the coupling, belt, etc. of the motor and the machine, so that the motor can operate independently. When it is to be operated with the motor and the machine connected, special care must be taken to insure safe operation.

5.2.1 Setting the Function Selection Switch

Set the function selection switch 1S as follows so that test operation can be performed disconnected from the higher order sequencer. [Operation by digital monitor or serial interface card (optional) + personal computer].

1S - ① : ON *Set other function selection switches as necessary.

5.2.2 Control Power Supply

Supply the control power, and check each power source voltage on the control printed circuit board check terminal.
It will indicate "UV", because the main circuit power is not supplied.

Table 5.1 Control Power Supply Voltages

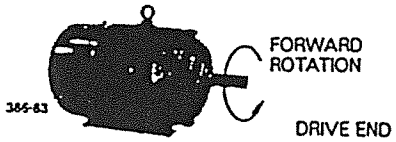
Check Terminal	VC (G)	P15 (G)	N15 (G)	P24 (G)	IP24 (IN24)	IP12 (IN12)	IP5 (IN5)
Normal range	4.75 V ~5.25 V	14.25 V ~15.75 V	−14.25 V ~−15.75 V	22.8 V ~25.2 V	19.2 V ~ 28.8 V	13 V (adjustment)	4.75 V ~ 5.25 V
					Isolated power source		

5.2.3 (*) Checking the Preset Constants

Check that the internal setting values (motor constants, inverter constants) and application constants are set according to the setting list.

5.2.4 (*) Checking the Direction of PG Rotation

When there is a P.G, indicate the speed detection on the digital monitor, and rotate the motor by hand, to check that the direction of rotation and the indicated polarity are correct, and that the speed indication is correct.
The forward direction of the motor is in the counter clockwise direction when viewed from the drive end.



5.2.5 (*) Supplying Power to the Main Circuit

After supplying power to the main circuit, check that there is no abnormality (abnormal noise, fumes, odor, etc.). The charge indication LED "CHARGE" lights as soon as power is supplied to the main circuit, and the inverter is ready to operate. (The inverter ready indicator "READY" lights.)

5.2.6 (*) Motor Operation

(1) Give a forward rotation command or a reverse rotation command, and input about 5% speed command, to check that the motor rotates as commanded.

(2) Next, gradually accelerate the speed command until it reaches the maximum speed, while checking that there is no motor vibration or noise.

(3) Set the acceleration/deceleration time (application constant: ACC, DEC) at about ACC =: 2 sec, DEC =: 20 sec (Note 2) and the torque limit (application constant: TLM, TLG) at TLM = 100%, TLG = 20% (Note 2), and check that the acceleration and deceleration is smooth in both forward and reverse rotations.

Note:

1 If the speed detector is hunting with the motor rotation at low-speed, check whether or not the phase sequence of the inverter output ⓤⓥⓦ and motor ⓤⓥⓦ are reversed.

2 Decide the deceleration time (DEC) and regeneration side torque limit value (TLG) setting according to the regeneration processing capacity of applicable circuit. When there is power regeneration circuit or a processing circuit by resistance discharge, check the following:

Function selection switch 2S-4: ON state

This completes the test operation. Proceed to load operation and general operation. When readjustment or resetting is necessary, refer to sect 6 "Adjustment and setting".

6. ADJUSTMENT AND SETTING

- The variable resistors and internal constants of the VS-676 have been adjusted properly prior to factory shipment. Do not change the setting unnecessarily.
- Even if the setting of the function selection switches (1S-3S) are changed during operation, the operation will be continued in the conditions existing before the change. The new function selection applies only after the control power supply is turned off once and then turned on again.

6.1 WHERE TO ADJUST AND SET

Table 6.1

Switch Symbol		Name	Function	Default
1S		Control mode selection Operation mode	The control mode can be selected according to the application. The test mode for test operation and check can also be selected.	OFF side See Table 6.4.
2S		Additional function selection Application function	Necessary functions can be selected according to the specifications.	OFF side See Table 6.5.
3S		(Command system selection)	The command system can be selected according to the application.	OFF side See Table 6.6.
Cn-33, -34 (SYC1) (SYC2)		Function selection	Necessary functions can be selected according to the specifications.	0000 H See Table 6.8 (1) to (4).
N, Φ V/C		Command Voltage mode/current mode N : Analog command 1 Φ : Analog command 2	• Select according to whether the command input (㉕, ㉖) is voltage mode(0 to ±10V) or current mode (4 to 20mA). • The 2 inputs can be selected independently.	V-side
4S		Motor selection	• Set according to the applied motor (VS-676 standard motor). • This setting is the final setting prior to factory ship shipment. Never change this setting.	
RU, RW		-Primary resistance compensation		
ΦU, ΦW		Magnetic flux gain setting		

Note: Setting of 1S - 3S and Cn-33, -34 must be made only by personnel with a thorough understanding of the functions and warnings.

Never change any shunt connectors or variable resistors that are not described in the above table. The functions and performances are not guaranteed in case changes are made.

6.2 LED INDICATION

(1) LED names and indications

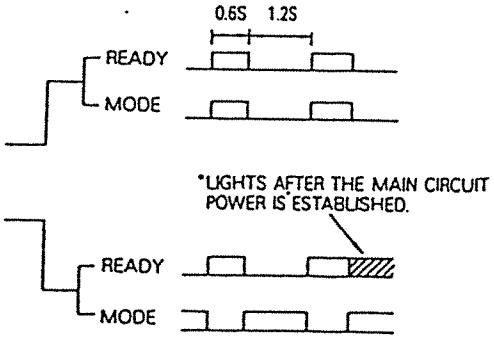
Table 6.2

LED Name	Color	Description	Remarks
READY	Green	• Lights when it is ready for inverter operation • Blinks when it is not ready for inverter operation • Turns off in case of initial error	• Same as contactor output READY.
RUN	Green	• Lights during inverter operation (BB-release) • Turns off in the base block	• Same as contactor output RUN.
MODE	Green	• Indicates the operation mode	
F1 ~ F4	Red	• Indicates the descriptions of abnormality in case inverter abnormality occurs.	The descriptions are distinguished by the combination of the READY and MODE LED. (See Table 6.3.)
CHARGE	Red	• Indicates main circuit during charging.	Perform maintenance and inspection of the main circuit after "CHARGE" goes out.

(2) Indication of the operation modes

Table 6.3 Operation Mode

LED Indication* READY	LED Indication* MODE	Operation Mode	
⊙	○	During normal Operation	
⊙	●	Automatic turning mode selection	IS-⑤ : ON
⊗	⊗	Base test mode selection	IS-② : ON IS-④ : OFF
⊙	⊗	V/f test mode selection	IS-② : ON IS-④ : ON
○	●	Initial error occurred in the system unit	
○	○	Initial error occurred in the control unit	Note :



Note: Control unit initial offline is excluded.

*LED Indication
⊙ :Blink ... Not ready for operation
Lit ..... Ready for operation
○ :Off
⊗ :Blink
● :On

Where to adjust and set in the single-system

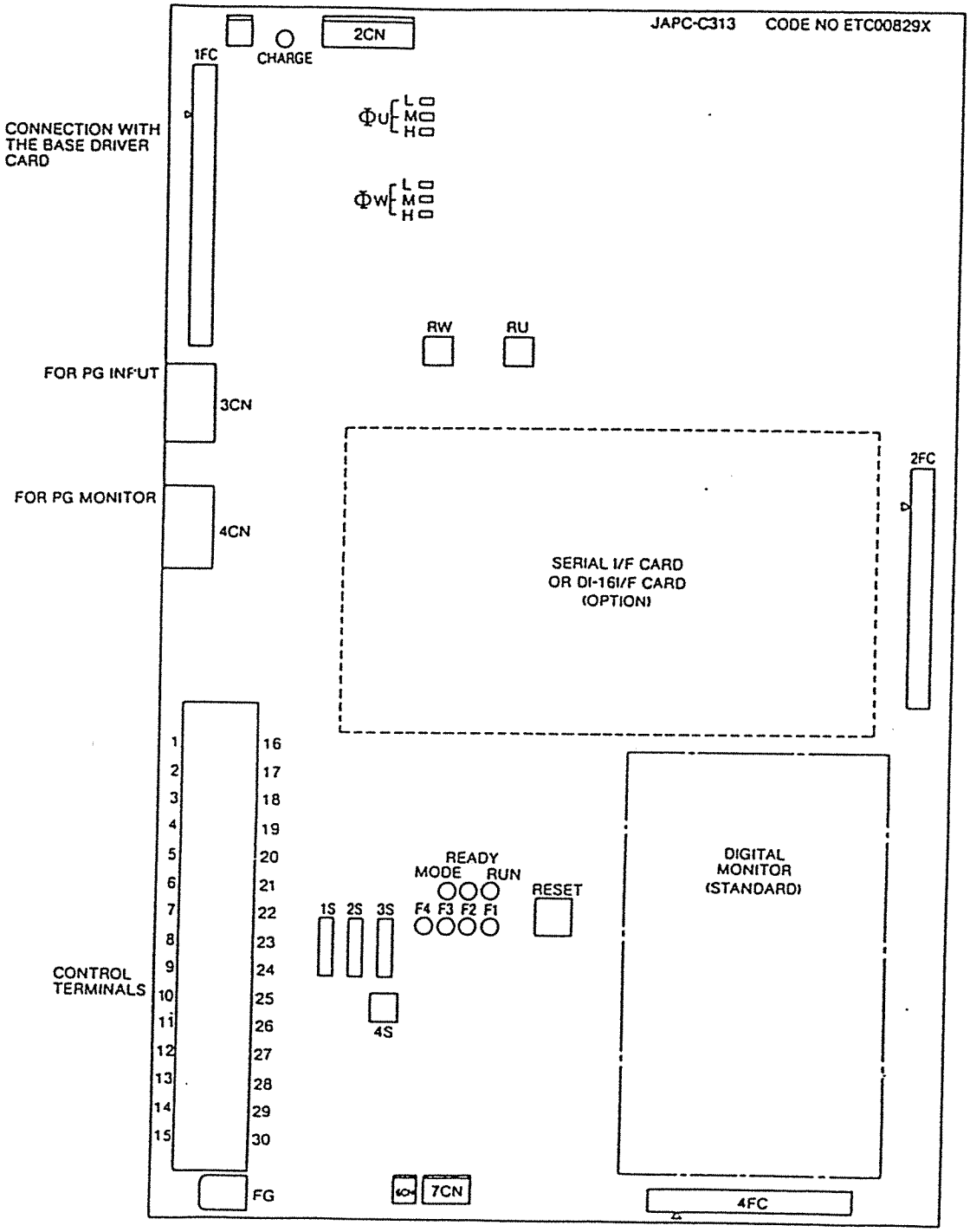


Fig. 6.1 Where to Adjust and Set
(For the Single-System)

6.3 FUNCTION SELECTION SWITCHES (1S to 3S, Cn-33, Cn-34)

1S Operation Mode, Control Mode Selection

Table 6.4

Notch No.	Function	Setting	Description of Function, Warning	
1	Operation mode operation / adjustment	OFF	Operation mode : Select this mode for normal line operation	
		ON	Adjustment mode. Select this for single operation, disconnected from the system the same as for test operation, or adjustment.	
2	Operation / test	OFF	Operation mode: The mode set by 1S-①.	
		ON	Test mode: The test mode set by 1S-④.	
3	EEPROM writing prohibited / allowed	OFF	Inhibited: Must always be prohibited under operation mode. (When 1S-1 is OFF)	
		ON	Allowed: Selected when setting or altering the constants	
4	Base test / V/f test	OFF	Base test mode: Selected for function check when only control power is required	Must be used with all setting "OFF".
		ON	V/f test mode. Selected to drive the motor under constant current.	
5	Operation / tuning	OFF	Operation mode: The mode set by 1S-①.	
		ON	Tuning mode: The mode used for adjustment at the factory prior to shipment.	
6	Tuning mode mode 1 / mode 2	OFF	The mode used for adjustment at the factory prior to shipment.	
		ON		
7	Without PG / With PG	OFF	Without PG: Selected when the adapted motor has no PG.	
		ON	With PG: Selected when the adapted motor has PG.	
8	Speed control / Torque control	OFF	Speed control Selected for speed control	
		ON	Torque control Selected for torque control	

[ ] indicates preset at the factory and must not be selected at your end.

2S Function Selection

Function Selection 2S Function Selection
Selected according to system specifications

Table 6.5 Default : All OFF

Notch No.	Function	Setting	Description of Function, Warning	
1	Motor rated voltage 180V / 160V	OFF	H Selected when the power supply voltage is 220V ±10%. *DC power supply: 297VDC ±10%	400V class : 440VAC ±10% : 594VDC ±10%
		ON	L Selected when the power supply voltage is 200V ±10%. *DC power supply: 270VDC ±10%	400V class : 400VAC ±10% : 540VDC ±10%
2	Non-standard motor constant torque / constant output	OFF	Constant torque: Selected when under non-standard motor constant torque control.	
		ON	Constant output: Selected when under non-standard motor constant output.	
3	With/without reverse rotation prevention function	OFF	Without reverse rotation prevention function	
		ON	Selected when applied to machines that may be damaged by reverse rotation. Note: The direction of revolution must be specified by Cn-33. + velocity commands only are accepted.	
4	With/without excess voltage controls the function	OFF	A function that automatically controls the regenerative torque in case it exceeds the regenerative processing capacity (for example, when there is no deceleration rate corresponding to the load GD^2). The deceleration time is longer than the set value. When power regenerative converter or resistance discharge circuit is used, set default to ON.	
		ON	It becomes excess voltage (OV) if it exceeds the regenerative processing capacity, and coasts to a stop. Install external regenerative circuits as necessary.	
5	With/without momentary power loss function	OFF	Coasts to a stop as soon as momentary power loss is detected.	
		ON	In case momentary power loss time is within 1 second, it accelerates to continue the operation after recovery. If momentary power loss time exceeds 1 second, it coasts to a stop. (Control power supply and backup capacitor are connected.)	
6	With/without coasting lead-in function	OFF	Without coasting lead-in function	
		ON	Re-accelerates the motor during coasting to the preset speed.	
7	Stop mode in case of complete operational coasting stop/rapid deceleration stop	OFF	Coasting stops in case of complete operational failure.	
		ON	In case of complete operational failure, it performs torque limit deceleration at the rate of 0.	
8	Master reset	OFF	• By operating as OFF → ON → OFF, CPU master reset is performed. • If this is perfomed inadvertently, the function will stop. Never do this during operation.	

Note: Consult your YASKAWA representative to select coasting lead-in function (2S-⑥: ON) under control without PG(1S-⑦: OFF).

3S Command System Selection

Table 6.6

Notch No.	Function	Setting	Description of Function/Warning
1	Analog command/Digital command	OFF	Analog command: Select whether the device is run by analog command 1, analog command 2 or external contact point.
		ON	Digital command: Operation is available by a function selected in par. 3S-②. (Running is not available by analog command or external contact point.)
2	Digital monitor/SERIAL I/F card	OFF	Digital monitor: Operation through digital monitor.
		ON	SERIAL I/F card: Operation through serial interface card (optional)
3	Contact command F/$\overline{R}$ / $\overline{R\text{-}RUN}$ $\overline{RUN}$ / $\overline{F\text{-}RUN}$	OFF	F/$\overline{R}$: Terminal ④ functions as F/$\overline{R}$ $\overline{RUN}$: Terminal ⑤ functions as $\overline{RUN}$
		ON	$\overline{R\text{-}RUN}$: Terminal ④ functions as $\overline{R\text{-}RUN}$ $\overline{F\text{-}RUN}$: Terminal ⑤ functions as $\overline{F\text{-}RUN}$
4 5	Function selection of analog command	See to Table 6.7.	Select a function of analog command 2 in a combination of 3S-④ and ⑤.
6	—	—	—
7	—	—	—
8	—	—	—

Table 6.7 Function Selection of analog command 2

3S ④	3S ⑤	Analog Command 2	1S-⑧ Selection
OFF	OFF	Not used (Input is 0)	—
ON	OFF	Speed compensation input (10 V/10 % speed)	Speed control selection (1S-⑧: OFF)
OFF	ON	Torque compensation input (5 V/100 % torque)	
ON	ON	External torque control input (5 V/100 % torque)	

Cn-33 Function Selection by System Constant (sycl)

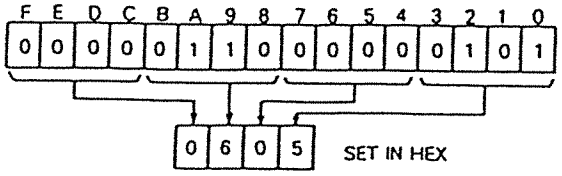
Set Cn-33 in hexadecimals (HEX) according to the function to be selected.

Table 6.8 (1)

Bit No.	Function	Setting		Remarks
		1	0	
0	Rotation direction when reverse rotation is prohibited	Forward rotation	———	• Effective when 2S-③ is ON. • Becomes abnormal when 0.0 and 1.1 are selected.
1		Reverse rotation	———	
2	0-speed start interlock	RUN is accepted when speed feed back is zero speed (ZSP) or less.	None	Do not select this function when without-PG control or coasting lead-in functions are selected.
3	Command start interlock	RUN is not accepted when speed command is zero-speed (ZSP) or less.	None	———
4	Stop interlock	In STOP, RUN is not accepted if it is less than the zero-speed.	None	
5	Only for multi-system drive	———	———	———
6*	Used internally	———	———	
7	Contact output ⑫, ⑬ function alteration	ALARM (minor failure)	READY (ready for inverter operation)	
8	Process in case of general purpose transmission error	Continues operation	Stops	• The stop mode is set by bit F.
9	Excess load (OL) failure rank	Minor failure	Major failore	
A	Failure rank of velocity deviation abnormality detection	Major failure	Minor failure	
B	Without PG interlock	Wo interlock	Stop mode when speed command is 2% and less	• Effective when without PG control is selected.
C*	Used internally	———	———	
D	ACC/DEC adjuster by-pass	ACC/DEC adjuster by-pass	ACC/DEC adjuster is used	
E	Function selection of external base block input	Major failure	Warning	• See to table 6.8(3) • 0 is not failure. • Applied to software No. S0102.
F	Stop mode in case of transmission error	Deceleration and stop	Coasting stop	

Note: The bits of * Mark mever be set at "1".

