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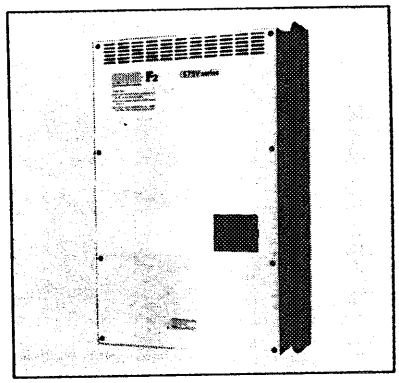
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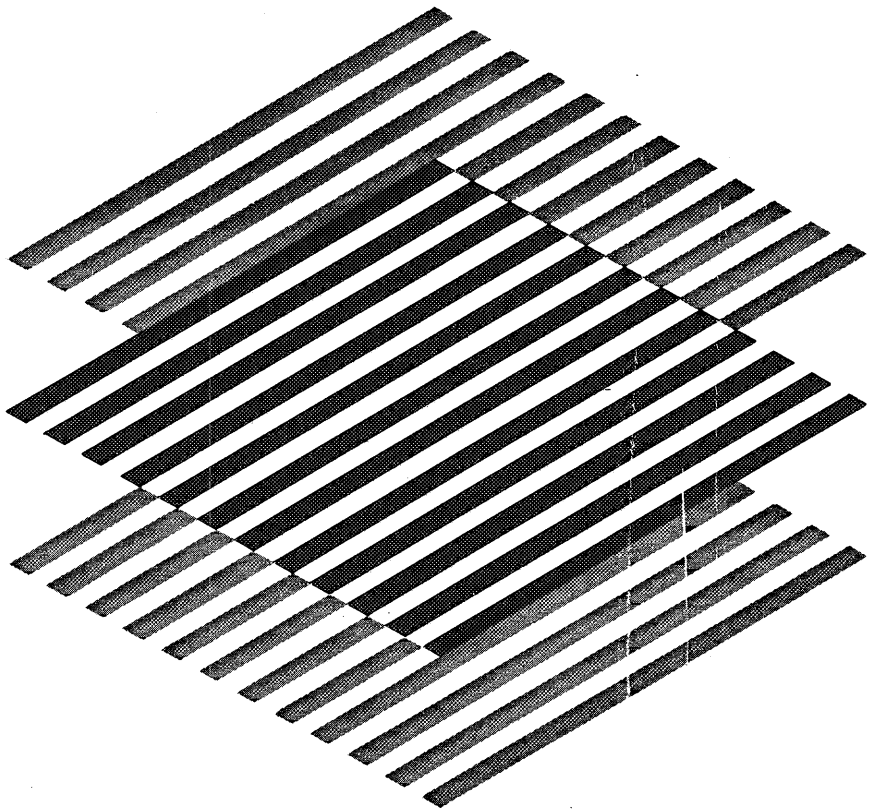
MITSUBISHI TRANSISTORIZED FREQUENCY INVERTER

FREQROL-F2-C



Instruction Manual

575V series



MITSUBISHI ELECTRIC

IB (NA) 66030-A

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FORWARD

Thank you for your purchase of Mitsubishi transistorized frequency inverter FR-F2-C.
This is a variable frequency power supply unit to control the speed of standard squirrel-cage induction motors. This instruction manual is intended to explain how to use the inverter.
Correct wiring, adjustment and operation will ensure you the long life and the high quality opration of the inverter.

CAUTION

Read this manual carefully before any wiring or adjustment of the inverter.

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1. INSTALLATION

(1) Install the inverter securely on the wall or in the cabinet box with bolts or screws vertically so that the letters "FREQROL-F2" appears front.

(2) Since the inverter does generate some heat during the operation, any other equipments or parts should be installed at least 10cm away from the top and the bottom of the inverter to keep the smooth air flow.

2. WIRING

Wire correctly according to following instructions and refer to Fig. 1, Standard Wiring Diagram.

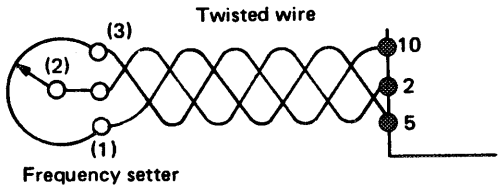
(1) Loose screws of the front cover and remove it out, then you can see the terminal block for your wiring at the bottom of the unit.

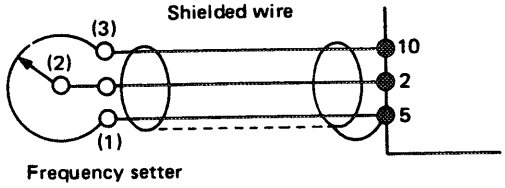
(2) Do not wire the power source line to the output terminals of the inverter U, V, W. It may cause the damage of the inverter.

(3) Do not connect only the resistor to the terminals P and N since these terminals are intended to connect the optional brake unit and the resistor.

(4) Any phase sequence of the input line is acceptable for the input terminals R, S and T. So it is not necessary to consider the phase sequence of the input power supply.

(5) Use shielded wires or twisted wires for the wiring of the control terminals for the frequency command signal (terminals 10, 2, 1 and 5) to prevent the inductive noise to the control circuit from other equipments, and also connect them away from the main circuit and the high voltage circuit wiring (575V, 230V and 115V).





(6) Since the frequency setting signal current is extremely low, if it is necessary to use contacts in the frequency setting circuit, use a pair of parallel contacts or twin contacts to prevent the poor contact.

(7) Rotating direction of the motor is counterclockwise seen from the load side with the normal wiring to the output terminals U, V and W.

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3. WIRING DIAGRAM

Refer to the following wiring diagram for the wiring.

