Section 6. TROUBLESHOOTING

6.1 GENERAL

A failure in the VCD 703 can fall into one of two categories.

A blinking "Alarm" indication is a warning that a VCD 703 trouble condition will soon occur, or that a problem in the external circuitry exists. The VCD 703 will continue to operate during an "Alarm" indication.

A steady "Fault" indication is displayed when the VCD 703's Fault relay has tripped (VCD 703 shutdown). The motor coasts to a stop, and a fault signal output is present at control circuit terminals 18 - 20.

Table 6-1. Failure Indication and Details

INDICATION (DISPLAY)	FAULT	DESCRIPTION
Uu	Momentary power loss	Low voltage has been detected (see "Undervoltage" specification, under "Protective Functions", in Appendix 1), but momentary power loss ride-thru is enabled, and momentary power loss ride-thru time (Cn-19 setting) has not been exceeded yet
Uu1	Power undervoltage fault (PUV)	Occurs two seconds after detection of low voltage (See "Undervoltage" specification, under "Protective Functions", in Appendix 1.)
Uu2	Control undervoltage fault (CUV)	Control circuit voltage is low during operation
Uu3	Undervoltage fault (MC-ANS fault)	Main circuit magnetic contactor (soft charge contactor) does not operate correctly
oC	Overcurrent (OC)	VCD 703 output current exceeds 120% of transistor rated current, or the ground current exceeds 25% of VCD 703 rated current
ou	Overvoltage (OV)	Detection level Approx 400V for 230V rated unit, Approx 800V for 460V rated unit
FAn	Cooling fan failure (FAN)	Cooling fan stopped while power is on Stop mode selection possible (Sn-13)
FU	Fuse blown	DC Bus fuse has cleared Check for short circuit in output
GF	Ground fault (GF)	Drive output ground current exceeded 50% of drive rated current
LC	Drive current limit	Drive output current exceeded drive rated current
oH1	Motor overheat (OH1)	Motor temperature has exceeded the allowable value (dn-18) Stop mode selection possible (Sn-14)
oH2	Heatsink overheated (OH2)	Fin temperature exceeds 90° C (194° F) ± 5°
oL1	Motor overload (OL1)	Protects the motor Motor thermal overload protection has tripped Cn-14, Cn-15 has been exceeded (initial value 150% for 60 sec), or motor exceeded 90% of the motor overheat level (dn-18) Stop mode selection possible (Sn-14)

Table 6-1. Failure Indication and Details - Continued

INDICATION (DISPLAY)	FAULT	DESCRIPTION
oL2	Drive overload (OL2)	Protects the VCD 703. Drive overload protection has tripped Stop mode selection possible (Sn-13)
rr	Braking transistor malfunction	Braking transistor failure
rH	Braking resistor unit overheated	Braking resistor unit temperature exceeds the allowable value (Built-in type only.)
ΓHΠ	Motor thermistor disconnection (THM)	Motor temperature detection thermistor is disconnected. Stop mode selection possible (Sn-14)
LF	Open phase fault	Problem in VCD 703-to-motor wiring
EF	Fwd Run and Rev Run commands are both applied to the VCD 703	VCD 703 is in "temporary" Ramp to Stop condition, one input command must be removed to resume operation
EF3	Ext. fault signal at term 3	A fault condition has occurred in the external circuit(s) monitored by the contact providing input to the indicated terminal. Stop mode selection possible (EF3. Sn-12, EF5 - EF8. Sn-15 - Sn-18)
EF5	Ext. fault signal at term. 5	
EF6	Ext fault signal at term 6	
EF7	Ext. fault signal at term 7	
EF8	Ext. fault signal at term 8	
ES	Speed estimation fault	A speed estimation fault occurred during PG-less operation.
SuE	Zero servo control error	Rotation position was shifted by more than 536,870,912/Cn-09 revolutions during zero-servo operation
PGo	PG disconnect (PGO)	PG cables are disconnected.
oS	Overspeed (OS)	Motor speed exceeds overspeed level (Cn-16) Stop mode selection possible (Sn-10).
dEu	Excessive speed deviation (DEV)	Deviation between speed reference and speed feedback exceeds the deviation level (Cn-04) Stop mode selection possible (Sn-10).
CPF00	Control circuit fault 1; transmission error or control function hardware fault (including internal RAM, external RAM or PROM)	Transmission between VCD 703 and Remote Operator is not established within 5 seconds after the power supply is turned on. (Displayed on the Remote Operator) Check operator connection
CPF01	Control circuit fault 2, Digital Operator transmission error	Transmission error occurs 2 seconds or more after transmission has first been established between VCD 703 and Digital Operator Check operator connection
CPF02	Control circuit failure	VCD 703 failure
CPF03	NV-RAM (S-RAM) fault	
CPF04	Constant destruction	
CPF05	A/D converter failure in CPU	
CPF06	Optional connection failure	VCD 703 failure. Check option connection
CPF07	A/D converter fault	Control card hardware was damaged.
CPF10	DSP hardware fault	VCD 703 failure

Table 6-1. Failure Indication and Details - Continued

INDICATION (DISPLAY)	FAULT	DESCRIPTION
CPF20	A/D converter fault in Analog Speed Reference card	Option card (AI-14B) A/D converter malfunctions.
CPF24	A/D converter fault in High Accuracy Torque Control card	Option card (TRQ-A) A/D converter malfunctions.
oP	Digital Monitor unit fault	Digital Monitor is mounted during Program mode, or during operation by the Digital Operator.
oP I	Torque control mode fault	Torque control selected by multifinction input selection (Sn-15 - Sn-18: Data **71**), and torque reference is missing when input is "CLOSED".
oP2	Base test mode fault	Main circuit DC voltage (VPN) exceeds 20V at test.
oP3	Unapplicable option card	One or more option cards improperly installed.
oP4	Open loop fault	W/o PG mode selected, and TRQ-A option card not installed.
oP5	Motor capacity incorrect	Motor rated current is less than 10% of drive rated current.
oP6	Control mode selection error	Speed/torque control changeover function was selected from a multi-function terminal while torque control mode was selected in Sn-25.
oPE01	VCD 703 capacity selection fault (Sn-01)	Sn-01 has been changed from correct factory setting value. Refer to Table A2-1.
oPE02	Constant setting range fault	One or more An-XX, bn-XX, Cn-XX or Sn-XX values are not within allowable setting range.
oPE03	Multi-function input setting fault	Sn-15 to -18 (multi-function input) set values are not in ascending order, or data other than **F** and **FF** are overlapping.
oPE05	Option card fault	Sn-08 XX<u>X</u>X is set to zero (0) and option card is <u>not</u> installed.
oPE20	Torque control selection fault	Torque control function is selected simultaneously by multifunction input selection (Sn-15 - Sn-18) and by AI-14B input function selection (Sn-25).
Err	Constant write-in fault	VCD 703 failure.
CALL	SI-B transmission error	Control data was not received when power supply was turned on.
bUS	Transmission error	Control data was not received for 2 seconds after initial communication.
Abort	Auto tuning fault	Tuning of R_1 and R_f was not completed within the specified time.
Er-E1	Auto tuning fault	A setting of dn-51 thru dn-58 is out of acceptable range.
Er-52 ***Er-62*** ***Er-72*** ***Er-82***	Auto tuning fault	Motor did not accelerate in the specified time.

Table 6-1. Failure Indication and Details - Continued

INDICATION (DISPLAY)	FAULT	DESCRIPTION
Er–13 ***Er–53*** ***Er–63*** ***Er–73*** ***Er–83***	Auto tuning fault	Tuning was not completed within the constant range (lower limit exceeded).
Er–14 ***Er–54*** ***Er–64*** ***Er–74*** ***Er–84***	Auto tuning fault	Tuning was not completed within the constant range (upper limit exceeded).
Er–F5	Auto tuning fault	Auto tuning was attempted when there was no TRQ-A card installed.
Er–F6	Auto tuning fault	Incorrect PG phasing or incorrect motor phasing.
Er–F7	Auto tuning fault	Torque reference became excessively large (100%) during tuning
Er–58 ***Er–68*** ***Er–78*** ***Er–88***	Auto tuning fault	Auto tuning was not completed within the specified time.
Er–FF	Auto tuning fault	Undefined tuning mode was selected.
SE10	Motor changeover sequence fault 1	Motor changeover was commanded when drive was running.
SE11	Motor changeover sequence fault 2	Motor answer back signal was not returned within 1 second of motor changeover command.

6.2 DISPLAYING FAULT SEQUENCE

Whenever the Fault relay trips (VCD 703 shutdown), the display code of the fault that caused the trip (except for Illegal Constant or Control Function Hardware) is entered into a register in NV-RAM memory. This register retains, in sequence, that fault code and those of up to three immediately preceding the shutdown failure.

The contents of this register can be displayed when the VCD 703 is in the Drive mode.

