



GPD 303

Technical Manual



QUICK REFERENCE - - GPD 303 CONSTANTS

CONSTANT	FACTORY SETTING	USER SETTING
<i>no-00</i>	01	
<i>no-01</i>	0000	
<i>no-02</i>	60 0	
<i>no-03</i>	230 0	
<i>no-04</i>	60 0	
<i>no-05</i>	1 5	
<i>no-06</i>	12 0	
<i>no-07</i>	1 5	
<i>no-08</i>	12 0	
<i>no-09</i>	10 0	
<i>no-10</i>	10 0	
<i>no-11</i>	10 0	
<i>no-12</i>	10 0	
<i>no-13</i>	0.0	
<i>no-14</i>	0 0	
<i>no-15</i>	0.0	
<i>no-16</i>	0 0	
<i>no-17</i>	6 0	
<i>no-18</i>	0000	
<i>no-19</i>	See para. 3.8 in manual	
<i>no-20</i>	0000	
<i>no-21</i>	0000	
<i>no-22</i>	1 00	
<i>no-23</i>	0 00	
<i>no-24</i>	100	
<i>no-25</i>	0	
<i>no-26</i>	50	

CONSTANT	FACTORY SETTING	USER SETTING
<i>no-27</i>	00	
<i>no-28</i>	00	
<i>no-29</i>	10	
<i>no-30</i>	170	
<i>no-31</i>	160	
<i>no-32</i>	1	
<i>no-33</i>	2	
<i>no-34</i>	0	
<i>no-35</i>	1	
<i>no-36</i>	00	
<i>no-37</i>	0000	
<i>no-38</i>	160 0	
<i>no-39</i>	0 1	
<i>no-40</i>	4 (= 10 kHz)	
<i>no-41</i>	00	
<i>no-42</i>	00	
<i>no-43</i>	00	
<i>no-44</i>	00	
<i>no-45</i>	1 00	
<i>no-46</i>	0000	
<i>no-47</i>	0	

<i>no-50</i>	00	
<i>no-51</i>	00	
<i>no-52</i>	00	
<i>no-53</i>	10	
<i>no-54</i>	150	
<i>no-55</i>	0 5	
<i>no-56</i>	100	

WARNING

Do not touch circuit components until main input power has been turned off and "CHARGE" lamp is extinguished. The capacitors are still charged and can be quite dangerous.

Do not connect or disconnect wires and connectors while power is applied to the circuit.

CAUTION

The GPD 303 leaves the factory with constants initialized for 2-Wire control and constant *no-00* set to 01 . Before using either initialization function of this constant, know your control wiring configuration :

- 08 = Factory 2-Wire control initialization (maintained Run contact)**
- 09 = Factory 3-Wire control initialization (momentary Start/Stop input)**

Entering either initialization code returns all constants to factory settings, and automatically returns constant *no-00* setting to 01 . If the GPD 303 is connected for 3-Wire control and this constant is set to 08 (2-Wire control initialization), the motor may run in reverse direction WITHOUT A RUN COMMAND APPLIED. Equipment damage or personal injury may result.

Constant *no-03* must be set for the proper motor voltage. Drive leaves factory with this constant set for 230.0 volts.

IMPORTANT

Always ground the GPD 303 using ground terminal G (E). See paragraph 1.4.2 "Grounding".

Never connect main circuit output terminals T1 (U), T2 (V), T3 (W) to AC main circuit power supply.

All constants have been factory set. Do not change their settings unnecessarily. Changing constant settings requires use of the optional Digital Operator, Model DS 393.

Do not perform a withstanding voltage test on any part of the GPD 303. Equipment uses semi-conductors and is vulnerable to high voltage.

The Control PC board employs CMOS ICs which are easily damaged by static electricity. Use proper electrostatic discharge (ESD) procedures when handling the Control PC board.

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GPD 303 SPECIFICATIONS

TYPE GPD303-		A0P7	A001	A002	A003	A005
Max. Applicable Motor HP (kW) (Note 1)		0.75 (0.4)	1 (0.75)	2 (1.5)	3 (2.2)	5 (3.7)
Weight - Lb (kg)		4.4 (2)	6.6 (3)	6.6 (3)	13.2 (6)	13.2 (6)
MCCB Rated Current (A) 3 ϕ / 1 ϕ		5 / 10	10 / 20	20 / 20	20 / 40	30 / 50
Cooling Method		Self-cooling			Forced fan cooling	
OUTPUT	Rated output capacity (kVA)	1.3	2.2	2.8	4.7	7.5
	Max. continuous output current (A) CT (VT) (Note 2)	3 (3.4)	5 (5.6)	6.5 (7.3)	11 (12.4)	17.5 (19.6)
	Max. output voltage	3-phase 200 / 208 / 220 / 230V (Matches input voltage)				
	Max output frequency	Up to 400Hz available by constant setting				
POWER SUPPLY	Rated voltage / rated frequency	3-phase ; 200 / 208 / 220V 50Hz, 200 / 208 / 220 / 230V 60Hz				
	Allowable volt. variation	± 10 %				
	Allowable freq. variation	± 5 %				
CHARACTERISTICS CONTROL	Control method	Sine wave PWM				
	Freq control range	0.1 - 400Hz				
	Frequency accuracy	Digital reference · 0.01 % (-10 to +40° C) Analog reference 0.1 % (25° C ± 10° C)				
	Freq. setting resolution	Digital Operator reference : 0.1Hz; Analog reference 0.06Hz / 60Hz				
	Output freq resolution	0.1Hz				
	Overload rating	150 % rated output current for one minute (CT)				
	Freq. setting signal	0 to +10VDC (20K ohms), 4 - 20mA (250 ohms)				
	Accel / decel time	0.1 - 600 sec. (accel / decel time can be set independently)				
	Braking torque	Approximately 20 % (up to 150 % possible with braking resistor option)				
	Volt. / freq pattern	Any desired program V / f pattern can be set				
	Stall prevention level	Stall level can be adjusted				

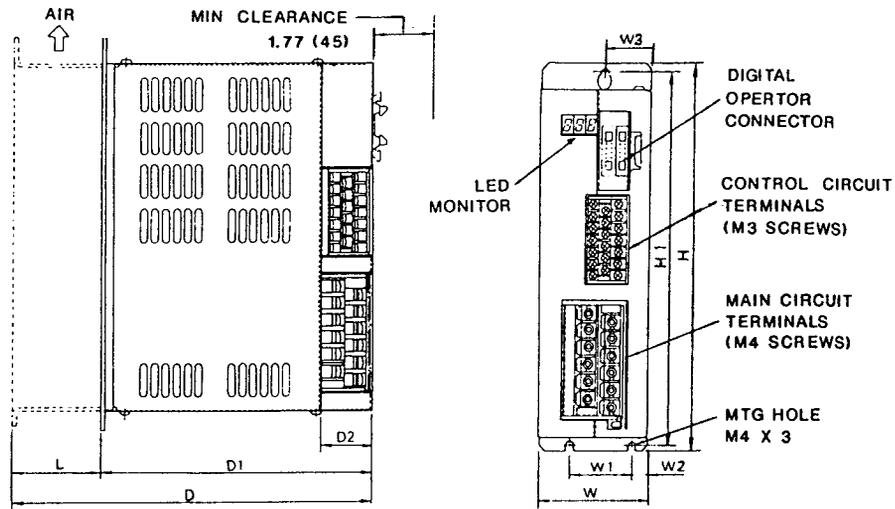
Notes:

1. A standard 4 pole motor is used for determination of maximum applicable motor horsepower
2. Overload capacity for CT - 150% of rated for 60 seconds; for VT - 125% of rated for 60 seconds.
3. Temperature during shipment Storing in this temperature for a long period may deteriorate main circuit capacitor.

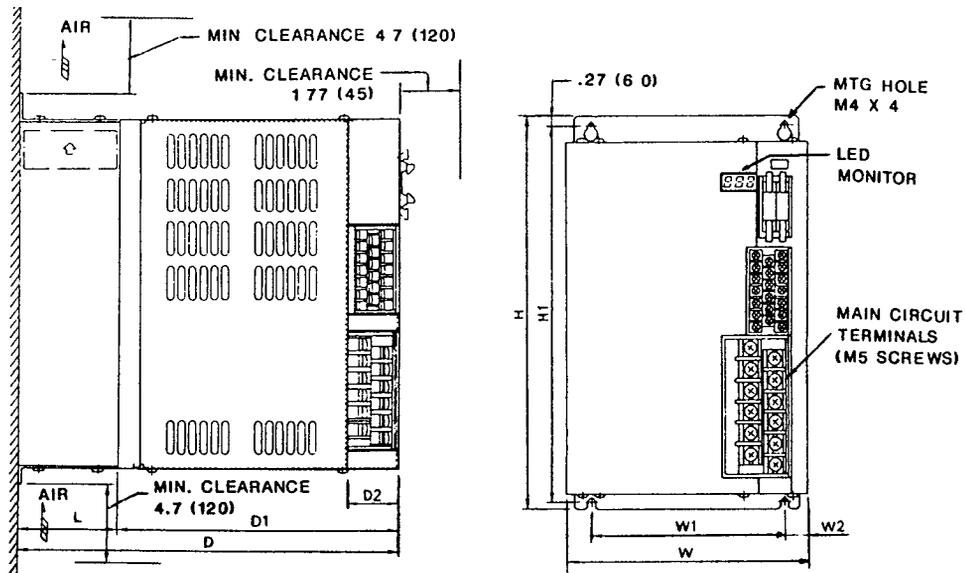
GPD 303 SPECIFICATIONS – Continued

TYPE		ALL	
PROTECTIVE FUNCTIONS	Momentary overcurrent	Coast stop at approximately 200 % rated current	
	Overload	Coast stop at approximately 150 % rated current for one minute	
	Motor protection	Protection by programmable electronic thermal overload	
	Overvoltage	Coast stop at main circuit DC voltage of approximately 410V or more	
	Undervoltage	Coast stop at main circuit DC voltage of approximately 210V or less	
	Momentary power loss	3/4-1HP: 1 sec.; 2-5HP: 2 sec. ride-thru, when enabled	
	Radiation fin overheat	Protection by thermistor	
	Grounding protection	Protection by electronic circuit with separate ground fault	
	Charging display	"CHARGE" lamp remains lit until main circuit DC voltage is 50V or less	
OPERATIONAL SPECIFICATIONS	INPUT	Operation signal	2-Wire, 3-Wire
		External fault	Output stopped (coast stop) by external fault input
		Reset	Fault reset input terminal
		Multi-step speed setting	Up to 9 preset speeds can be used in 2-Wire control, up to 8 preset speeds in 3-Wire control
		Multifunction input selection	9 functions can be selected (2 items) as multifunction input
	OUTPUT	Operation status (open collector output)	The following functions can be selected (2 items) as multifunction output: Running, frequency coincidence, output freq. > or = set value, overtorque detection, zero speed
		Fault contact	One Form C contact output
	Built-in functions		Frequency reference bias / gain setting, frequency upper / lower limit setting, DC injection current setting at start / stop, analog monitor gain setting, etc.
	Display Monitor Function	7 segment, 3 digit LED Monitor	Output current display, output frequency display, fault display
		Digital Operator, Model DS393 (Optional)	Setting frequency, programming constants, output current display, output frequency and rotating direction display, fault display
		Analog output monitor	0 - 10VDC output, proportional to output frequency or current
Enclosure		Open chassis	
ENVIRONMENT	Location	Indoor (no corrosive gasses or dust)	
	Ambient temperature	-10° to +50° C (+14° to +122° F) (no freezing)	
	Storage temperature (Note 3)	-20° to +60° C (-4° to +140° F)	
	Humidity	90 % RH (no condensation)	
	Vibration	1G at less than 20Hz, up to 0.2G at 20-50Hz	

(1) 0.75 TO 2 HP



(2) 3, 5 HP



NOTE

All inch measurements are rounded off after conversion from mm.

HP (KW)	EXTERNAL DIMENSIONS Inches (mm)		
	W	H	D
0.75 (0.4)	2.8 (70)	9.9 (250)	6.9 (174)
1, 2 (0.75, 1.5)	2.8 (72)	9.9 (250)	9.1 (230)
3, 5 (2.2, 3.7)	5.9 (150)	9.9 (250)	9.1 (230)

HP (KW)	MOUNTING DIMENSIONS Inches (mm)						MTG. SCREW SIZE	FIN DIMENSION Inches (mm)
	W1	W2	W3	H1	D1	D2		L
0.75 (0.4)	1.6 (40)	0.4 (10)	1.2 (30)	9.5 (240)	6.9 (174)	1.3 (33)	M4 x 3	—
1, 2 (0.75, 1.5)	1.6 (40)	0.4 (10)	1.2 (30)	9.5 (240)	6.6 (167)	1.3 (33)	M4 x 3	2.5 (63)
3, 5 (2.2, 3.7)	4.7 (120)	0.6 (15)	—	9.5 (240)	6.5 (165)	1.3 (33)	M4 x 4	2.6 (65)

Figure 1-1. GPD 303 Open Chassis Dimensions

Section 1 INTRODUCTION/INSTALLATION

1.1 GENERAL

The GPD 303 is a high performance pulse width modulated design which generates a sine-coded, adjustable voltage/frequency three phase output for complete speed control of any conventional squirrel cage induction motor. The GPD 303 can maintain a 150% current overload capability for 60 seconds. The GPD 303 will not induce any voltage line notching distortion back to the utility line and maintains a displacement power factor of not less than 0.98 throughout its speed range.

When properly installed, operated and maintained, the GPD 303 will provide a lifetime of service. It is mandatory that the person who operates or maintains this equipment thoroughly read and understand this manual before proceeding.

While this manual primarily describes the GPD 303 and the optional Digital Operator, it contains basic information for the operator control station as well. For operational details of other drive system units, refer to their respective manuals.

1.2 RECEIVING

The GPD 303 is thoroughly tested at the factory. After unpacking, verify the part numbers with the purchase order (invoice). Any damages or shortages evident when the equipment is received must be reported immediately to the commercial carrier who transported the equipment. Assistance, if required, is available from your sales representative.

1.3 PHYSICAL INSTALLATION

Location of the GPD 303 (Figure 1-1) is important to achieve proper performance and normal operating life. The unit should be installed in an area where it will be protected from:

- Direct sunlight, rain or moisture.
- Corrosive gases or liquids.
- Vibration, airborne dust or metallic particles.

For effective cooling as well as proper maintenance, the GPD 303 must be installed vertically. There **MUST** be a **MINIMUM** 5.0 inch clearance above and below, a **MINIMUM** 0.5 inch clearance on each side, and a **MINIMUM** 2.0 inch clearance in front of the GPD 303.

1.4 ELECTRICAL INSTALLATION

The GPD 303 leaves the factory with all constants set for 2-Wire external reference control. Figure 1-3 must be used for all external connections.

To use the GPD 303 in a 3-Wire application, drive constants *no-00* and *no-01* must be reprogrammed, using the optional Digital Operator, Model DS 393. Figure 1-4 must then be used for all external connections.

CAUTION

Use only closed loop (ring lug) connectors sized for the selected wire gauge. The connectors are to be installed using the correct crimp tool recommended by the connector manufacturer.

WIRE SIZE		TERMINAL SCREW	CLOSED-LOOP CONNECTOR
AWG	mm ²		
20	0.5	M3	1.25 - 3.5
18	0.75	M4	1.25 - 4
16	1.25		
14	2	M4	2 - 4
		M5	2 - 5
12	3.5	M4	3.5 - 4
		M5	3.5 - 5
10	5.5	M4	4 - 5.5
		M5	5 - 5.5

1.4.1 Main Circuit Input/Output

Complete wiring interconnections for the main circuit per the appropriate figure, while observing the following:

- Use only factory supplied installation instructions to install optional dynamic braking resistors. Failure to do so may cause equipment damage or personal injury.
- Use 600V vinyl-sheathed lead or equivalent. Wire size should be determined by considering voltage drop of leads. Size of wire must be suitable for Class 1 circuits.
- Never connect AC main power to output terminals T1 (U), T2 (V), and T3 (W).
- Never allow wire leads to contact the GPD 303 enclosure. Short-circuit may result.
- Never connect power factor correction capacitors or noise filter to GPD 303 output.