(Example of setting)



Cn-34 Function Selection by System Constant

Set Cn-34 in hexadecimals (HEX) according to the function to be selected.

Table 6.8 (2)

Bit No.	Function	Setting		Remarks
		1	0	
0	Analog command conversion	• V mode 125%/10V • I mode 125%/4 to 20mA	• V mode 100%/10V • I mode 100%/4 to 20mA	If 125%/10V internally limited to 109%.
1	(Not used)	–	–	–
2	Internally used	–	–	–
3		–	–	–
4 5	Current control gain changing	By the combination of table. 6.8(4).		–
6	(Not used)	–	–	–
7	(Not used)	–	–	–
8 to F	Optional code	–	–	8 to F are-all 0. (All codes other than 0 are handled as type check errors)

Table 6.8 (3) Function Selection of Terminal 2.28 (Syc1-E)

Terminal	System Constants (Syc 1-E)		
	0	1	
2 (EB)	Nomal at "close" Automatic reset (not handled as a fault) FAULT : Does not output. READY: Is not affected.		Remote variable on multi-system 01 (STS) bit 5 02 (ARM) bit 7.
	EB indication at contact "open"	No indication	
28 (EXT. B.B)	Abnormal at "close" Automatic reset. (not handled as a fault) FAULT : Does not output. READY: Is not affected.	Abnormal at "close" handled as a fault during running. FAULT : Output READY: Down *Remote: variable 02-⑦ output. *Automatic reset during base block. *Selectable coasting stop /rapid deceleration stop. *Reset by failure reset.	The Syc 1-E "0" is the same function as a base block of a multi-system.
	No indication	EB indication at contact "close"	

Table 6.8 (4)

Bit No. 4	Bit No. 5	Current control gain
0	0	Standard gain
0	1	Standard gain
1	0	75% for standard gain
1	1	50% for standard gain

6.4 SETTING AND REFERENCING THE COMMANDS AND CONSTANTS

Application constants as shown in table 6.9 are set by digital monitor.

Monitoring the setting of commands, constants, and variables. The commands, constants, and variables of Table 6.10 to Table 1.12 can be referenced via the digital monitor.

See the following document for the method of setting and referencing:
Digital Monitor Operation Manual

> In addition to the application constants shown in Table 6.9, there are also constants used internally. Though these can also be referenced and set, never change the preset value. The function and performances will no longer be guaranteed, and it may damage to the inverter and motor.

Setting of Application Constants

Table 6.9 Setting of Application Constants

See Table 6.11 "Application constants" for the upper and lower limits of the setting as well as the initial value.

Constant No.	Name	Function	Remarks
Cn-01 Cn-02	ASR proportional gain (ASRP) ASR integral time (ASRI)	• The proportional gain and integral time of the speed controller are set. $K \cdot (1 + \frac{1}{ST})$ K: ASRP, ST: ASRI	Set in a range that will not cause hunting in the speed control system.
Cn-03 Cn-04	Electric drive side torque limit (TLM) Regeneration side torque limit (TLG)	• The torque limit value is set at the electric drive and regeneration side. • It will be internally accepted as the secondary current command (I2R) limit. T: Reverse rotation, regeneration (+TLG) / Forward rotation, electric drive (+TLM); N: Reverse rotation, regeneration (−TLM) / Forward rotation, electric drive (−TLG)	
Cn-05 Cn-06	Acceleration time (ACC) Deceleration time (DEC)	• The ACC/DEC rate of the speed command is set. • Set within the range of 0 to ±100%. • ACC/DEC can be set individually DEC, ACC, t	The minimum value of the deceleration time is decided by the regenerative electric power processing function of the entire system.

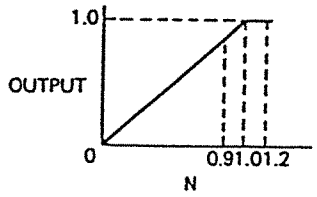
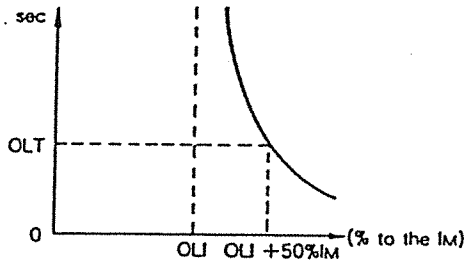
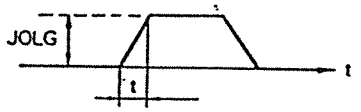
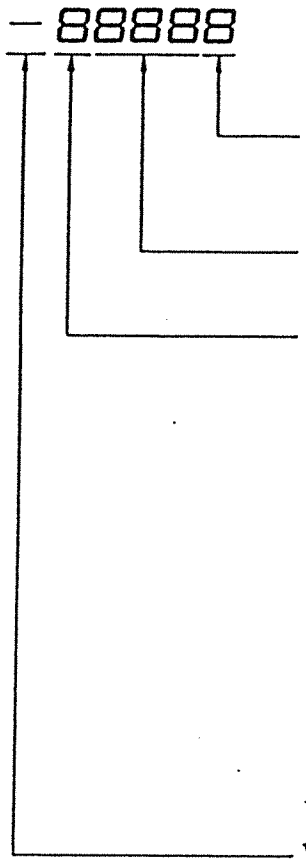
Constant No.	Name	Function	Remarks
Cn-07	Reted speed adjustment (SADJ)	• Fine adjustment of the motor rated rpm at 100% speed command is performed. • SADJ: 1.0 – 1.2 Becomes rated output characteristics. • SADJ: 0.9 – 1.0 Can be adjusted but the output will be lower. 	Used for fine adjustment due to the difference in rpm caused by gears, etc.
Cn-08	Torque command variation limit (DTL)	• A primary delay time constant that controls the secondary current command variation is set.	Avoids generation of excess torque due to abnormal resonance caused by a rapid change in the torque command.
Cn-09 Cn-10	Motor OL operation start current (%) (OLI) Operation time (sec) at OLI +50% IM (OLT)	• Motor OL protection operation area is set. • OLI: Set by the % of the motor rated current • The motor OL operation time to the output current IAC (% to the motor rated current) is expressed by the following expression. $T(S) = \frac{50\,(\%)}{I\,(\%) - OLI\,(\%)} \times OLI\,(S)$ 	Incorporated in the inverter OL (the setting is fixed) Processing during OL operation depends on the major/minor failure selection. (See Cn-33 -⑨)
Cn-11	0-speed level (ZSP)	• The zero-speed detection level is set.	
Cn-12	Excess speed level (OSP)	• The motor excess speed level is set.	
Cn-13	Speed deviation abnormality (EXSP)	• The abnormality detection level of the deviation between the amount of the speed command and the speed feedback is set. Setting pf EXSP = 0.0 is not detected as a abnormarity.	Processing in case abnormality occurs depends on the major/minor failure selection. (See Cn-33 -④)

Table 6.9 Setting of Application Constants (Cont'd)

Constant No.	Name	Function	Remarks
Cn-14 Cn-15	Jogging command (JOGL) Jogging ACC/DEC time (JOGT)	• THe jogging operation speed command and ACC/DEC rate are set. • The ACC/DEC time is set by the time of 0 ↔ ±100% speed command. When the jogging command is 10%, it is 1/10 of the setting time. • The setting of the ACC/DEC times are the same.  $t = \frac{\text{JOGL (\%)}}{100} \cdot \text{JOGT (sec)}$	
Cn-16	Only for multi-system drive	—	
Cn-17	Feeder resistance (RF)	The feeder resistance between the inverter output and the motor is set. $\text{RF (\%)} = \frac{\gamma_F \times I_{20}}{Vo/\sqrt{3}} \times 100 \text{ (\%)}$	γ_F(Ω): Feeder resistance value I_{20}(A): Motor rated secondary current Vo: Motor non-load voltage
Cn-18	Trace sampling time (TSAP)	• The trace back data sampling time is set.	See Section 8.4 "Trace back".
Cn-19	ACC/DEC speed compensation (GDC)	• Torque compensation at ACC/DEC speed is set.	
Cn-32	Initial excitation timer (EXCT)	• The initial excitation time for a previous initial excitation is set.	
Cn-33	System constant 1 System constant 2	• Function selection soft switch See Table 6.8 (1) to Table 6.8 (4) (Bit match table) for details	HEX indication
Cn-35	DB time (DBT)	• The DB time is set when DB stop is selected in case the speed is zero or less. When DBT = 0, coasting is allowed with zero-speed or less.	

Un- 17 System Selection Indication

Following shows inverter capacity (kVA), control method selection, etc.



Shunt Indication	200/400V	Shunt Connector (⌿U, ⌿W) Selected Position Designation
0	200 V	L
1	200 V	M
2	200 V	H
3	400 V	L
4	400 V	M
5	400 V	H

Table 6.10 Command Value (Bn-)

No.	Name	Abbreviation	Unit	Lower Limit	Upper Limit	Remarks
01	Speed command	SREF	10^{-2}%	-109.22	109.22	Speed control (kept in case of transmission error)
	Speed limit			-32767 (30000/100%)	32767 (30000/100%)	Torque control (kept in case of transmission error)
02	Torque command	TREF	10^{-2}%	-200.00	200.00	Speed, torque control (kept in case of transmission error)
03	Torque compensation	TCMP				Speed, torque control (not kept in case of transmission error)

Application Constants (Initial Data) (Cn-)

Table6.11 Application Constants (Initial data) (Cn-)

No.	Name	Abbreviation	Unit	Lower limit	Upper limit	Initial Value	Remarks
01	ASR proportion gain	ASRP	10^{*}	0	100	10	
01	ASR integral time	ASRI	ms	0	10000	500	No integrals with=0
03	Torque limit (electric drive)	TLM	10^{-2}%	0.00	200.00	120.00	
04	Torque limit (regeneration)	TLG	10^{-2}%	0.00	200.00	20.00	
05	Acceleration time	ACC	10^{-1}S	0.0	1800.0	10.0	Canceled when=0.
06	Deceleration time	DEC	10^{-1}S	0.0	1800.0	10.0	Canceled when=0
07	Rated speed adjustment	SADJ	10^{-4}	0.9000	1.2000	1.0000	A constant-setting device is required for setting the 4th decimal place.
08	Torque command variation limit	DTL	10^{*}ms	0	100 (20)	4	*
09	Motor OL current	OLI	10^{-2}%	50.00	200.00	150.00	
10	Motor OL time	OLT	10^{*}S	1	120	60	
11	0-speed level	ZSP	10^{-2}%	0.00	20.00	2.00	
12	Excess speed level	OSP	10^{-2}%	100.00	130.00	120.00	
13	Velocity deviation abnormality	EXSP	10^{-2}%	0.00	130.00 (50.00)	20.00	Note: A malfunction will not be detected if the abnormal speed deviation (EXPS)= 0 is set.
14	Jogging level	JOGL	10^{-1}%	0.0	100.0 (10.0)	0.0	*
15	Jogging ACC/DEC time	JOGT	10^{-1}S	0.0	1200.0	10.0	
16	Only for multi-system	—	—	—	—	—	
17	Feeder resistance	RF	10^{-2}%	0.00	5.00	0.00	
18	Trace sampling time	TSAP	10^{*}ms	8	480	80	
19	ACC/DEC compensation	GDC	10^{*}ms	0.00	50.00	0.00	
20	—	—	—		—	—	

*Applied to software Nos. S0102 and higher.

The numerical values enclosed in ( ) are applied to S0101 and lower.

Remote Variable (Un-)

Table 6.12 Remote Variable (Un-)

No.	Name	Abbreviation	Unit	Lower Limit	Upper Limit	Remarks
01	Status	STS	—	0000	FFFF	Bit information
02	Alam	ARM	—	0000	FFFF	Bit information
03	Secondary torque command	TRO	10^{-2}%	−250.00	250.00	
04	Torque feedback	TORQ	10^{-2}%	−250.00	250.00	
05	Speed feedback	SPED	10^{-2}%	−109.22	109.22	
06	Primary current command	IIR	10^{-2}%	0.00	250.00	
07	Primary frequency command	FIR	10^{-2} Hz,	−180.00	180.00	
08	Main circuit direct current voltage	VPN	10^{-1}V	0.0	1000.0	200V class 500V/100% 400V class 1000V/100%

Remote Variable Constant No.01 Status (STS)

Bit	Signal Name	Description		Rank*
		1	0	
0	Under operation	Under operation	Under base-block	
1	Zero-speed	Detecting zero-speed	Not zero-speed	
2	Reverse rotation	Reverse rotation	Forward rotation	
3	Failure reset	Failure reset	Failure reset is released	
4	Emergency stop	Emergency stop	Emergency stop is reset	
5	Externally normal	Contact input (EB) Closed	(EB) Open	(A)
6	Minor failure	Detecting minor failure	Minor failure is reset	B
7	Major failue	Detecting major failure (inverter stopped)	Inverter is normal	A
8	Command is abnormal	The transmission command input is not within the preset range.	Normal	B
9	Only for multi-system drive	——	——	—
A	Only for multi-system drive	——	——	—
B	Only for multi-system drive	——	——	—
C	Speed synchronization	Detecting speed match signal	Speed not synchronized	
D	Detecting speed *	Speed detection without PG not completed	Speed detection without PG completed	
E	——	——	——	
F	Inverter ready*	Ready	Not ready	

* Always 0 when it is with PG.

* Inverter ready (READY)
[READY in MCON and major failure]

*Rank: A: Major failure
B: Minor failure
C: S for signal system
Status signal for milti-system
S: By selection

— Remote Variable Constant No.02 Alarm (ARM)

Bit	Signal Name	Description	Rank*
0	Overcurrent		A
1	Overvoltage		A
2	Overload		S
3	Overspeed		A
4	Overheat		A
5	Fuse blown		A
6	Open phase		A
7	External abnormality	EB became "Open" during operation or EXT BB became "Close".	(A)*
8	Control unit hardware error	Watch dog + Control unit initial error	A
9	Transmission error between CPUs	Transmission error between control unit, system unit CPUs	A
A	Power failure 1	In momentary power loss detection	B
B	Power failure 2	Power failure of 1 second or more	A
C	Speed deviation abnormality		C*
D	Intial setting error	Drive mode abnormality. Control mode abnormality. Standard motor section abnormality	—
E	Memory error		A
F	Transmission error		S

*When single system, when minor/major failure selection is accomplished via the memory switches, or when the speed deviation level = "0", it is not regarded as failure.

*Applied to software No. S0102

*Rank: A; Major failure
Values enclosed in ( ) are applied to software Nos. other than S0102.
B; Minor failure
C; S for single system
Status signal for multi-system
S: By selection

Trace Back Data

Table 6.13 Trace Back Data

No.	Name	Abbreviation	Unit	Remarks
01	Speed command	SREF	10^{-2}%	30000/100%
02	Secondary torque command	TRO	10^{-2}%	10000/100%
03	Primary current comand	IIR	10^{-2}%	10000/100%
04	Torque feedback	TORQ	10^{-2}%	10000/100%
05	Speed feedback	SPED	10^{-2}%	10000/100%
06	Status	STS	—	
07	Alarm	ARM	—	
08	Local alarm	LAM	—	See 11.6 「Alarm Contents」

7. MAINTENANCE

Periodical maintenance is necessary to avoid accidents, and to maintain the function and performance of the system.
Note the following when checking the system.

- Always disconnect the power of the main circuit and control unit.
- The smoothing capacitor will not discharge for some time after the power is disconnected. The charging indicator (CHARGE) will turn off to indicate that the capacitor is discharged. But for safety, check the capacitor with a tester, before proceeding with the checking.

7.1 PERIODIC CHECK ITEMS

The following items must be periodically checked.

Table 7.1 Periodic Check Items

Check items	Check Cycle	Description	Troubleshooting
• External terminals, unit set screws, connectors, etc.	Annually	• Are the screws loose? • Are the connectors loose?	• Tighten the screws. • Attach the connectors again.
Cooling fin	Annually	• Is the fin free of dust and dirt?	*
Printed circuit board	Annually	• Is it coated with dust or oil mist?	• Clean (Check if there is no dust or dirt stuck.) • If it cannot be removed, replace the printed circuit board.
		• Has the color of the printed circuit board changed to brown?	• Replace the printed circuit board.
Cooling fan	Monthly	• Is there any abnormal noise or odor? • Has the cumulative operation time exceeded 20,000 hours?	• Replace the cooling fan
Power, element (Main circuit)	Annually	• Has the color changed or is there any abnormal odor?	• Replace the abnormal part.
		• Is it coated with dust or oil mist?	*
		Are there metallic or wire chips present?	
Smoothing capacitor	Annually	Has the color changed, or is there any abnormal odor? • Is the electrolyte leaking? • Is the safety valve open?	• Replace the capacitor or inverter unit.

* If there is any dust, remove the dust with compressed air (dry air pressure: 4 to 6 kg/cm^2) taking care not to apply excessive air pressure to the parts. Remove interval dust by vacuum cleaner, etc.

8. FAILURE INDICATION

In case abnormality occurs, it will coast to a stop, rapidly decelerat to a stop, or normally decelerat to a stop. A failure output contactor signal is also output. The description of the abnormality can be checked by the indication of the LED (READY, MODE and F1 - F4) and the digital monitor, as shown in Table 8.2 and Table 8.3.

8.1 ABNORMALITY RANKING

The abnormality is ranked as follows (AA to B), according to whether the abnormality will cause the motor to stop (major failure) or the operation will be continued (minor failure).