A. After VCD 703 Fault Shutdown (With Power Still Applied).

Table 6-2. Displaying Fault Sequence After Fault Shutdown

STEP	OPERATION PROCEDURE	DIGITAL DISPLAY
1	Before a RESET command is entered, the fault that caused Fault trip (shutdown) is displayed	oC
2	Press ^ The display indicates that this is currently the first code in the memory register	1 oC
3	Continue pressing ^ to display the other codes in the memory register After the last register code is displayed, the sequence will return to the first code	2 ou 3 oH 1 oC

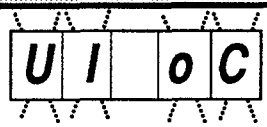
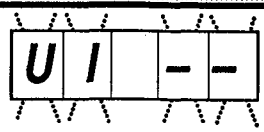
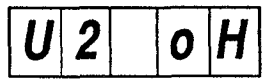
After the fault sequence has been examined, troubleshoot the most recent fault or enter a RESET command (from Digital Operator or external signal) to prepare the VCD 703 for restart of operation.

IMPORTANT: In 2-wire control, any RUN/STOP command and/or the Excitation command (multi-function input) must be removed before the RESET will be accepted.

B. At Power-Up.

NOTE: In Table 6-3, digital display A occurs if there was a Fault trip (shutdown) before turning off power, and digital display B occurs if there was no shutdown.

Table 6-3. Displaying Fault Sequence After Power-up

STEP	OPERATION PROCEDURE	DIGITAL DISPLAY A	DIGITAL DISPLAY B
1	Turn on power.	 Blinking for 5 seconds, then last selected monitor display.	 Blinking for 5 seconds, then last selected monitor display.
2	Press ^ while holding **DATA/ENTER** to select Previous Fault Display.		
3	Continue pressing ^ to display the other codes in the memory register. After the last code is displayed, the sequence will return to the first code.		

After the fault sequence has been examined, refer to Table 6-1.

6.3 TROUBLESHOOTING FLOWCHARTS

If the VCD 703 malfunctions, locate the cause and take corrective action by following the flowcharts given in this section.

A. TROUBLESHOOTING MOTOR SYMPTOMS

Motor Does Not Rotate ..... Chart 6.1
Motor Stalls During Acceleration ..... Chart 6.2
Motor Does Not Rotate at Set Speed ..... Chart 6.3
Motor Hunting ..... Chart 6.4

B. TROUBLESHOOTING FOR FAULT CONDITIONS

Overvoltage (***oU***) ..... Chart 6.5
Blown Fuse (***FU***) ..... Chart 6.6
Overcurrent (***oC***) ..... Chart 6.7
Overload (***oL***) ..... Chart 6.8
Undervoltage (***Uu***) ..... Chart 6.9
VCD 703 Overheated (***oH2***) ..... Chart 6.10
Control Function Error (***CPF_ _***) ..... Chart 6.11
Fault Signal Input (***EF_***) ..... Chart 6.12
Overspeed (***oS***) ..... Chart 6.13
Motor Overheated (***oH1***) ..... Chart 6.14

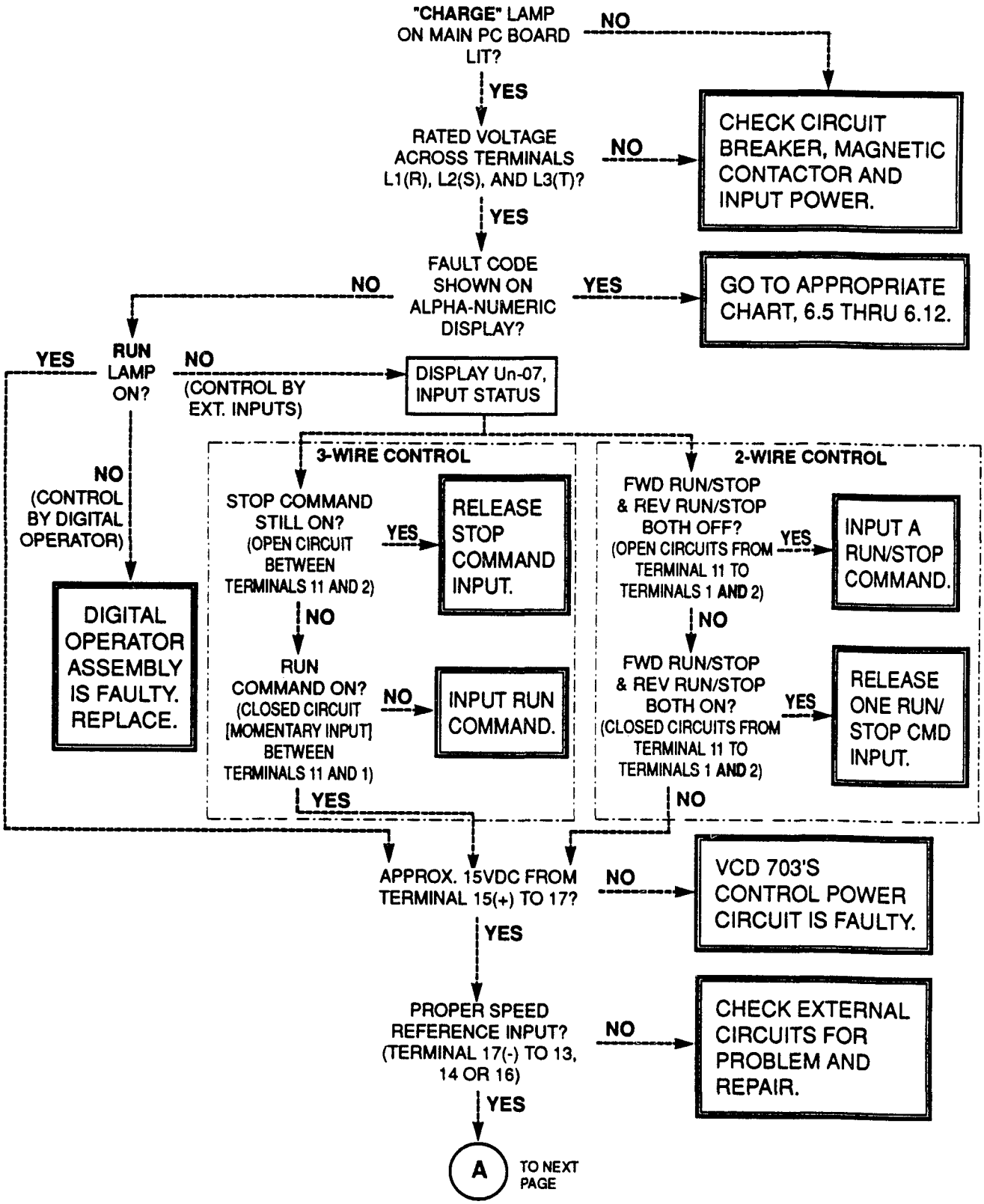
Oscilloscope chassis may be at voltages potentially hazardous to life if not properly grounded. If oscilloscope is used to measure high voltage waveforms, use only a dual channel oscilloscope in the differential mode with X100 probes. Always connect oscilloscope chassis to earth ground.

Voltages dangerous to life exist when equipment is open and energized. Do not work alone.

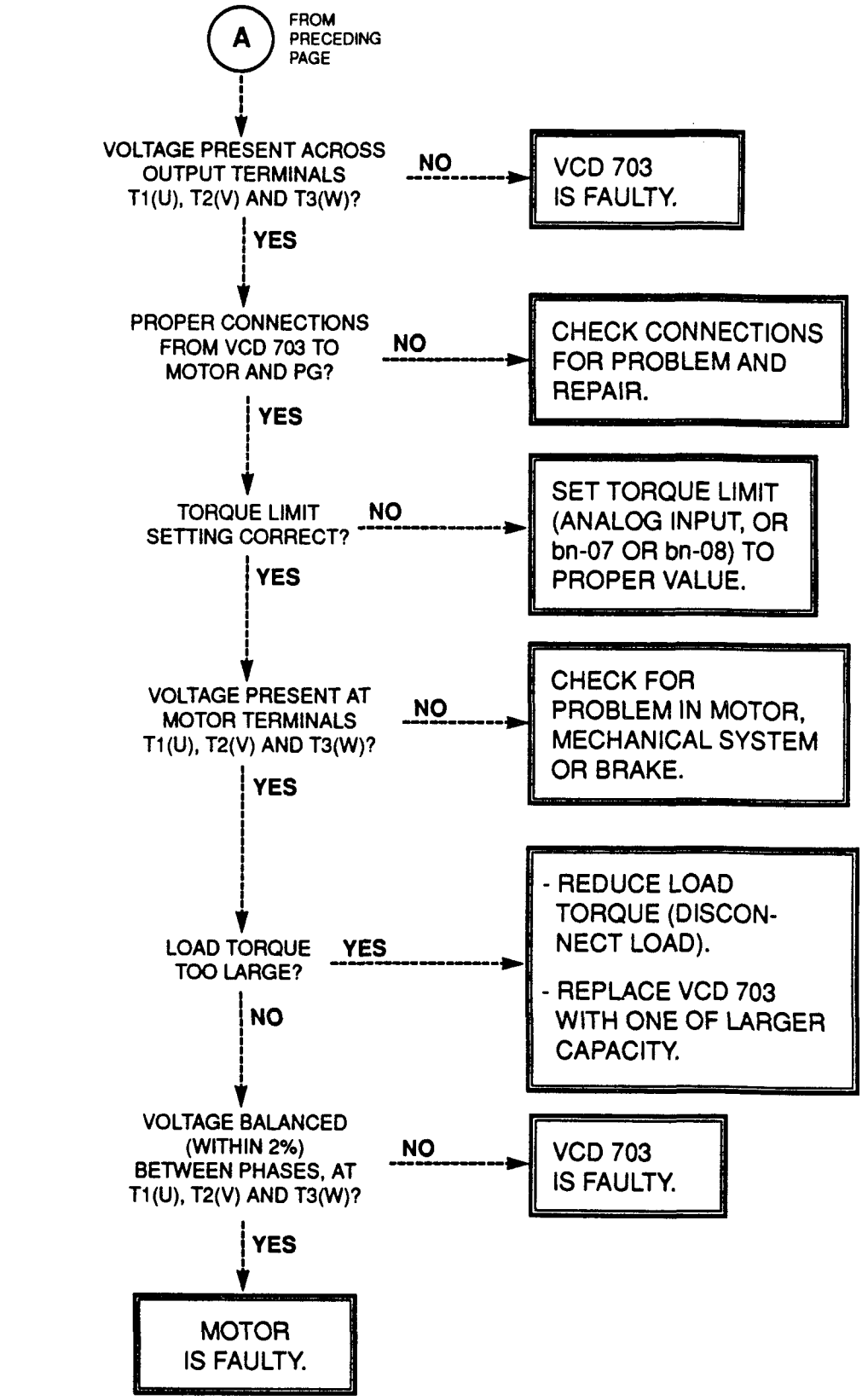
To prevent equipment damage always remove incoming three-phase power before test equipment is connected or removed. Never disconnect or connect the wiring while the power is applied.