Wire Sizing For Main Circuit

RATING (HP)	TERMINAL SYMBOL	SCREW SIZE	WIRE SIZE	
			AWG	mm ²
0.75, 1	L1 (R), L2 (S), L3 (T), T1 (U), T2 (V), T3 (W), B1, B2, G (E)	M4	14 - 10	2 - 5.5
	FLT-A, FLT-B, FLT-C	M4	16 - 14	1.25 - 2
2	L1 (R), L2 (S), L3 (T), T1 (U), T2 (V), T3 (W), B1, B2	M4	14 - 10	2 - 5.5
	FLT-A, FLT-B, FLT-C	M4	16 - 14	1.25 - 2
	G (E)	M4	12 - 10	3.5 - 5.5
3	L1 (R), L2 (S), L3 (T), T1 (U), T2 (V), T3 (W), B1, B2	M5	12 - 8	3.5 - 8
	FLT-A, FLT-B, FLT-C	M5	16 - 14	1.25 - 2
	G (E)	M5	12 - 8	3.5 - 8
5	L1 (R), L2 (S), L3 (T), T1 (U), T2 (V), T3 (W), B1, B2, G (E)	M5	10 - 8	5.5 - 8
	FLT-A, FLT-B, FLT-C	M5	16 - 14	1.25 - 2

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Terminal Functions and Voltages of Main Circuit

TERMINAL	FUNCTION	0.75 - 5 HORSEPOWER
L1 (R) L2 (S) L3 (T)	Main circuit input power supply	Three Phase 200 / 208 / 220V at 50Hz 200 / 208 / 220 / 230V at 60Hz
T1 (U) T2 (V) T3 (W)	Main circuit output	Three Phase 0 - 200 / 208 / 220 / 230V (matches input voltage)
FLT-A FLT-B FLT-C	Fault Relay output – NO contact Fault Relay output – NC contact Fault Relay output – common	250Vac, 1A or less 30Vdc, 1A or less
B1, B2	For connection of braking resistor or braking resistor unit (option)	
G (E)	Ground terminal (100 ohms or less)	----

1.4.2 Grounding

- The GPD 303 must be solidly grounded using main circuit ground terminal G (E). Ground resistance should be 100 ohms or less. Select lead size suitable for size of terminal screw. Make lead length as short as possible.
- NEVER ground the GPD 303 in common with welding machines, motors, or other large-current electrical equipment.
- Where several GPD 303s are used, ground each directly or daisy-chain to the ground pole(s). DO NOT FORM A LOOP WITH THE GROUND LEADS.

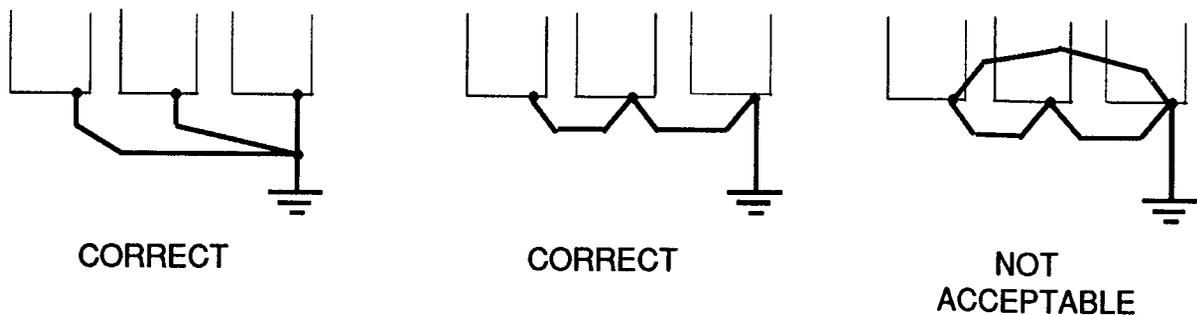
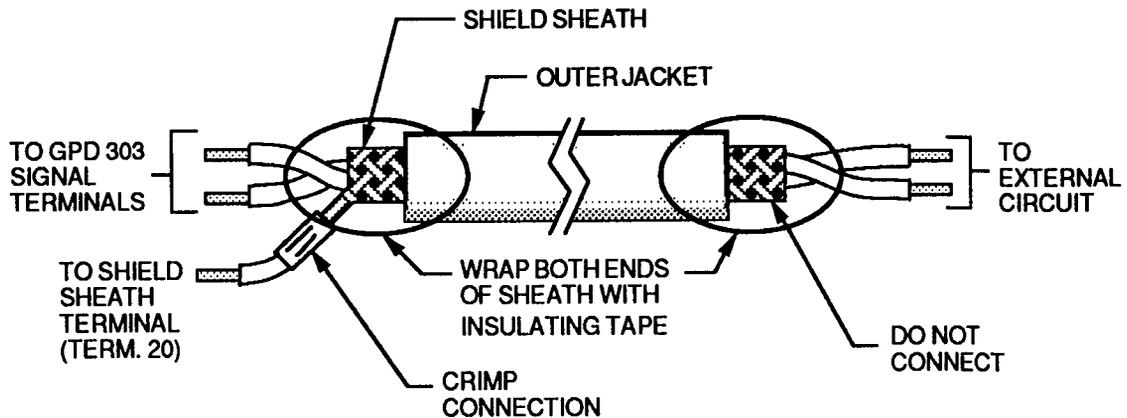


Figure 1-2. Grounding of Three GPD 303s

1.4.3 Control Circuit

All basic control circuit (signal) connections are shown in the appropriate diagram.

- Figure 1-3 shows basic connections for external 2-Wire control.
- Figure 1-4 shows basic connections for external 3-Wire control.
- Use twisted shielded or twisted-pair shielded wire, 18-14 AWG (0.75-2mm²), for control circuit leads. Wire size should be determined considering voltage drop in leads. Connect shield sheath AT THE GPD 303 END ONLY; the far end should be dressed neatly and left unconnected.



- Signal leads 1 thru 20 must be separated from main circuit leads L1 (R), L2 (S), L3 (T), T1 (U), T2 (V), T3 (W) and any other power cables, to prevent erroneous operation caused by noise interference.
- FLT-A, B, & C leads must be separated from signal leads 1-20.
- Lead length should NOT EXCEED 164 feet (50 meters).

Control Circuit Terminal Functions

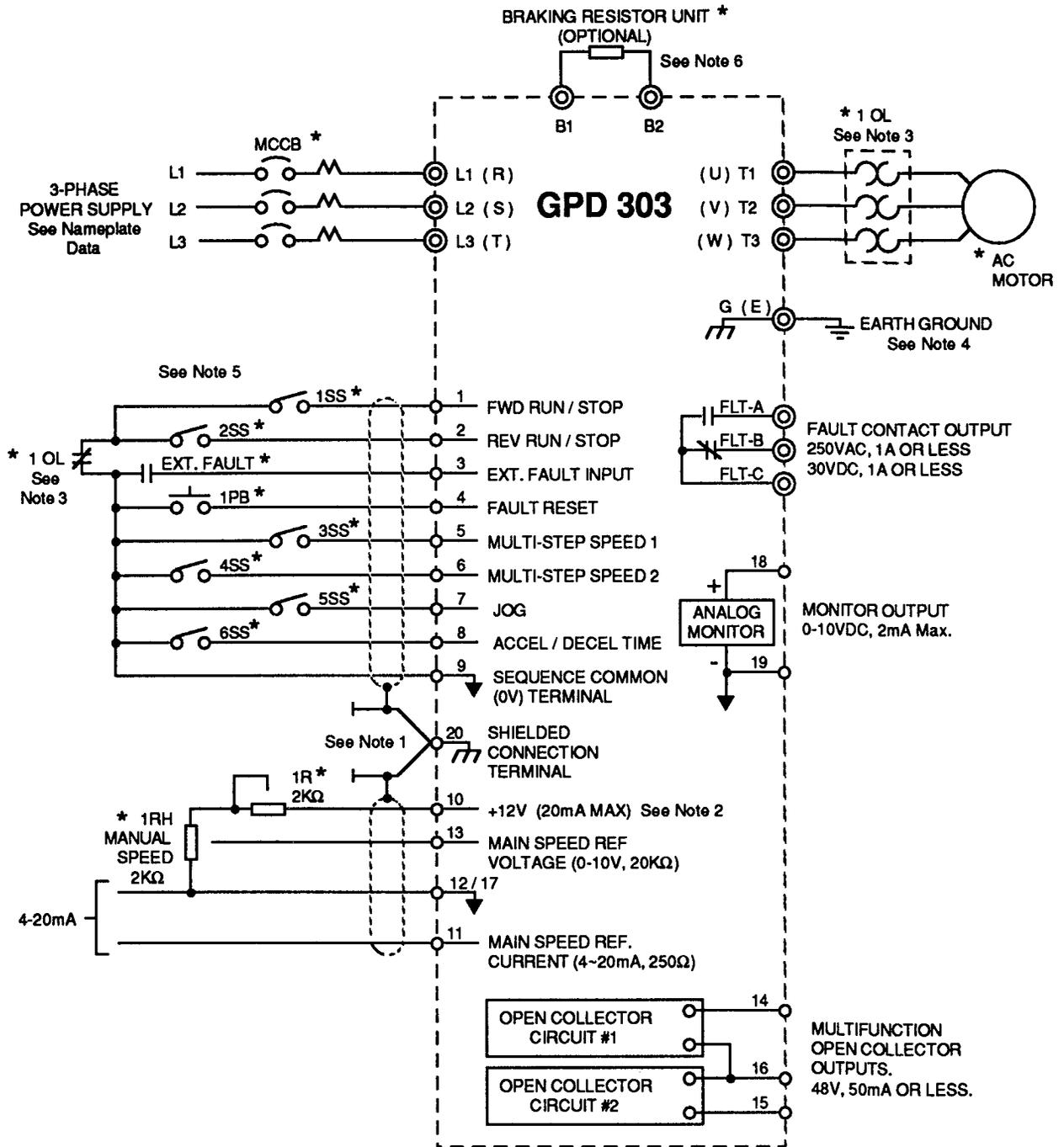
TYPE	T	NAME	FUNCTION DESCRIPTION		SIGNAL LEVEL
Sequence Input Signal	1	FWD Run / Stop Command (See Note 2)	FWD run at closed, stop at open		} (See Note 1) 24Vdc 8mA Photocoupler Isolated Warning: Dry contact or switch. Apply no external voltage
	2	REV Run / Stop Command (See Note 2)	REV run at closed, stop at open		
	3	External Fault Input	Fault at closed, normal at open		
	4	Fault Reset	Reset at closed		
	5	Multi-step Speed Ref 1	Multi-step speed ref 1 effective at closed		
	6	Multi-step Speed Ref 2	Multi-step speed ref 2 effective at closed		
	7	JOG Command (See Note 2)	JOG at closed	9 functions can be selected as multifunction input	
	8	Accel / Decel Time Change	2nd accel / decel time effective at closed		
	9	Sequence Control Input Common	--		
Analog Input Signal	10	Speed Ref Power Supply Terminal	Speed reference power supply		+12V (Up to 20mA current)
	13	Frequency Reference	0 - +10V / 100% frequency		0 - +10V (20k Ω)
	11		4 - 20mA / 100% frequency		4 - 20mA (250 Ω)
	12	Control Common	0V		--
	17				
	20	For shielded wire connection	--		--
Sequence Output Signal	14	Running	"Low" level at run Factory setting.	5 functions can be selected as multifunction output	Open collector output +48V, 50mA or less
	15	Frequency Coincidence Signal	"Low" level at set freq. = output freq Factory setting.		
	16	Open Collector Output Common	--		
Analog Output Signal	18	Positive	0 - 10V / 100%		0 - 11V Max. 2mA or less
	19	Common			

NOTES:

- When Forward Run/Stop and Reverse Run/Stop inputs are both closed for more than 500ms, the Digital Operator or LED Monitor flashes "EF" and the motor, if rotating, is decelerated to a stop by the GPD 303. This stop condition is not stored by the GPD 303. **IF ONE OF THE INPUTS IS OPENED, THE MOTOR WILL RUN.**
- Table is based on 2-Wire control. For 3-Wire control definitions of terminals 1, 2, and 7, see Figure 1-4.

———— NOTES FOR FIGURES 1-3 ————

- * - Indicates components not supplied.
 - ⊙ - Indicates main circuit terminal.
 - - Indicates control circuit terminal.
 - () - Indicates alternate terminal marking, i.e. (R) and L1.
1. Insulated twisted shielded wire is required.
 - 2-conductor #18 GA. (Beldon #8760 or equivalent)
 - 3-conductor #18 GA. (Beldon #8770 or equivalent)Connect shield only at GPD 303 end. Stub and isolate other end.
 2. +12V voltage output current capacity of control terminal 10 is 20mA max.
 - 3.. The GPD 303 does not include overload 1OL, it is a separate item. The contact from the separately supplied overload relay should be interlocked with the GPD 303 as shown. It should be the manual reset type to prevent automatic restart following a motor fault and subsequent contact reclosure after cool down.
 4. Customer to connect terminal G (E) to earth ground.
 5. If Digital Operator is used, remote operators which duplicate functions of its command keys (see Figure 2-1) may not be required.
 6. Use factory supplied installation instructions for installation of Dynamic Braking resistor.



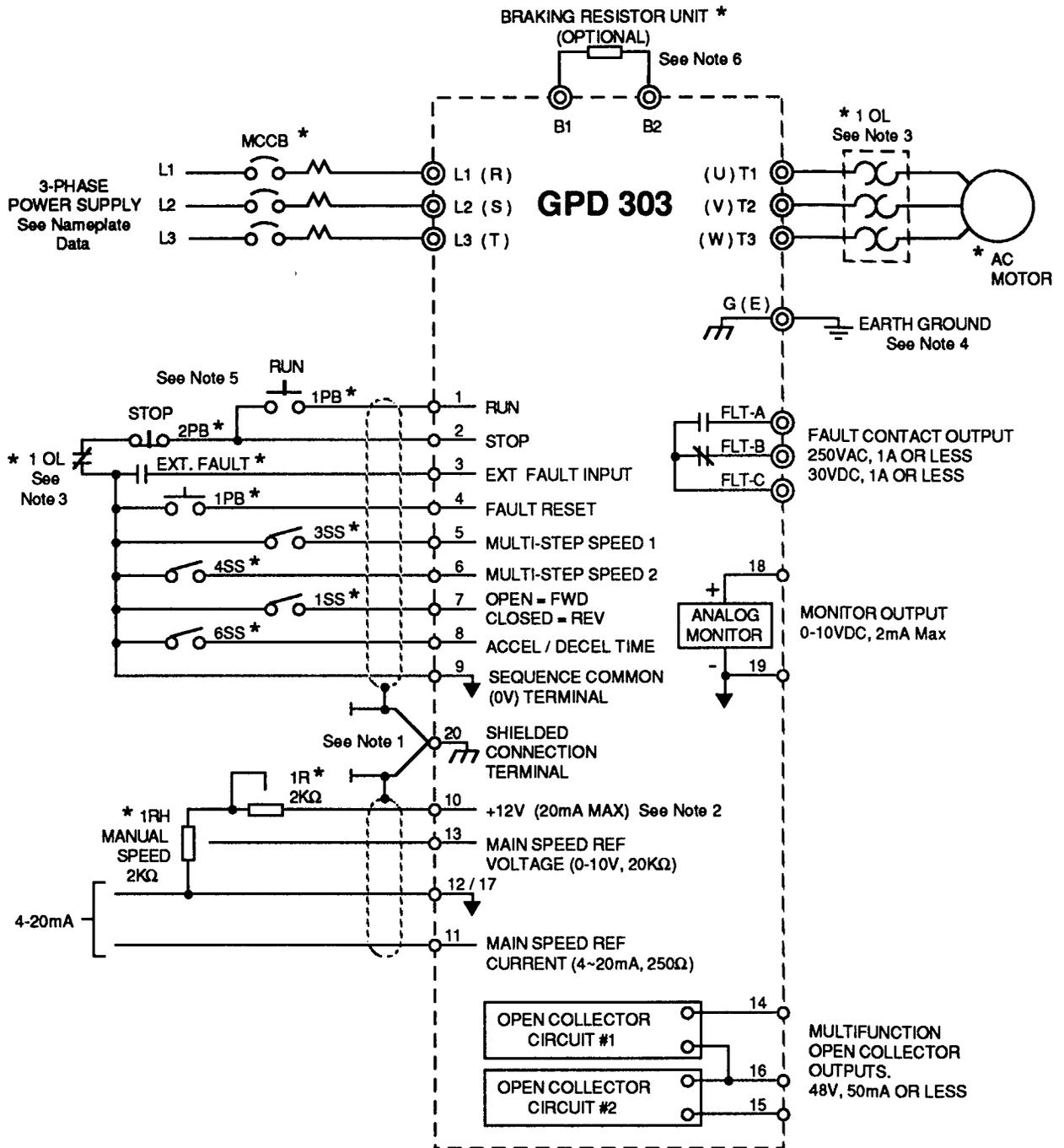
**Figure 1-3. Standard Connections (2-Wire Control)
(Constant no-00 set to 08)**