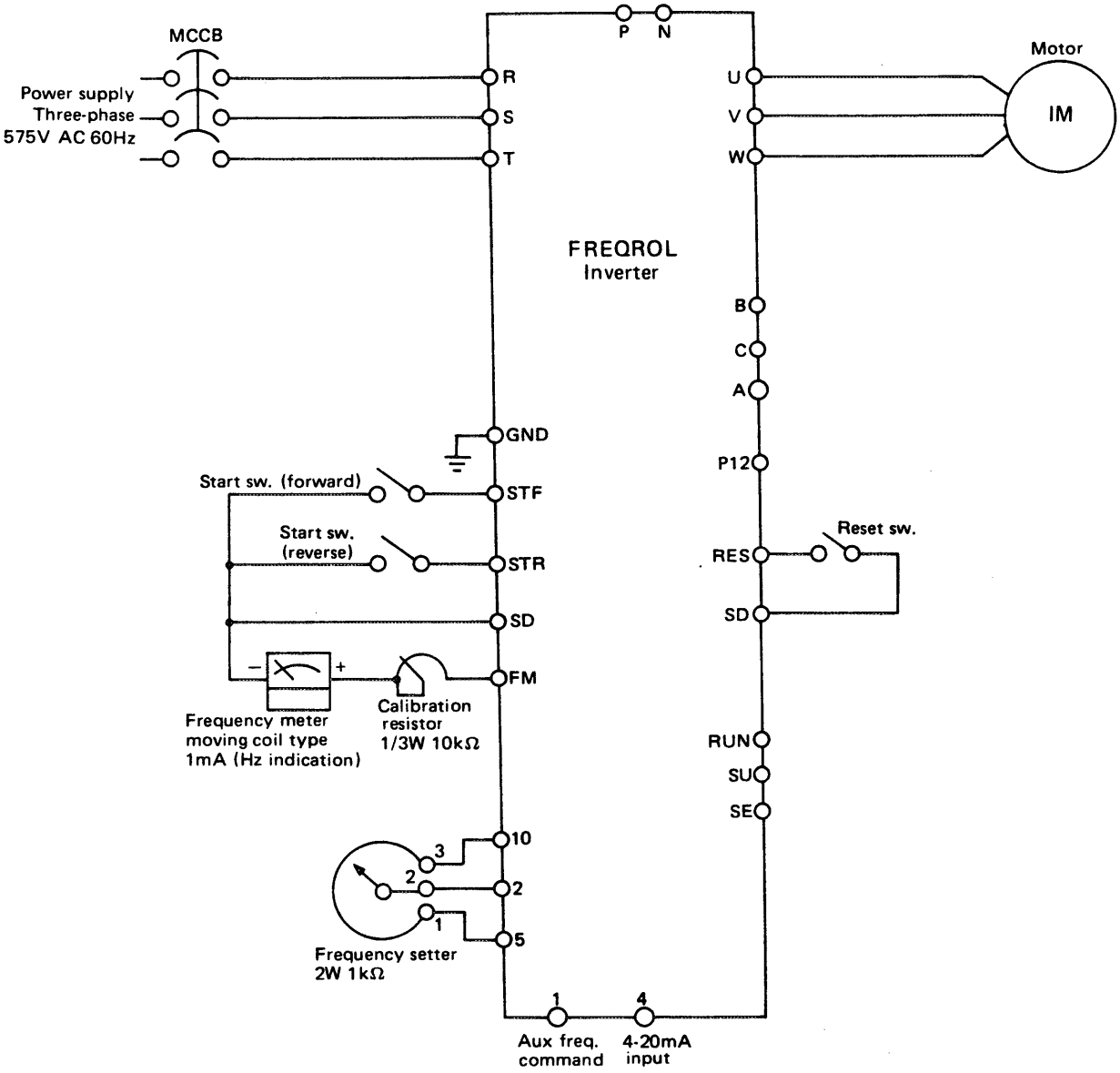


Fig. 1 Standard Wiring Diagram

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4. OPERATION'S PRECAUTIONS

When the confirmations described before have been completed you may begin normal operations, but keep the following points in mind when doing so.

(1) When a standard motor is being driven by the inverter, the temperature, noise and vibrations will be somewhat higher than they would be with a commercial power supply.

(2) Since cooling efficiency decreases at low speed operations, it is necessary to reduce the torque from the rated motor torque. (Refer to the catalog for the torque reduction ratio.)

(3) The FREQROL is capable of controlling plural motors at the same time. When the inverter is used to control more than one motor, care should be taken that the total current requirement for the simultaneously operated motors is within the rated output current of the inverter.

(4) If the FREQROL is being used to control multipole motors with 8 or more poles, submersible motors, or other special-purpose motors, carefully examine the rated current and other electrical specification.

(5) Do not add a capacitor nor surge suppressor to the output circuit of the inverter. This may cause the overcurrent protection to activate.

(6) If you are using a motor with mechanical brakes, the brake exciting circuit should not be connected to the inverter output, and make certain that brake action can be affected after turning off the inverter's output.

(7) If using motors of differect capacity or special-purpose motors, or if more than one motor is being used simultaneously, add a thermal overload relay to the inverter output circuit to protect the motor from being burned up. In this case **turn the electronic thermal relay setting dial (TH) on the operation panel as far as it will go in the clockwise direction.**

5. OPERATIONS

5.1 Points to check before operations

After installation and wiring of FREQROL is completed, check the following points before operating.
If insulation is to be checked with megger, perform only the test between controller and grounding.
Never perform a megger test between the inverter's terminals.
Also do not perform a megger test on the control circuit terminals.
Refer to section 6 for details on megger insulation tests.

(1) Check whether wiring conforms to the standard wiring diagram.

(2) Check for points short-circuited by broken wire, etc.

(3) Check if any wire is strained.

(4) Check tightness of screws, of terminals and other fasteners.

(5) Check motor load conditions.

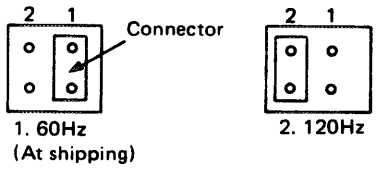
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5.2 Perparations before operations

When inspection is completed, open the setting panel flap on the inverter front panel and make the following setting.

5.2.1 Selection of maximum output frequency (set with connector)

By changing the position of the connector on the p.c.b., set the maximum output frequency.
The maximum output frequency is set to 60Hz at shipping. (Don't change the connector while inverter is operating)



1. 60Hz (At shipping)

2. 120Hz

5.2.2 Selection of frequency setting signal (set with select switch)

The settings 0 – 5V and 0 – 10V are available for frequency signal.

(1) For 0 – 5V DC signal: Use terminals 2 & 5.
(2) For 0 – 10V DC signal: Use terminals 1 & 5.
(3) For 4 – 20mA signal: Use terminals 4 & 5.

Note: Terinals 1 and 2 can subtract or add the signal voltage each other.

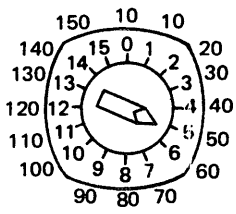
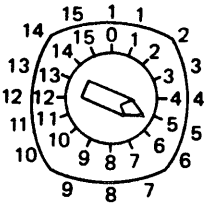
5.2.3 Setting of acceleration/deceleration time (set with ACCEL/DECEL dials and select switches)

Set acceleration and deceleration time by setting the ACCEL and DECEL dials and the acceleration and deceleration time magnifying select switches.

(1) Acceleration and deceleration time can be set independatly.

(2) Acceleration and deceleration time refers to the time during which output frequency is increasing from 0 to maximum frequency or decreasing from maximum frequency to 0.

(3) The relationship between the figures on the notches of the ACCEL and DECEL dials and the position of the acceleration and deceleration time magnifying select switch is shown in the figure below. Set them at positions appropriate according to applications and kinds of the motor load.

Select switch		
Select dial (sec.)		
Range	10 to 150 sec. (10 seconds increment)	1 to 15 sec. (1 second increment)

(4) Both the acceleration and deceleration times are set at 5 seconds at shipping.

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5.2.4 Setting of electronic thermal relay (set by setting dial)

(1) For setting of the electronic thermal relay, the rated output current of the inverter is determined at 100%. (The setting range is 50 to 100%)

(2) The electronic thermal relay is set at 100% at shipping.

(3) Set the setting dial for the electronic thermal relay by calculating the percentage according to the following equation.

- When a single motor is operated by the inverter, the following equation applies:

$$\text{Set sclae (\%)} = \frac{\text{Rated current of the motor (A)}}{\text{Rated output current of the inverter (A)}} \times 100$$

If the value of the set scale (%) exceeds 100%, then set the setting dial to 100%.
Rated output current is shown in the name plate.

(4) If a multipole motor with eight or more poles, an special-purpose motor, or plural motors are being operated, the built-in electronic thermal relay will not affort sufficient protection so a thermal overload relay should be added to the inverter's output circuit.
If such cases, **turn the electronic thermal relay setting dial (TH) as far as it will go in the clockwise direction.**

5.3 Operations

When the preparations have been completed, being inverter operations in the following procedure:

(1) First close the MCCB, then the magnetic contactor (MS) by pushbutton. The power pilot lamp on the inverter panel should light in yellow. The motor will not yet rotate in this state. Touch the motor with your hand to see that there are no buzzing sounds or vibration.

(2) If there are not abnormalities, turn the FWD start switch (or REV start switch) on. Gradually turn the knob of frequency setter clockwise. When the knob is turned to "3Hz" position, the motor will start rotating. And turned farther clockwise, the frequency (rotation of the motor) will increase gradually up to its maximum frequency setting (60Hz or 120Hz).

(3) When the frequency setter has been set at the desired frequency, and the FWD start siwtch (or REV start switch) has been turned on, motor revolutions will increase to the set value within the time set by the acceleration time setting dial described above, and then continue to operate at the setting frequency. If the motor does not accelerate smoothly and the OL lamp blinks during the acceleration or the "OCT" indication lamp lights up, this is because the acceleration time has been set at too short period in relation to the motor load, and the acceleration time should thus be lengthened.