Table 8.1 Abnormality ranking

Rank	Classification	Remarks	Indication
AA	Maior failure : (it does not become online)	Failure reset cannot be done	• Indication of some LEDs only
A	Major failure (during online)	• Inverter trip (base block)	• LED indication • Digital monitor indication
S	Major failure or minor failure according to selection		• LED indication • Digital monitor indication
B	Minor failure	• Operation is continued	• LED indication • Digital monitor indication

8.2 INDICATION OF SEQUENCE OF FAILURE GENERATION

If failure occurs, the sequence of = a maximum of 8 simultaneously generated events can be traced.

(1) LED indication

Depress the failure reset button momentarily (release within 1 second), and the LED will indicate the sequence of the failure generation.

Note 1 The failure will be reset if the failure reset button is deressed for 1 second or longer.

2 The failure generation sequence indication can be called only once.

(2) Indication on the digital monitor

Depress the  key to indicate the sequence and descriptions of the failure generation, as many times as necessary.

8.3 FAILURE RESET

Failure reset can be achieved by the failure reset button (RESET), by operating the external contactor input ($\overline{\text{RESET}}$), or digital monitor keys (SHIFT + RESET/FAULT).

8.4 TRACE BACK

The VS-676 has a trace back function. The items shown in Table 6.11 can be traced. Use this function to trace the cause in case of abnormality.

8.4.1 Trace Stop Conditions

(1) In case of major failure of the VS-676

(2) Trace stop instruction from the constant setter (PC-8201)

8.4.2 Trace Start Conditions

The trace will not start while the trace stop conditions are satisfied.

(1) Master reset when the power is supplied.

(2) Operation command is ON (when RUN is input).

(3) Trace start instruction from the constant setter (PC-8201)

8.4.3 Trace Data Reference

(1) Constant setter (PC-8201) --- Numerical display

8.4.4 Trace Sampling Time

TASP application constant Can be set by 18 (Cn- 18)

TSAP : 8 - 480ms (Initial setting value 80ms)

8.4.5 Trace Data

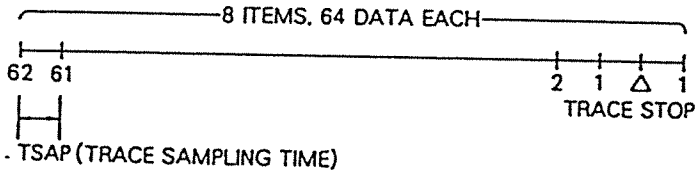
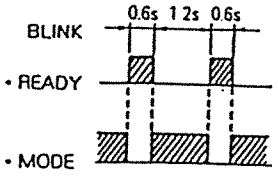


Table 8.2 Online Failure Indication

No.	LED Indication READY	MODE	F4	F3	F2	F1	Digital Monitor Indication	Abnormality		Rank	Remarks
1	⊗	○	○	○	○	●	OC	Overcurrent		A	
2	⊗	○	○	○	●	○	OU	Overvoltage		A	
3	⊗	○	○	○	●	●	OS	Overspeed		A	
4	⊙	○	○	●	○	○	OL	Overload		S	
5	⊗	○	○	●	○	●	OH	Overheat		A	
6	⊗	○	○	●	●	○	UU	Detecting momentary power failure		B	Automatic reset
7	⊗	○	○	●	●	●	PUU	Power failure	Main circuit DC voltage low voltage	A	
							nC		MC OFF	A	
							PF		Main circuit power supply missing phase	A	
							CUU		Control power supply low voltage	A	
8	⊗	○	●	○	○	○	FU	Fuse blown		A	
9	⊗	○	●	○	○	●	LF	Load failure		A	
A	⊗	○	●	○	●	○	CPU	Transmission error between CPUs		A	
B	⊙	○	●	○	●	●	SE	Speed deviation abnormality		S	Automatic reset at minor failure selection
C	⊙	○	●	●	○	○	CCd	Serial transmission is broken (Single system)	Control data abnormality	B	(Multi-system)
							9En		General transmission is broken	S	(Single-system)
							d2		Digital monitor II transmission is broken	S	(Single-system)
D	⊗	○	●	●	○	●	CPE	Online memory error	Control unit memory error	A	
							dPE		System unit memory error	A	
							dEE		System unit EEPROM error	A	
E	●	○	●	●	●	○	Eb	External trouble See Table 6.8 (3)		(A)	(VS-676 is not abnormal) No FAULT output is made.
F	○	○	●	●	●	●	Cdn	Watchdog		AA	

LED ····· Indication

⊙: Blink ····· Not ready for operation
Lit ····· Ready for operation
○: Off
⊗: Blink
●: On



(AA:Major failure (Failure reset cannot be done.)
A :Major failure (base block)
S :Major failure or minor failure according to selection
B :Minor failure)

*Mark is applied to software No. S0102.

• System Unit

Table 8.3 Initial Error Failure Indication for System Unit

No.	LED Indication						Digital Monitor Indication	Abnormality	Rank	Remarks
	READY	MODE	F4	F3	F2	F1				
11	○	●	○	○	○	●	—	PROM error	AA	Does not become online
12	○	●	○	○	●	○	—	Internal RAM error	AA	Does not become online
13	○	●	○	○	●	●	—	External RAM + common memory error	AA	Does not become online
14	○	●	○	●	○	○	EEP	EEPROM error	AA	Failure reset cannot be done
15	○	●	○	●	○	●	EEE	Format check error (PROM, EEPROM)	AA	Failure reset cannot be done
16	○	●	○	●	○	○	—	D/A error	AA	Does not become online
17	○	●	○	●	○	●	—	Counter error	AA	Does not become online
18	○	●	●	○	○	○	—	I/O error	AA	Does not become online
19	○	●	●	○	○	●	—	Control unit initial offline error	AA	Does not become online
1A	○	●	●	○	○	○	E in	EEPROM initialization not completed	AA	Failure reset cannot be done
1B	○	●	●	○	○	●	ECd	EEPROM code mismatch	AA	Failure reset cannot be done
1C	○	●	●	○	○	○	drU	Drive mode abnormality	AA	Failure reset* cannot be done
1D	○	●	●	○	○	●	CCr	Control mode abnormality	AA	
1E	○	●	●	●	●	○	nrr	Standard motor selection abnormality	AA	
1F	○	●	●	●	●	●	ndr	Only for molti-system	AA	

*Applied to software No. S0102.
S0101 and lower do not online.

• Control Unit

Table 8. 4 Initial Error Failure Indication for Control Unit

No.	LED Indication						Digital Monitor Indication	Abnormality	Rank	Remarks
	READY	MODE	F4	F3	F2	F1				
21	○	○	○	○	○	●	0F 1	PROM error	AA	Failure reset cannot be done
22	○	○	○	○	●	○	0F2	Internal RAM error	AA	Failure reset cannot be done
23	○	○	○	○	◉	●	0F3	External RAM error	AA	Failure reset cannot be done
24	○	○	○	●	○	○	—	——	—	
25	○	○	○	●	○	●	0F5	A/D error	AA	Failure reset cannot be done
26	○	○	○	●	●	○	0F6	D/A error	AA	Failure reset cannot be done
27	○	○	○	●	◉	●	0F7	Counter error	AA	Failure reset cannot be done
28	○	○	●	○	○	○	0F8	I/O error	AA	Failure reset cannot be done
29	○	○	●	○	○	●	—	——	—	
2A	○	○	●	○	●	○	—	——	—	
2B	○	○	●	○	●	●	—	——	—	
2C	○	○	●	●	○	○	—	——	—	
2D	○	○	●	●	○	●	—	——	—	
2E	○	○	●	●	●	○	—	——	—	
2F	○	○	●	●	●	●	Cdn	Watchdog	AA	

9. TROUBLESHOOTING

In case any kind of error occurs during operation, determine the exact reason according to the following notes, and take necessary corrective actions using the troublshooting flowchart. If there the cause cannot be determined, or if the error cannot be corrected, or if the parts have broken, etc., contact your YASKAWA representative (YAS REP).

Note:

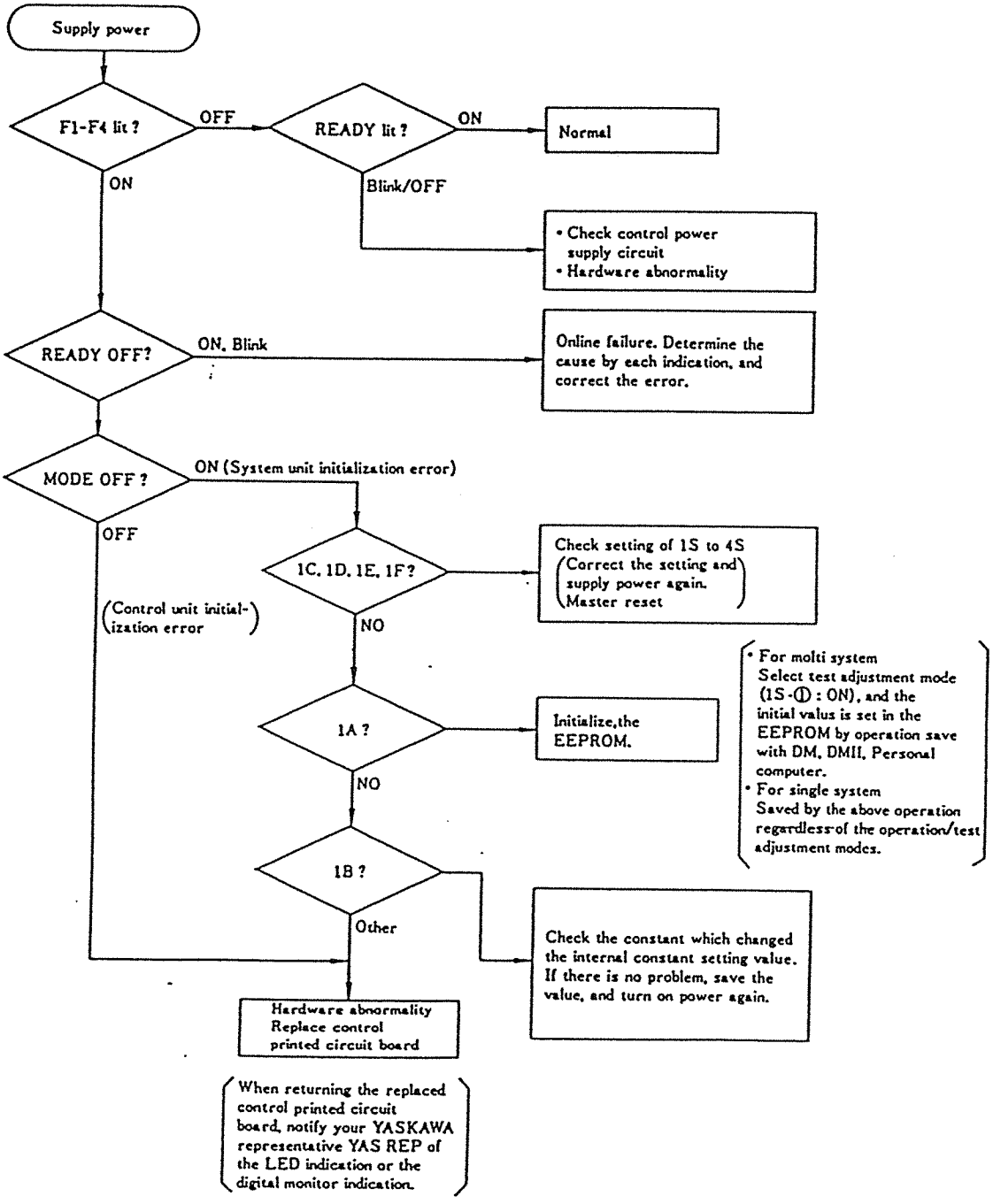
(1) Do not cut off power or reset the failure unnecessarily, because the failure indication will be lost: Check the details of the failure and the sequence of the occurrence.
- If the main circuit power alone can be cut off, first turn off only the main circuit power. The failure indication will be kept. If failure reset is made, the failure indication will be lost.

(2) Never remove or connect any wiring while the power is on.

(3) Checking inside the main circuit must be done only after the power is turned off, the charge indicator (CHARGE) is off, and the voltage at both ends of the capacitor has been measured by a tester to make sure that the capacitor has been fully discharged.

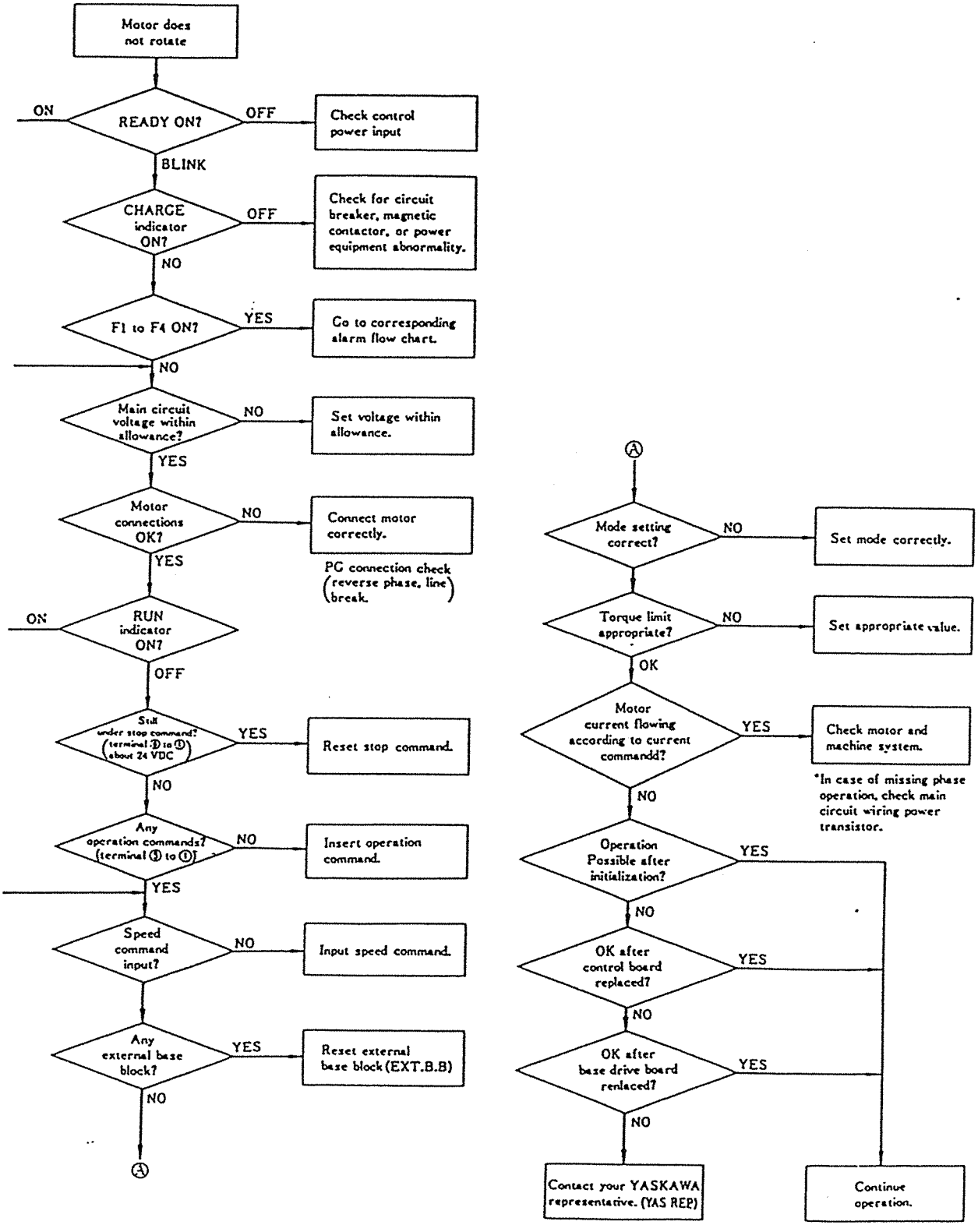
9.1 POWER SUPPLY ABNORMALITY (Self Diagnosis)