TROUBLESHOOTING CHART 6.1

MOTOR DOES NOT ROTATE

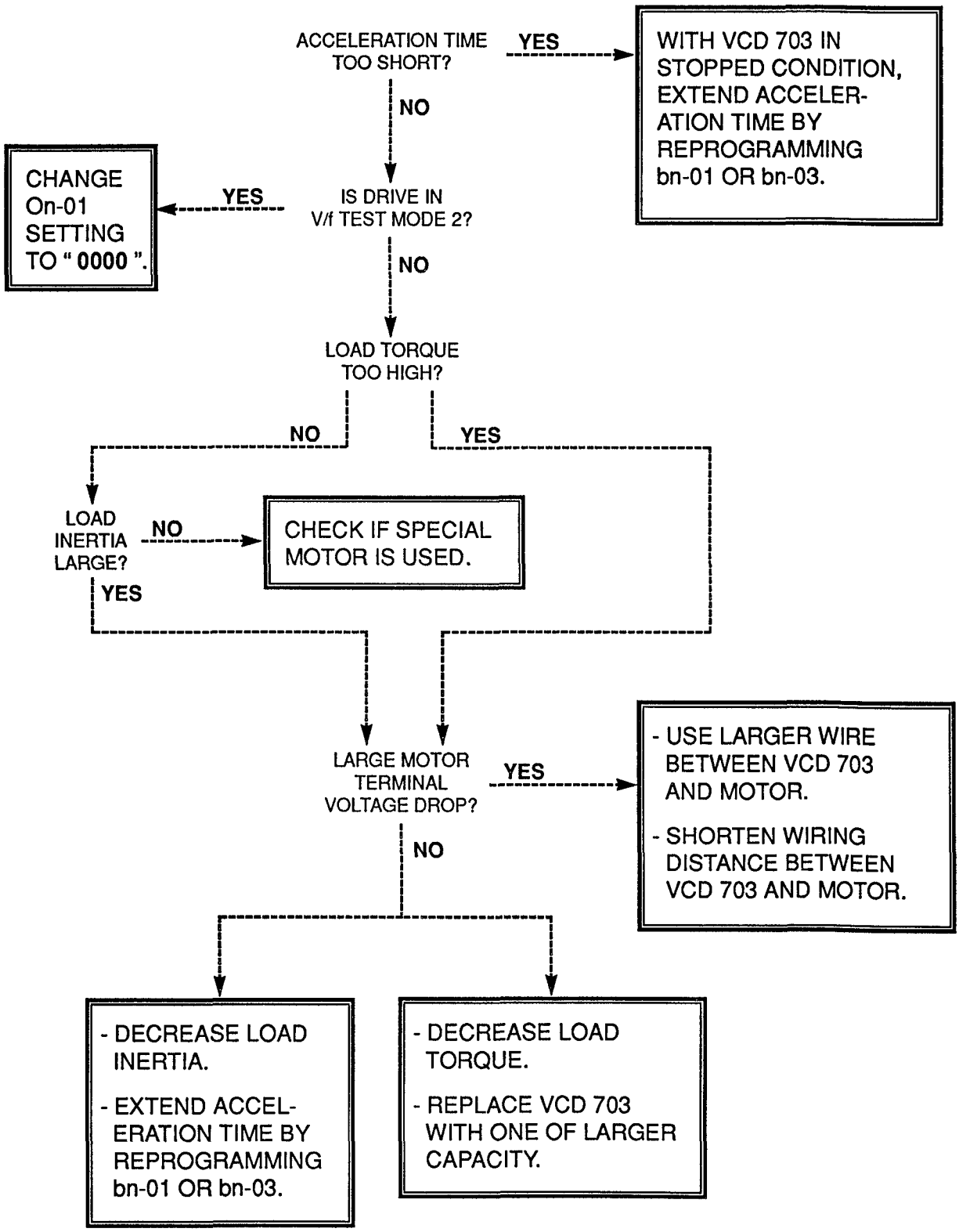


TROUBLESHOOTING CHART 6.1 (Continued)