———— **NOTES FOR FIGURES 1-4** ————

- * - Indicates components not supplied.
 - ⊙ - Indicates main circuit terminal.
 - - Indicates control circuit terminal.
 - () - Indicates alternate terminal marking, i.e. (R) and L1.
1. Insulated twisted shielded wire is required.
 - 2-conductor #18 GA. (Beldon #8760 or equivalent)
 - 3-conductor #18 GA. (Beldon #8770 or equivalent)Connect shield only at GPD 303 end. Stub and isolate other end.
 2. +12V voltage output current capacity of control terminal 10 is up to 20mA.
 3. The GPD 303 does not include overload 1OL, it is a separate item. The contact from the separately supplied overload relay should be interlocked with the GPD 303 as shown. It should be the manual reset type to prevent automatic restart following a motor fault and subsequent contact reclosure after cool down.
 4. Customer to connect terminal G (E) to earth ground.
 5. If Digital Operator is used, remote operators which duplicate functions of its command keys (see Figure 2-1) may not be required.
 6. Use factory supplied installation instructions for installation of Dynamic Braking resistor.

CAUTION

Constant *no-32* must be set to 00 , and constant *no-00* must be set to " 09 ". Resetting drive constant *no-00* to " 08 " may cause the motor to run in reverse direction **WITHOUT A RUN COMMAND, and possibly result in equipment damage or personal injury.**



**Figure 1-4. Standard Connections (3-Wire Control)
(Constant no-00 set to 09)**

1.5 START-UP

1.5.1 Pre-power Checks

- Wires properly connected and no erroneous grounds exist.
- Motor not connected to load. After start-up procedure is completed, motor can be connected to load, and normal operation can begin.

1.5.2 LED Monitor

On the front of the GPD 303 is a 3-digit, 7 segment LED Monitor. This provides a local indication of either output frequency or output current (as selected by constant *no-21* digit XXXX; factory setting of **0** selects output frequency).

This display is always available when power is applied to the GPD 303, even if it has been programmed for operation by means of the optional Digital Operator. When operating in the Program mode of the Digital Operator, any display on the LED Monitor should be disregarded.

Constant *no-21* (XXXX)

0 : Output Frequency

60.0

No minus (i.e. "-") display for running in reverse.
Display in 0.1Hz increments for under 100Hz.
Display in 1Hz increments for 100Hz or more.

1 : Output Current

3.5 A

Display in 0.1 Amp increments for under 10 Amps.
Display in 1 Amp increments for 10 Amps or more.

1.6 START-UP WITHOUT DIGITAL OPERATOR (2-Wire control)
 (constant *no-01* set to 0000 [factory setting])

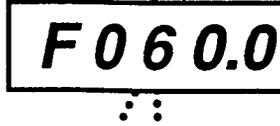
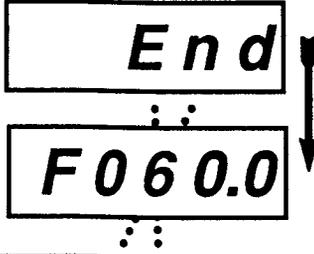
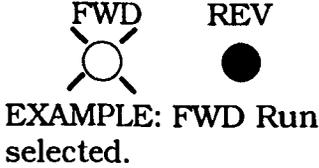
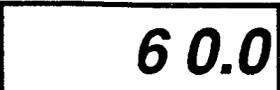
ACTION	DESCRIPTION	LED MONITOR DISPLAY
Apply Power.	Display of " 0.0 " appears on LED Monitor, indicating no GPD 303 output to motor.	0.0
Close JOG input; close FWD RUN/ STOP input.	Display on LED Monitor indicates that GPD 303 output to motor is 6.0 Hz (factory setting of constant <i>no-17</i>). Check that motor is rotating in the correct direction. See Note 1.	6.0
Open JOG input.	GPD 303 output increases at programmed accel rate (constant <i>no-09</i> ; factory setting = 10.0 seconds accel time from 1.5Hz to 60Hz) to level commanded by analog frequency reference input. Motor speed increases accordingly.	18.0
Increase analog frequency reference input to maximum.	GPD 303 output increases to programmed maximum output frequency (Fmax) value (constant <i>no-02</i> ; factory setting = 60.0Hz).	60.0
Open FWD RUN/ STOP input.	Motor speed decreases under GPD 303 control, at programmed decel rate (constant <i>no-10</i> ; factory setting = 10.0 seconds decel time from 60Hz to 1.5Hz). Motor then remains stopped.	0.0

NOTES:

1. If motor is not rotating in proper direction, stop motor and turn off power to the GPD 303. Switch motor connections T1 (U) & T2 (V) at the GPD 303 to change direction.

1.7 START-UP USING DIGITAL OPERATOR, MODEL DS 393

(constant *no-01* set to 0011) (See Note 2)

ACTION	DESCRIPTION	DISPLAY
Apply Power.	The Main Frequency Reference (constant <i>no-13</i>) set value appears.	
Use ►, ▲, and ▼ keys as necessary until display shows desired run frequency.	Blinking position of display shifts to the right, value of blinking digit increases or decreases, when keys are pressed.	
Press DATA key ENTER to write new value into memory.	" <i>End</i> " appears, then digit resumes blinking.	
Press FWD key REV to select desired direction of motor rotation.	Observe FWD and REV indicator lamps on Digital Operator to see which direction motor should rotate when GPD 303 is started.	
Press DSPL key.	Present output frequency is displayed.	
Press and hold JOG key; then release.	Motor runs at Jog frequency (constant <i>no-17</i> setting) operating speed WHILE KEY IS PRESSED. Check for correct rotation of motor. See Note 1.	
Press RUN key.	GPD 303 output increases to Main Frequency Reference level, at programmed accel rate. Motor speed increases accordingly.	
Press STOP key.	Motor speed decreases under GPD 303 control, at preset deceleration rate, to zero. Motor remains stopped.	

NOTES:

1. If motor does not rotate in proper direction, stop motor and turn off power to the GPD 303. Switch motor connections T1 (U) & T2 (V) at GPD 303 to change direction.
2. If constant *no-01* is programmed with a "0" for either of the 00XX digits, Digital Operator commands will be replaced by external inputs. See paragraph 3.3.

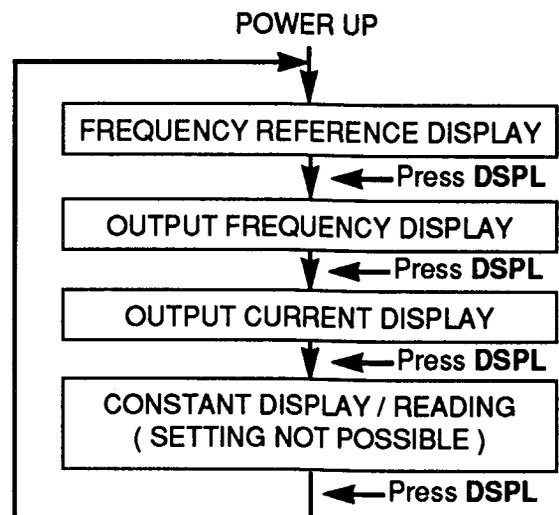
SECTION 2 DIGITAL OPERATOR

2.1 GENERAL

This section describes the function of the Digital Operator Model DS 393. The GPD 303 can be operated by remote signal inputs without the need for the Digital Operator; however, for operation by means of keypad entry, or for changing of constant settings from the factory preset values (via Program mode), the Digital Operator must be connected to the GPD 303.

2.2 DRIVE MODE OPERATION

- A) The flow chart shows the display items in the Drive mode after the power supply is turned on. Press **DSPL** key to cycle.



- B) Frequency Reference Display

Frequency reference is displayed in units of 0.1 Hz. See paragraph 1.7 to change frequency reference.

F060.0

- C) Output Frequency Display

Output frequency is displayed in units of 0.1 Hz. The far left digit indicates the rotating direction while running (blank = forward; " - " = reverse).

-060.0

- D) Output Current Display

Output current is displayed in units of 0.1 Amp.

10.0A

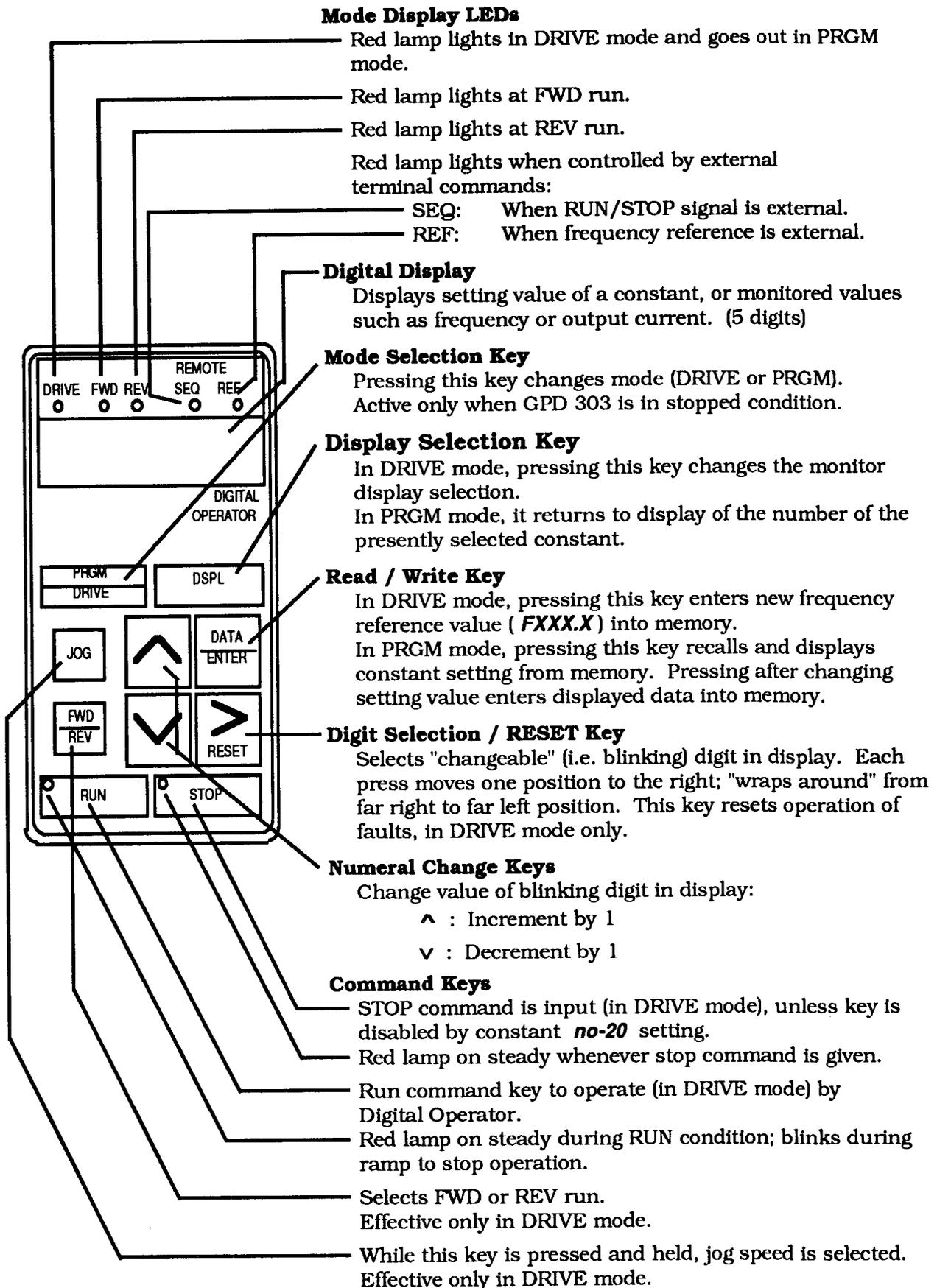


Figure 2-1. Digital Operator (Optional)

2.3 PROGRAM MODE OPERATION

IMPORTANT

Constant *no-00* determines which constants can be read or set. Therefore, it should always be the first constant read, and set if necessary.

Constants are read/set in the Program mode by the following procedures:

1. Press the **PRGM/DRIVE** key during stop to enter the Program mode.
2. Press **▲** or **▼** key to select the constant number to be read/set.
3. Press the **DATA/ENTER** key and the selected constant data are displayed.
4. Press **►/RESET**, **▲** or **▼** key to set the data.
 - To change the sign of data (constant *no-23* only), press **▲** or **▼** key when the far left digit blinks.

Minus data: Far left digit = "-"
Plus data: Far left digit = "□"

(When the far left digit is selected positive, "□" blinks; when the far left digit is selected negative, "-" blinks.)

+ DATA			
"□"	□	.	□ □
- DATA			
"-"	□	.	□ □

5. Press the **DATA/ENTER** key to write-in the data.
If the set value exceeds the setting range, the whole display blinks for 3 seconds, then the set value before change is again displayed. When the set value is within the setting range, "**End**" will appear on the Digital Display for 1 second, then the new set value is again displayed.
6. Press the **DSPL** key to display the constant number again.
7. Repeat steps 2-5 to read/set other constants.
8. When finished with constant programming, press the **PRGM/DRIVE** key to return to Drive mode.

Displays appearing only on the Digital Operator (i.e. not on LED Monitor):

CONSTANT STATUS	MONITOR DISPLAY	RESULT
Accepted	" End " (1 sec)	Indicates constant setting was written into EEPROM.
Not accepted	Blinking for 3 seconds, then return to former data display	Indicates constant setting was not written into EEPROM.

SECTION 3 PROGRAMMABLE FEATURES

3.1 GENERAL

Paragraphs in this section provide a description of the GPD 303 features which are defined by programmed settings in memory. These feature descriptions appear in numerical order by constant number.