Power Supply Abnormality

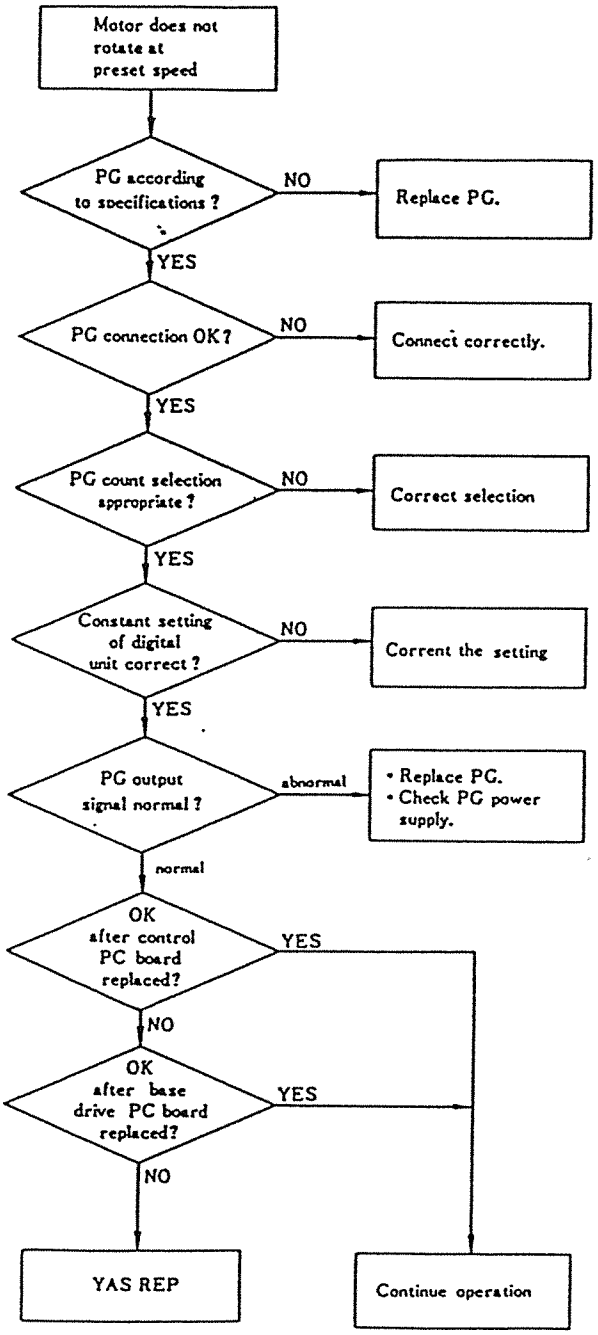


9.2 MOTOR ABNORMALITY

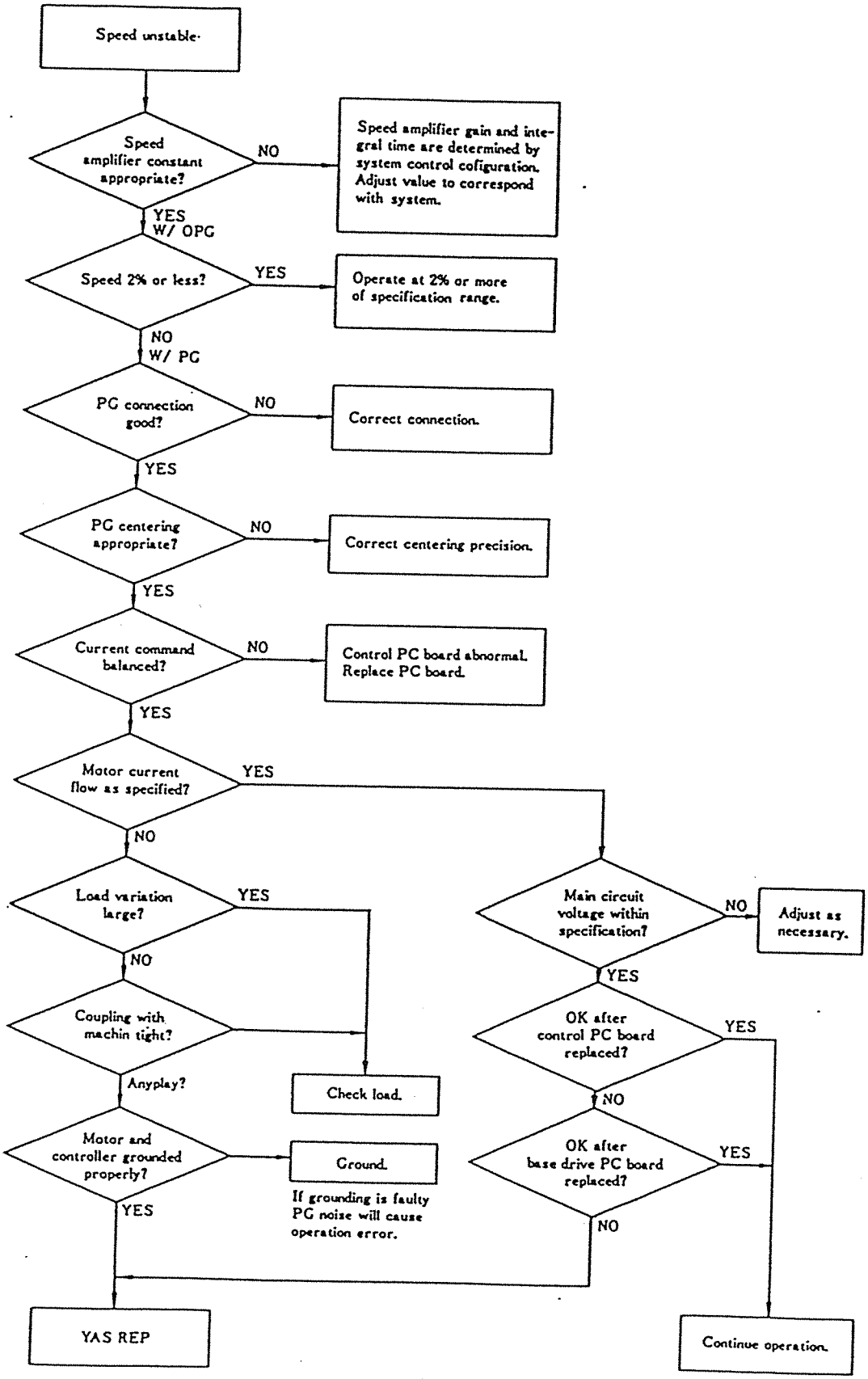
(1) Motor does not rotate



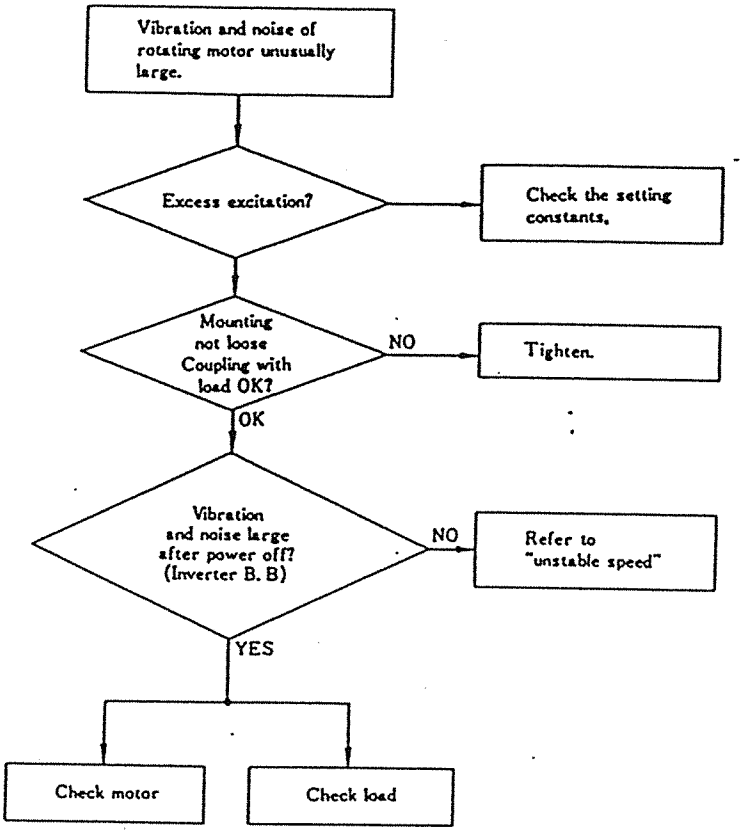
(2) Motor does not rotate at preset speed



(3) Speed unstable



(4) Vibration and noise of rotating motor unusually large



9.3 ABNORMALITY DURING INVERTER OPERATION

The following kinds of abnormalities may occur during operation.

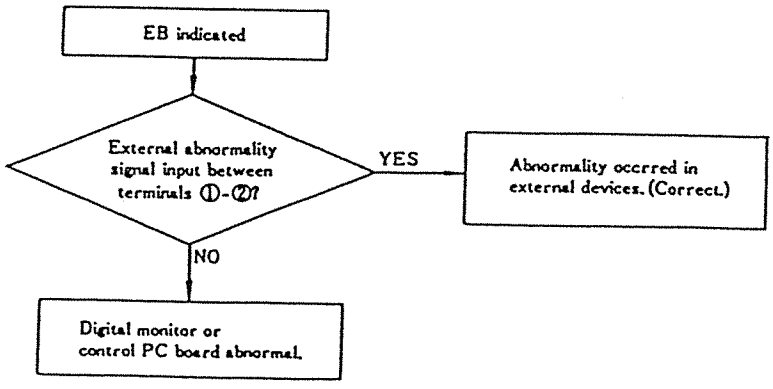
(1) The inverter protection circuit operated.

(2) External abnormality (EB) was input. (System abnormality)

(3) Hardware abnormality occurs in the control circuit.

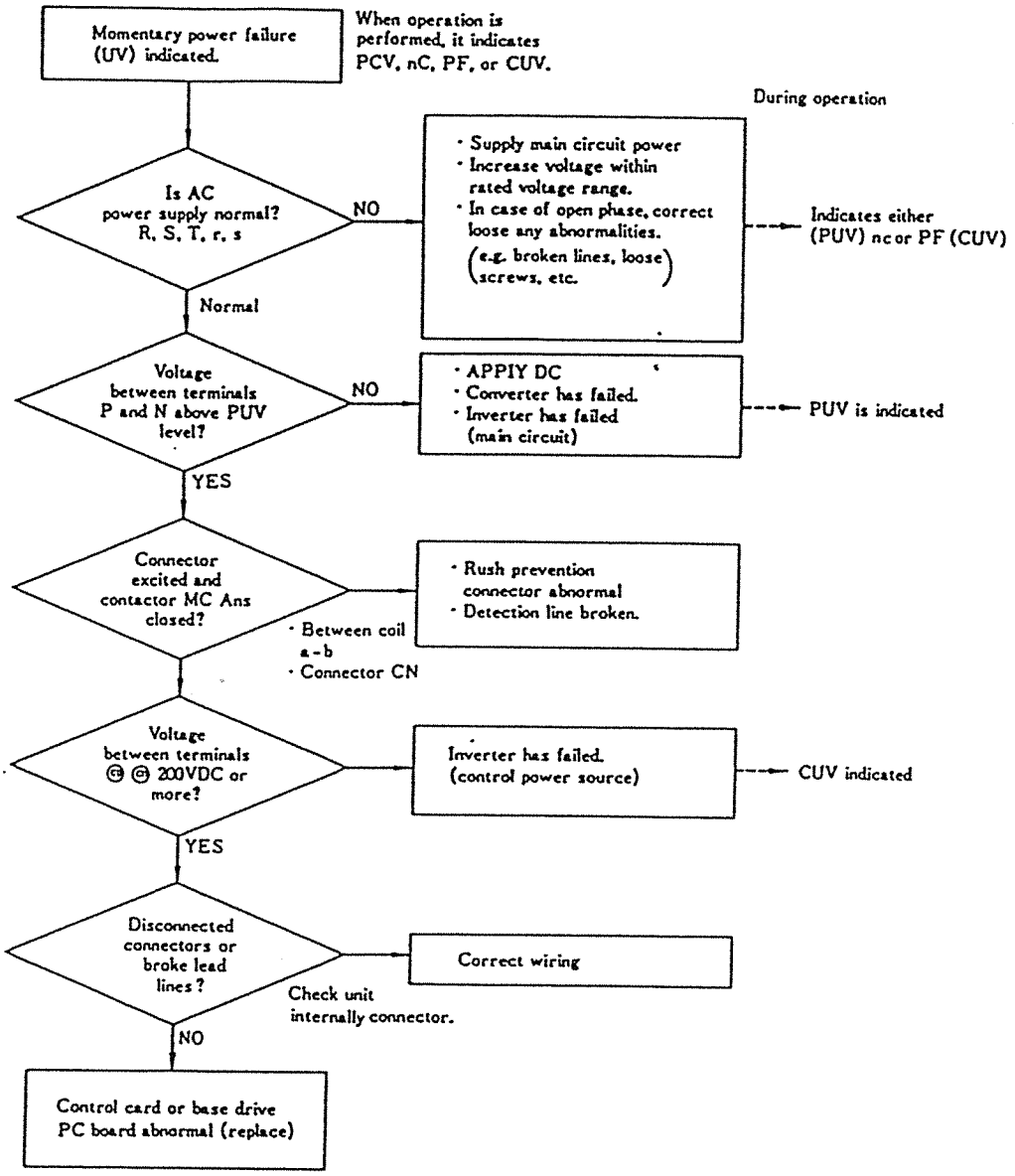
Abnormality indication as shown in Table 8.2 will be given in each of the above cases. After a full understanding of the abnormality status, determine the cause of abnormality, referring to the trouble shooting flow chart.

(1) When EB is indicated

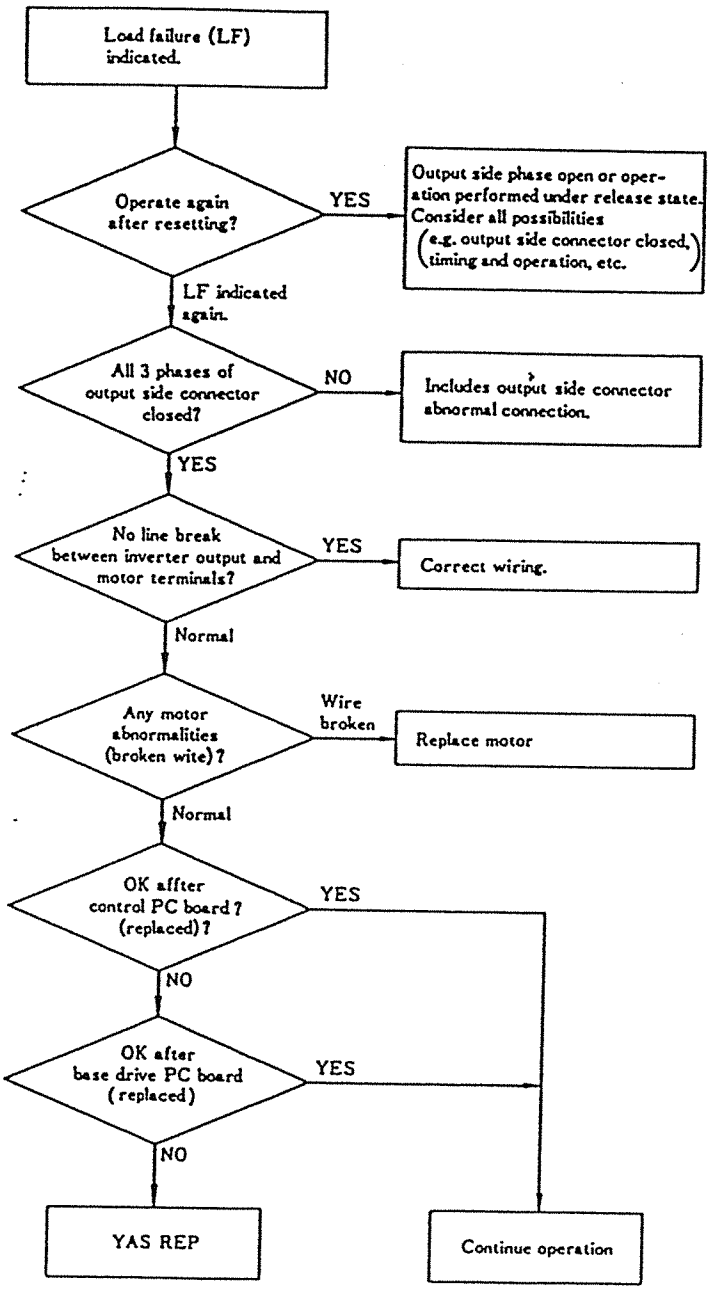


(2) Indicates momentary power failure

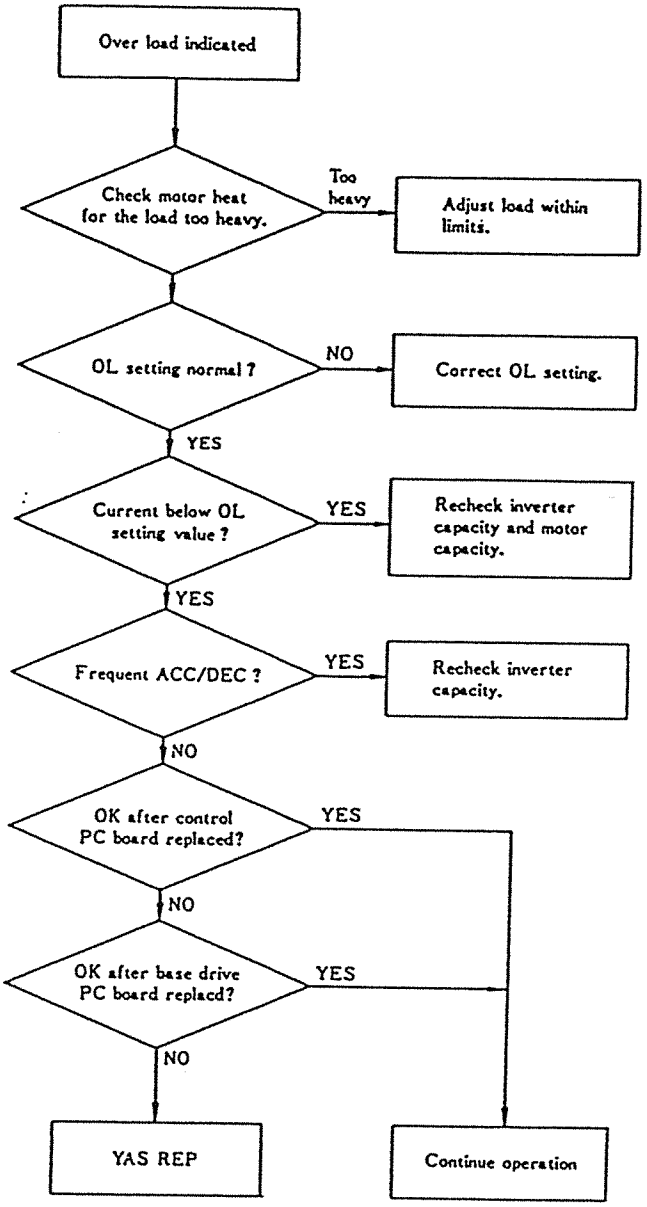
(The digital monitor indicates *UU*)