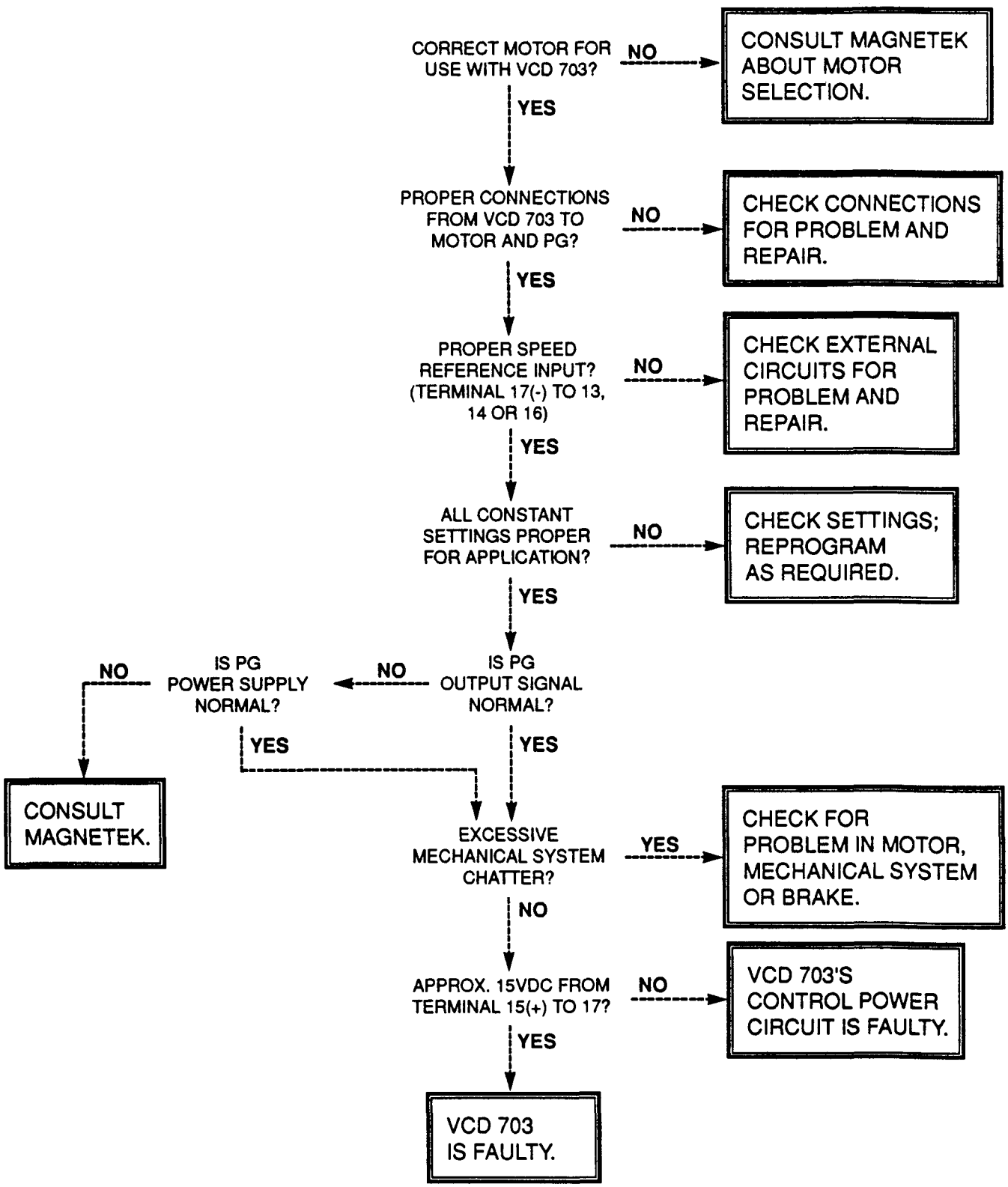
TROUBLESHOOTING CHART 6.2

MOTOR STALLS DURING ACCELERATION

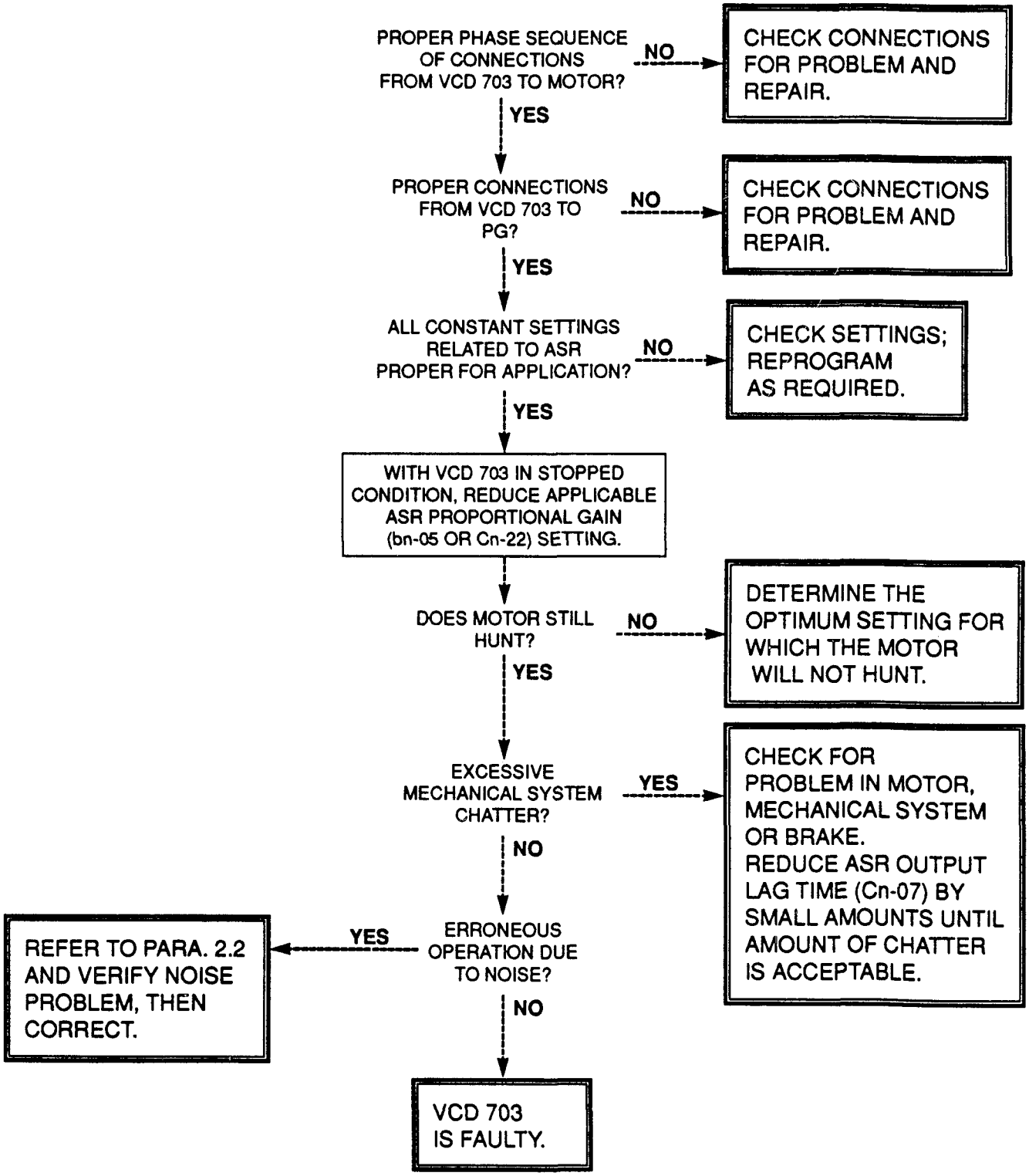


TROUBLESHOOTING CHART 6.3

MOTOR DOES NOT ROTATE AT SET SPEED

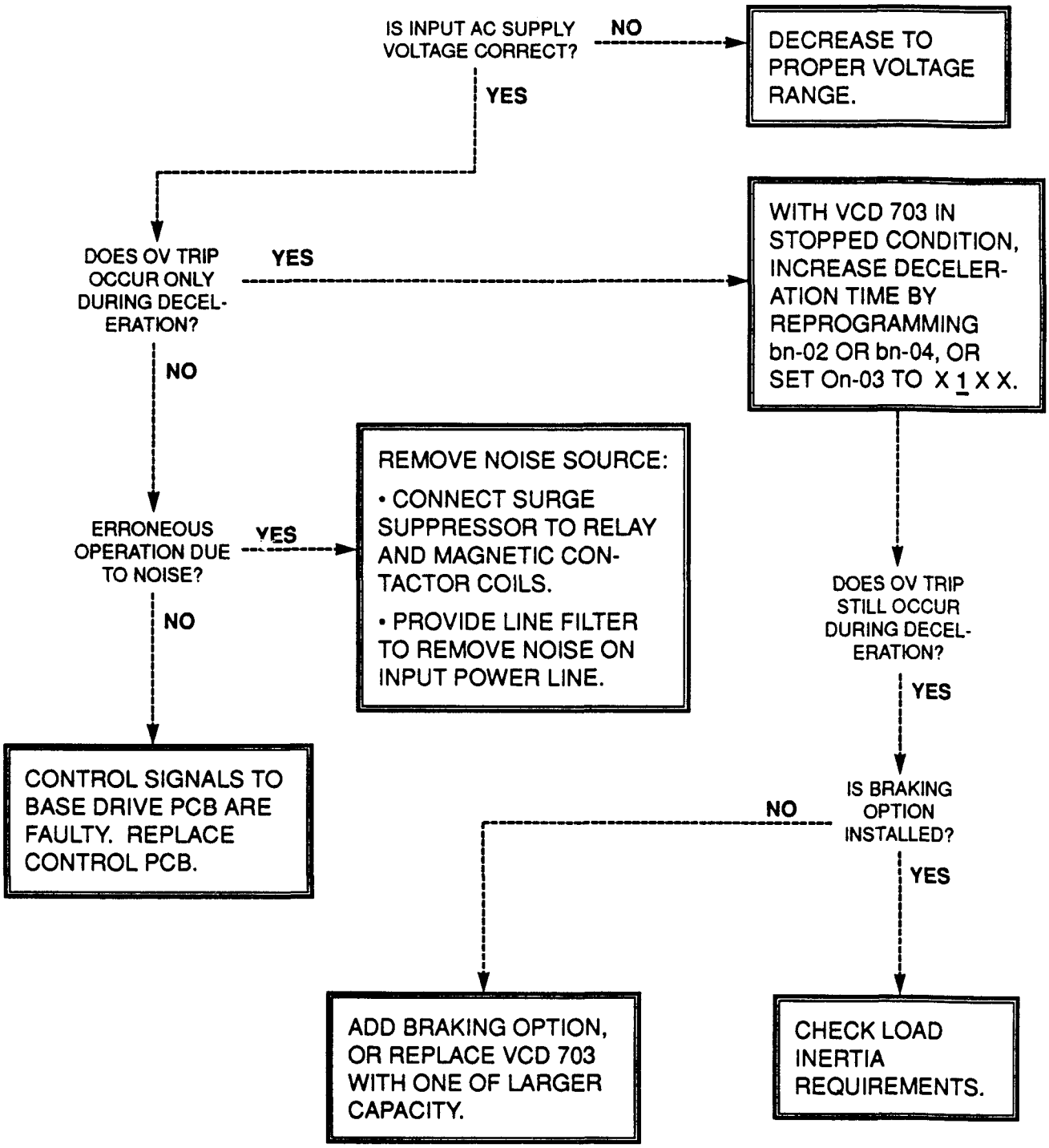


MOTOR HUNTING

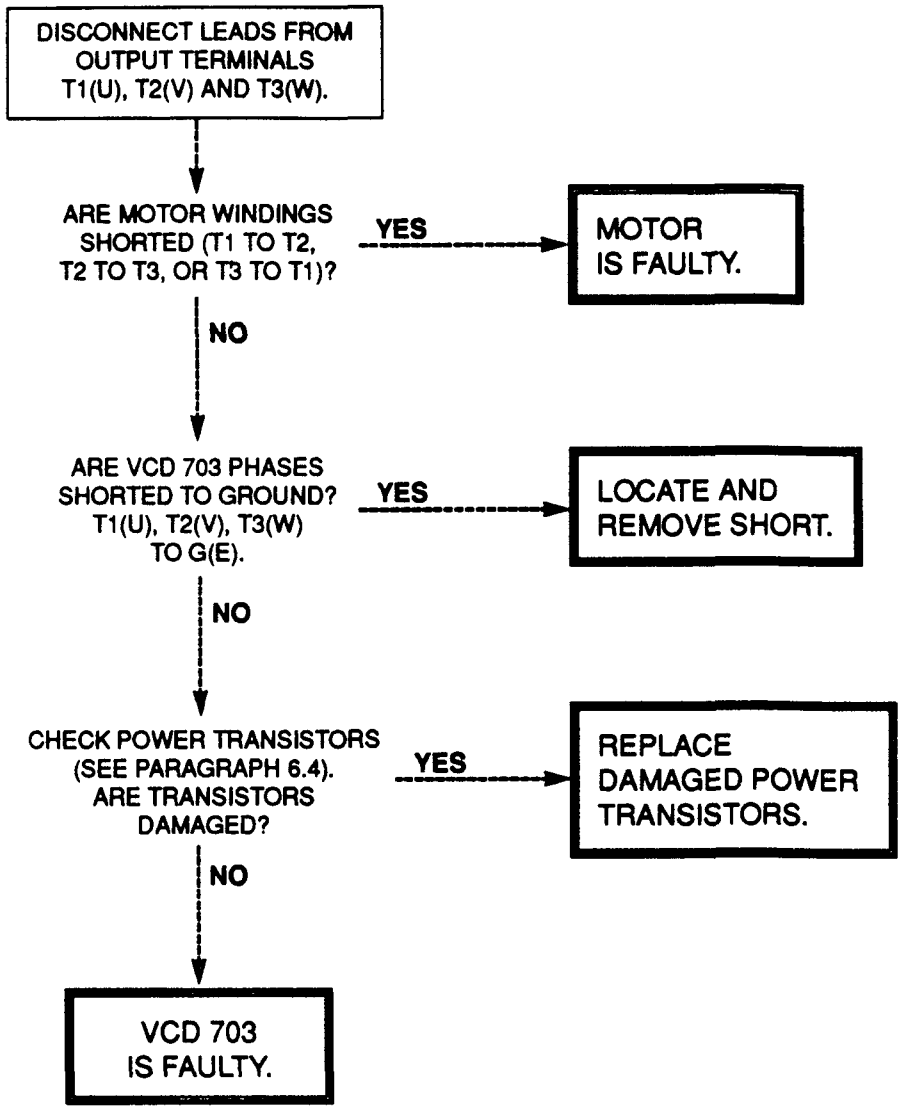