GPD 303 Constants

CONSTANT	DATA NAME	SETTING RANGE AND (UNIT)	INCREMENT	FACTORY SETTING	REF PARA.
<i>no-00</i>	Password / Initialization	00 - 09	1	01	3.2
<i>no-01</i>	Operation Signal Selection 1	0000 - 1111 (BINARY CODE)	---	0000	3.3
<i>no-02</i>	Maximum Frequency (Fmax)	50.0 - 400.0 (Hz)	1	60 0	3.4
<i>no-03</i>	Maximum Voltage (Vmax)	0.1 - 255.0 (V)	1	230 0	3.4
<i>no-04</i>	Max. Voltage Frequency (Fa)	0.2 - 400.0 (Hz)	.1	60 0	3.4
<i>no-05</i>	Frequency Midpoint (Fb)	0.1 - 399.9 (Hz)	1	15	3.4
<i>no-06</i>	Voltage Midpoint (Vc)	0.1- 255.0 (V)	.1	12 0	3.4
<i>no-07</i>	Min. Output Frequency (Fmin)	0.1- 10.0 (Hz)	.1	15	3.4
<i>no-08</i>	Min Output Freq. Voltage (Vmin)	0 1 - 50.0 (V)	.1	12 0	3.4
<i>no-09</i>	Accel Time 1	0.0 - 600.0 (s)	.1	10 0	3.5
<i>no-10</i>	Decel Time 1	0.0 - 600 0 (s)	1	10 0	3.5
<i>no-11</i>	Accel Time 2	0.0 - 600.0 (s)	.1	10 0	3.5
<i>no-12</i>	Decel Time 2	0.0 - 600 0 (s)	1	10 0	3.5
<i>no-13</i>	Frequency Reference 1	0.0 - 400.0 (Hz)	.1	0 0	3.6
<i>no-14</i>	Frequency Reference 2	0.0 - 400 0 (Hz)	.1	0 0	3.6
<i>no-15</i>	Frequency Reference 3	0.0 - 400.0 (Hz)	.1	0 0	3.6
<i>no-16</i>	Frequency Reference 4	0 0 - 400.0 (Hz)	1	0 0	3.6
<i>no-17</i>	Jog Frequency Reference	0.0 - 400.0 (Hz)	1	6 0	3.7
<i>no-18</i>	Motor Protection Selection	0000 - 0111 (BINARY CODE)	---	0000	3.7

GPD 303 Constants - Continued

CONSTANT	DATA NAME	SETTING RANGE AND (UNIT)	INCREMENT	FACTORY SETTING	REF PARA.
no-19	Motor Rated Current (See Note 1)	(10% to 120% of GPD 303 Rated Output Current)	.1 Amp	See Para. 3.8	3.8
no-20	Operation Selection Signal 2	0000 - 1111 (BINARY CODE)	---	0000	3.9
no-21	Output Monitor Selection	0000 - 1111 (BINARY CODE)	---	0000	3.10
no-22	Freq. Command Gain	0.01 - 2.00	.01	1.00	3.11
no-23	Freq. Command Bias (See Note 2)	- 1.00 - 1 00 (%)	01	0 00	3.11
no-24	Freq. Command Upper Limit	0 - 110 (%)	1	100	3.11
no-25	Freq. Command Lower Limit	0 - 110 (%)	1	0	3.11
no-26	DC Injection Braking Current	0 - 100 (%)	1	50	3.12
no-27	DC Injection Braking Time at Stop	0.0 - 5.0 (s)	.1	0 0	3.12
no-28	DC Injection Braking Time at Start	0.0 - 5 0 (s)	.1	0 0	3.12
no-29	Automatic Torque Boost Gain	0.0 - 3.0	.1	1 0	3.13
no-30	Stall Prevention Level During Accel	30 - 200 (%)	1	170	3.14
no-31	Stall Prevention Level at Set Speed	30 - 200 (%)	1	160	3.14
no-32	Multi-function Input – Terminal 7	0 - 8	1	1	3.15
no-33	Multi-function Input – Terminal 8	1 - 8	1	2	3.15
no-34	Multi-function Output – Terminal 14	0 - 4	1	0	3.16
no-35	Multi-function Output – Terminal 15	0 - 4	1	1	3.16
no-36	Frequency Detection Level	0 0 - 400.0 (Hz)	1	0 0	3.17
no-37	Overtorque Detection Function Select	0000 - 0111 (BINARY CODE)	---	0000	3.18
no-38	Overtorque Detection Level	30 0 - 200.0 (%)	1	160.0	3.18
no-39	Overtorque Detection Time	0.1 - 10 0 (s)	.1	0 1	3.18
no-40	Carrier Frequency	1 - 6 (x 2.5 kHz)	1	4 (= 10 kHz)	3.19

NOTES:

1. Initial value depends upon GPD 303 Capacity. See paragraph 3-8.
2. To change to negative setting, select the far left digit ("X" X . X X). Press ▲ key to change it to "-".

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GPD 303 Constants - Continued

CONSTANT	DATA NAME	SETTING RANGE AND (UNIT)	INCREMENT	FACTORY SETTING	REF PARA.
<i>no-41</i>	Frequency Reference 5	0.0 - 400.0 (Hz)	.1	00	3.6
<i>no-42</i>	Frequency Reference 6	0.0 - 400.0 (Hz)	.1	0.0	3.6
<i>no-43</i>	Frequency Reference 7	0.0 - 400.0 (Hz)	1	00	3.6
<i>no-44</i>	Frequency Reference 8	0.0 - 400.0 (Hz)	.1	00	3.6
<i>no-45</i>	Analog Monitor Gain	0.01 - 2.00	.01	1.00	3.10
<i>no-46</i>	Momentary Power Loss Function Selection	0000 - 0111 (BINARY CODE)	---	0000	3.22
<i>no-47</i>	No. of Auto-restart Attempts	0 - 10	1	0	3.23
<i>no-48</i>	Fault Record	N/A	N/A	N/A	3.20
<i>no-49</i>	PROM No.	N/A	N/A	N/A	3.21
<i>no-50</i>	Prohibited Frequency 1	0.0 - 400.0 (Hz)	0.1	00	3.24
<i>no-51</i>	Prohibited Frequency 2	0.0 - 400.0 (Hz)	0.1	00	3.24
<i>no-52</i>	Prohibited Frequency 3	0.0 - 400.0 (Hz)	0.1	00	3.24
<i>no-53</i>	Prohibited Frequency Deadband	0.0 - 25.5 (Hz)	0.1	1.0	3.24
<i>no-54</i>	Speed Search Operation Level	0 - 200 (%)	1	150	3.35
<i>no-55</i>	Min Base Block Time	0.5 - 5.0 (s)	0.1	0.5	3.25
<i>no-56</i>	V/f During Speed Search	0 - 100 (%)	1	100	3.25

3.2 PASSWORD / INITIALIZATION

Factory Setting : 01

Constant no-00 This constant determines which of the constants can be examined in the Drive mode, and read/set in the Program mode.

When **06** is entered, the GPD 303's internal fault record is cleared; then the setting value automatically returns to **01**.

When either **08** or **09** is entered (initialization settings), the definitions of inputs at terminals 1 and 2 are changed. Constant **no-32** (Multi-function Input - Terminal 7) setting is also changed, according to the requirements of the control configuration (see Figures 1-3 and 1-4). All other constants are returned to FACTORY SETTINGS; constant **no-00** setting then returns to **01**.

SETTING	FUNCTION
00	Password reading / setting enabled; constants no-01 thru no-19 can be read only; no constants can be set
01	Constants no-00 thru no-19 can be read / set; no other constants can be read / set (NOTE: this is factory setting)
02	Constants no-00 thru no-29 can be read / set; no other constants can be read / set
03	Constants no-00 thru no-59 can all be read / set
04	NOT USED
05	NOT USED
06	Clear Fault Record (then return to factory setting)
07	NOT USED
08	Initialization for 2-Wire Control (then return to factory setting)
09	Initialization for 3-Wire Control (then return to factory setting)

3.3 OPERATION SIGNAL SELECTION 1

Factory Setting : 0000

Constant no-01 This four-digit binary code determines the source of frequency reference and Run/Stop/Jog signals, and the method of stopping the motor when the Stop command is issued.

DIGIT	FUNCTION
X X X <u>X</u>	0 = External frequency reference (0-10Vdc or 4-20mA) (Term. 11 or 13)
	1 = Internal Frequency Reference (set by Digital Operator)
X X <u>X</u> X	0 = External Run / Stop commands
	1 = Run / Stop / Jog by Digital Operator
X <u>X</u> X X	0 = Ramp to stop at Stop command
	1 = Coast stop at Stop command
<u>X</u> X X X	0 = V/f with output voltage limiter
	1 = V/f without output voltage limiter

Note: If X X X X is set to 1, the V/f pattern (see paragraph 3.4) must be set to match motor data.

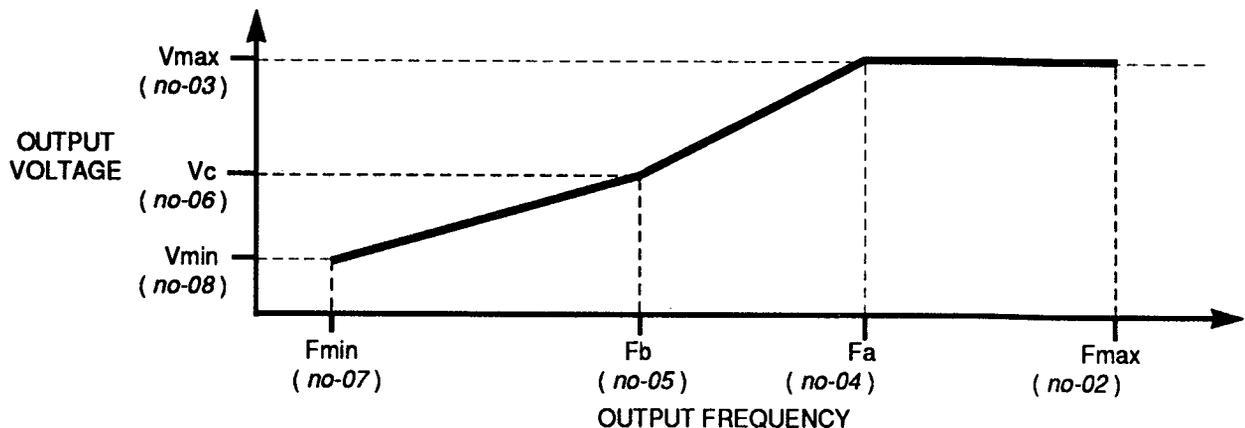
3.4 V/f PATTERN

Constants

no-02
thru
no-08

This paragraph explains how these seven constants define the V/f pattern and how they relate to each other.

CONSTANT	DATA NAME	SETTING RANGE	FACTORY SETTING
<i>no-02</i>	Maximum Frequency (Fmax)	50.0 - 400 0 (Hz)	60.0
<i>no-03</i>	Maximum Voltage (Vmax)	0.1 - 255.0 (V)	230 0
<i>no-04</i>	Maximum Voltage Frequency (Fa)	0.2 - 400.0 (Hz)	60.0
<i>no-05</i>	Frequency Midpoint (Fb)	0.1 - 399.9 (Hz)	1.5
<i>no-06</i>	Voltage Midpoint (Vc)	0.1 - 255.0 (V)	12 0
<i>no-07</i>	Minimum Output Frequency (Fmin)	0.1 - 10.0 (Hz)	1 5
<i>no-08</i>	Minimum Output Frequency Voltage (Vmin)	0.1 - 50 0 (V)	12.0



To establish a V/f pattern with a straight line from Fmin to Fa, set Fb = Fmin, and Vc = Vmin.

IMPORTANT

When entering a setting for one of these constants, an improper constant fault will occur if any part of the following relationships among constants *no-02* thru *no-08* is NOT TRUE:

- a) $F_{max} \geq F_a \geq F_b \geq F_{min}$
- b) $V_{max} > V_c \geq V_{min}$

The attempted setting value will blink for approx. 3 seconds, then the display will again show the previous setting of the constant.

3.5 ACCEL / DECEL TIMES

Range (ea.) : 0.0 to 600.0 (s)

Constants

no-09 **Accel Time 1**
no-10 **Decel Time 1**

These constants set the normal accel and decel times required for the GPD 303 output to ramp from Fmin to Fmax or from Fmax to Fmin, respectively.

Factory Setting (ea.) : 10.0

Constants

no-11 **Accel Time 2**
no-12 **Decel Time 2**

If a Multi-function Input (terminal 7 or 8) is programmed as Accel/Decel Time Change command (see paragraph 3.15), the GPD 303 uses the settings in *these* constants as its accel and decel times when that input is closed.

3.6 MULTI-STEP SPEED PRESETS

Range (ea.) : 0.0 to 400.0 (Hz)

Constants

no-13 thru **no-17** Terminals 5 & 6 are permanently defined as Multi-step Speed Ref 1 and Multi-step Speed Ref 2 command inputs; therefore Multi-step Speed operation is possible at all times. (Constant **no-01** must be set to X X X 1.)

Factory Settings : **no-17** = 6.0;
all others = 0.0

Multi-step (9 preset speeds) in 2-Wire control

CONSTANT and NAME	EXTERNAL TERMINAL			
	7	8	6	5
no-13 Frequency Ref 1	0	0	0	0
no-14 Frequency Ref 2	0	0	0	1
no-15 Frequency Ref 3	0	0	1	0
no-16 Frequency Ref 4	0	0	1	1
no-41 Frequency Ref 5	0	1	0	0
no-42 Frequency Ref 6	0	1	0	1
no-43 Frequency Ref 7	0	1	1	0
no-44 Frequency Ref 8	0	1	1	1
no-17 Jog Reference	1	0	0	0

To use the maximum of 9 preset speeds (in 2-Wire control only), constant **no-32** must be set to **1** (Jog) and constant **no-33** must be set to **3** (Multi-step Speed Ref 3).

1 = Closed (ref terminal 9)

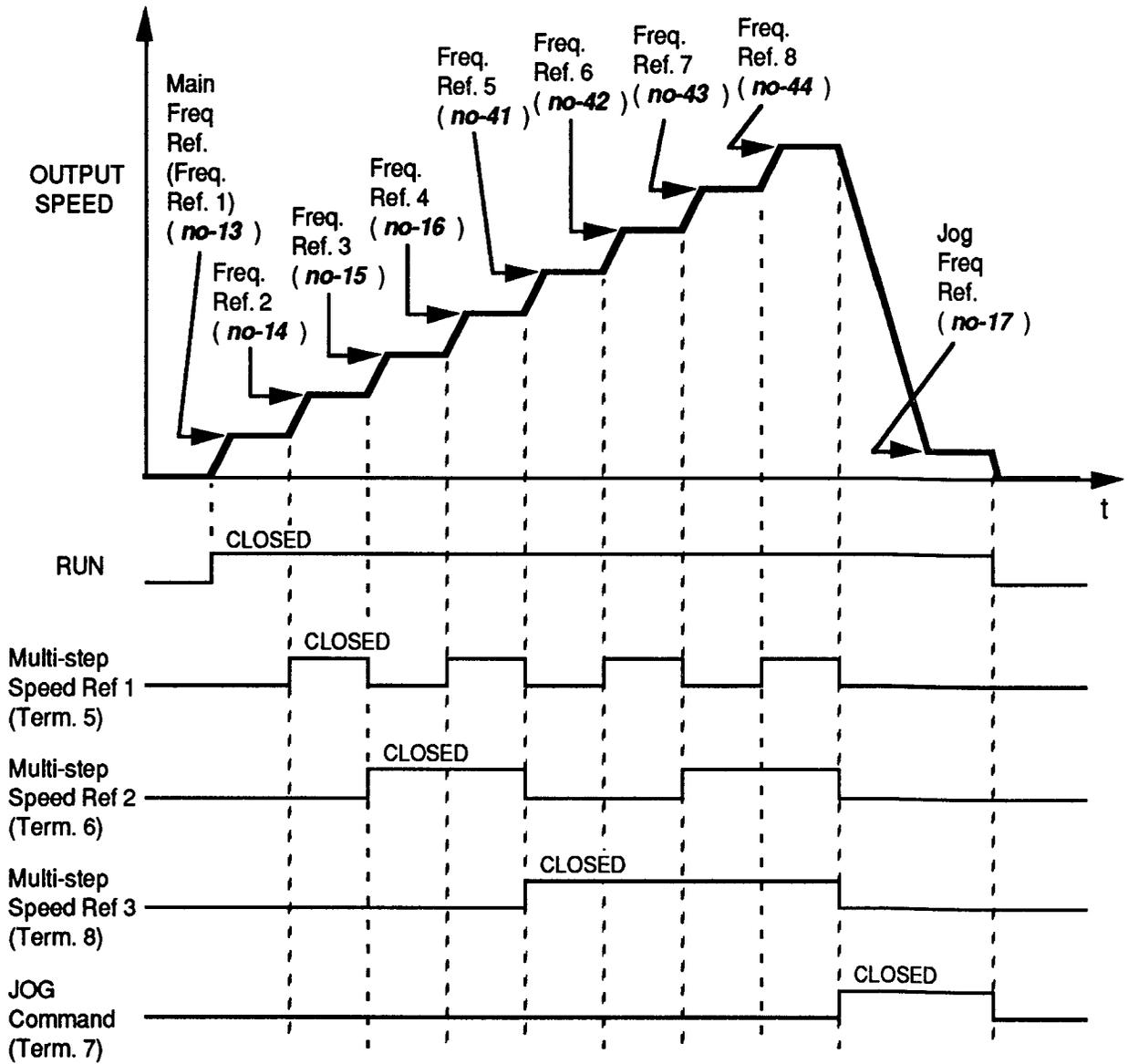
0 = Open (ref terminal 9)

In Drive mode, each Frequency Ref setting can be changed on the fly, while selected by input commands, by use of the Frequency Reference display (see paragraph 2.3)

Multi-step (8 preset speeds) in 3-Wire control

CONSTANT and NAME	EXTERNAL TERMINAL		
	8	6	5
no-13 Frequency Ref 1	0	0	0
no-14 Frequency Ref 2	0	0	1
no-15 Frequency Ref 3	0	1	0
no-16 Frequency Ref 4	0	1	1
no-41 Frequency Ref 5	1	0	0
no-42 Frequency Ref 6	1	0	1
no-43 Frequency Ref 7	1	1	0
no-44 Frequency Ref 8	1	1	1

For 3-Wire control, constant **no-32** must be **0** (FWD/REV). Therefore, a maximum of 8 preset speeds can be used, if constant **no-33** is set to **3** (Multi-step Speed Ref 3).