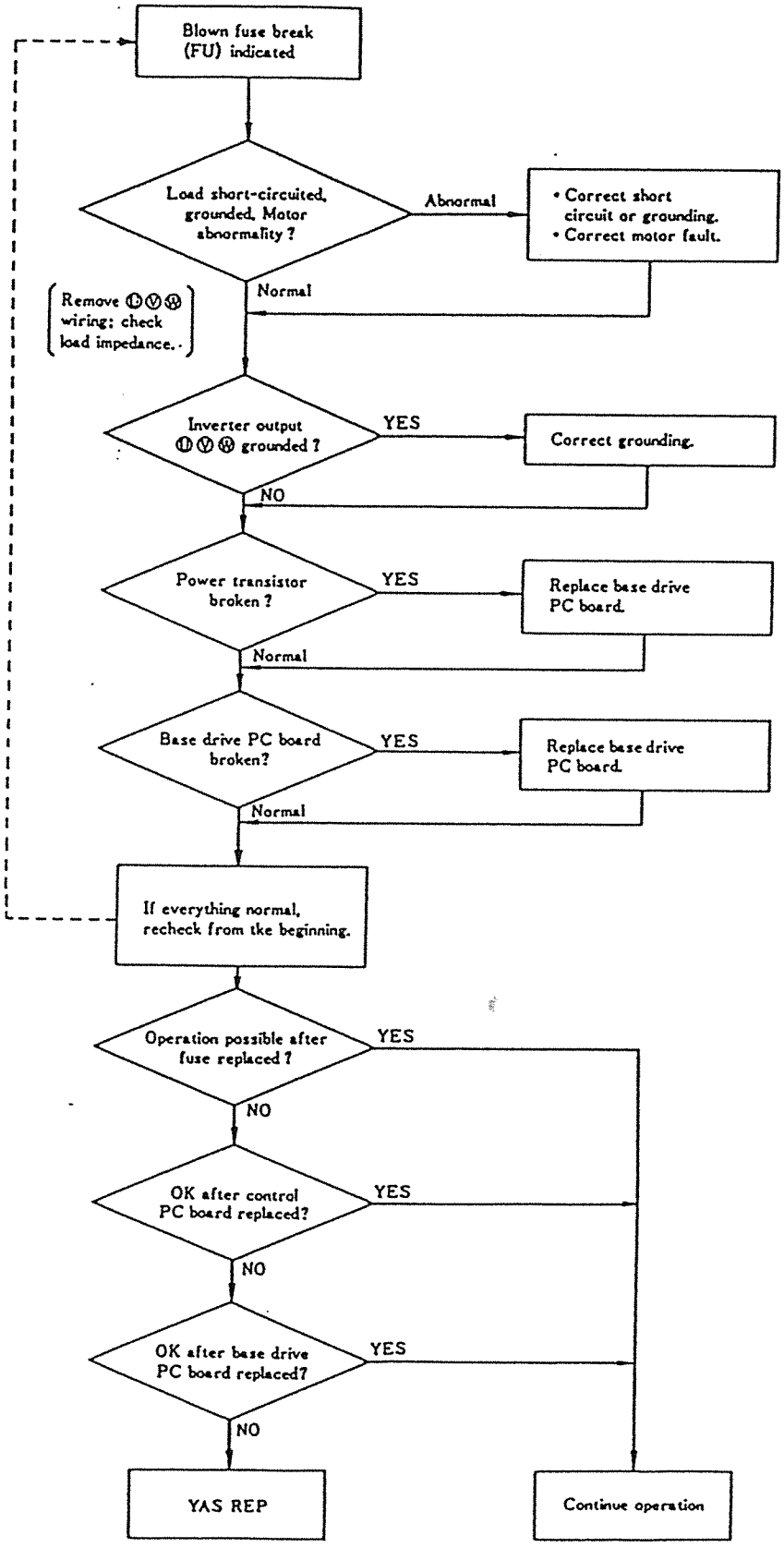
(3) When load abnormality (LF) is indicated



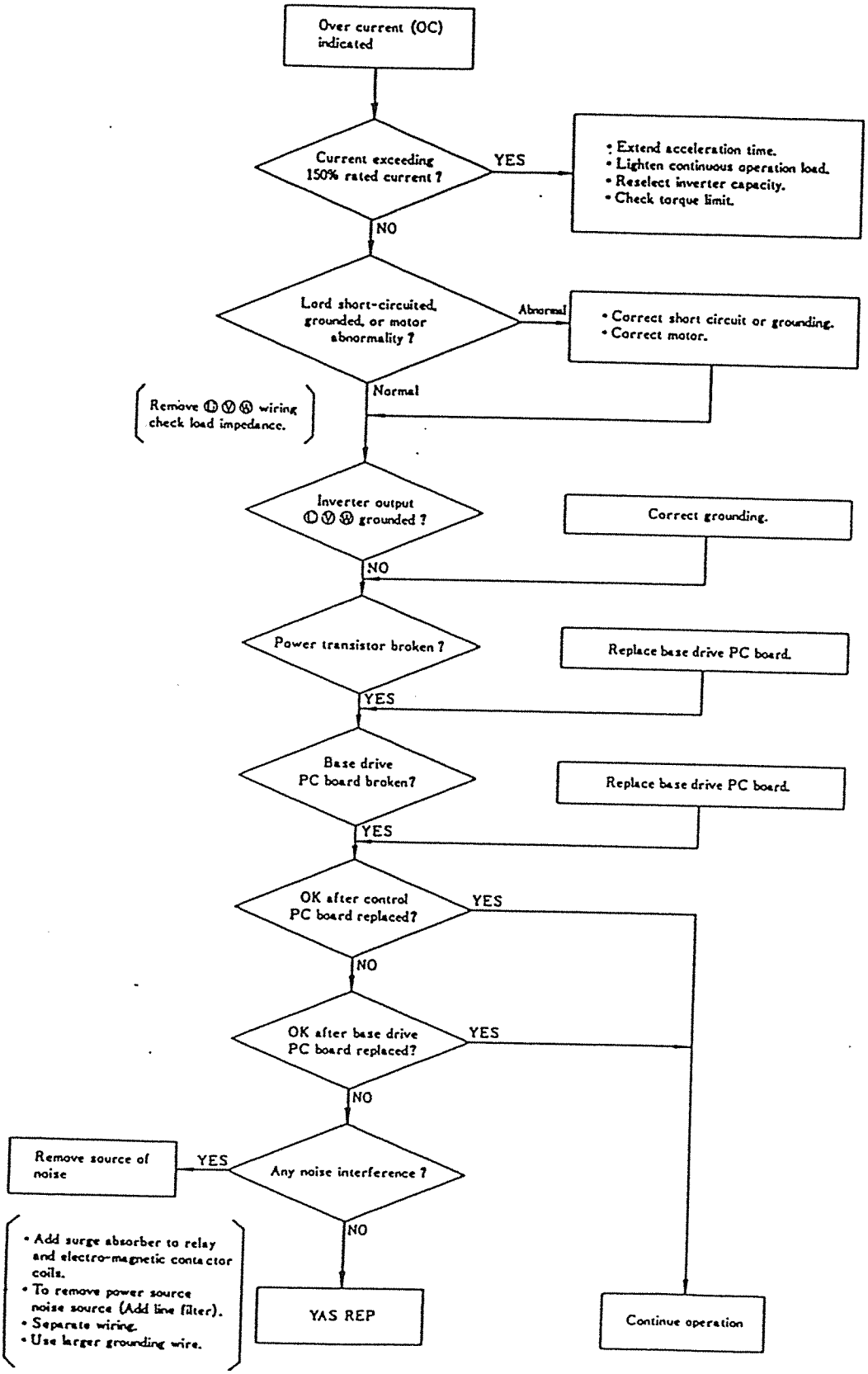
(4) When overload (OL) is indicated



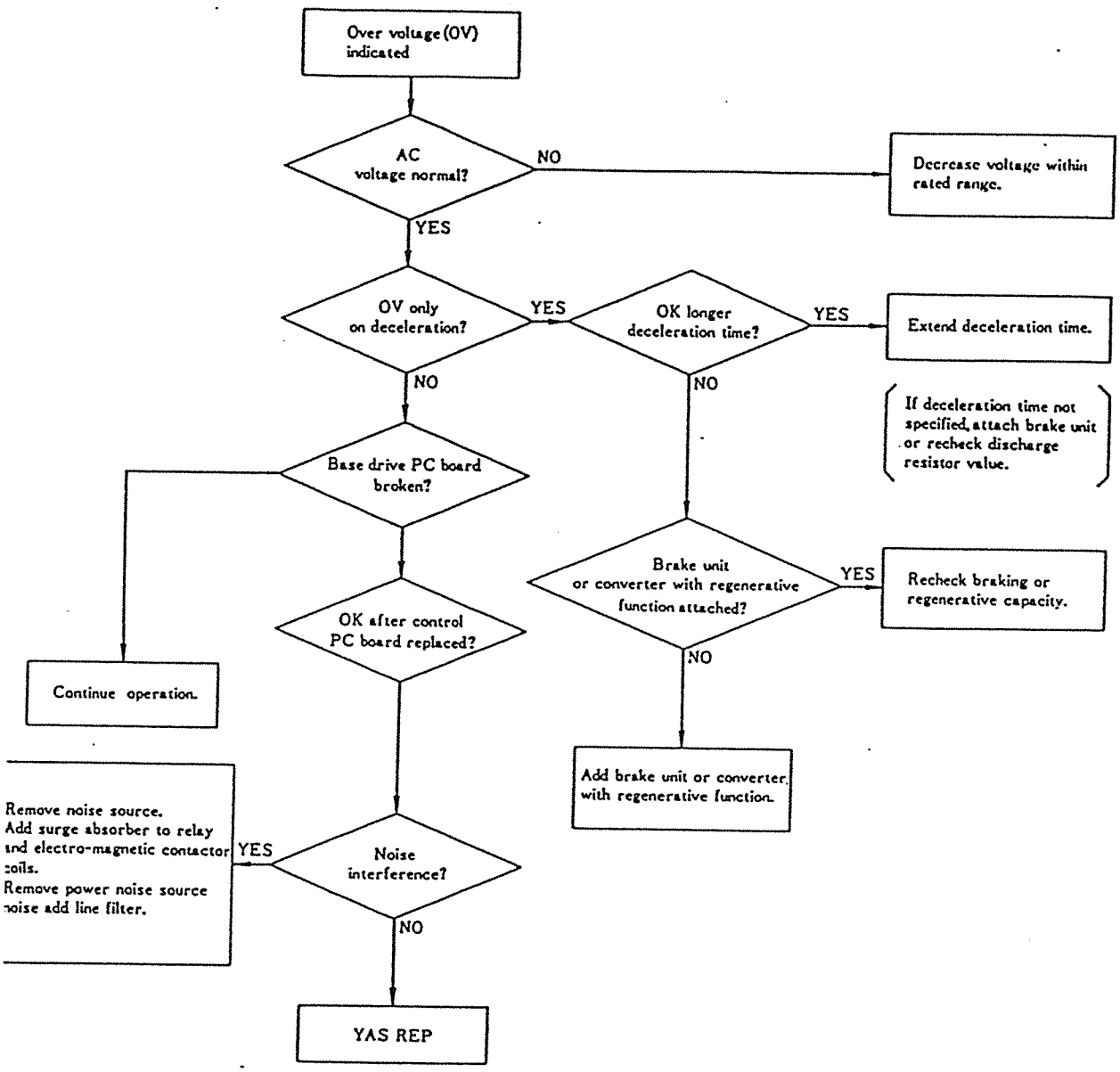
(5) When blown fuse (*FU*) is indicated



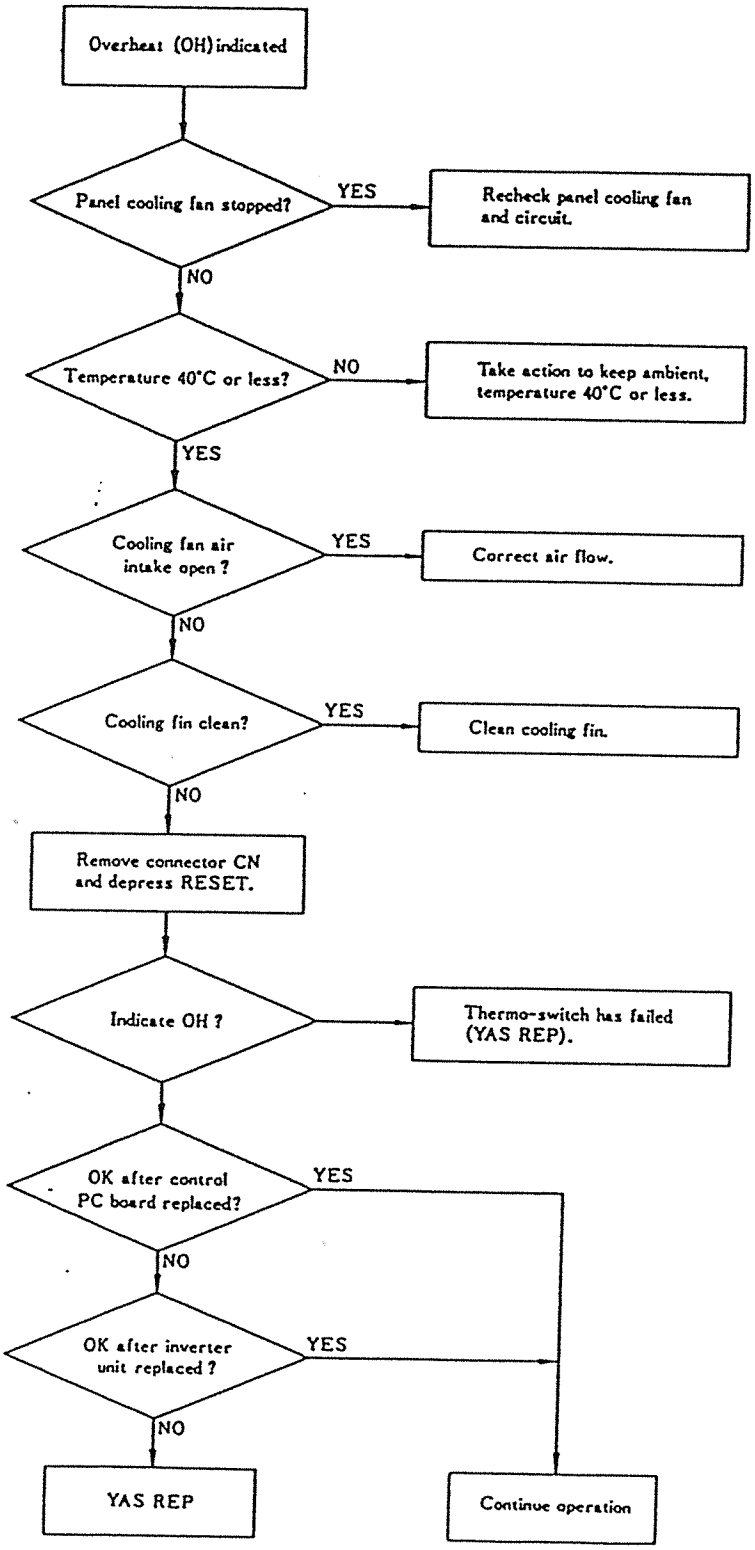
(6) When overcurrent (OC) is indicated



(7) When overvoltage (OU) is indicated



(8) When overheat (OH) is indicated



10. SPARE PARTS

(1) 200V Class Spare Parts List

Table 10.1

Parts / Capacity kVA	Control PC Board	Base Drive PC Board	Transister Module	DC Circuit Fuse	Diode Module	Remarks *
1 (3A)	JPAC-C313 (ETC 829X)	JPAC-C392 (ETC-9220)	QM15TD-H* (STR 234)	CR2SL-20* (FU 799)	RM10T8-H* (SID 393)	* 1
1.5 (5A)		JPAC-C314 (ETC 830X)	QM15TD-H* (STR 234)	CR2SL-20* (FU 799)	RM10T8-H* (SID 393)	* 1
3 (10A)		JPAC-C315 (ETC 831X)	6DI30B-050* (STR 235)	CR2SL-20* (FU 799)	RM15T8-H* (SID 394)	* 1
5 (17.5A)		JPAC-C316 (ETC 832X)	MG50G6EL1* (STR 199)	CR2SL-30* (FU 791)	50L6P43* (SID 395)	* 1
10 (35A)		JPAC-C317 (ETC 833X)	MG100G2CL1* (STR 200)	CR2SL-50** (FU 797)	100L6P41** (SID 291)	* 3 ** 1
15 (50A)		JPAC-C318 (ETC 834X)	MG150H2CL1* (STR 216)	CR2SL-75** (FU 792)	100L6P41** (SID 291)	* 3 * 1
20 (70A)		JPAC-C319 (ETC 835X)	MG200H1AL1* (STR 159)	CR2SL-100** (FU 794)	RM60DZ-H*** (SID 303)	* 6 ** 1 *** 3
30 (100A)		JPAC-C320 (ETC 836X)	QM300HA-H* (STR 173)	CR2SL-140** (FU 793)	RM60DZ-H*** (SID 303)	* 6 ** 1 *** 3
40 (140A)		JPAC-C321 (ETC 837X)	QM400HA-H* (STR 230)	CR2SL-200** (FU 751)	RM100DZ-H*** (SID 332)	* 6 ** 1 *** 3
60 (190A)		JPAC-C322 (ETC 838X)	QM300HA-H* (STR 157)	CR2SL-300** (FU 753)	RM100DZ-H*** (SID 332)	* 12 ** 1 *** 6
80 (250A)		JPAC-C323 (ETC 839X)	QM400HA-H* (STR 231)	CR2SL-350** (FU 795)	RM100DZ-H*** (SID 332)	* 12 ** 1 *** 9

*Arrange control PC boards with software No.

JPAC-C313・□ ETC829X-S□□□

*Characteristics should be arranged for modules used for a capacity of 60 and 80kVA due to parallel transistor connections. Arrange them with code No.