TROUBLESHOOTING CHART 6.5

OVERVOLTAGE (*ou*) FAULT INDICATION



BLOWN FUSE (*FU*) FAULT INDICATION



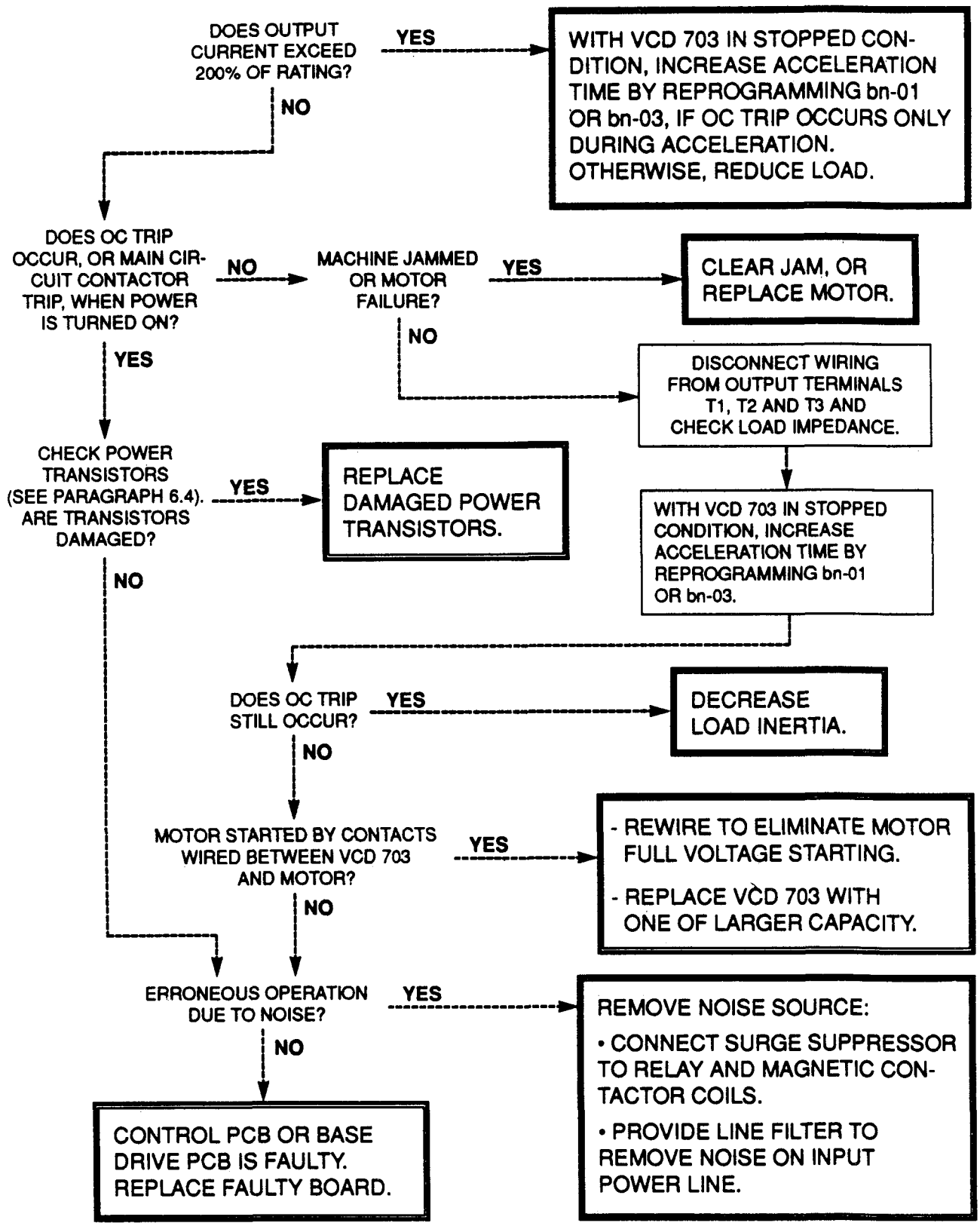
CAUTION

DO NOT REPLACE DC BUS FUSE WITHOUT

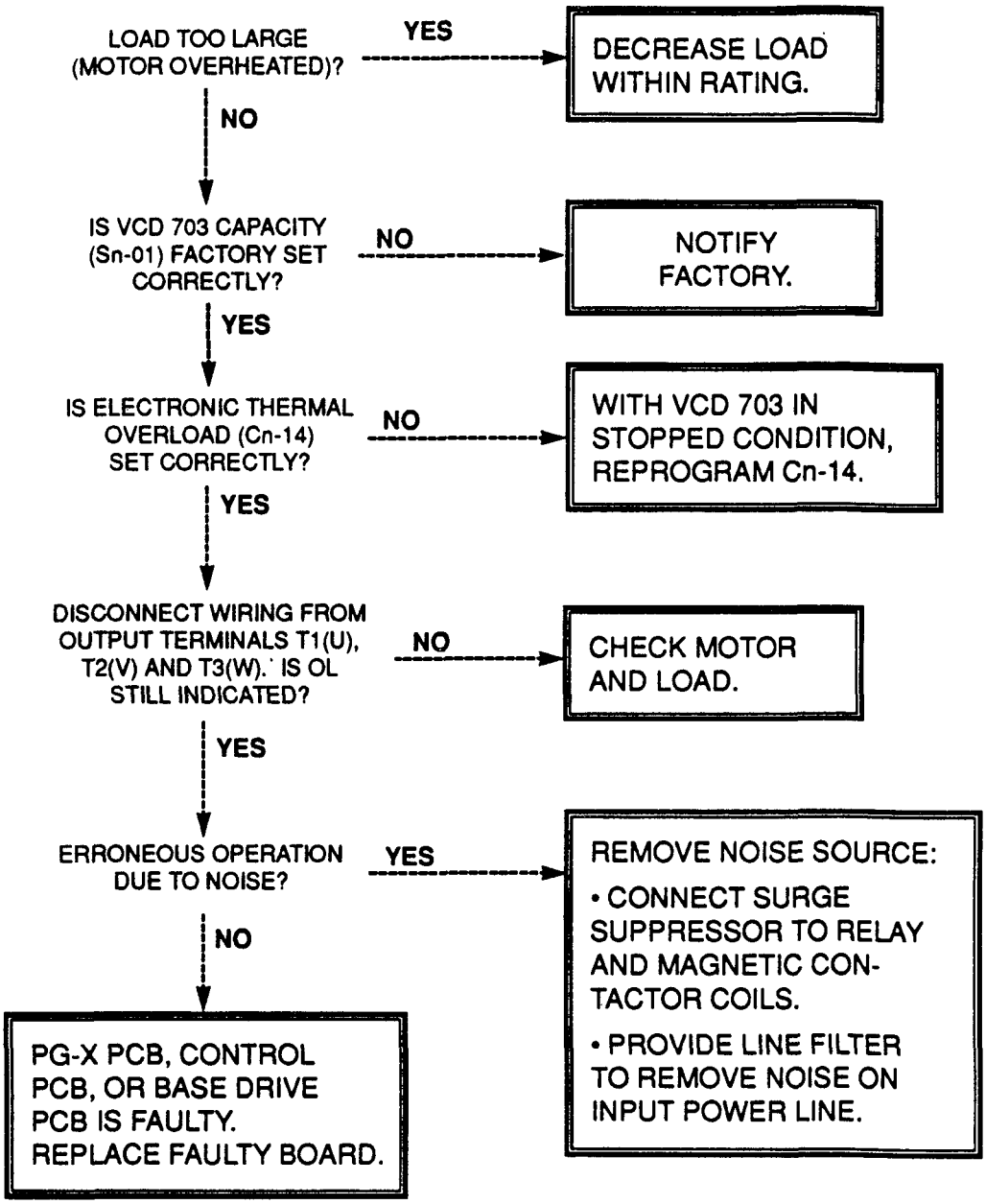
FIRST CHECKING OUTPUT TRANSISTORS.