(4) When the FWD start switch (or REV start switch) is turned off while the motor is rotating, motor speed is decelerated in the time period set by the DECEL dial. If the motor speed does not decelerate smoothly and the OL lamp blinks during the deceleration or the "OVT" indication lamp lights up, this is because the deceleration time is not sufficient for the motor load, and the deceleration time should thus be lengthened.

(5) If the FWD start switch and the REV start switch are turned on simultaneously, the motor will not rotate. Also, if the FWD start switch and the REV start switch are simultaneously activated while the motor is rotating, the motor will begin decelerating in the same manner as when the FWD (or REV) start switch is turned off.

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(6) If the FWD start switch is turned off and the REV start switch turned on while the motor is rotating forward, the motor speed will decelerate to a frequency of 3Hz, at which point the rotation direction will automatically be reversed, accelerating gradually to the frequency that has been set. The same is also true of movement from reverse to forward rotation.

(7) Even if the input power of inverter is turned on with the FWD or REV start switch on, the inverter does not start for several seconds. After several seconds have elapsed, the inverter will start.

(8) If the settings of the acceleration or deceleration time are changed during motor operations, the previous settings will remian in memory and the changes will not take effect. Note that this unit is designed for changes in the setting of acceleration and deceleration time to be made at a inverter frequency below 3Hz.

(9) If the protective circuits, such as those against overcurrent and regenerative overvoltage are activated, the alarm indication lamp will light up in red and the shut-off state will continue. To reset after a shut-off, perform the following operations:
- First turn off the power supply with the MCCB or the Magnetic contactor (MS), then turn it on.
- Short-circuit the terminals between RES (reset) and SD (common) of the control circuit by the reset switch, then (after about 0.1 second), re-open.

(10) Use the calibration resistor to adjust the frequency meter so that the frequency is indicated as 60, or 120 Hz when the commanded voltage (across terminals between 2 and 5) is set to 5V DC.

6. MAINTENANCE AND INSPECTION

The FREQROL is the static type, so almost no daily maintenance is required. The following maintenance practices should, however, be observed.

(1) **Since the capacitor in the inverter remains charged at high voltage for a while after the inverter is turned off, perform inspections only after charge indication lamp "CHARGE" goes out.** Also, the cooling fan will continue to run for some time after the power has been turned off, so be careful to keep hands away from this area.

(2) From time to time, inspect the inverter for dust and dirt accumulated inside, and clean it if there is a buildup.

(3) Check the tightness of terminal block screws and mounting screws. If they come any loose, tighten them securely. Make certain there are no defects in the wiring parts or components. Replace defective wiring part if found, or contact your service representative.

(4) Insulation resistance test using a megger

a) When performing a megger test on the external equipment, remove all inverter terminals so that the test voltage will not be applied to the inverter.

b) Perform megger tests only for the main circuit of the inverter as shown in Fig. 2. Do not apply the test voltage to the control circuit.

c) **To check the FREQROL control circuit, use a multimeter (set to high resistance range position). Do not use a megger or buzzer.**

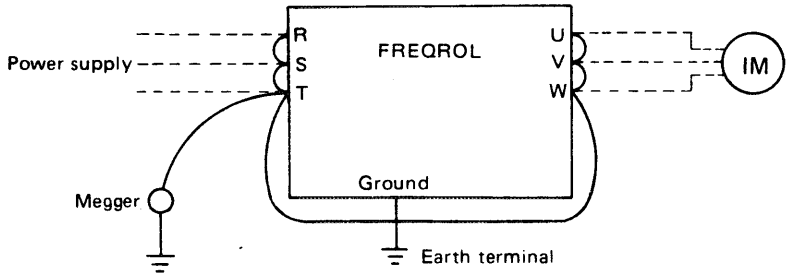
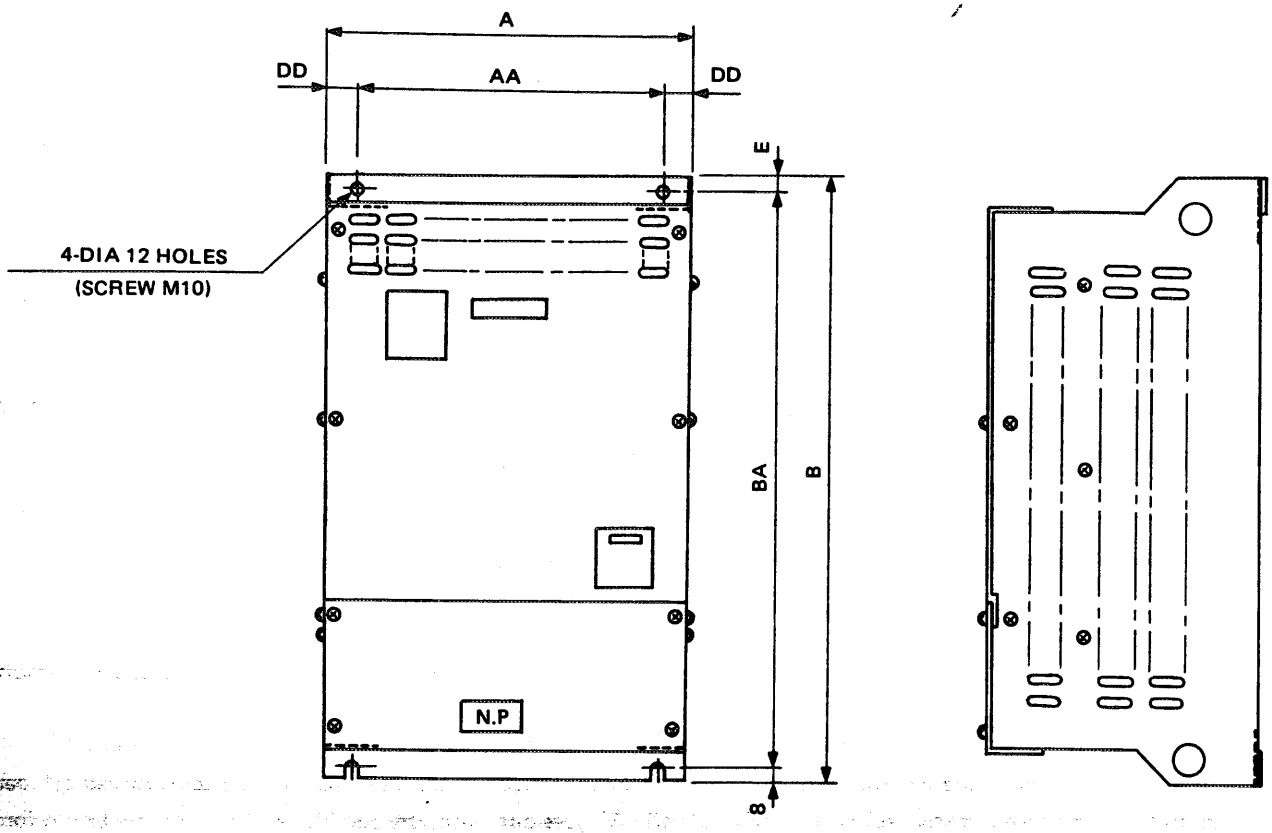
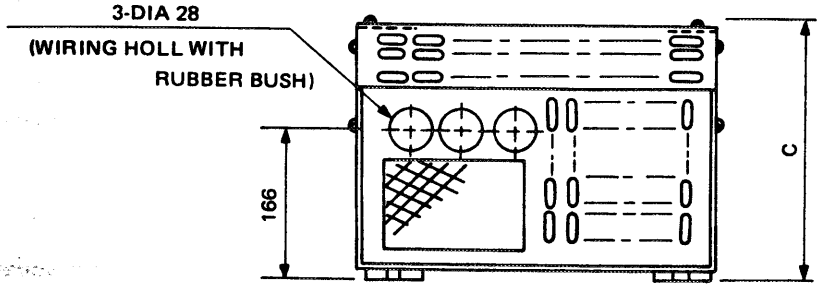