NOTE: The JOG command takes priority over multi-step speed select inputs.

**Typical Multi-step Speed Operation
(2-Wire Control Example)**

3.7 MOTOR PROTECTION SELECTION

Factory Setting : 0000

Constant no-18 This four-digit binary code determines whether or not thermal overload protection is provided for the motor and whether it is for constant torque or variable torque load.

DIGIT	FUNCTION
X X X <u>X</u>	0 = Electronic thermal overload motor protection enabled
	1 = Electronic thermal overload motor protection disabled
X X <u>X</u> X	0 = Electronic thermal overload is for variable torque
	1 = Electronic thermal overload is for constant torque
X <u>X</u> X X	0 = Type 20 overload (standard)
	1 = Type 10 overload (5 times faster than standard)
<u>X</u> X X X	NOT USED

3.8 MOTOR RATED CURRENT

Constant no-19 Factory set according to the horsepower rating of the GPD 303, and should be set per motor rating. The motor rated current setting is

Range (in Amps) : From 10% to 120% of drive's continuous output current rating.

Increment: .1 Amp

used by the electronic thermal overload circuit (if enabled; see above) to protect the motor by means of **oL1** fault shutdown.

Motor Rated Current Settings

HP RATING	MAX MOTOR OUTPUT HP (kW)	MOTOR RATED CURRENT - AMPS (CONSTANT no-19) FACTORY SETTING	GPD 303 RATED OUTPUT CURRENT (AMPS) CT / VT
0.75	0.75 (0.4)	19	3 0 / 3.4
1	1 (0.75)	33	5.0 / 5.6
2	2 (1.5)	6.2	6.5 / 7.3
3	3 (2.2)	85	11 0 / 12.4
5	5 (3.7)	14.1	17.5 / 19.6

3.9 OPERATION SIGNAL SELECTION 2

Factory Setting : 0000

Constant no-20 The four-digit binary code of this setting determines reverse run capability, Digital Operator STOP key function, external fault signal type, and stall prevention.

DIGIT	FUNCTION
X X X <u>X</u>	0 = Reverse run enabled
	1 = Reverse run disabled
X X <u>X</u> X	0 = Digital Operator STOP key effective
	1 = Digital Operator STOP key ineffective
X <u>X</u> X X	0 = External fault (terminal 3) – NO contact input
	1 = External fault (terminal 3) – NC contact input
<u>X</u> X X X	0 = Stall prevention during deceleration enabled
	1 = Stall prevention during deceleration disabled (braking resistor connected)

3.10 OUTPUT MONITORING

Constant no-21 Output Monitor Selection

Factory Setting : 0000

The four-digit binary code of this setting establishes which output parameter will be monitored on the GPD 303's 3-digit LED monitor, and which will be applied to the Analog Monitor Output at terminals 18 & 19.

DIGIT	FUNCTION
X X X <u>X</u>	0 = LED Monitor display : output frequency
	1 = LED Monitor display : output current
X X <u>X</u> 1	0 = Analog monitor output : output frequency
	1 = Analog monitor display : output current
<u>X</u> X X X	S-Curve Accel/Decel Selection 00 = Not provided; 01 = 2 sec , 10 = 5 sec; 11 = 1.0 sec

Constant no-45 Analog Monitor Gain

Range : 0.01 to 2.00
Factory Setting : 1.00

The Analog Monitor output is a 0-10Vdc signal, proportional to the selected output parameter selected by constant **no-21** . To calibrate the output signal for the external metering circuit, the Analog Monitor Gain is adjusted by the setting of constant **no-45** .

3.11 FREQUENCY COMMAND

Frequency Command Gain

Range : 0.01 to 2.00

Factory Setting : 1.00

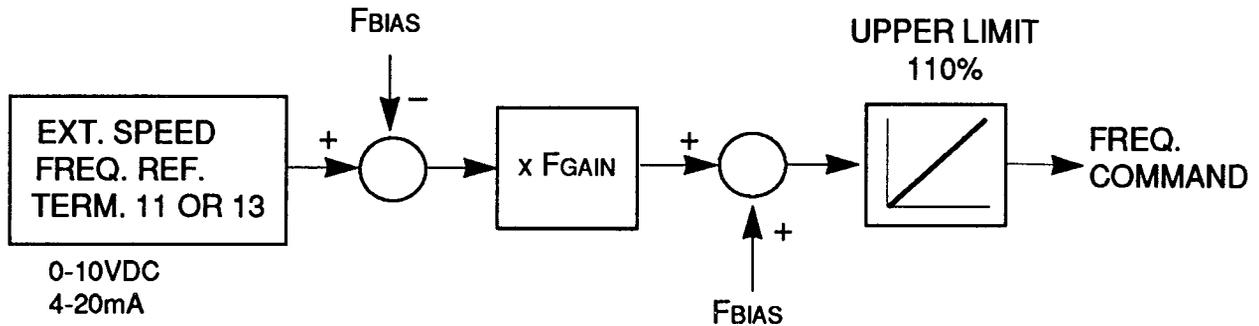
Sets the External Speed Frequency Reference gain, in increments of 0.01.

Frequency Command Bias

Range : -1.00 to (+)1.00

Factory Setting : 0.00

Sets the External Speed Frequency Reference bias, in increments of 0.01.



Constants

no-24 **Frequency Command Upper Limit**
no-25 **Frequency Command Lower Limit**

Range (ea.) : 0 to 110 (%)

Factory Settings : *no-24* = 100

no-25 = 0

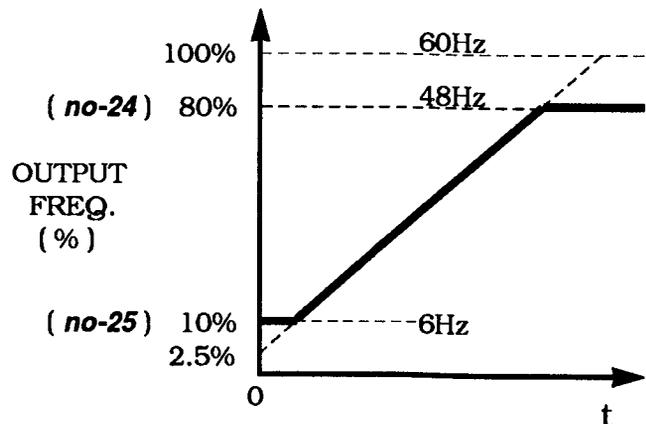
These two constants set the range for the frequency command signal. Each is set as a percentage of maximum frequency (F_{max}) as established by the setting of constant *no-02* (see paragraph 3.4). All references are affected by the upper and lower limit.

EXAMPLE:

Constant *no-02* = 60 (Hz) (100%)

Constant *no-24* = 80 (%) = 48Hz

Constant *no-25* = 10 (%) = 6Hz



3.12 DC INJECTION BRAKING

Constant

no-26 DC Injection Braking Current

Range : 0.0 to 100.0 (%)

Factory Setting : 50.0

Sets the DC current level that the GPD 303 outputs at DC braking time. Time and current level must be set to provide adequate stopping without excessive motor heating.

Constant

no-27 DC Injection Braking Time at Stopping

Range : 0.0 to 5.0 (s)

Factory Setting : 0.0

Sets the time, in increments of 0.1 second, during which DC injection braking current is applied at ramp to stop. This time starts when output frequency reaches Fmin (constant **no-07**). If set to zero, then operation is coast stop after Fmin. This function is disabled if coast stop is enabled in constant **no-01** .

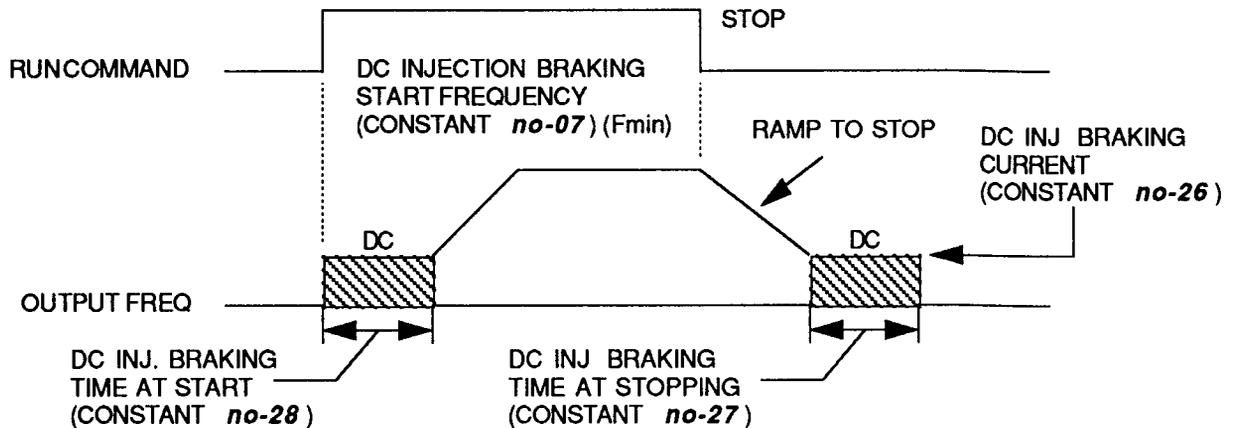
Constant

no-28 DC Injection Braking Time at Starting

Range : 0.0 to 5.0 (s)

Factory Setting : 0.0

Sets the time, in increments of 0.1 second, during which DC injection braking current is applied at starting (by inputting a Forward or Reverse run command). When set to zero, acceleration begins immediately with the minimum output frequency.



3.13 AUTOMATIC TORQUE BOOST GAIN

Range : 0.0 to 3.0
Factory Setting : 1.0

Constant no-29 Sets the torque compensation, in increments of 0.1. When the motor has the same capacity as that of the GPD 303, the gain is 1.0.

3.14 STALL PREVENTION

Constant no-30 **Stall Prevention Level During Accel** Range : 30 to 200 (%)
Factory Setting : 170

Determines the actual GPD 303 output current level during an accelerating condition. Set in percent of GPD 303 rated output current (see paragraph 3.8).

Constant no-31 **Stall Prevention Level at Set Speed** Range : 30 to 200 (%)
Factory Setting : 160

Determines the actual output current level of the GPD 303 while operating at set speed (frequency). Also set in percent of GPD 303 rated output current (see paragraph 3.8).

3.15 MULTI-FUNCTION INPUTS

Constants

no-32 **Multi-function Input - Terminal 7** Inputs to these two terminals
no-33 **Multi-function Input - Terminal 8** are defined by these two constants. When either

terminal is closed to sequence common, the selected function is enabled. To disable the function, the input must be opened.

Constant no-32 - Term. 7

SETTING	FUNCTION
00 (See Note 1)	FWD / REV select command (for 3-wire control configuration)
01	JOG command
02	Accel / Decel Time Change command
03	Multi-step Speed Ref 3
04	External baseblock (NO contact input)
05	External baseblock (NC contact input)
06	Speed search from max freq.
07	Speed Search from set freq.
08	Acce/decel prohibit (when command is input during accel/decel, output freq. is held)

Constant no-33 - Term. 8

SETTING	FUNCTION
01	JOG command
02	Accel / Decel Time Change command
03	Multi-step Speed Ref 3
04	External baseblock (NO contact input)
05	External baseblock (NC contact input)
06	Speed search from max freq.
07	Speed search from set freq.
08	Accel/decel prohibit

IMPORTANT

- Only constant **no-32** can be set to **00** .
- Constant **no-32** MUST BE A LOWER VALUE than constant **no-33** .
- Program ONLY ONE of the multi-function terminals for speed search; a second speed search setting will not be accepted.

3.16 MULTI-FUNCTION OUTPUTS

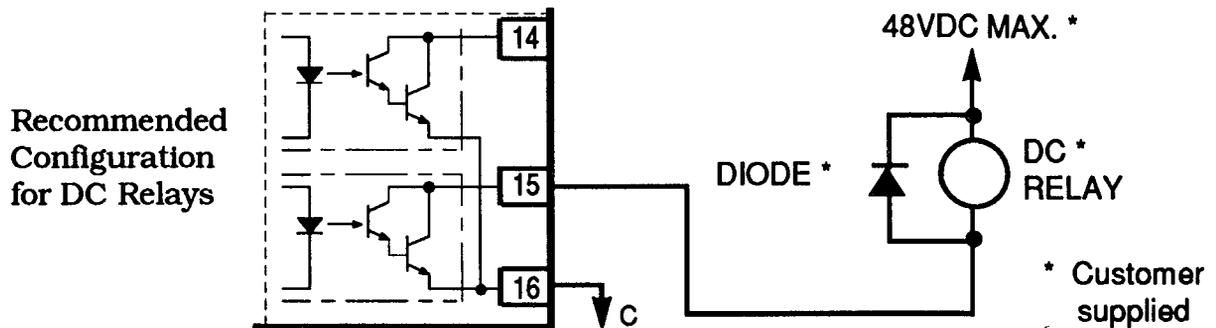
Constants

- no-34* **Multi-function Output - Terminal 14 (ref term. 16)**
- no-35* **Multi-function Output - Terminal 15 (ref term. 16)**

Multi-function output terminals 14 & 15 are defined by the settings of these two constants. Each open collector output will switch low (with respect to terminal 16, common) when the selected condition is met.

SETTING	FUNCTION
00	Running
01	Speed at set frequency
02	Zero speed
03	Frequency detection (output frequency > or = constant no-36)
04	Overtorque Detection

Multi-function Output Terminals



3.17 FREQUENCY DETECTION LEVEL

Range : 0.0 to 400.0 (Hz)
 Factory Setting : 0.0

Constant
no-36

Establishes the frequency level used as a reference when programming a multi-function output terminal to change state at Frequency Detection (see paragraph 3.16).

3.18 OVERTORQUE DETECTION

Overtorque detection compares GPD 303 rated output current with the overtorque detection level. When the output current is equal to or greater than the detection level, an overtorque condition exists. This will be indicated as an **oL3** fault or warning on the Digital Operator or LED Monitor. (The detection level is a percent of GPD 303 rated output current; see paragraph 3.8.)

Constant Factory Setting : 0000
no-37 **Overtorque Detection Function Selection**

The four-digit binary code of this setting determines how the overtorque detection function of the GPD 303 will operate. See Timing Diagram.