*This column indicates parts used per unit.

(2) 400V Class Spare Parts List

For single-system or in case of AC input type.

Table 10.2

Parts / Capacity kVA	Control* PC Board	Base Drive PC Board	Transistor Module	Q'ty	DC Fuse	Q'ty	Diode Module	Q'ty	AC Fuse	Q'ty
1.5 (3 A)	For Multi-System JPAC-C312 (ETC828X)	JPAC-C324 (ETC840X)	MG25N6EK1 (STR273)	1	80LF-5 (FU)	1	50Q6P43 (SID407)	1		
3 (6 A)		JPAC-C325 (ETC841X)	MG25N6EK1 (STR273)	1	80LF-10 (FU)	1	50Q6P43 (SID407)	1		
5 (9 A)		JPAC-C326 (ETC842X)	MG25N6EK1 (STR273)	1	80LF-15 (FU760)	1	50Q6P43 (SID407)	1		
10 (17.5A)		JPAC-C327 (ETC843X)	QM50DY-2H (STR146)	3	80LF-25 (FU761)	1	50Q6P43 (SID407)	1		
20 (35 A)		JPAC-C328 (ETC844X)	QM100DY-2H (STR147)	3	80LF-50 (FU762)	1	100Q6P43 (SID408)	1		
30 (50 A)		JPAC-C329 (ETC845X)	QM150DY-2H (STR212)	3	CR6L-75 (FU757)	1	110Q2G43 (SID409)	3		
40 (70 A)		JPAC-C330 (ETC846X)	QM200HA-2H (STR149)	6	CR6L-100 (FU758)	1	110Q2G43 (SID409)	3		
60 (100A)	For Single-System JPAC-C313 (ETC829X)	JPAC-C331 (ETC847X)	QM300HA-2H (STR150)	6	CR6L-150 (FU756)	1	160Q2G43 (SID410)	3		
80 (140A)		JPAC-C332 (ETC848X)	QM400HA1-2H (STR267)	6	CR6L-200 (FU755)	1	160Q2G43 (SID410)	6		
120 (190A)		JPAC-C333 (ETC849X)	QM300HA-2H† (STR168)	12	CR6L-300 (FU754)	1	RM250DZ-24 (SID411)	3		
140 (230A)		JPAC-C334 (ETC850X)	QM300HA-24† (STR281)	12	CR6L-350 (FU818)	1	RM250DZ-24 (SID411)	3		
200 (300A)		JPAC-C347 (ETC863X)	NPSB-W†† (ETJ2321)	3	CS10F-500 (FU680)	1	NPSB-Y (ETJ2310)	3	CS5F-600 (FU616)	2
400 (600A)		JPAC-C348 (ETC864X)	(ETJ2540)† (ETJ2550)	3 / 3	CS10F-1000-P (FU801)	1	(ETJ2600)	3	CS5F-1000-P (FU802)	2

* Arrange control PC boards with software No.

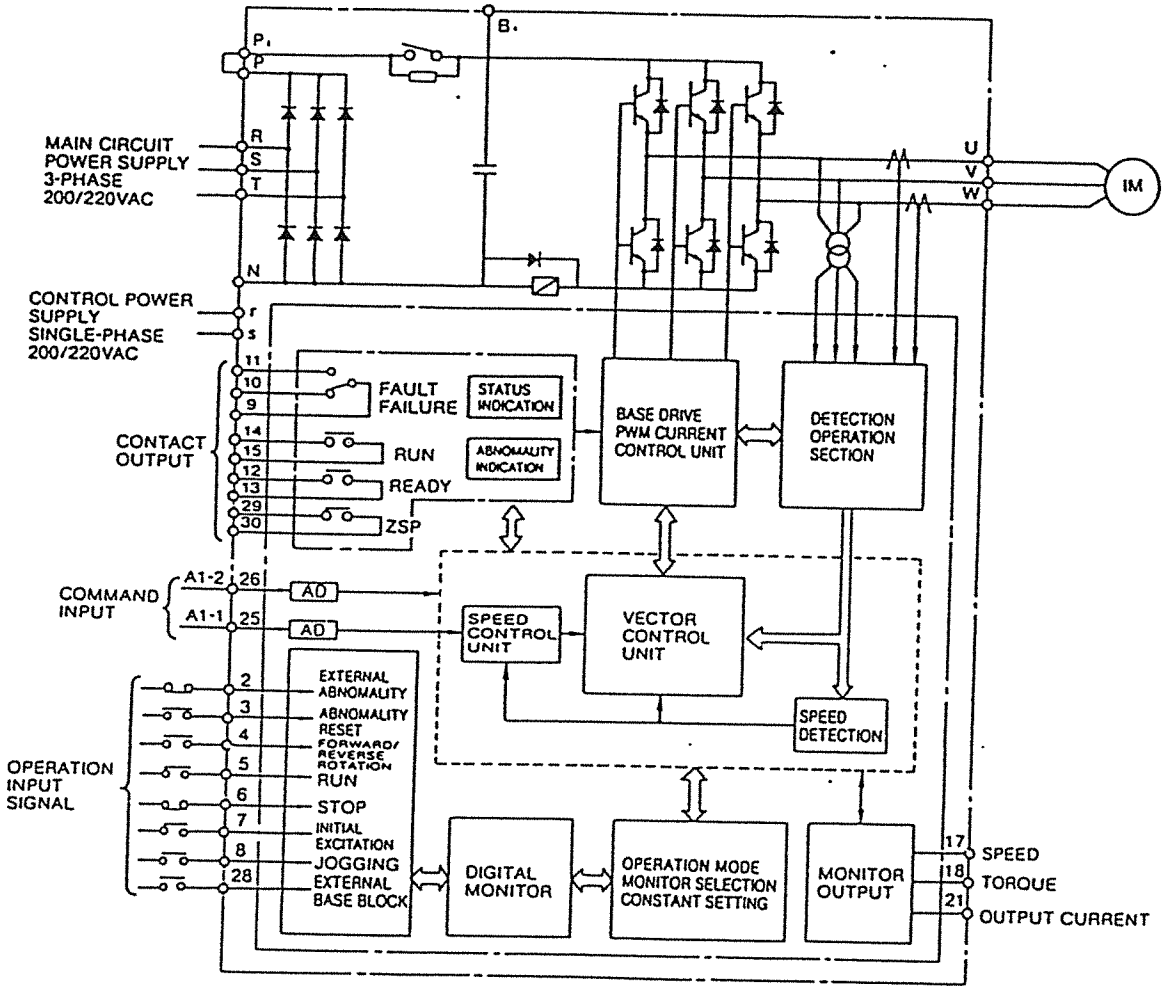
  · For single-system JPAC-313·□ ETC829X-S□□□

† Characteristics should be arranged for modules used for a capacity of 120 and 140kVA due to parallel transistor connections. Arrange them with code No. This column indicates parts used per unit.

†† Models more than of 200kVA are described in the transistor power module.

11. APPENDIX

11.1 BLOCK DIAGRAM (Example of 200V Class Drive with PG for Single-system)



For 400V Class, only main circuit section and control power supply input section are different from 200V Class as shown above.

Fig. 11.1

11.2 FUNCTIONAL BLOCK DIAGRAM (Example of VS-676SP Series; Drive with PG for Single-system)

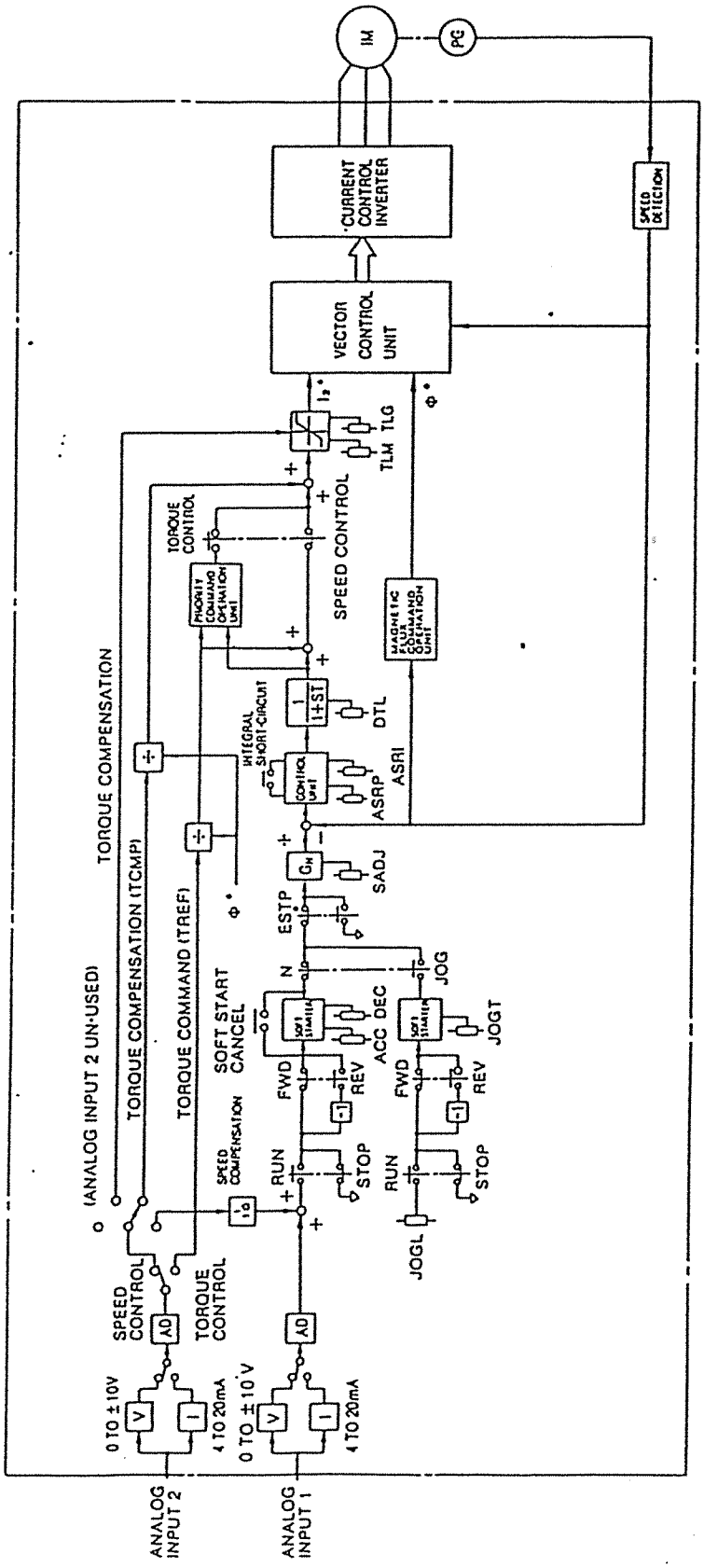


Fig. 11.2

.3 PRODUCT SERIES AND STANDARD SPECIFICATIONS

Drive Unit for Single-system (VS-676A, AP Series)

Table 11.1 VS-676 Inverter Standard Product Series

Specifications \ Series			200 V Series											400 V Series												
Nominal Capacity kVA			1	1.5	3	5	10	15	20	30	40	60	80	1.5	3	5	10	20	30	40	60	80	120	140	200	400
Output Characteristics	Rated Output Current A		3	5	10	17.5	35	50	70	100	140	190	250	3	6	9	17.5	35	50	70	100	140	190	230	300	600
	Overload Current Rating		150 % 60 s											150 % 60 s												
	Rated Output Voltage V		3-Phase 200 V (at input 300 VDC or 3-phase 200 V)											3-Phase 400 V (at input 600 VDC or 3-phase 440 V)												
Input Power Supply	Main Circuit	For Single-System	3-Phase 200/220 V (±10 %), 50/60 Hz											3-Phase 400/440 V (±10%) 50/60 Hz												
		For Multi-System	240 to 340 VDC											480 to 680 VDC												
	Control Circuit		Single-phase 200/220 V (±10 %), 50/60 Hz											Single-Phase 200/220 V (±10 %), 50/60 Hz (400/440 V input is available.)												

Table 11.2 VS-676 Inverter Standard Specifications

Control Specification	Vector Control	Without PG	Speed control precision: ±0.5% Speed control range: 1 : 20 (Allowable control range: 1 : 50)	Torque linearity: ±3% Torque control range: 1 : 50 (Speed range: 1 : 20)
		With PG	Speed control precision: ±0.01 % Speed control range: 1 . 200	Torque linearity: ±3% Torque control range: 1 : 50 (Speed range: 1 : 20)
	Rated Speed Adjustable Range		90 to 120 % (to standard speed)	
	Torque Limitation		Setting range: 0 to 150 % (Independent setting on drive side or regeneration side)	
	Speed Reference	Input Specification	Voltage reference: 0 to ±10 V (±100 % speed reference)	Changed with shunt connector
			Current reference: 4 to 20 mA (500 Ω)	
		Accel/Decel Adjustable	Setting range: 0 to 1800 s (Accel/decel time set independently)	
	Torque Reference	Input Specification	Voltage reference: 0 to ±10 V (±200 % torque reference)	Changed with shunt connector
			Current reference: 4 to 20 mA (500 Ω)	
Protection Function	Error Detection		Instaneous over current, overload current, over DC voltage, undervoltage momentary power failure, overspeed, general-purpose transmission error cooling fin heating, fuse blown(DC side), load circuit error, speed deviation error, open phase power.	
	Error Indication		• Indication of individual error (alphabetic), error occurence order by digital monitor. • LED indicating (Individual code) • Error contact output (IC)	
Monitoring Function			• By digital monitor · Reference of constant/reference value setting and variable · Operation separated system • Test mode selection	
Environmental Condition	Location		Elevation: 1000 m or below, indoor (protected from corrosive gas and dust)	
	Temperature		Ambient temperature: 0 to ±45°C (not frozen) storage temperature: −20 to −60°C	
	Humidity		90 % RH or below (noncondensing)	
	Vibration		Below 20 Hz: 1 G 20 to 50 Hz 0.2 G	

11.4 INPUT TERMINAL LIST

Terminal in main circuit and auxiliary main circuit

Table 11.3

Terminal Signal	Appliciation	Summary
R. S. T	AC input terminal to main circuit.	• Supply 3-phase 200/220 V. 50/60 Hz and 400 V class 400/440 V. 50/60 Hz to the power circuit.
U. V. W	Output terminal to motor	• Connect to monitor terminal U. V and W.
P. P_1 N	Input terminal to main DC circuit.	• Use to supply 300 VDC and 400 V class 600 VDC to the power circuit (between P and N).
	Connection terminal to DC reactor	• If not used. keep short-circuited between P and P_1. (Standard)
r. s *	Input terminal to control power	• Supply 200/220 V. 50/60 Hz. single-phase. to the control circuit.
CP. Cn	Connection terminal to backup smoothing capacitor for instantaneous power failure.	• Connect a smoothing capacitor for the re-running specification at instantaneous power failure (instantareos power failure time period with in one second.)
B_1. B_2 a. b. N	Connection terminal to braking module or resistor.	• Incorporate B_2. and a and b in units below 10 kVA. Connect to the circuit between B_1 and N in units more than 10 kVA.
E	Eearth (ground) terminal enclosure.	• For grounding of cabinet.

*400V Class: Single-phase 400/440V, 50/60Hz is also available.

r-s_1: Single-phase 200/220V
r-s_2: Single-phase 400/440V

Terminal in control circuit

Table 11.4

		Application		Summary	
Command Setting Input	25	Analog command 1		• 0 to ±10V(1 mΩ or more) or 4 to mA(500Ω) • Signal texts are changeable by selecting function selection switch (IS-⑧. 3S-④⑤)	
	26	Analog command 2			
Contact Input	2	E B	External abnormality	Coasting/SYCI. at contact open. See Table 6.8(3)	Using contact 24VDC 10mA
	3	$\overline{\text{RESET}}$	External abnomality reset	Abnormality reset at contact closed	
	4	FWD/$\overline{\text{REV}}$	Forward/reverse rotation command	Reversed rotation at contact closed	
	5	$\overline{\text{RUN}}$	Run command	Run at contact closed	
	6	STOP	Stop command	Deceleration stop at contact open	
	7	EXT	Initial excitation command	Initial excitation at contact closed	
	8	$\overline{\text{JOG}}$	Jogging command	Jogging at contact closed. stop at open	
	28	$\overline{\text{EXT BB}}$	External base block	Coasting stop at contact closed. See to Table 6.8(8)	
Contact Output	9.10.11	FAULT	Inverter abnormality	When inverter causes major failure ⑨-⑩ is open and ⑨-⑪ is closed	
	12.13	READY	Inverter ready (1C)	When inverter is normal, ⑫-⑬ is closed. System constants 1 can be changed to ALARM with ⑦	Contact capacity 250VAC 1A or less 30VDC 1A or less
	14.15	RUN	Inverter running (1a)	⑭-⑮ is close in inverter running (At B B released)	
	29.30	ZSP	Zero-speed detection (1a)	㉙-㉚ is closed by detecting zero-speed	
Monitor Output (Analog)	21	Signal for ammeter		Three-phase full-wave output 5V peak value/inverter rated current peak value	Connect to DC 1mA ammeter Full scale is calibrated outside.
	17	Signal for voltmeter		D/A conversion output ±5V 100% speed (10V/10bit, Output every 8ms) Output every 8ms (4ms)	
	18	Signal for torquemeter		D/A Conversion output ±5V 100% torque (10V/10bit, Output every 8ms)	
External Power Supply and Others	1	Common terminal in part of contact input		Common for part of contact ioput	
	19.22.27	Command input. common terminal for monitor output(0V)		Control power supply 0V output	
	20	Command input. monitor output		• Same as control power 0V. • Is not used for control.	
	23	Shield external cover connection		External supply 30mA Max	
	24	15V power supply terminal		External supply 30mA Max	
	16	−15V power supply terminal		• Same as earth(ground) terminal enclosure.	
PG Input	3CN	Speed detector pulse input			
PG Monitor	4CN	Speed detector pulse input			

Note: Applied to software No. S0102.