Fig. 2 Megger Test

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7. OUTLINE AND DIMENSIONS





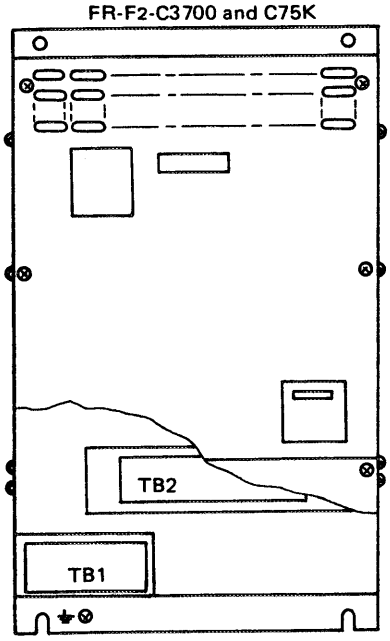
Type	A	AA	B	BA	C	DD	E
FR-F2-C3700 FR-F2-C7.5K	300	250	530	510	244	25	13
FR-F2-C15K	370	320	645	625	244	25	12

(mm)

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8. TERMINAL ARRANGEMENT

FR-F2-C3700 and C75K



GND

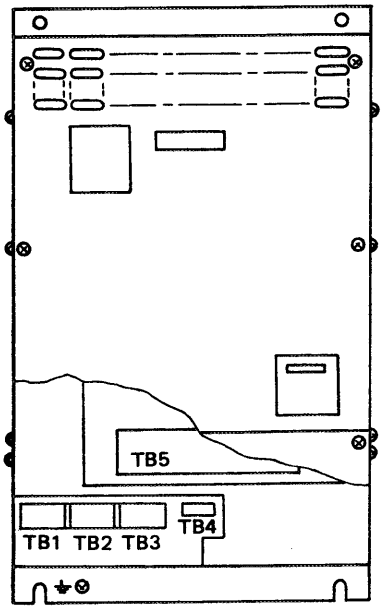
TB1

R	S	T	U	V	W	R1	S1		N		P

TB2

A	B	C	P12	SU	RUN	SE	10	1	2	4	5	STF	STR	SD	RES	SD	FM	5	AM

FR-F2-C15K



GND

TB1

R	S	T

TB2

U	V	W

TB3

N		P

TB4

R1		S1

TB5

A	B	C	P12	SU	RUN	SE	10	1	2	4	5	STF	STR	SD	RES	SD	FM	5	AM

Terminal Screw Size

Type	Control Circuit	R.S.T	U.V.W	P.N	R1, S1	Ground Terminal
FR-F2-C3700 FR-F2-C7.5K	M3	M4	M4	M4	M4	M5
FR-F2-C15K	M3	M5	M5	M5	M4	M5

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9. ALARMING AND ITS RESETTING

The alarming functions used in the FREQROL works as listed below.
It is very important for operator to take action with composure when an alarm lamp lights.
For details of alarm lamp functions, refer to the list "Alarm lamp Functions".

Alarming	Cause	Description	Restoration
Over-current (OCT)	Acceleration/deceleration time is set too short.	Overload alarm lamp "OL" lights during acceleration or deceleration.	Prolong acceleration deceleration time setting.
	FREQROL output is switched on and off.	Check if operation sequence is that magnetic contactors (switch) in the output circuit is closed after FREQROL start signal (ST) is set to "ON".	●Change the operation sequence. ●If the output must be switched on and off, use a FREQROL having capacity 5 times larger than that currently in use.
	Peak load momentary occurs.	Overload alarm lamp "OL" momentarily lights.	Improve the mechanical system to eliminate occurrence of peak load. Use a FREQROL having a one or two rank larger capacity.
	Load is too heavy.	Overcurrent preventive means trips while motor does not run at all, even though acceleration/deceleration time is prolonged.	Static frictional torque is larger than the motor torque at start (3Hz). Use a motor and FREQROL having larger capacity.
	Capacitor for enhancement of power factor, or surge suppression capacitor is inserted in FREQROL output circuit.	Overcurrent flows because impedance of capacitor is too small for high frequency.	Remove the capacitor(s). For enhancement of power factor, it is recommended to insert a reactor in the input circuit of FREQROL.
	Short-circuiting on FREQROL output side		Locate where short-circuiting occurs and remedy.
	Mechanical (frictional) brake (brake motor, magnetic brake) operation is not compatible with FREQROL operation.	Check if brake works while FREQROL is not reset.	With braking command signal, the FREQROL should be reset (by short-circuiting across terminals RES and SD). Power source for AC magnetic brake coil should be taken from FREQROL primary circuit.
	External noise	If alarm lamp lights for a cause other than described above, it is likely that alarm lamp lights due to external noise.	Use twisted wires, or shielded wires in frequency setting signal circuits (10, 2, 5, 4). Shielded wire armor should be connected to terminal "5" at only one point, but not be grounded to the soil or other circuit (instrument circuit, for example).

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Alarming	Cause	Description	Restoration
Over-current (OCT)	Motor was started during free running.	Since motor should be started with output at 3Hz from FREQROL, starting during free running produces regenerative energy, resulting in overcurrent. Free running (running by inertia) occurs when, ●FREQROL power source is turned off. ●FREQROL output is shut off. (for switching of motor in the case of multi-motor operation, or multi-pole motor operation) ●Reset is operated or thermal relay is tripped.	Motor should be started after it has stopped completely. For automatic operation, use a timer to assure starting after the complete stop.
Heatsink overheat (OCT OVT)	Thermal relay on heatsink was tripped	If heatsink overheats, FREQROL output is shut off and alarm lamps "OCT" and "OVT" light. Alarm lamp "OVT" goes out in certain time.	Cooling fan is defective, or heatsink is not properly ventilated. Remove the cause of overheat.
Overload (OCT OVT)	Electronic thermal protector tripped.	The electronic thermal protector trips when motor overheats due to overload operation or long-lasting low speed operation. Alarm lamps "OCT" and "OVT" light.	Lighten the load or change operation pattern, or consider the use of a FREQROL and motor having larger capacity.
Load circuit grounding (GF)	Grounding in FREQROL output circuit.	If FREQROL output circuit is grounded, output is shut off and alarm lamp "GF" light.	Locate where grounding occurs and remedy.
Regenerative over-voltage (OVT)	Deceleration time setting is too short.	This occurs if energy produced by regenerative braking causes capacitor voltage exceeding the limit level.	●Prolong acceleration/deceleration time. ●Install a brake unit.
	Regenerative operation occurred during constant-speed motor operation (inverse torque is generated)	●Check if motor is forcedly rotated by grinding wheel, or flywheel, when FREQROL is used to control grinder motor and the link, for example. ●Check if motor is forcedly rotated by gravity of load (in the case of lifter, elevator, or the like)	Install a brake unit.
Instantaneous power (IPF)	Power is momentarily interrupted.	Alarm lamp "IPF" lights and FREQROL operation stops if power failure lasting over 15msec. occurs.	●Lamp "IPF" is for indication of instantaneous power failure. ●To resume operation, reset the FREQROL. ●If it is desirous to hold "IPF" display, an external circuit should be used.

Note: If the cause is unknown even after the completion of the above-mentioned checking, disconnect the FREQROL from the motor. If the alarm lamp still lights after the disconnection, the trouble is likely to be attributable to the FREQROL.

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Alarm lamps are installed on the setting panel, indicating tripping of protective means.
The following alarm lamps are used for the following protective or alarming functions:

Protective function	**Alarm lamp**
Overcurrent shut-off	Lamp "OCT" lights.
Regenerative overvoltage	Lamp "OVT" lights.
Electronic thermal protector	Lamps "OCT" and "OVT" light.
Heatsink overheat	Lamps "OCT" and "OVT" light. Lamp "OVT" goes out in certain time.
Instantaneous power failure	Lamp "IPF" lights.
Load circuit grounding	Lamp "GF" lights.
Overload alarming	Lamp "OL" flickers.

Note: For details of protective functions, refer to the description in section 9.