DIGIT	FUNCTION
X X X <u>X</u>	0 = Overtorque detection function disabled
	1 = Overtorque detection function enabled
X X X <u>1</u>	0 = Overtorque detection only when output is at set frequency
	1 = Overtorque detection at all times (except during stopping or DC injection braking)
X <u>X</u> X 1	0 = Operation continues after overtorque detection
	1 = Coast stop after overtorque detection
<u>X</u> X X X	NOT USED

Constant Range : 30 to 200 (%)
no-38 **Overtorque Detection Level** Factory Setting : 160

This is the reference point for determining that an overtorque condition exists. Set as a percent of GPD 303 rated current. See paragraph 3.8.

Constant Range : 0.1 to 10.0 (s)
no-39 **Overtorque Detection Time** Factory Setting : 0.1

Determines how long an overtorque condition must exist before another event will occur, i.e. coast stop or open collector output change of state, or **oL3** warning displayed.

3.18 OVERTORQUE DETECTION - CONTINUED

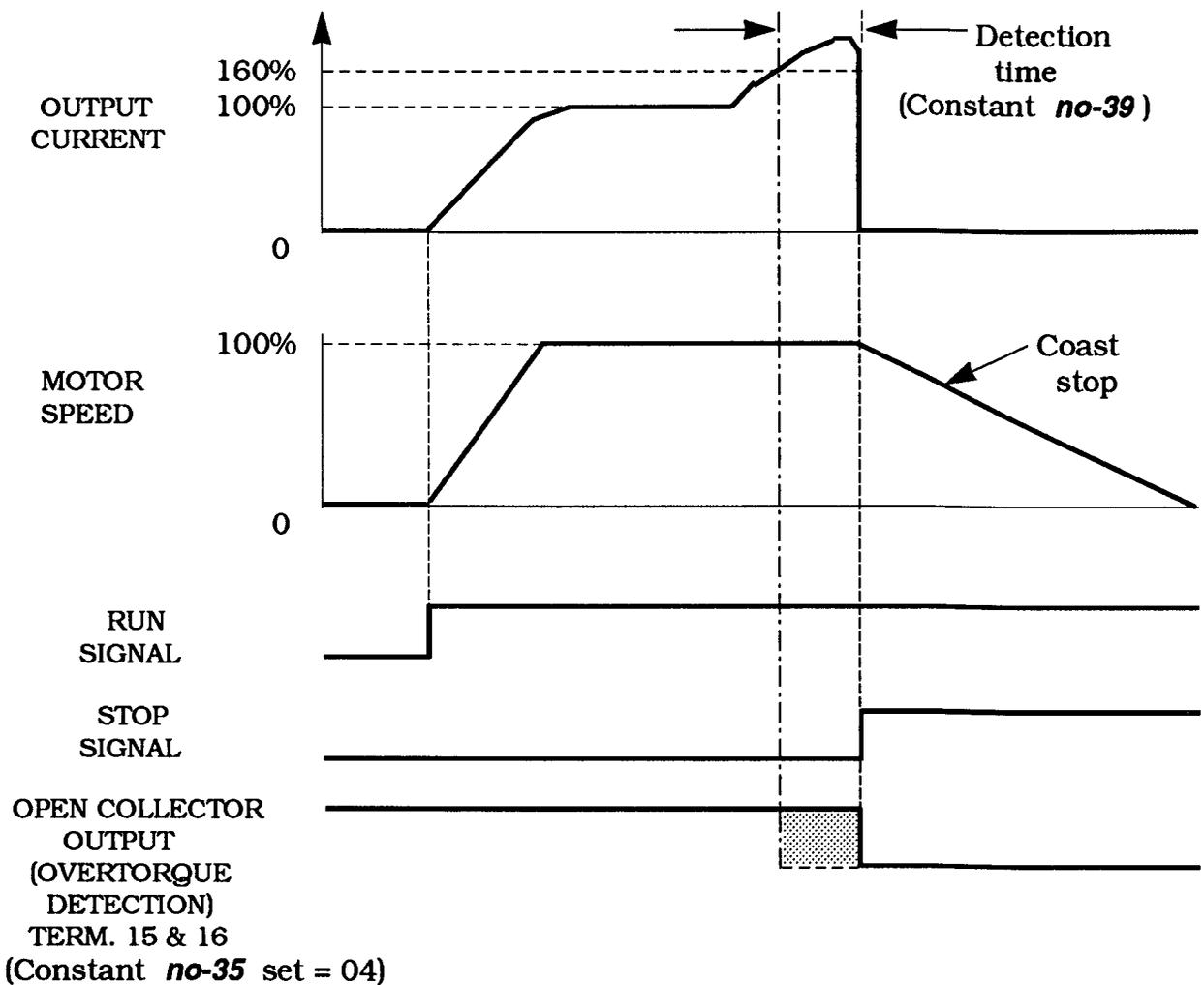
EXAMPLE:

Constant **no-35** = 04 (See paragraph 3.17)

Constant **no-37** = 0101 ; Overtorque enabled, only at set frequency,
coast to stop

Constant **no-38** = 160 (%)

Constant **no-39** = 1.0 (s)



Overtorque Detection Timing Diagram

3.19 CARRIER FREQUENCY

Range : 1 to 6 (x 2.5 kHz)

Constant Allows the user to select a higher or lower carrier frequency, depending on allowable operating noise levels for the application. Adjusts in increments of 2.5 kHz (set value x 2.5 kHz = carrier frequency).
no-40 Factory Setting : 4 (= 10 kHz)

IMPORTANT

If setting **5** (12.5 kHz) or **6** (15 kHz) is used, max continuous output current must be reduced to 90% of its nameplate rating.

- For constants *no-41* thru *no-44* , see paragraph 3.6.
- For constant *no-45* , see paragraph 3.10.

3.20 FAULT RECORD

Constant Display-only function which cannot be programmed by the user.
no-48 When this constant number is selected and the **DATA/ENTER** key is pressed, the fault code of the most recently occurring fault is displayed.

3.21 PROM NO.

Constant Display-only function which cannot be programmed by the user.
no-49 When this constant number is selected and the **DATA/ENTER** key is pressed, the display shows the code number of the EPROM that is installed on the Control PC board.

3.22 MOMENTARY POWER LOSS RIDE-THRU

Constant
no-46 **Momentary Power Loss Function Selection**

The four-digit binary code of this setting determines how the momentary power loss ride-thru function of the GPD 303 will function.

DIGIT	FUNCTION
	0 = Operation during momentary power loss disabled
X X X <u>X</u>	1 = Operation during momentary power loss enabled 3/4-1 HP : 1 sec power loss ride-thru 2-5 HP : 2 sec. power loss ride-thru
<u>X</u> X X X	Not Used

3.23 AUTO-RESTART

Constant

no-47

No. of Auto-restart Attempts

Range : 0 to 10

Factory Setting : 0

When a fault occurs during operation, the GPD 303 can be programmed for an auto-restart operation to automatically reset the fault. Auto-restart operation will use the number of restart attempts set in this constant, up to the maximum of ten. When set to **0**, no auto-restart will be attempted.

- Only the following faults can be automatically reset:

oC:	Overcurrent	oH:	Overheat
ou:	Overvoltage (OV)	GF:	Ground Fault

- The number of restart attempts available will reset to the constant ***no-47*** setting when:

1. 10 minutes have elapsed without a fault occurring.
2. An external Fault Reset push button is pressed (or the **RESET** key of optional Digital Operator is pressed).

3.24 CRITICAL FREQUENCY REJECTION

Constant		Range (ea.) : 0.0 to 400.0 (Hz)
no-50	Prohibited Frequency 1	Factory Setting (ea.) : 0.0
no-51	Prohibited Frequency 2	
no-52	Prohibited Frequency 3	

These three constants allow programming of up to three prohibited frequency points, in increments of 0.1 Hz, for eliminating problems with resonant vibration of the motor/machine. This feature does not actually eliminate the selected frequency values, but will accelerate and decelerate the motor through the prohibited bandwidth.

Constant		Range : 0.0 to 25.5 (Hz)
no-53	Prohibited Frequency Deadband	Factory Setting : 1.0

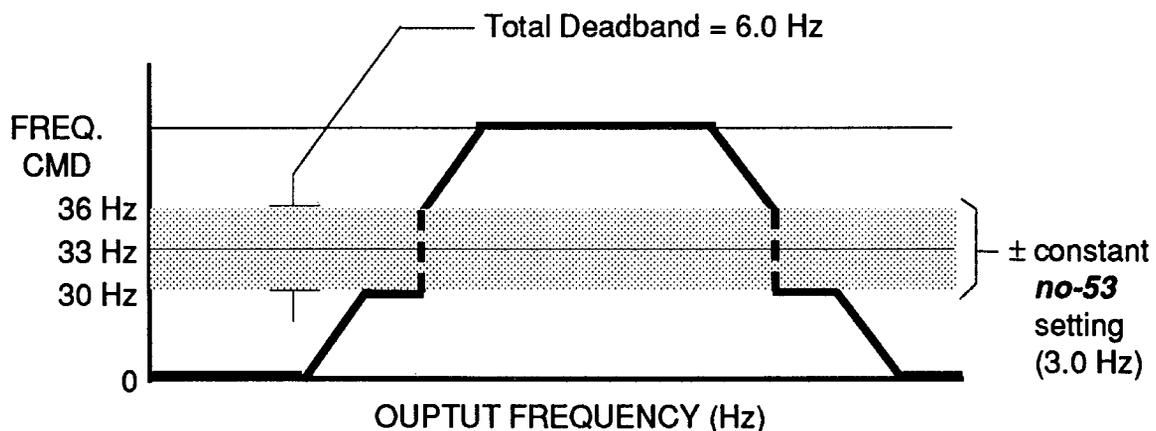
This constant determines the width of the deadband, in increments of 0.1 Hz, around each selected prohibited frequency point. The factory setting of 1.0 establishes a deadband of ± 0.1 Hz.

EXAMPLE:

Vibration encountered between 30.0 and 36.0 Hz.

SOLUTION: Set constant **no-50** to **33.0**. This is the center of the problem frequency band.
Set constant **no-53** to **3.0**. This will cause the GPD 303 to reject all frequency command values between 30.0 and 36.0 Hz.

A frequency command in the deadband will be converted to the bottom value of the deadband, e.g. a command of 33 Hz would result in a run frequency of 30 Hz.



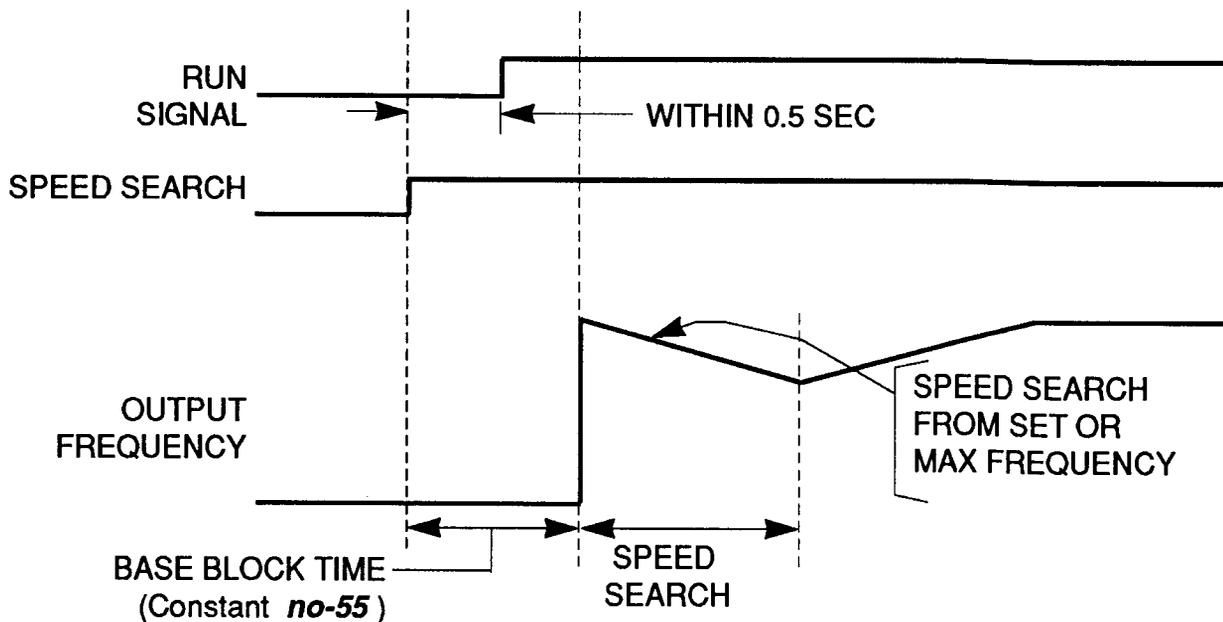
3.25 SPEED SEARCH

<p>Constant no-54</p>	<p>Speed Search Operation Level</p>	<p>Range : 0 to 200 (% of inverter rated current) Factory Setting : 150</p>
<p>Constant no-55</p>	<p>Min. Base Block Time</p>	<p>Range : 0.5 to 5.0 (s) Factory Setting : 0.5</p>
<p>Constant no-56</p>	<p>V/f During Speed Search</p>	<p>Range : 0 to 100 (%) Factory Setting : 100</p>

A multi-function input at terminal 7 or 8 (see paragraph 3.15) is utilized to activate speed search. When the external speed search command is closed, the base is blocked for the amount of time set in constant **no-55**, then the speed search is made.

The operation depends on the set value of the multi-function input constant:

- When speed search from max frequency is selected, the speed search operation begins at maximum frequency and ramps downward until a speed match is recognized (speed coincidence point).
- When speed search from set frequency is selected, the speed search operation begins its downward ramp from the value of the frequency command that has been set after input of the speed search command.



NOTE: When continuous operation mode at momentary stop function is selected, the Speed Search command must be enabled.

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SECTION 4 FAULT/WARNING FUNCTIONS

4.1 GENERAL

The GPD 303's Fault circuit monitors operating parameters and initiates drive shutdown (Fault contacts change state) when allowable limits are exceeded, or provides a warning indication when conditions exist which may lead to a Fault shutdown. The 3-digit LED Monitor on the front of the GPD 303, or the 5-digit display on the Digital Operator (when present), provides a coded display related to the Fault Function or Warning Function which has occurred.

4.2 FAULT FUNCTIONS

FUNCTION	DISPLAY	DESCRIPTION
Undervoltage	<i>U u 1</i>	GPD 303 drive shutdown; main circuit DC voltage was lower than 210V.
Overcurrent	<i>o C</i>	GPD 303 drive shutdown; output current exceeded 200% of GPD 303 rated current.
Grounding	<i>G F</i>	GPD 303 drive shutdown; grounding occurred at GPD 303 output side and grounding current flowed.
Overvoltage	<i>o u</i>	GPD 303 drive shutdown; main circuit DC voltage exceeded 410V.
Fuse Blown	No display	GPD 303 drive shutdown; blown fuse
Fin Overheat	<i>o H</i>	GPD 303 drive shutdown; radiation fin exceeded 90° C.
Overload (Motor)	<i>o L 1</i>	GPD 303 drive shutdown; electronic thermal overload detected.
Overload (Inverter)	<i>o L 2</i>	GPD 303 drive shutdown, electronic overload operated (at 150% for one minute).
Overload (Overtorque)	<i>o L 3</i>	GPD 303 drive shutdown; overtorque detection programmed for shutdown (coast stop), and GPD 303 output current exceeded detection level (constant no-38) for longer than overtorque detection time (constant no-39).
External Fault Signal Input	<i>E F 3</i>	GPD 303 drive shutdown; external fault signal input is present at control circuit terminal 3.
Initial Memory Fault	<i>F 0 0</i> <i>* C P F 0 0</i>	GPD 303 Failure.
Transmission Error	<i>F 0 1</i> <i>* C P F 0 1</i>	GPD 303 Failure.
*** Improper Constant	<i>F 0 4</i> <i>* C P F 0 4</i>	GPD 303 CPU not properly initialized.
A/D Converter Fault	<i>F 0 5</i> <i>* C P F 0 5</i>	GPD 303 Failure.
Thermistor Fault	<i>F 0 7</i> <i>* C P F 0 7</i>	GPD 303 Failure; thermistor short / open is detected.