The numerical values enclosed in ( ) are applied to S0101 and lower.

11.5 PROTECTION FUNCTIONS

(1) Inverter protection (main circuit)

Table 11.5

Item	Abbreviation	Description	Treatment	Protection
Overcurrent	OC	Inverter output peak value exceeded the OC setting value. (OC setting value = 1.9 × 2 × INV)	Base block (keep) Major failure	· Power transistor
Overvoltage	OV	The main circuit current voltage exceeded the OV setting value. OV setting value = 395V (200V-grade) 790V (400V-grade)	Base block (keep) Major failure	· Power transistor
Inverter overload	(OL)	Exceeded withstand inverter over load (150 %, 1 minute of inverter rated current)	According to the major failure / minor failure selection	· Power transistor · Smoothing capacitor
Transistor cooling fin overheat	OH	Transistor cooling fin temperature exceeded allowable value (Thermo switch operation point: 90 ±5°C)	Base block (keep) Major failure	· Power transistor · Smoothing capacitor
Blown fuse	FU	The DC circuit fuse blown.	Base block (keep) Major failure	· Unit internal wiring · Prevention of secondary influence of accidental current.
Power source abnormality	UV	Main circuit power source: control power source abnormal.	Base block	· Main circuit element · Control circuit operation · Memory protection
Main circuit DC power source low voltage	PUV	The main circuit DC voltage lower than PUV setting value. PUV setting value = 226V (200V class) 452V (400V class) recover = 240V (200V class) 480V (400V class)	Base block 1 Automatic recover during momentary power failure timer count 2 Major failure after timer count completed.	· Main circuit element Power transistor diode
Main circuit AC power open phase	PF	Open phase in main circuit AC input (operation approx. 0.1 sec after open phase detection.)	Base block : (Major failure)	· Main circuit element Smoothing capacitor. Diode.
Control power source power failure, contactor open	MC. OFF	Control power source AC input (single-phase) has failed. The rush control contactor open.	Base block 1 Automatic recover during momentary power failure timer count 2 Major failure after timer count completed.	
Control power supply	CUV	Control power source DC low-voltage.	Base block (major failure)	· Control circuit operation · Memory protection

11.5 PROTECTION FUNCTIONS (Cont'd)

(2) System protection

Table 11.6

Item	Abbrevi-ation	Description	Treatment	Protection
Overspeed	OS	Motor rpm exceed OS setting value. OS setting value = Reted rpm (OSP) 1.0 to 1.3 variable	Coasting stop / rapid deceleration and stop According to selection (2S-⑦)	· Motor · Machine system
Overload	OL	Exceeded motor OL setting (OLI, OLT setting) (OL indication for inverter OL)	Major failure / minor failure According to selection (SYC Cn-33-⑨)	· Motor
Load failure	LF	Operation under load open phase.	Base block (keep) Major failure	*Load side wiring Check for broken relays.
Transmission error (Transmission break)	SEn d2	CP-213 transmission continuously broken for 2 seconds or more.	Major failure / minor failure According to selection (SYC1-⑧)	
External abnormality	E8	The external abnormality contactor input became "Open" See Table 6.8 (3)	Befor aoft No. SO101	
Speed deviation abnormality	SE	The speed deviation exceeded the setting value (EXSP).	Major failure / minor failure According to selection (Cn-33-Ⓐ)	

11.6 ALARM CONTENTS

Alarm Contents (Variable No.Un-18)

Table 11.7

Bit No.	Meaning		Description	
			1	0
0	PROM error(control section)		Detection	Normal
1	Internal RAN error(control section)			
2	External RAM error(control section)			
3	EEPROM initial error			
4	A/D error(control section)			
5	D/A error(control section)			
6	Counter error(control section)			
7	I/O error(control section)			
8	EEPROM initialize incomplete			
9	EEPROM code unmatching			
A	EEPROM online error			
B	PROM error(transmission section)			
C	Power Failure	Power supply		
D		MC OFF		
E		Power open phase		
F		Control UV		

11.7 TRANSISTOR CHECKING METHOD

Turn off main circuit and control power supply. After checking if main circuit DC voltage is 0V, remove the wiring of motor and inverter to check the transistor.

• Refer to the Table 1 shown below for judging criteria of defective transistors. On actual site, relative evaluation judgement by all-phase measured values is also necessary. Therefore, it is recommended that resistance values at normal operation be measured beforehand.

• When a defective transistor phase is found,
  • Check the transistor of another phase of P or N again.
  • Check the part on base drive PC board which is equivalent to the defective transistor.

Table 11.8 Transistor Failure Judging Criteria

Transistor Terminal		Standard Value	Fault Value	Remarks
Tester Terminal ⊖	Tester Terminal ⊕			
E	C	Some 10 Ω or less	0 Ω or ∞	It is recommended that these values be measured beforehand.
C	E	Some 100 kΩ or more	0Ω	
B (BX)	E	Some 10 Ω	Some 10 kΩ	
E	B (BX)	Some 10 Ω	0 Ω or ∞	

Set test range ×1Ω.

(1) 200V:1kVA to 80kVA, 400V:1.5kVA to 140kVA

(a) Open power unit control panel.

(b) Remove connector on base drive PC board (2PCB)

• 200V: 10kVA or less 4 to 6CN
  20kVA or more 8 to 13CN

• 400V: 5kVA or less 4 to 6CN
  10kVA or more 8 to 13CN

(c) Detect defective transistor by measuring resistance among each terminal using tester.

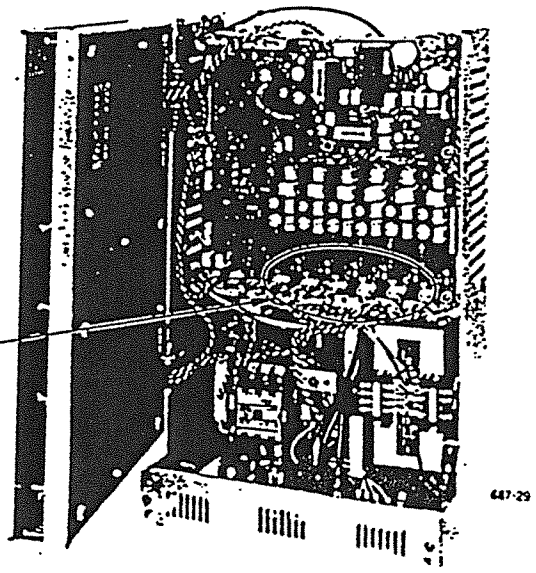


Fig 11.3 When Control Panel Open

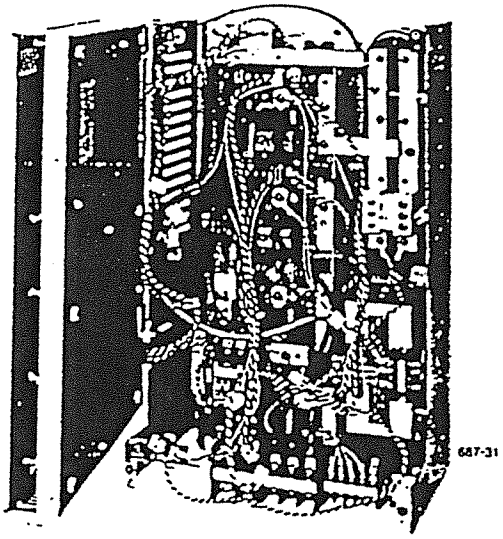


Fig 11.4 Armature Base Drive PC Board Removed

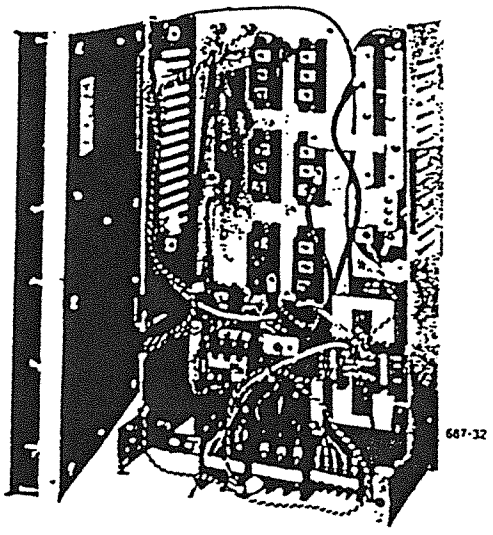


Fig 11.5 When All Connections to Transistor Removed

11.7 TRANSISTOR CHECKING METHOD (Cont'd)

(2) 400V: 200kVA

(a) Open the power unit control panel.

(b) Pull out base drive PC sub-board on the power module.

(c) Pull out power module after loosening four power module mounting screws and connection nuts.

(d) Measure each resistor among terminals P,N and M of power module to find defective power module. Open the power module side cover to perform transistor module appearance check.

(e) When a defective transistor phase is found,

- Recheck the transistor with the other phase of P or N.
- Recheck the parts equivalent to the defective transistor phase on the base drive PC board or base drive PC sub-board.

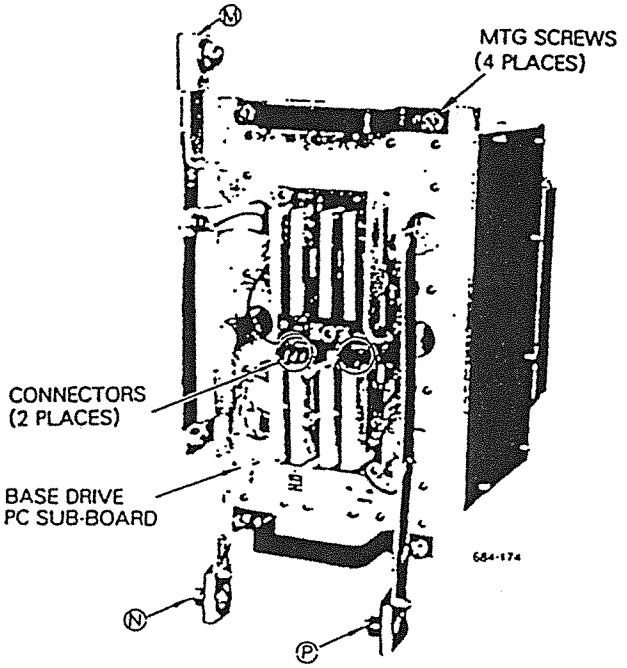


Fig. 11.6 Power Module

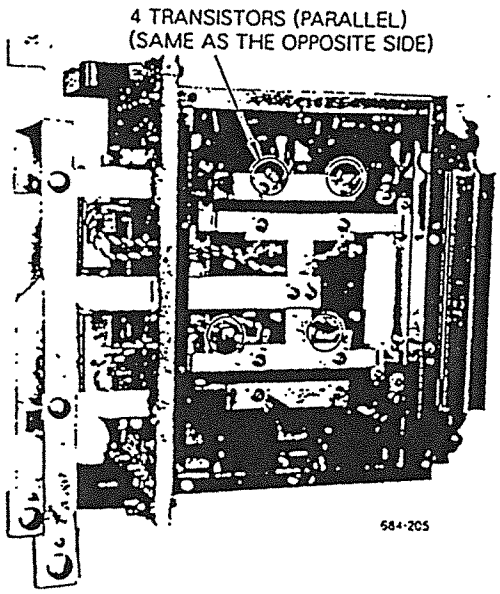


Fig. 11.7 When Power Module Side Cover Open

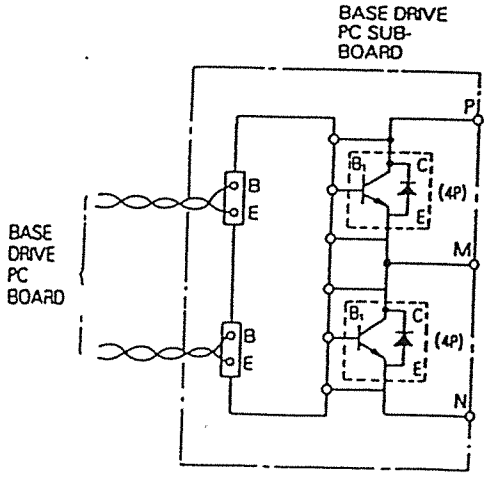


Fig. 11 8 Power Module Connection

(3) 400V: 400kVA

(a) Pull out emitter base connector.

(b) Pull out snubber resistance connector connected to N side power module from P side power module (lower).

(c) Pull out the power module after loosening two power module mounting screws and two busbar connecting nuts.

(d) Measure each resistance between terminals P and M, and N and M to find a defective power module. Open the power module side cover to perform the transistor module appearance check.

(e) When a defective transistor phase is found,
- Recheck the transistor with the other phase of P or N.
- Recheck the parts equivalent to the defective transistor phase on the base drive PC board or base drive PC sub-board.

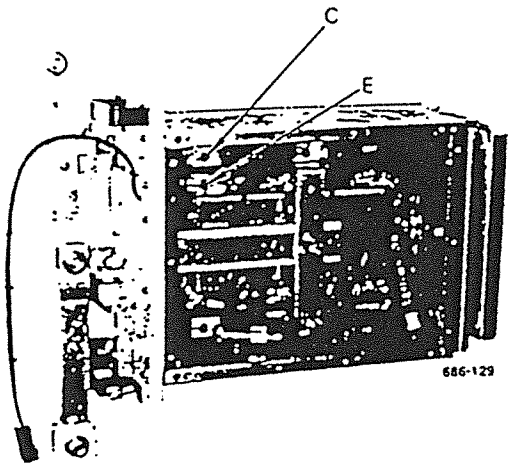


Fig. 11.9 Power Module (at P side)

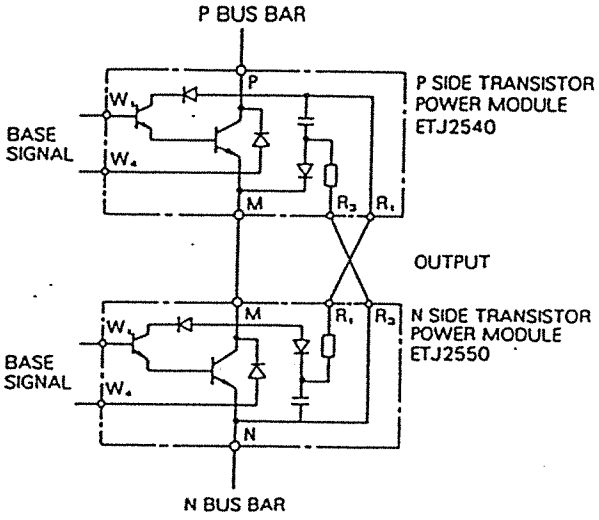


Fig. 11.10 Power Module Connection

11.8 TRANSISTOR REPLACEMENT

When a defective transistor is found, replace it according to the following procedures:

- Sketch drawing and circuit diagram of 400V class transistor module are given on page 66 for reference.
- Types more than 200V class 60kVA or 400V class 140kVA are connected with 2 or 4 transistors in parallel. For replacement, change all the transistors.
- 400V class 200kVA and 400kVA are of semi plug-in power module configuration. Replacement by power module is recommended.

11.8 TRANSISTOR REPLACEMENT (Cont'd)

(1) 200V: 1kVA to 80kVA, 400V: 1.5kVA to 140kVA

Removing method

① Remove transistor connection wire. All the connection wires to the transistor are removed. Twisted wire to base (B) or emitter (E) are fasten or screw terminal, wiring (bus bar or lead wire) to collector (C) or emitter (E) is screw terminal.

② Remove transistor mounting bolts and the defective transistor.

Mounting method

① Clean each contact surface of transistor module and fin, and apply thermal compound "JOINTAL Z" (Nippon Light Metal Co., Ltd.), or equivalent compound, to the base surface of the transistor module.

② Mount the transistor module on the fin using 25(±5)kgf cm of fastening torque.

③ The procedures for mounting the transistor power module is the reverse of those followed for removing the module.

(2) 400V: 200kVA

Removing method

Transistor power modules are of semi plug-in type. Replacement can be performed on the desk.

① Pull out emitter base connector on the base driver PC Sub-board.

② Loosen three busbar connecting nuts and four power module mounting screws. See Fig. 11.11(A).

③ Take off the power module with care not to damage any parts. See Figs. 11.11(B) and (C).

④ Remove the ten mounting screw of power module side cover. See Fig. 11.11(D).

⑤ Remove ten busbar connecting nuts, four base wiring screws and print board connecting nuts.

⑥ Remove four transistor mounting screws to take off the transistor module. See Fig. 11.11(E).

Mounting method

① Clean each contact surface of transistor module and fin, and apply thermal compound "JOINTAL Z" (Nippon Light Metal Co., Ltd.), or equivalent compound, to the base surface of the transistor module.

② Mount the transistor module on the fin using 25(±5)kgf cm of fastening torque.

③ The procedures for mounting the transistor power module is the reverse of those followed for removing the module.