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10. PROTECTIVE FUNCTIONS

FR-F2-C series inverters have the following built-in protective functions.

When the protective circuits are activated, output transistors are cut off so that the elements are protected. This will cause the motor to stop after a brief free run. To start again, it is necessary to either reset by disconnecting the reset terminal "RES", or to turn the power off and on.

Protection against stalls caused by overcurrent	If an overcurrent more than 150% of the rated current occurs during acceleration, the frequency increase is stopped and frequency is kept until the load current has been reduced, thus preventing the inverter from stalling. If an overcurrent larger than 150% of the rated current occurs during normal operations (at constant speed), the frequency is decreased until the load current has been reduced, thus preventing the inverter from stalling. When the load current has been decreased below 150%, frequency will be increased again and acceleration will be continued to reach the set frequency level.
Protection against stalls caused by regenerative overvoltage	This protective circuit detects inverter output voltage and any regenerative current when the regenerative braking torque exceeds 20% during deceleration so that the frequency decrease will be stopped until the output current has been reduced, thus preventing the inverter from stalling. When the regenerative energy has been reduced, frequency will be decreased again and deceleration continued.
Overcurrent protection	If an overcurrent larger than 165% of rated output current is detected through the output current, the overcurrent protection circuit will be activated to cut off the transistor circuit and keep it off. (when an over-current protection circuit has been activated, the Overcurrent trip indication lamp (OCT) will light up.) (Activation of the overcurrent protection circuit is caused mainly by a power supply voltage decrease, extreme load inertia (GD^2), extremely short preset acceleration time, or a short-circuit in the inverterr secondary circuit, so to remove the trouble and restore the circuit examine all possible failures.)
Regenerative overvoltage protection	When an overvoltage is caused by regenerative energy at the converter output, the protection circuit is activated to cut off the transistor circuit and keep it off. (An OCT indication lamp lights in such cases.) (Activation of the regenerative overvoltage protection circuit is caused mainly by an extremely short preset deceleration time, so lengthen the preset deceleration time again.)
Instantaneous power failure protection	If a power failure continues for 15msec. or more, the instantaneous power failure protection circuit is activated to cut off the transistor circuit and keep it off. (IPF indication lamp lights in such cases.) (If the power failure ends within 15 msec., the protection circuit will not work and the control circuit will continue operating.)
Overload protection (electronic thermal relay)	Any overload while the motor is running under its rated condition, or overheating at low speed running, is detected by the electronic thermal relay, which cuts off the transistor circuit and keeps it off. (Alarm indication lamp will light up in such cases.) (Check the cause of the overload and either lighten the load, change the operations pattern or reconsider the capacity of inverter of motor.)
Overload alarm	If the motor becomes overloaded, an overload indication lamp (OL) will go on and off. If overload increases further, the overcurrent protection function (OCT) will be activated. If the OL indication lamp goes on during acceleration/deceleration, preset to longer acceleration/deceleration times. If an OL indication lamp goes on during fixed speed operations, lighten the load or reconsider the capacity of inverter or motor.
Thermo detection of heatsink	When the heatsink is overheated through a decrease in the cooling effect of the semiconductor, the temperature sensor is activated to stop the function and output of the power element and to keep them off. (OCT and OVT indication lamp will light up. OVT indication lamp will go off after a short time.) (Examine the cooling fan and the ambient temperature.) However, inverters below type FR-F2-C3700 are not provided with this function.
Protection against ground fault at load side	When a ground fault occurs at inverter load, the protection will be activated to cut off the transistor circuit and keep it off. (GF indication lamp lights in such cases.) (After checking the cause of ground fault at load side and overcurrent protection, remove the cause and restore the circuit.)

Note: *When the overcurrent protection, regenerative overvoltage protection, or instantaneous power failure protection is activated, an indication lamp lights up and that state will be retained. However, when the magnetic contactor (MS) is opened by an alarm signal, the alarm display will not be retained. If you wish to retain the alarm display, design the circuit so that main circuit and control circuit are configured independently. In order to retain the display of an alarm, disconnect control circuit power terminal R1 and S1, and connect to separate power.*

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11. INPUT/OUTPUT TERMINAL

Terminal symbol	Terminal name	Rating	Description
R.S.T.	AC powered supply input terminal	three-phase 575V 60Hz	
E	Ground terminal		Be sure to ground both inverter and the panel box which encloses inverter.
U.V.W.	Output terminals for motor		Connection for three-phases induction motor.
P.N.	Output terminals for converter		Terminals for connection of regenerative brake unit. Never connect anything other than brake unit to these terminals.
10-5	Power supply terminal for frequency setting	5V DC ± 0.01V DC Allowable load current: 6mA	Use these terminals as power supplies for external setters such as the variable resistor for frequency setting (motor speed setting).
2-5	Terminals for input signal of frequency	Input resistor 11kΩ ± 1kΩ	Maximum frequency (60Hz or 120Hz) is obtained at 5V.
STF-SD STR-SD	Input terminal for forward start signal Input terminal for reverse start signal	Input resistor 2.5kΩ Open voltage 14 to 20V DC Optoelectronic isolator Controllable by means of opencollector.	Forward start by closing terminals between STF and SD, stoppage by opening them. Reverse start by closing terminals between STR and SD, stoppage by opening them. Closing terminals between STF and SD, and STR SD simultaneously causes stop command.
FM-SD	Output terminal for frequency meter	Allowable load current: 1mA Optoelectronic isolator output voltage form is pulse.	Appromixately 5V DC is obtained at maximum frequencies (60Hz or 120Hz) and output voltage is in proportion with the frequencies. Connect moving-coil type ampere meter (1mA DC) with terminals FM and SD. Use calibration variable resistor 10K 1/3W by inserting it in series.
RES-SD	Input terminal for signal	Input resistor 4.7kΩ Open voltage 14 to 20V DC Optoelectronic isolator Controllable by means of opencontroller	For resetting emergency stop of the inverter caused by the activation of protection circuit. Resetting initalizes each part of the control circuit immediately, and the circuit to inverter and converter is shut off. To give this reset command, it is necessary to short-circuit across terminals RES and SD for 0.1 second or more. Initial reset is automatically performed inside the controller 0.2 to 0.4 seconds later after power up.
A-B-C	Output terminal for alarm	Contact output 230V AC 0.3A cosϕ = 0.4 30V DC 0.3A	A 1C dry contact that provides alarm signal when protective circu t is activated. When this signa is provided, power to the converter and inverter are cut off and the motor will stop after free running.
4-5	4-20mA current freq. setting	4-20mA Input resistor 280ohm	Used for the 4-20mA current signal from the PI controller.
1-5	Aux. freq. setting signal	±10V	Used to add or subtract the additional signal to the freq. setting signal.

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Terminal symbol	Terminal name	Rating	Description
RUN-SE	Output terminal controller operations	Open-collector of transistor Allowable load 23V DC 0.1A	Open-collector: L ..... when the commanded frequency is above 3Hz H ..... normally Use power supply 24V DC with ripple voltage within 10%.
SU-SE	Output terminal for correspondence of frequencies		Output terminal that indicates whether the actual frequency corresponds to the preset frequency: Open-collector: L ..... corresponds H ..... does not correspond
P12		Exclusive terminal for manufacturer check	