- NOTES
- * Indicates the Digital Operator display
 - ** Fault can be cleared by performing constant initialization.

4.3 WARNING FUNCTIONS

FUNCTION	DISPLAY	DESCRIPTION
Overtorque Detection	(Blinks) o L 3	Overtorque detection programmed to continue operation after overtorque detection, and GPD 303 output current has exceeded overtorque detection level for longer than overtorque detection time.
FWD / REV Simultaneous On	(Blinks) E F	Motor stops according to selected GPD 303 stopping method, when FWD / REV run commands are closed at the same time. (If either input is removed, motor operation will resume.)
Undervoltage Display	(Blinks) U u	Displayed when main circuit DC voltage is 210V or less while GPD 303 is in stopped condition.
External Base Block	(Blinks) b b	Displayed when external Base Block signal is applied. (Motor operation will resume when Base Block input is removed.)

SECTION 5 TROUBLESHOOTING

5.1 GENERAL

If a fault shutdown of GPD 303 has occurred, locate the cause and take corrective action per the following flowcharts. See paragraph 4.2 for fault indications.

Blown Fuse, or Ground Fault (GF) Indication	Chart 5.1
Overvoltage (ou) Indication	Chart 5.2
Overcurrent (oC) Indication	Chart 5.3
Overload (oL) Indication	Chart 5.4
Undervoltage (Uu) Indication	Chart 5.5
GPD 303 Overheated (oH) Indication	Chart 5.6
Control Function Error (CPF__ or F__) Indication	Chart 5.7
External Fault (EF3) Indication	Chart 5.8

WARNING

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.

WARNING

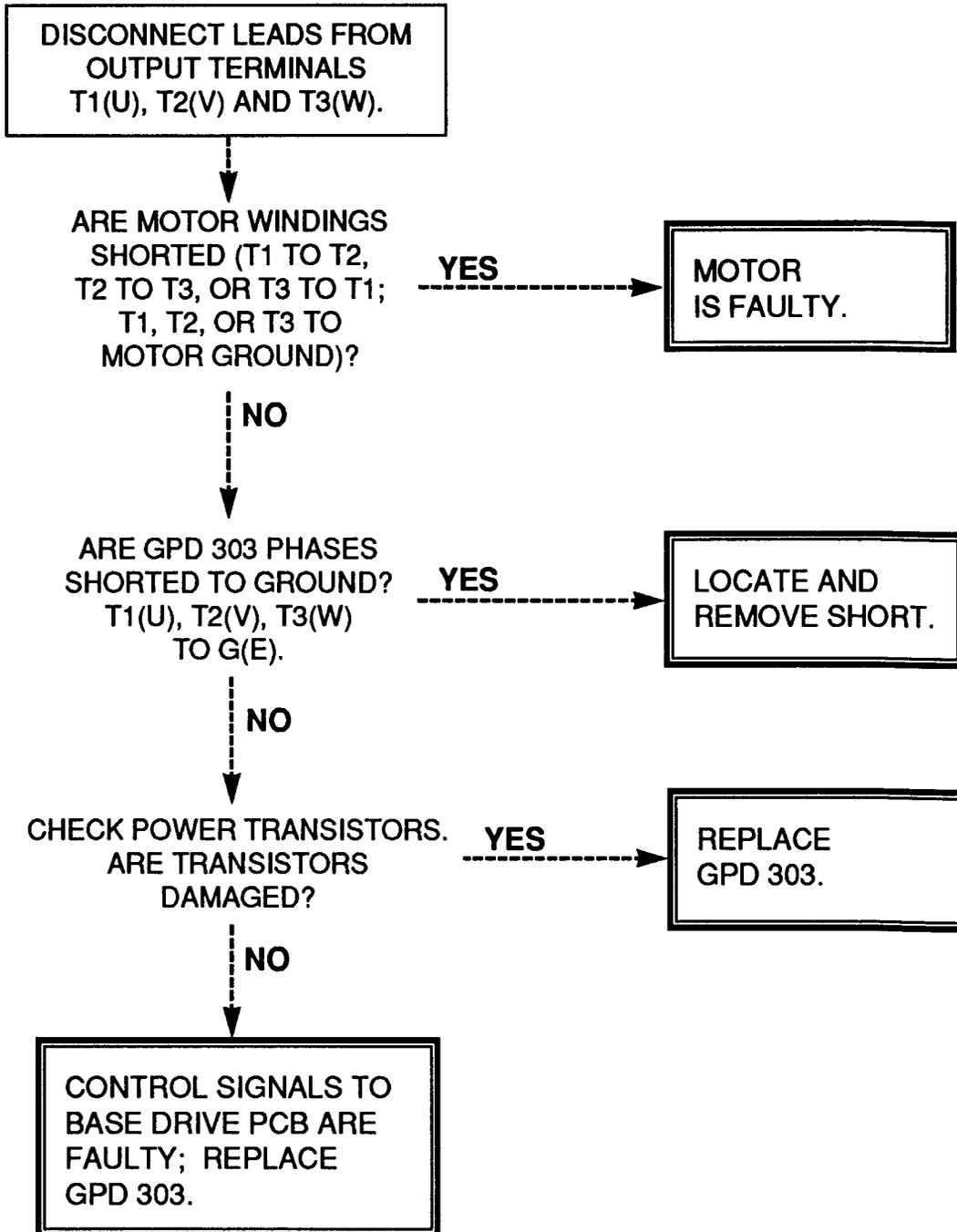
Voltages dangerous to life exist when equipment is open and energized. Do not work alone.

CAUTION

To prevent equipment damage always remove incoming three-phase power before test equipment is connected or removed.

TROUBLESHOOTING CHART 5.1

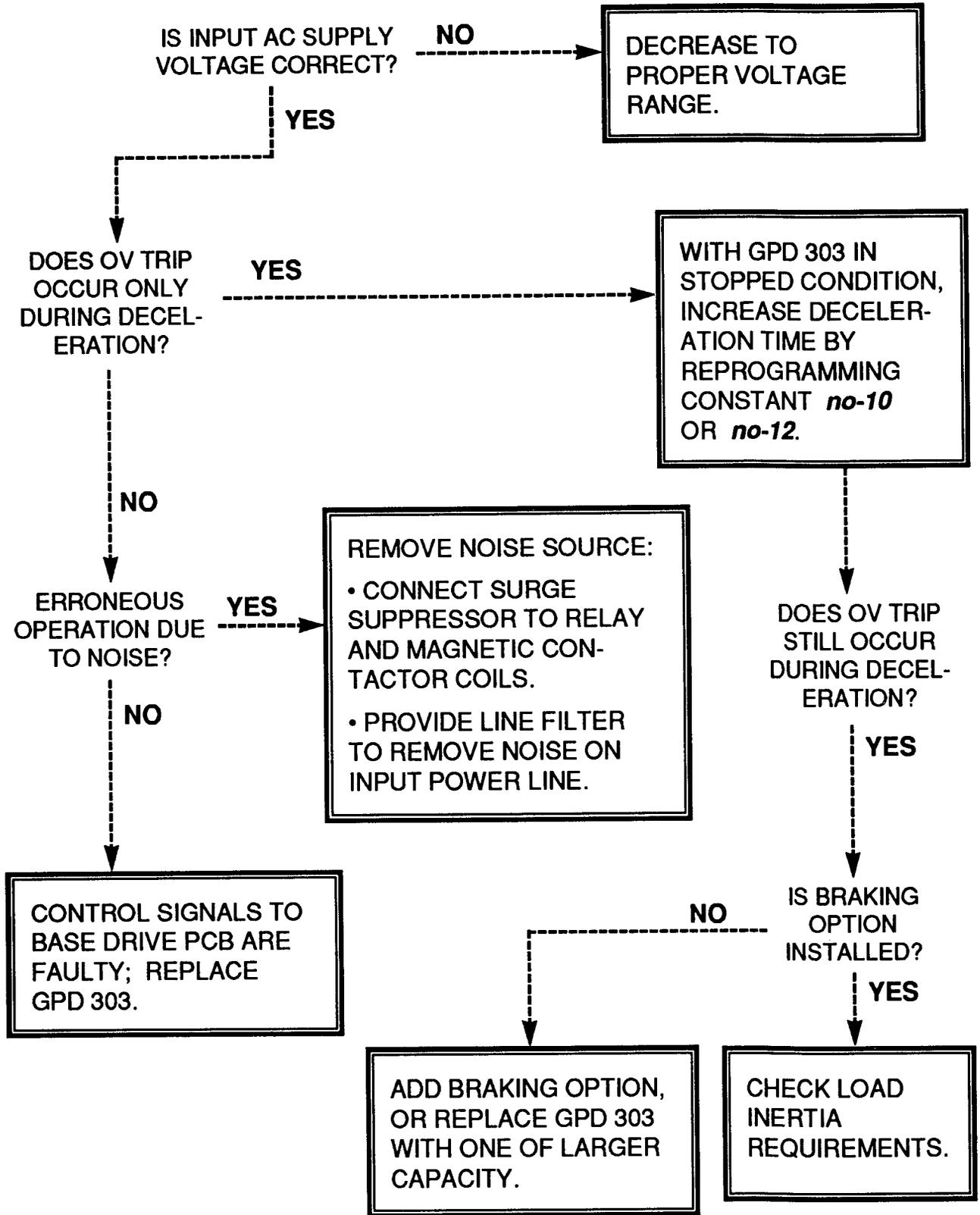
BLOWN FUSE, or GROUND FAULT (GF) INDICATION



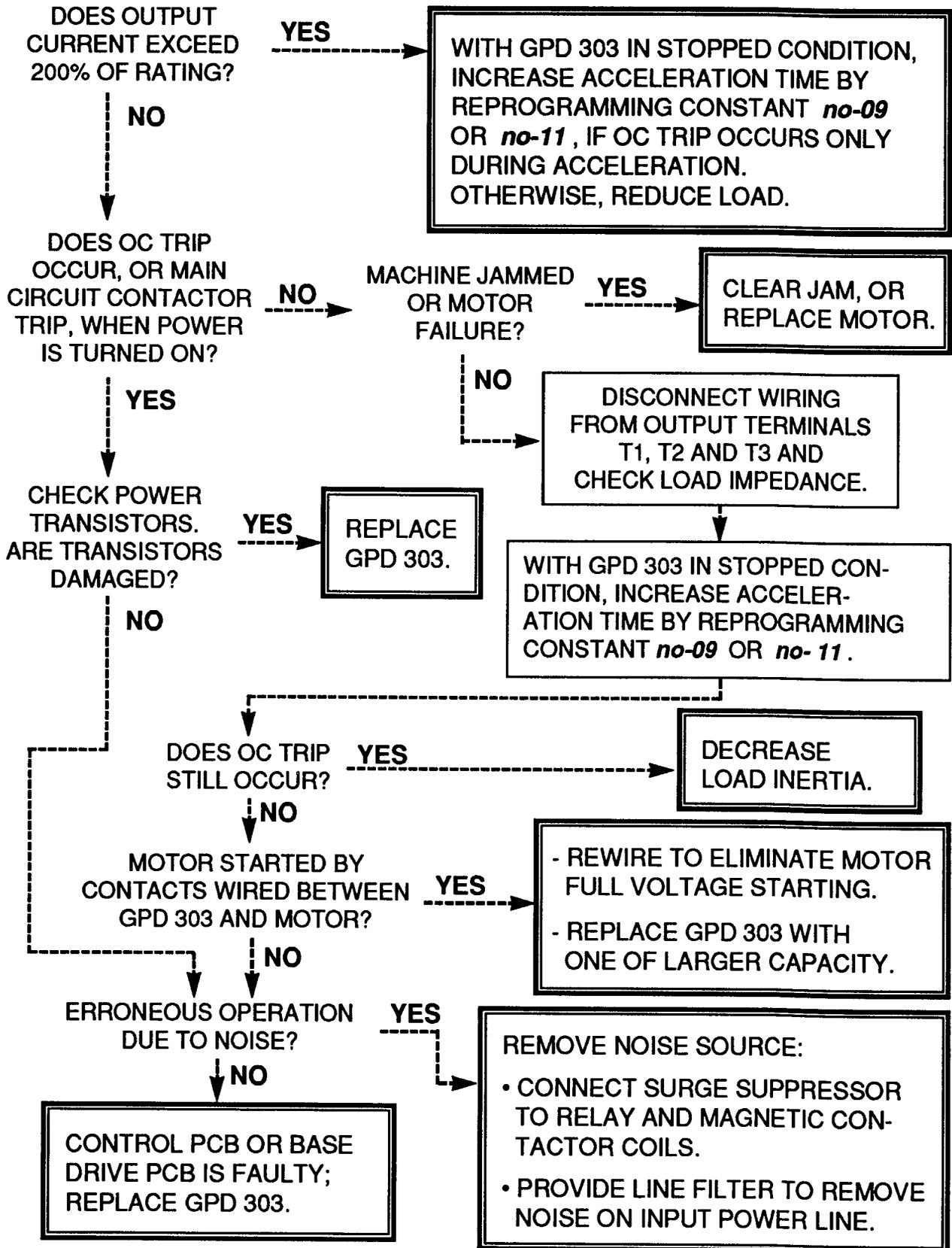
CAUTION
DO NOT REPLACE DC BUS FUSE WITHOUT FIRST CHECKING OUTPUT TRANSISTORS.