TROUBLESHOOTING CHART 6.7

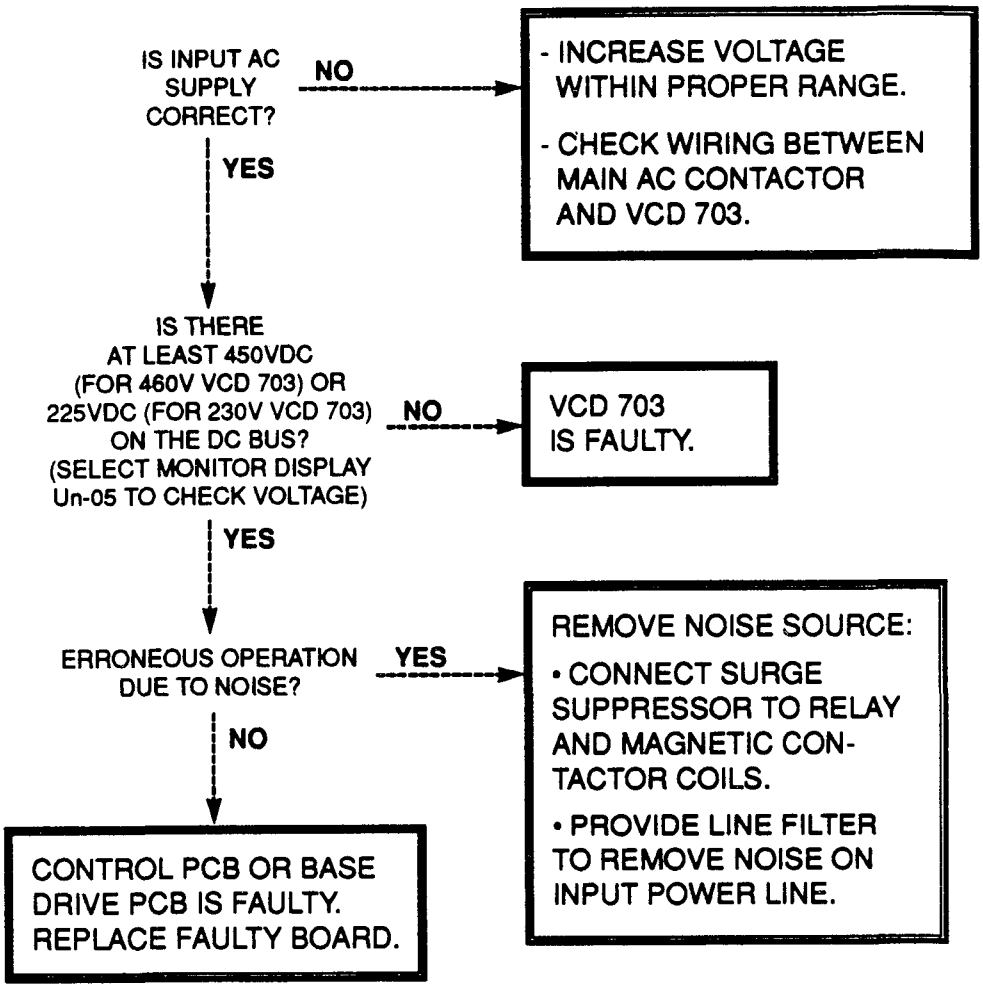
OVERCURRENT (*oC*) FAULT INDICATION



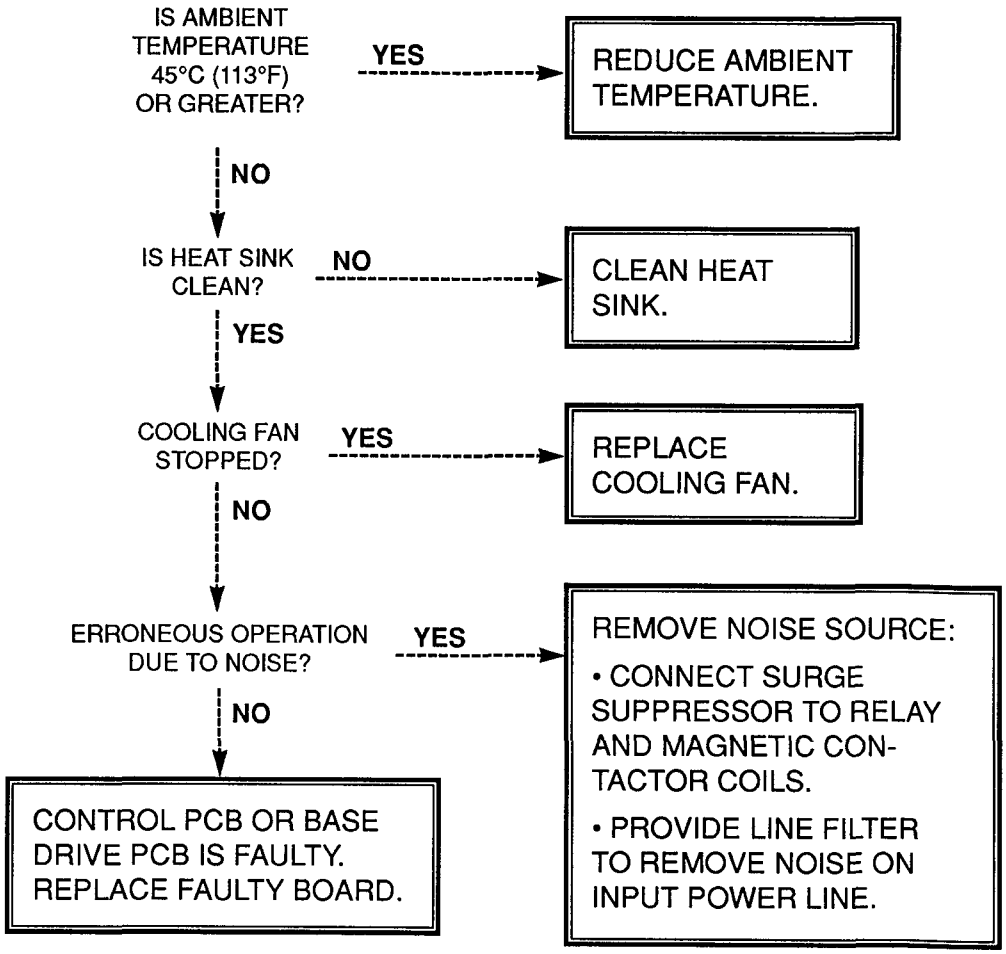
OVERLOAD (*oL*) FAULT INDICATION



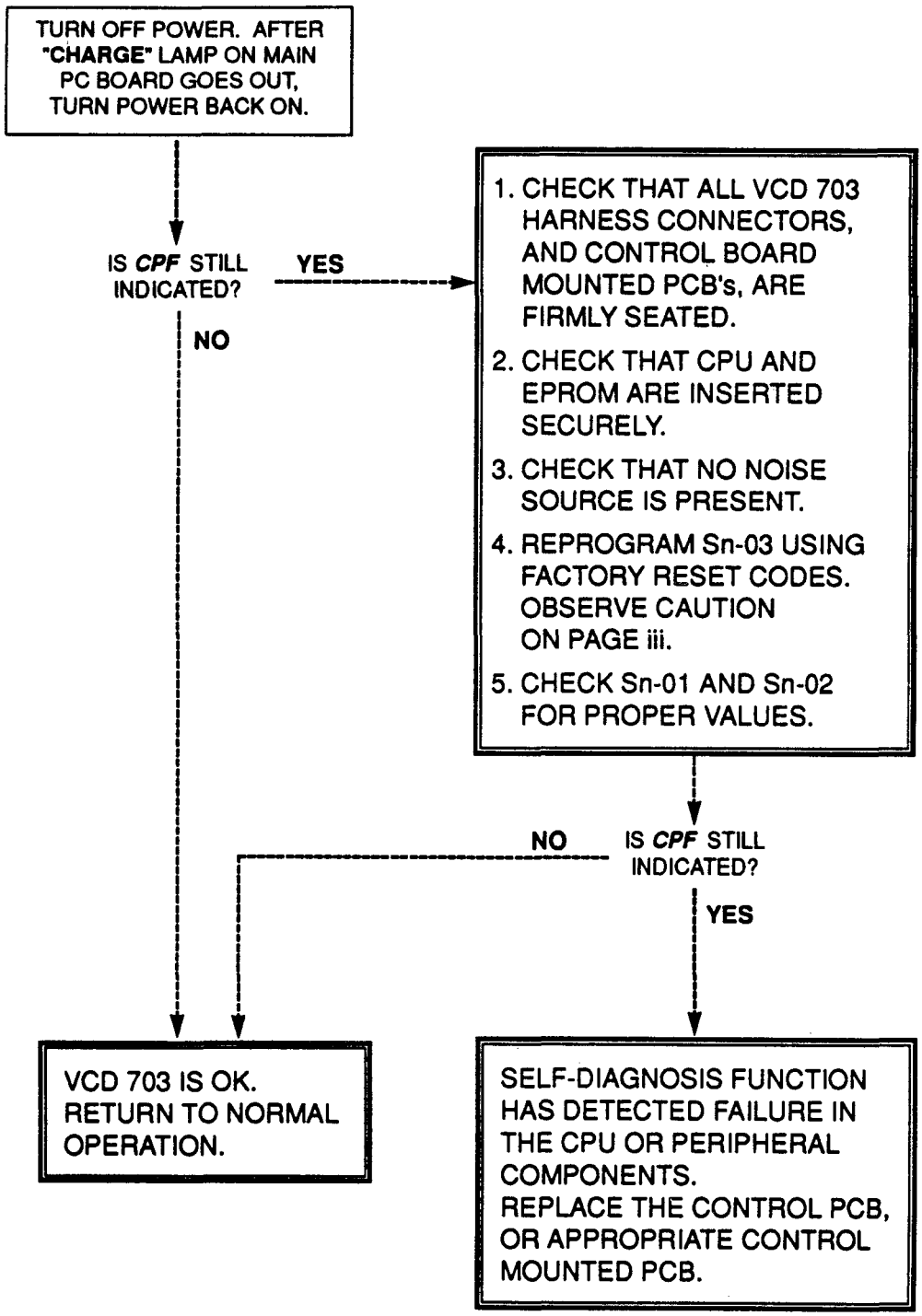
UNDERVOLTAGE (*Uu*) FAULT INDICATION



INVERTER OVERHEATED (*oH2*) FAULT INDICATION

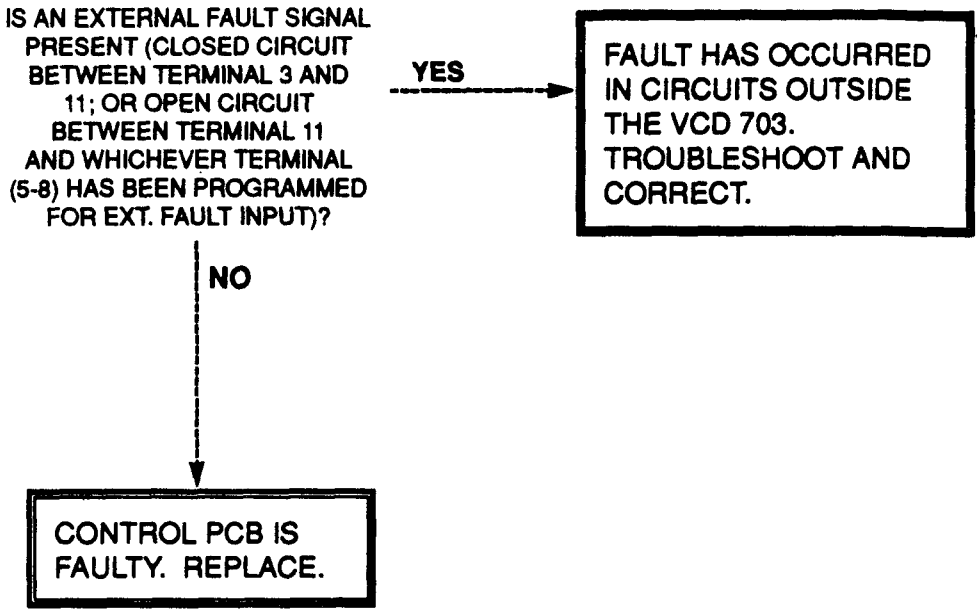


CONTROL FUNCTION ERROR (*CPF_ _*) FAULT INDICATION



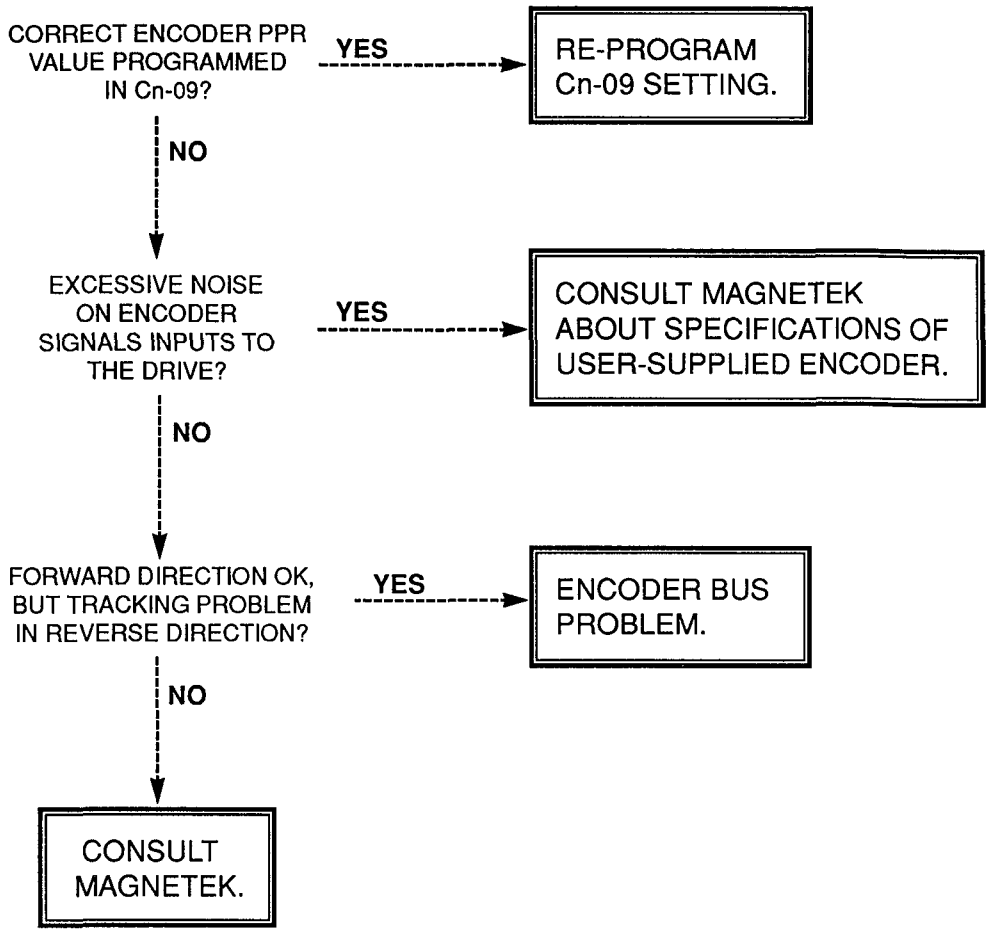
TROUBLESHOOTING CHART 6.12

EXTERNAL FAULT (*EF_*) INDICATION

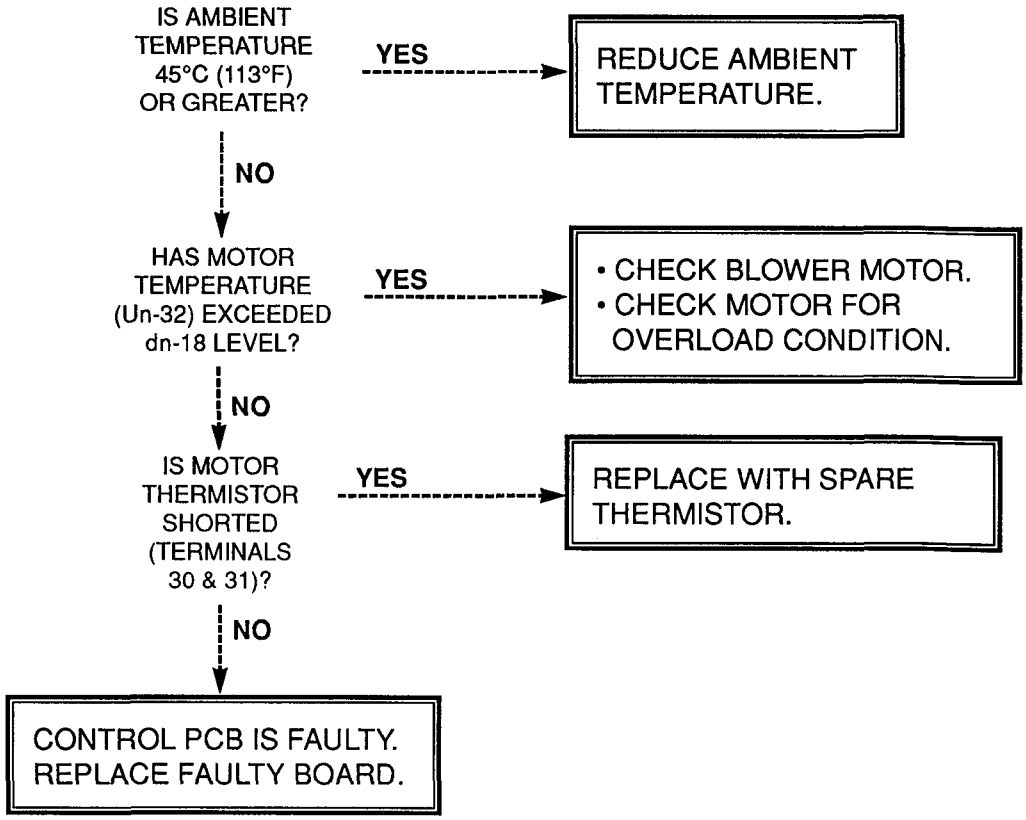


TROUBLESHOOTING CHART 6.13

OVERSPEED (*oS*) INDICATION



MOTOR OVERHEATED (*oH1*) FAULT INDICATION



NOTE

Factory reset code can be used to reset OH1 fault if Control PCB is bad. Make sure settings are recorded before using factory reset.

6.4 DIODE AND TRANSISTOR MODULE RESISTANCE TEST

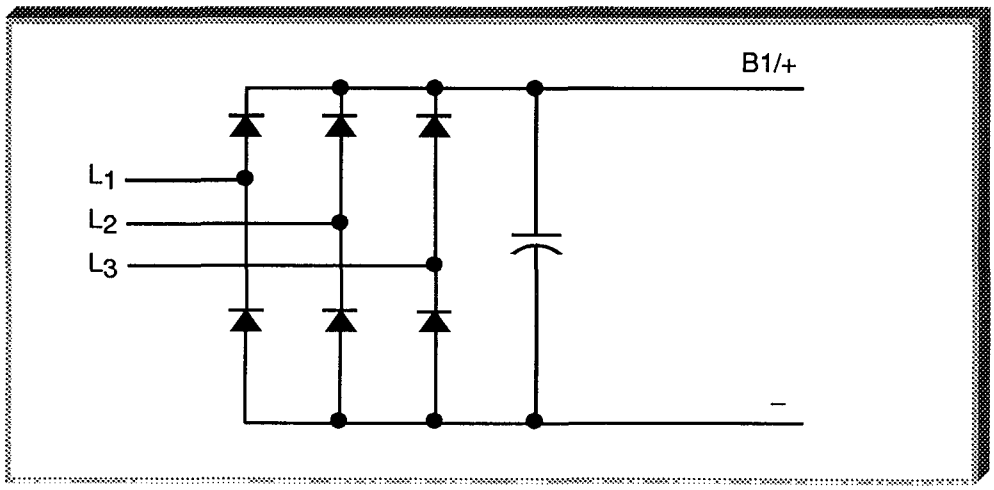
A. DIODE MODULE