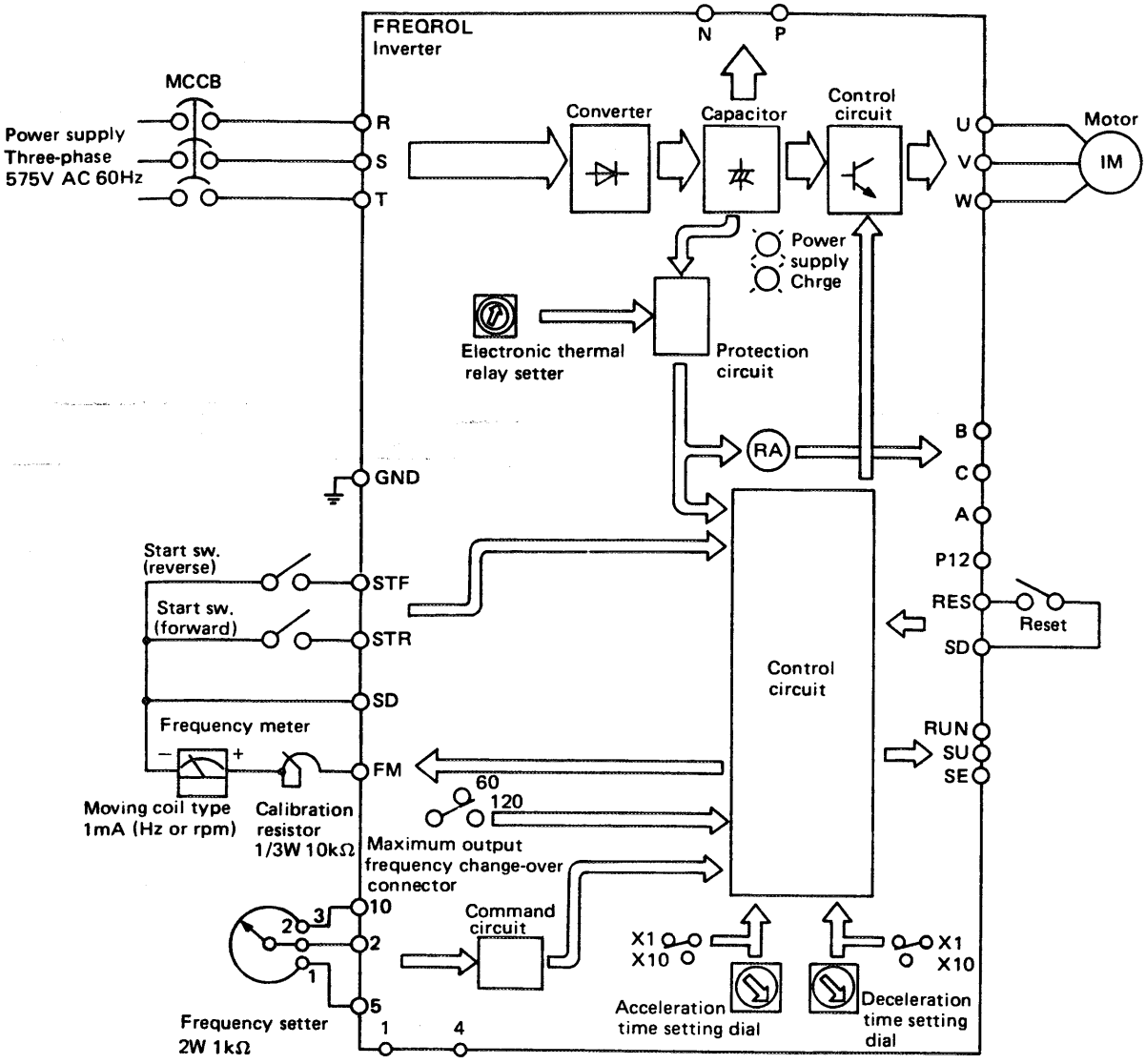


Fig. 7 Block Diagram

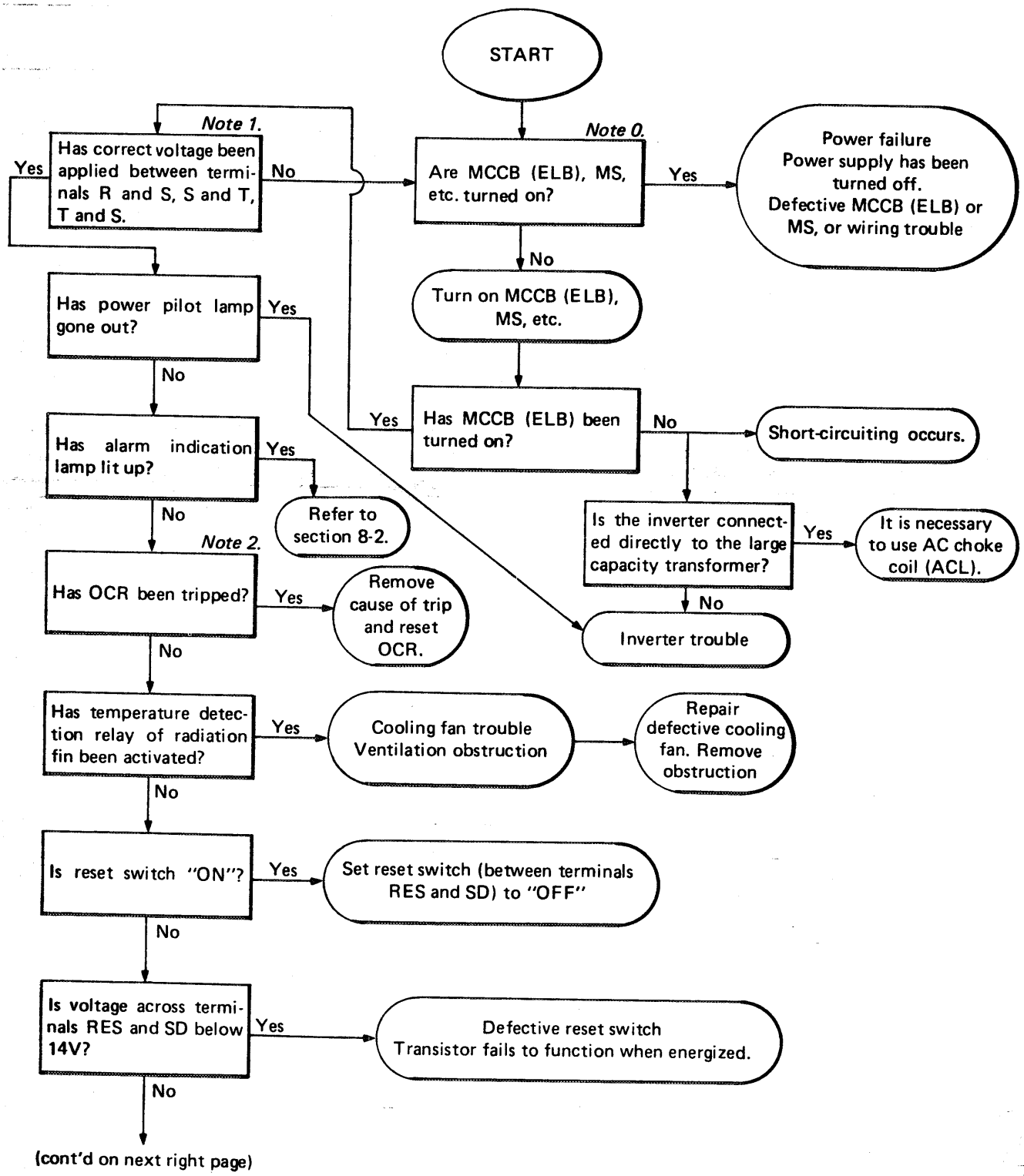
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12. TROUBLESHOOTING AND COUNTERMEASURE

In the unlikely event that there should be problems with the inverter or its should lose any of its functions, use the trouble-shooting chart below to identify the cause and apply the appropriate countermeasure. If your problem is not described below, the inverter is out of order, one of the parts has been damaged or if you have any other problem not dealt with here, contact with your local service representation.