TROUBLESHOOTING CHART 5.2

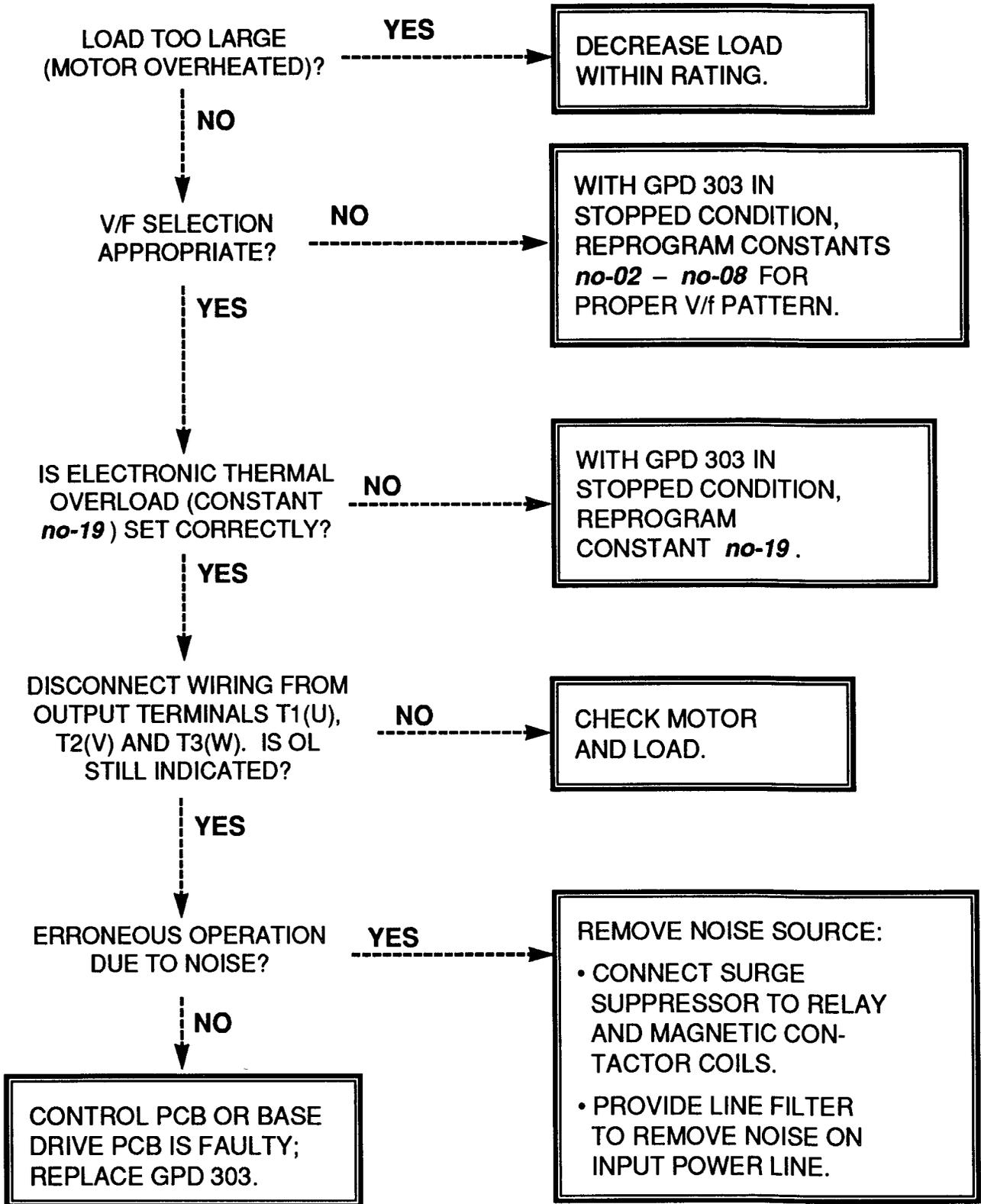
OVERVOLTAGE (*ou*) FAULT INDICATION



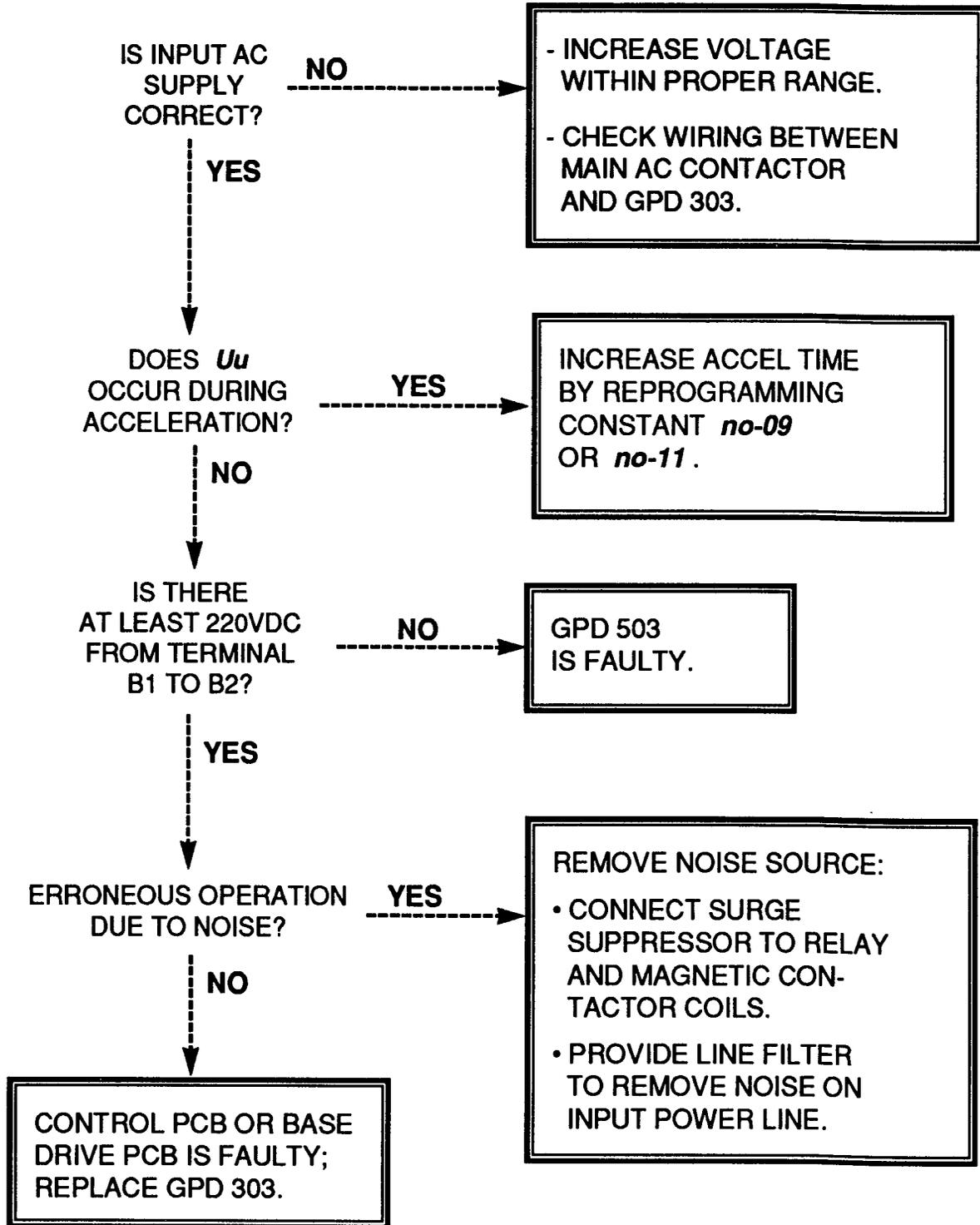
OVERCURRENT (oC) FAULT INDICATION



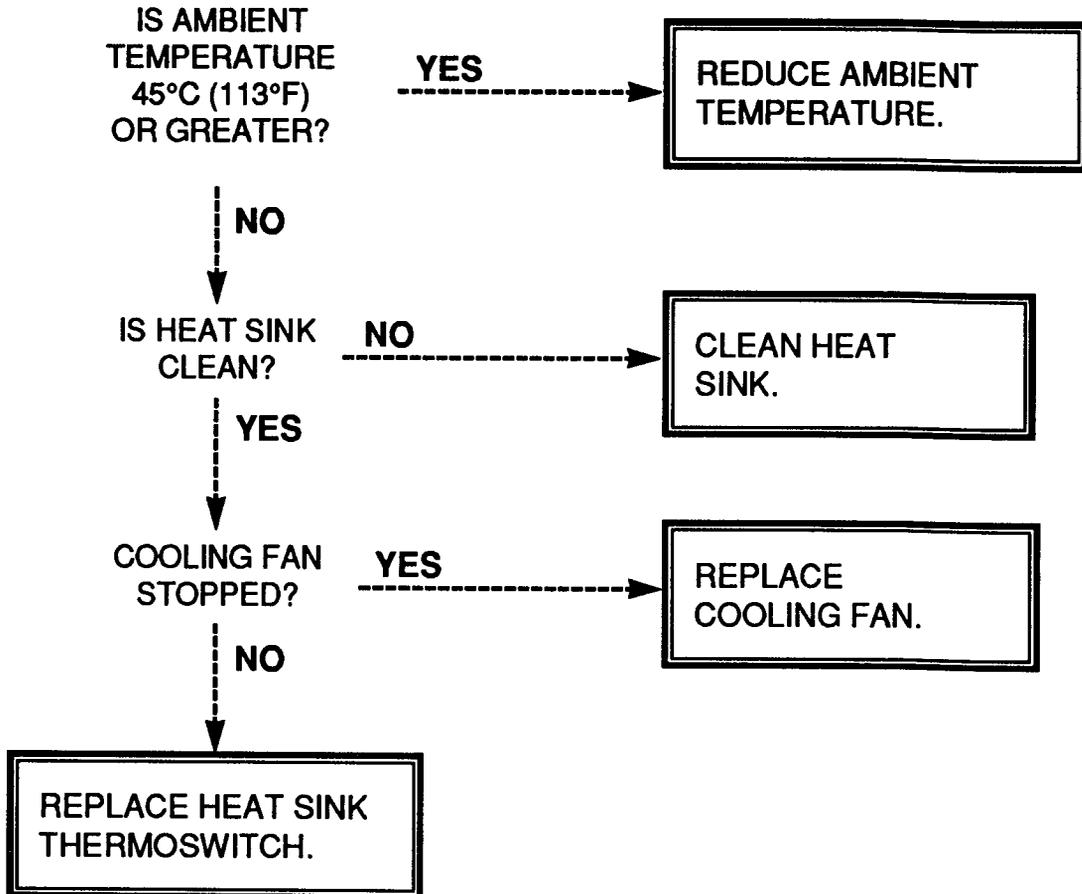
OVERLOAD (oL) FAULT INDICATION



UNDERVOLTAGE (Uu) FAULT INDICATION

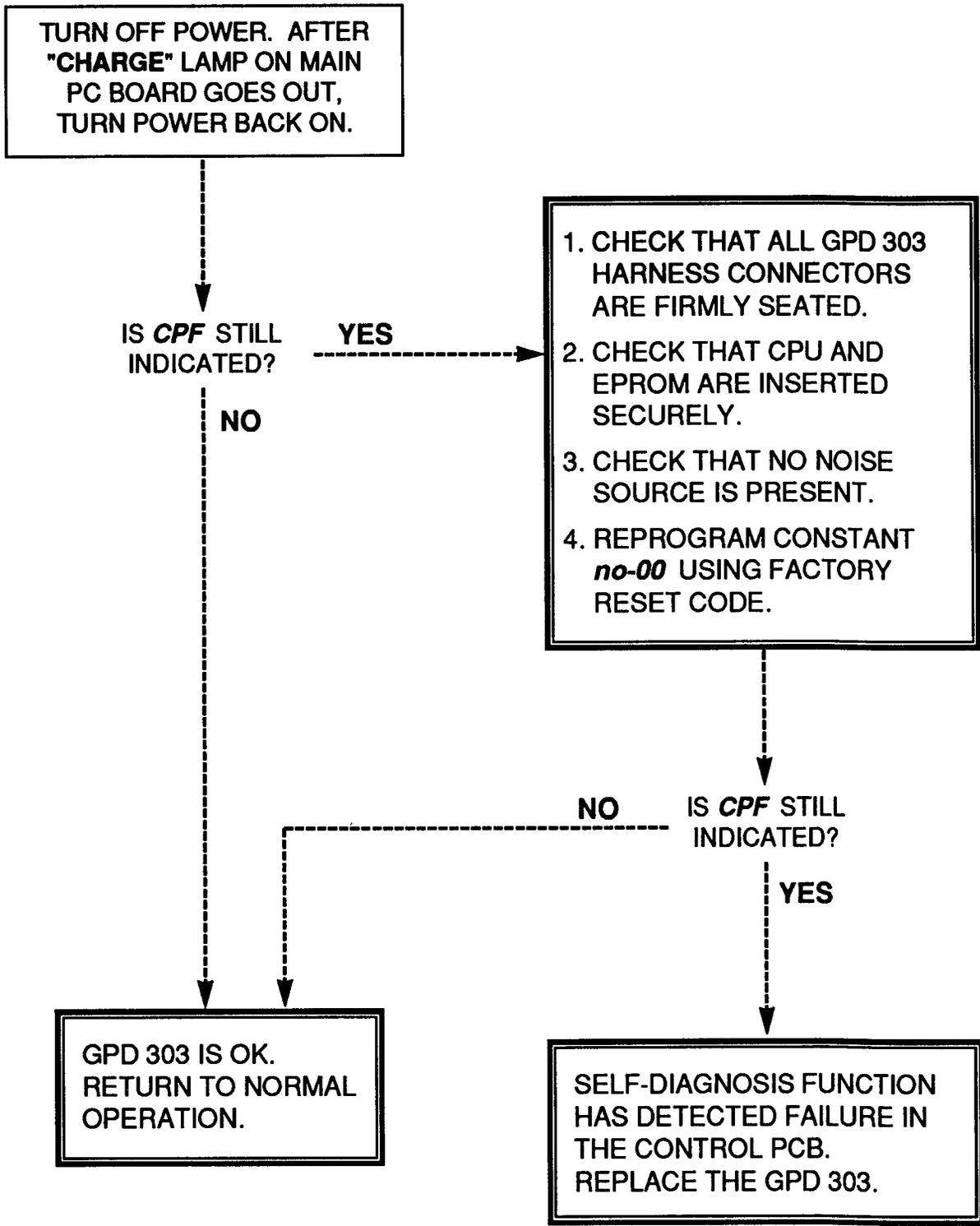


GPD 303 OVERHEATED (*oH*) FAULT INDICATION

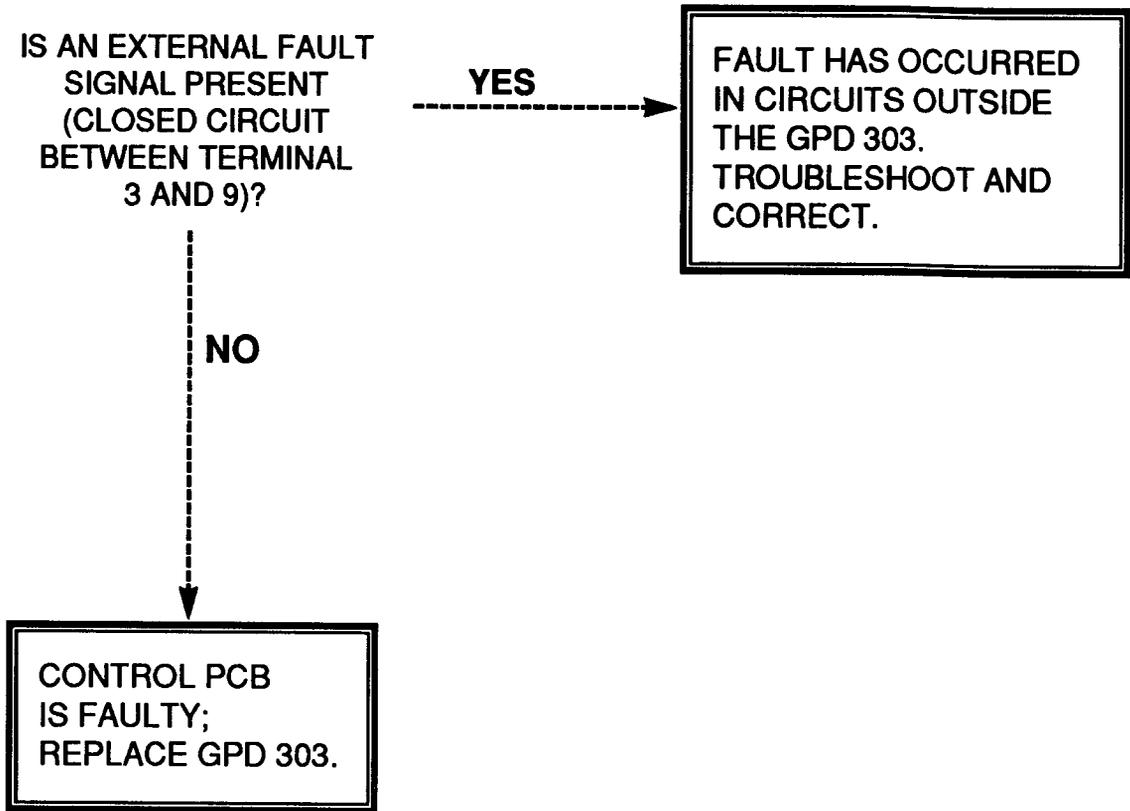


TROUBLESHOOTING CHART 5.7

CONTROL FUNCTION ERROR (CPF__ or F__) FAULT INDICATION



EXTERNAL FAULT (EF3) INDICATION



TO: MagneTek, AutoMotion & Drive Products
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FAX (414) 782-1283

Please send more information on the following MagneTek products:

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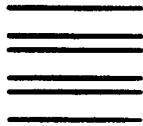
Position/Title _____

Company _____

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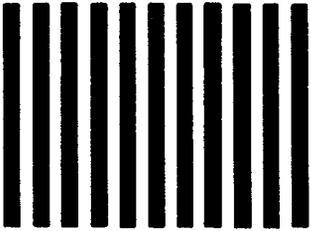
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