Measure the resistance across the module terminals with a volt-ohm meter. Set the meter at the X1 range. The measured resistance should be within the values listed in Table 6-4.

Table 6-4. Diode Module Resistances

+ ON	– ON	NORMAL READING (OHMS)	ABNORMAL READING (OHMS)	+ ON	– ON	NORMAL READING (OHMS)	ABNORMAL READING (OHMS)
L1	B1/+			L1	–		
L2	B1/+			L2	–		LESS
L3	B1/+	2.5 to 50	0 or INFINITE	L3	–	INFINITE	THAN
–	L1	or		B1/+	L1		1M
–	L2	0 25 to 0 7		B1/+	L2		
–	L3	if using		B1/+	L3		
		→ scale					
				B1/+	–	MAGNITUDE OF CAP CHARGE TO INFINITE	0 or INFINITE

RESISTANCE TEST FOR 3Ø CONVERTER MODULES (BRIDGE RECT)



VOM RESISTANCE SCALE R x 1
+ IS THE POSITIVE POLARITY LEAD *
- IS THE NEGATIVE POLARITY LEAD

* THE VOM RED LEAD IS NOT NECESSARILY THE POSITIVE POTENTIAL IN THE RESISTANCE MODE FOR THESE TESTS THE + LEAD REFERS TO THE POSITIVE POTENTIAL MAKE SURE YOU KNOW WHICH POLARITY YOU HAVE ON YOUR VOM

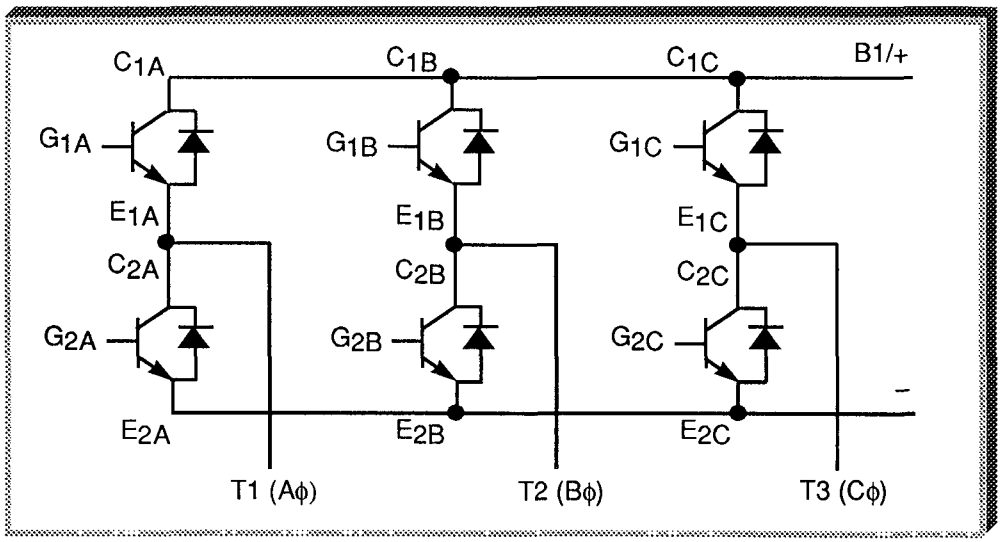
B. TRANSISTOR MODULE