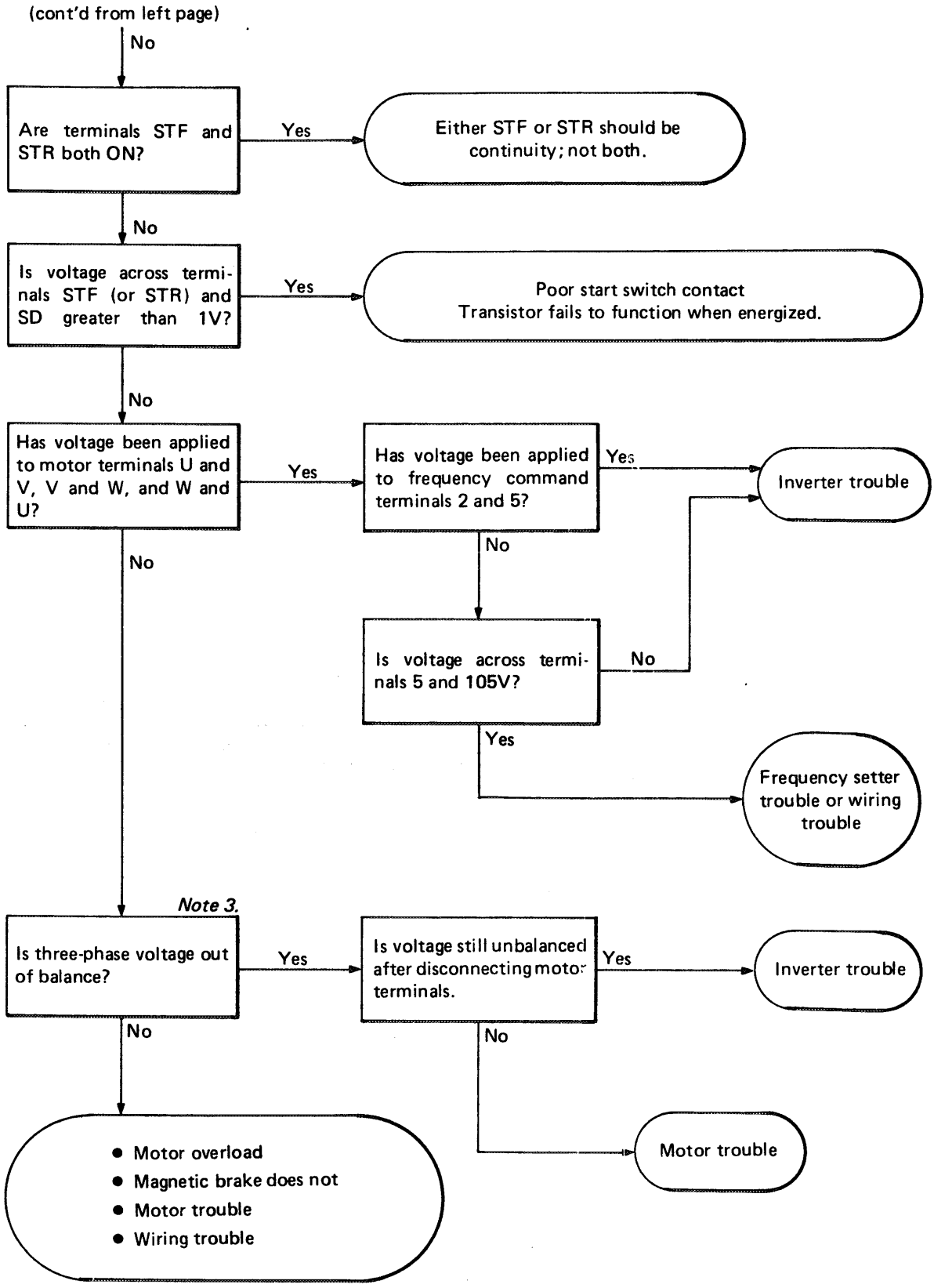
12.1 Troubleshooting Chart

(1) Motor does not run.



(cont'd on next right page)

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Note 0: ELB = Earth Leakage Braker

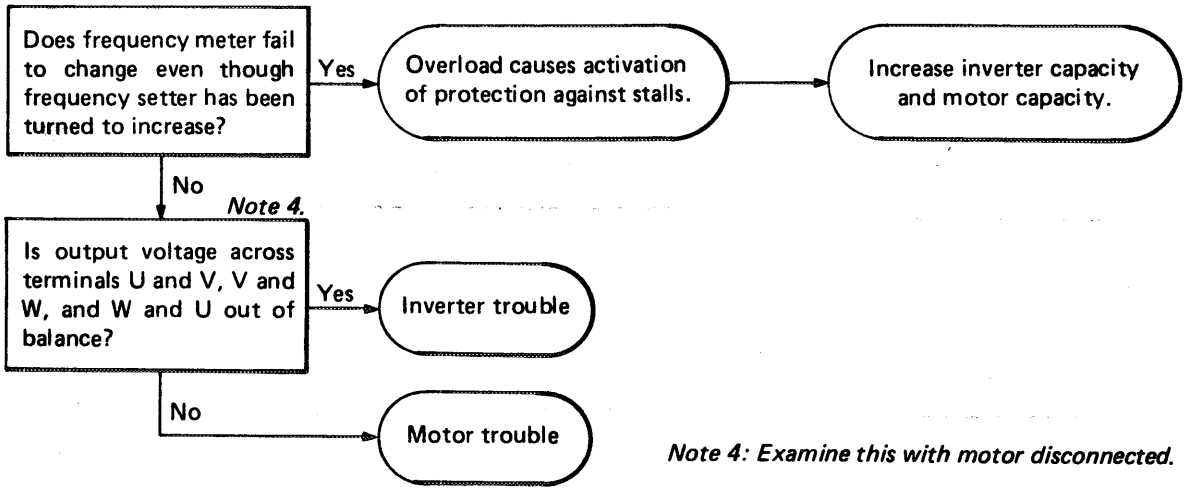
Note 1: Out of voltage should be within ±10% of rated voltage.

Note 2: Is thermal overload relay (OCR) connected.

Note 3: Umbalanced should be within 1% of maximum output voltage.

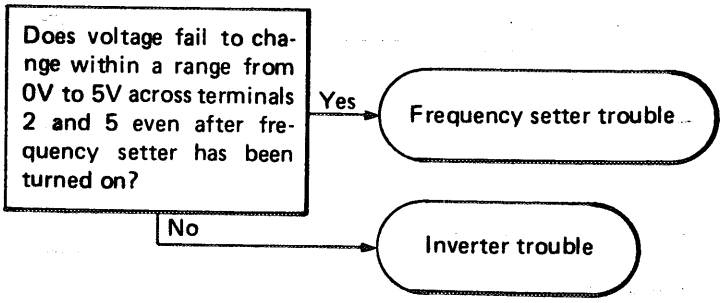
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(2) Motor buzzes and does not run.