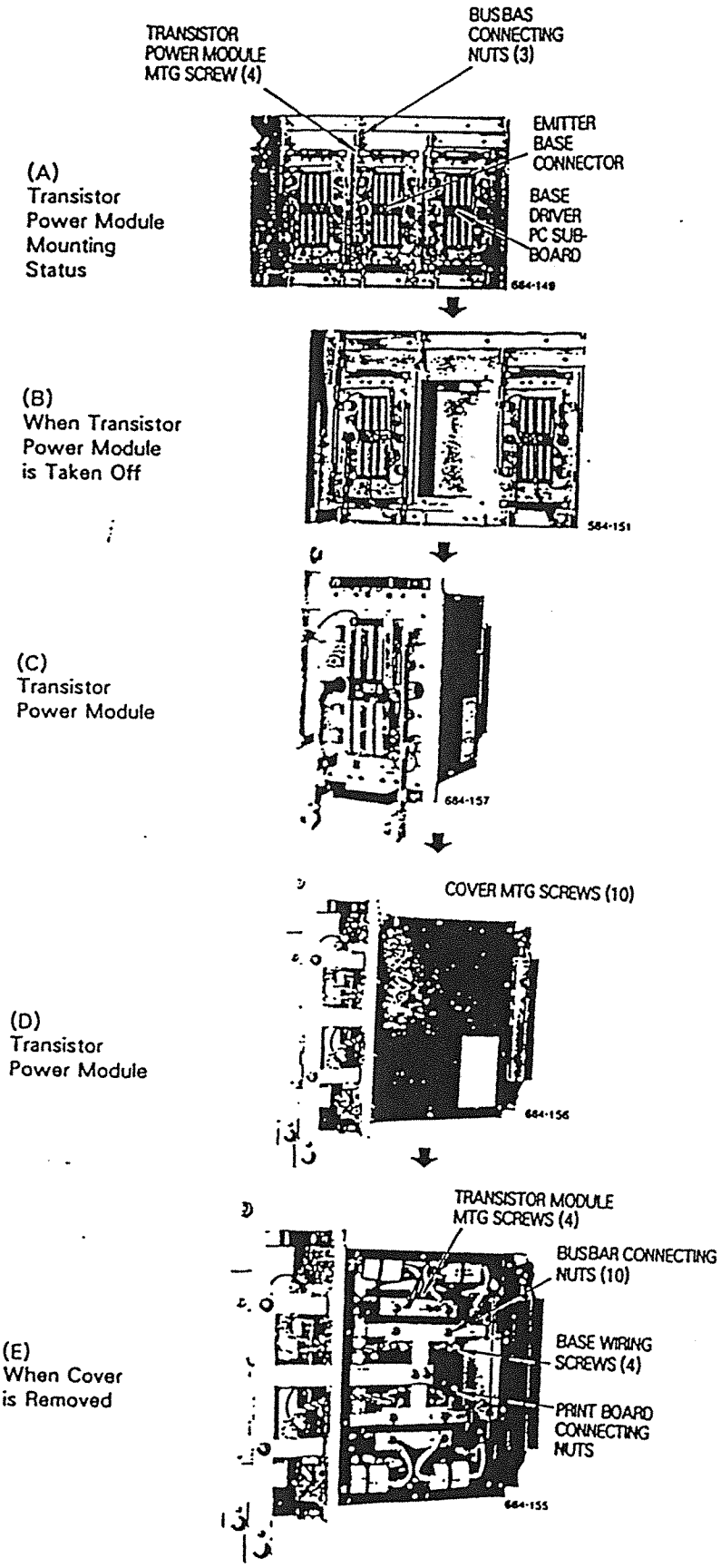

TRANSISTOR POWER MODULE MTG SCREW (4)
BUS BAS CONNECTING NUTS (3)
EMITTER BASE CONNECTOR
BASE DRIVER PC SUB-BOARD
684-148
(A) Transistor Power Module Mounting Status
(B) When Transistor Power Module is Taken Off
584-151
(C) Transistor Power Module
684-157
COVER MTG SCREWS (10)
(D) Transistor Power Module
684-156
TRANSISTOR MODULE MTG SCREWS (4)
BUSBAR CONNECTING NUTS (10)
BASE WIRING SCREWS (4)
PRINT BOARD CONNECTING NUTS
(E) When Cover is Removed
684-155

Fig. 11.11

11.8 TRANSISTOR REPLACEMENT (Cont'd)

(3) 400V: 400kVA

Removing method

Transistor power modules are of semi plug-in type. Replacement can be performed on the desk. First, power module removing procedure is described below:

① Pull out emitter base connector.

② Pull out snubber resistance connector connected to N side power module from P side power module (lower).

③ Pull out the power module after loosening two power module mounting screws and two busbar connecting nuts. See Fig. 11.12(A).

④ Take off the power module with care not to damage any part. See Figs. 11.12(A) and (C).

The following describes how to remove transistor modules:

⑤ Remove fourteen power module side cover mounting screws. See Fig. 11.12(D).

⑥ Remove seventeen busbar connecting nuts, six base wiring screws and six BX terminal connecting nuts.

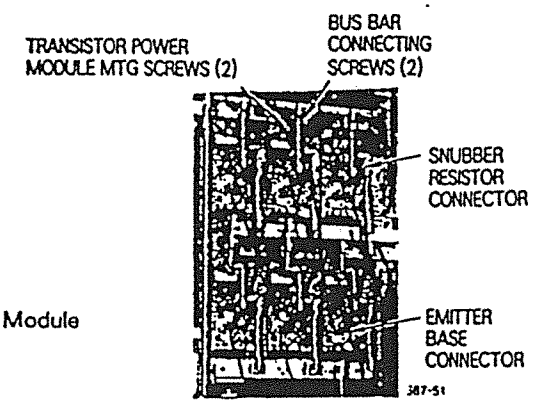
Remove four transistor module mounting screws to take off the transistor module. See Fig. 11.12(E).

Mounting method

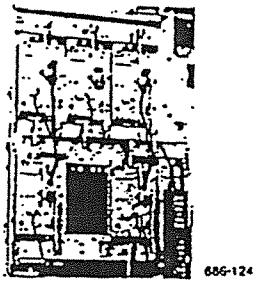
(a) Clean each contact surface of transistor module and fin, and apply thermal compound "JOINTAL Z" (Nippon Light Metal Co., Ltd.), or equivalent compound, to the base surface of the transistor module.

(b) Mount the transistor module on the fin using 25(±5)kgf cm of fastening torque.

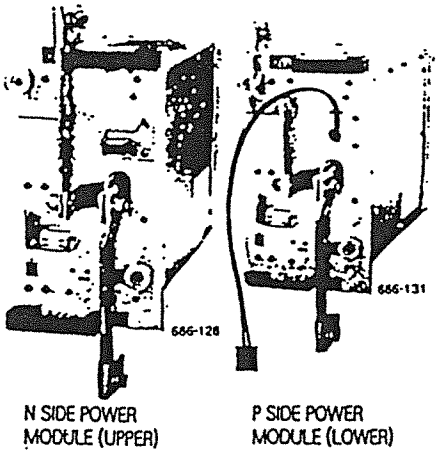
(c) The procedures for mounting the transistor power module is the reverse of those followed for removing the module.



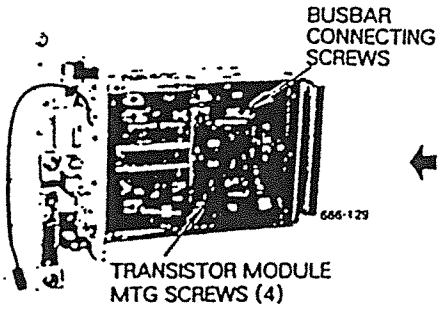
(A) Transistor Power Module Mounting Status



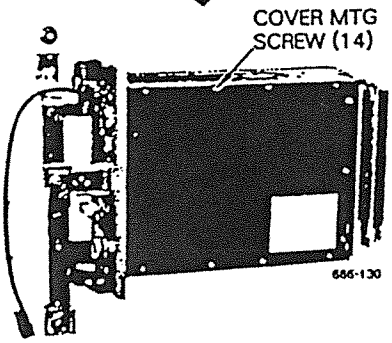
(B) When Transistor Power Module is Taken Off



(C) Transistor Power Module Sketch



(E) When the Cover is Removed

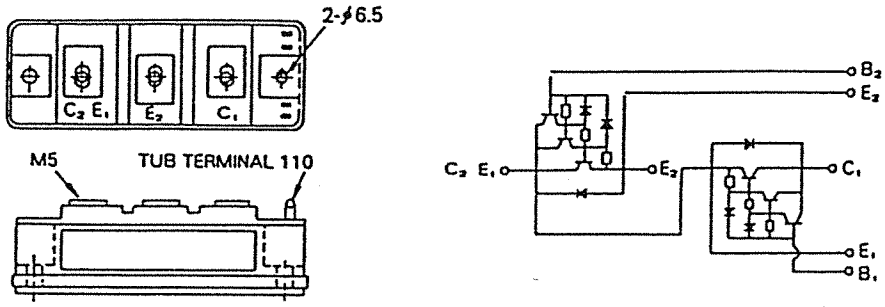


(D) Transistor Power Module Profile

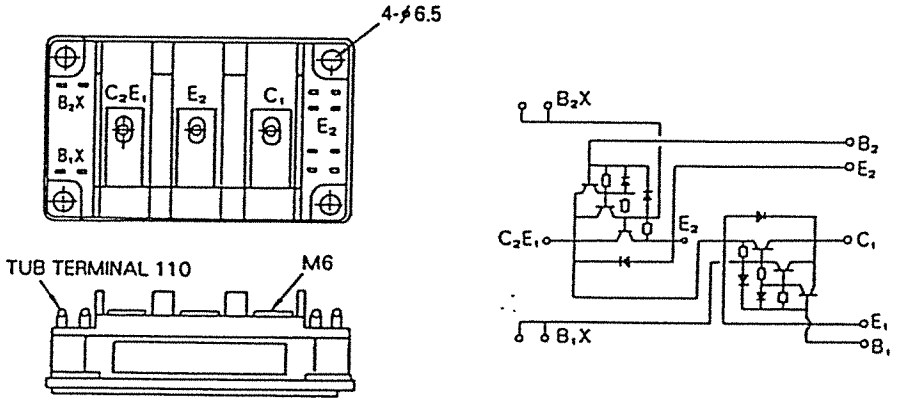
Fig. 11.12

11.8 TRANSISTOR REPLACEMENT (Cont'd)

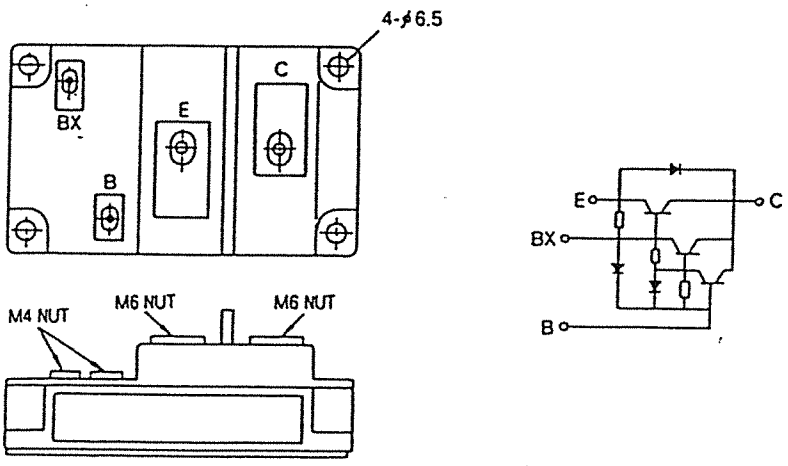
Reference: 400V class Transistor Module Sketch and Circuit Diagram



Model QM50DY-2H



Model QM100DY-2H

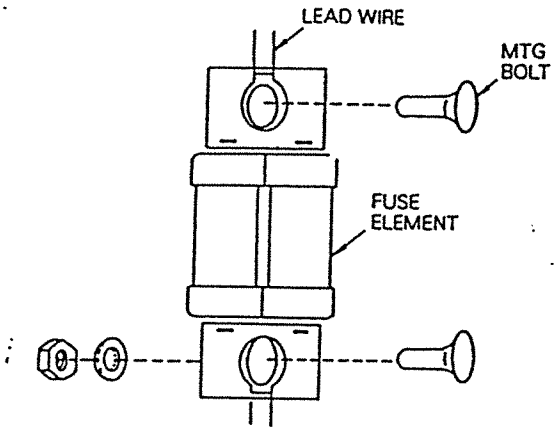


Models QM200HA-2H. QM300HA-2H and QM400HA1-2H

REPLACEMENT OF MAIN CIRCUIT FUSE

(1) 200V class models and 400V class models less than 140kVA

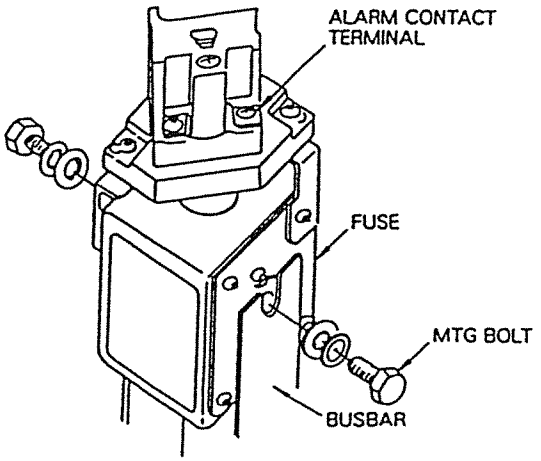
Remove fuse mounting bolts lead wire to replace fuse element.



Replacement of Main Circuit Fuse

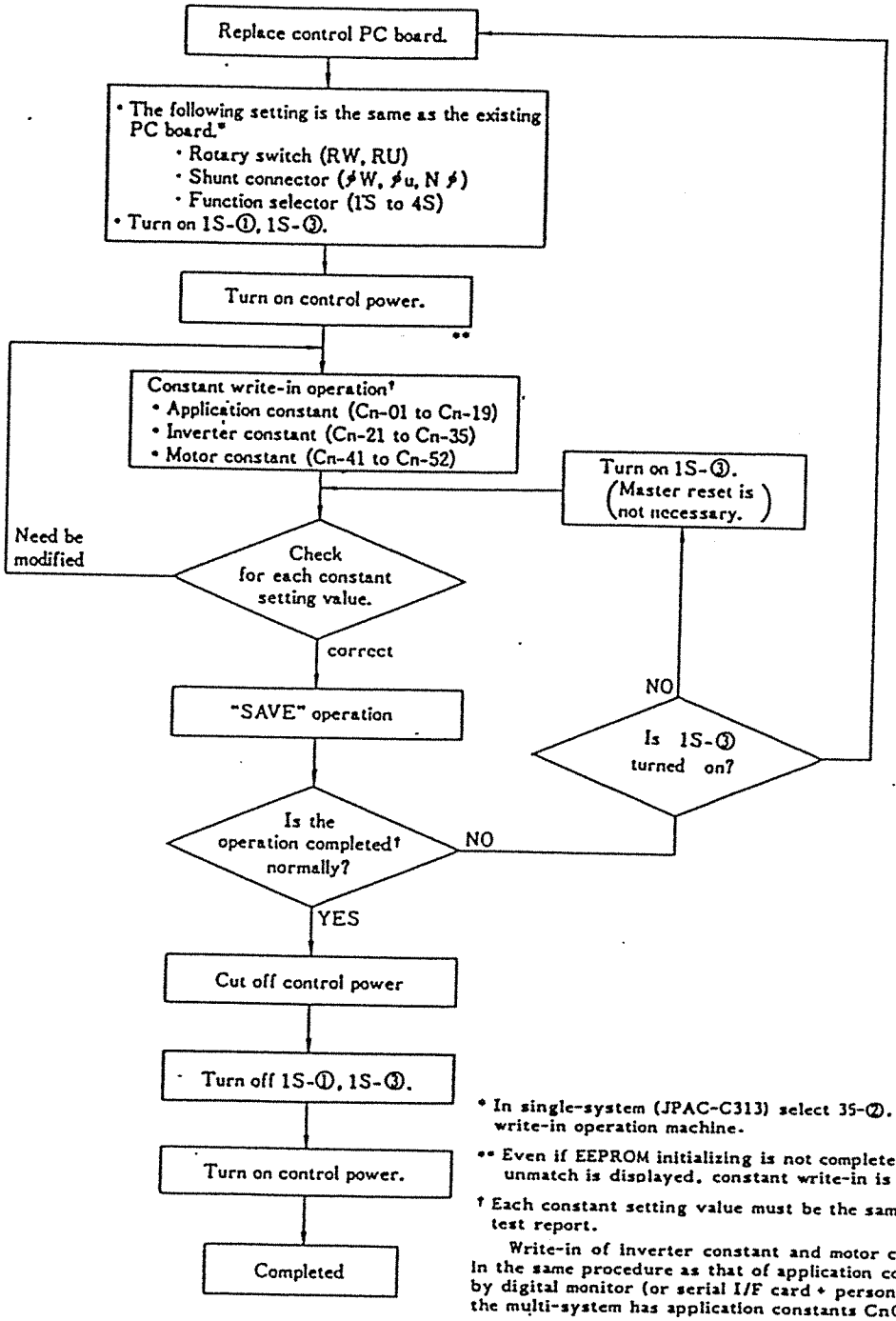
(2) 400V class 200kVA, 400kVA

Replace fuse by loosening mounting bolt. Then remove lead wire connected alarm contact terminals and connect it to a new fuse.



Replacement of Main Circuit Fuse

11.9 VS-676 CONTROL PC BOARD SPARE PARTS REPLACEMENT



* In single-system (JPAC-C313) select 3S-②, corresponding to write-in operation machine.

** Even if EEPROM initializing is not completed, or EEPROM code unmatch is displayed, constant write-in is operational.

† Each constant setting value must be the same as those in the test report.

Write-in of inverter constant and motor constant is performed in the same procedure as that of application constant (Cn-01 to Cn-19) by digital monitor (or serial I/F card + personal computer). However, the multi-system has application constants Cn01 to Cn-18.

When control PC board before soft No. S0101 is replaced with the one after S0102, set Cn-33 bit B at "1". For drive with PG, this operation is not needed.

† At normal completion
For digital monitor: End is displayed.
For personal computer: Complete is displayed.

TRANSISTOR INVERTER

Varispeed™-676

INSTRUCTION MANUAL

FOR SINGLE-SYSTEM DRIVES 200 V CLASS 1 TO 80 kVA 400 V CLASS 1.5 TO 400 kV

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