Measure the resistance across the module terminals with a volt-ohm meter. Set the meter to the X1 range. The measured resistance should be within the values listed in Table 6-5.

Table 6-5. Transistor Module Resistances

+ ON	– ON	NORMAL READING (OHMS)	ABNORMAL READING (OHMS)	+ ON	– ON	NORMAL READING (OHMS)	ABNORMAL READING (OHMS)
B1/+	T1			G1A	T1		
B1/+	T2			G1B	T2		
B1/+	T3			G1C	T3		LESS
T1	–	INFINITE	0	G2A	–	INFINITE	THAN
T2	–			G2B	–		1M
T3	–			G2C	–		
T1	B1/+			T1	G1A		
T2	B1/+	2 5 to 50		T2	G1B		LESS
T3	B1/+	or	0 or INFINITE	T3	G1C	INFINITE	THAN
–	T1	0.3 to 0 7		–	G2A		1M
–	T2	if using		–	G2B		
–	T3	→ scale		–	G2C		

RESISTANCE TEST FOR 3Ø TRANSISTOR MODULES



VOM RESISTANCE SCALE R x 1
+ IS THE POSITIVE POLARITY LEAD *
- IS THE NEGATIVE POLARITY LEAD

* THE VOM RED LEAD IS NOT NECESSARILY THE POSITIVE POTENTIAL IN THE RESISTANCE MODE FOR THESE TESTS THE + LEAD REFERS TO THE POSITIVE POTENTIAL. MAKE SURE YOU KNOW WHICH POLARITY YOU HAVE ON YOUR VOM