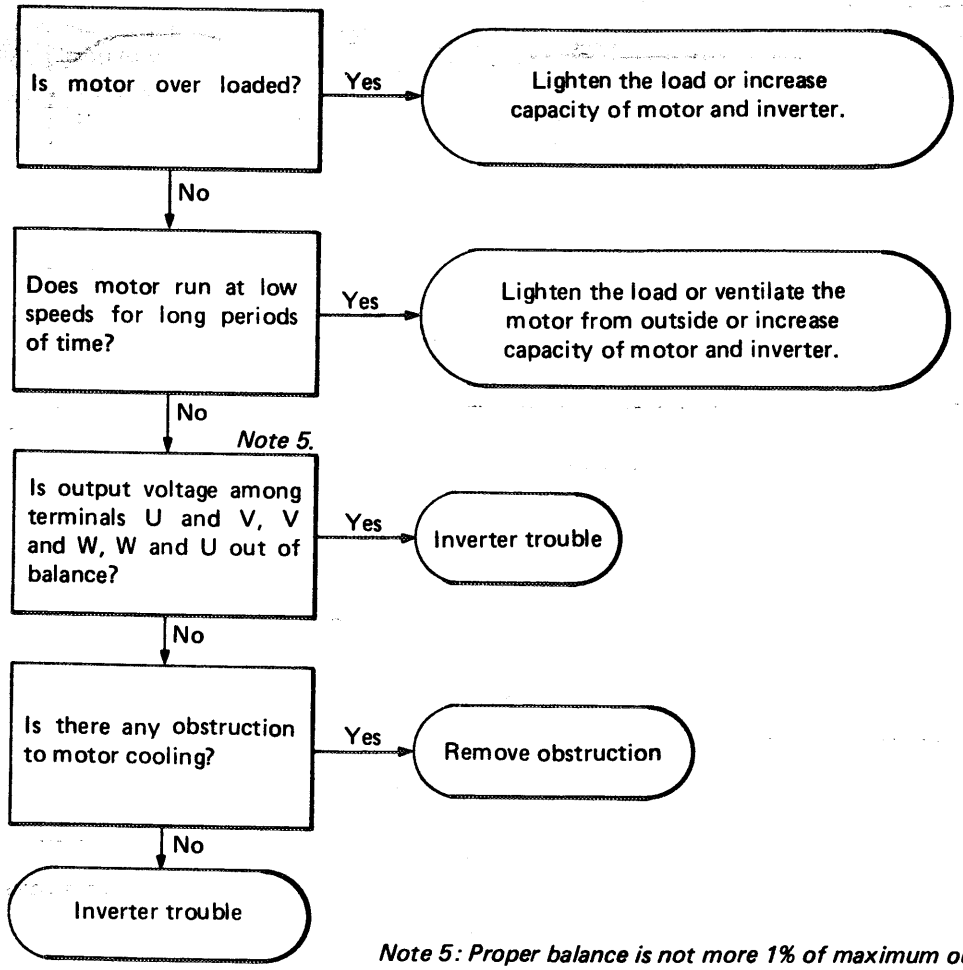


Note 4: Examine this with motor disconnected.

(3) Motor runs at constant speed and cannot be controlled.



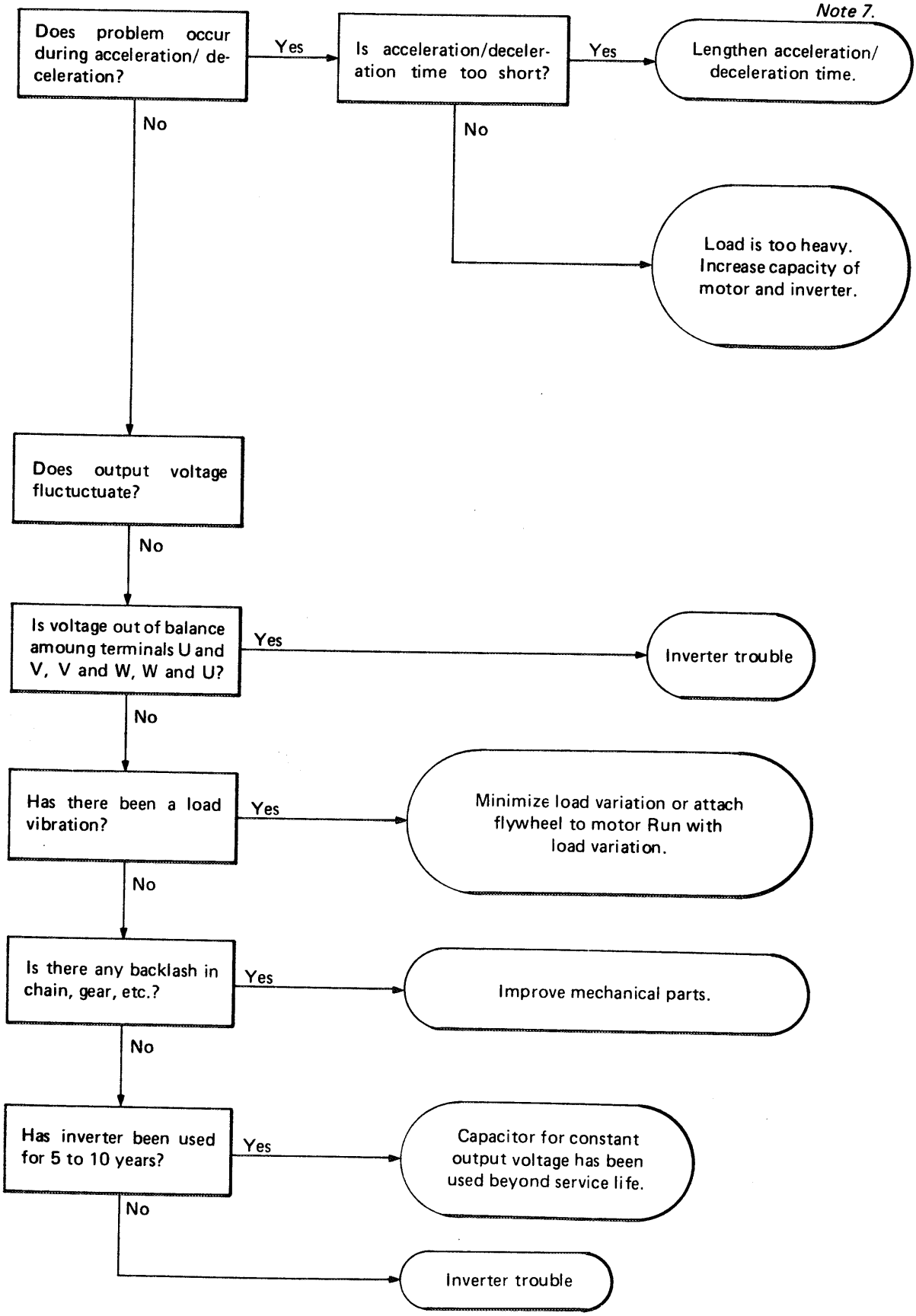
(4) Motor overheats.



Note 5: Proper balance is not more 1% of maximum output voltage.

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(5) Motor does not run smoothly



Note 7: Activation of protection function against stalls causes unstable acceleration/deceleration.

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13. STANDARD SPECIFICATION

Item		FR-F2-C3700	FR-F2-C7.5K	FR-F2-C15K
Output rating	Nominal output kW (HP)	3.7 (5)	7.5 (10)	15 (20)
	Output capacity (kVA)	6	12	22
	Rated output current (A)	6	12	22
	Maximum output voltage	3 phase 575V AC		
Power source requirement (kVA)		9	17	27
Weight kg (lbs)		20 (44)	21 (46)	31.7 (70)
Enclosure		NEMA-1		
Input power supply	Voltage/frequency	3-phase 575V AC 60Hz		
	Allowable voltage regulation	575V ± 10%		
	Allowable frequency regulation	Within ± 5%		
Control specifications	Control method	Voltage-control, Sinusoidal PWM		
	Frequency range	1 : 10 (6 - 60Hz) or 1 : 20 (6 - 120Hz) selectable		
	Starting frequency	3Hz		
	Frequency resolution (Hz/maximum frequency)	0.25/60, 0.5/120		
	Frequency accuracy	±0.5Hz (25°C ± 10°C, 77°F ± 18°F)		
	Reverse Operation	Electronic Reverse		
	Voltage/frequency ratio	Voltage/Frequency ratio is constant below 60Hz, Voltage is constant in 60 - 120Hz		
	Overcurrent resistance	150% for one minute 165% Instantaneous tripping		
	Frequency setting signal	0 - 5V DC, 0 - 20mA changeable		
	Acceleration/deceleration time	1 - 15sec. (in 1sec. increments), 10 - 150sec. (in 10sec. increments) selectable		
	Regenerative braking torque	Approx. 20% of rated motor torque		
	Protective functions	Overcurrent prevention, Regenerative overvoltage prevention, Overcurrent tripping, Regenerative overvoltage tripping, Overload tripping (Electronic thermal), Overheat tripping for heatsink, Instantaneous power failure (IPF) (continuous operation is guranteed for power interruption below 15 msec.), Ground fault		
Environmental conditions	Ambient temperature	−10°C to 50°C (14°F to 122°F) (To be free from freezing)		
	Ambient humidity	45 - 90% RH (To be free from condensation)		
	Atmosphere	To be free from corrosive gas and dust		
	Altitude	Less than 1000m (3000ft.)		
	Vibration	Less than 0.5G		

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