MagneTek

GPD 505
Technical Manual

This Manual
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GPD 505 SIMPLIFIED START-UP PROCEDURE

This procedure will quickly get you up and running using the Digital Operator keypad or a user supplied remote operator control. It assumes that the GPD 505 and motor are correctly wired (see pages 1-12 thru 1-15), and start-up is to be performed without any changes to factory set parameters. Detailed information on the many other features of this drive will be found in later sections of this manual.

INSTALLATION

1. Be certain your input voltage source, motor, and drive name plates are all marked either 230V or 460V. Other voltages can be used, but require additional programming; see Section 5.
2. Mount drive on a vertical surface with adequate space for air circulation.
3. Remove front cover with Digital Operator, fit conduit to bottom plate, and connect power and ground wires as shown.

Be certain you connect input power to terminals L1, L2, and L3 only, or serious damage will result. Connect motor to terminals T1, T2, and T3 only.

KEYPAD OPERATION

1. **Replace front cover and Digital Operator and apply input power** - Keypad display shows " ***0.0*** "; **REMOTE SEQ** & **REF** LEDS and **STOP/RESET** LED are on, and **Fref** Function LED is lit.
2. **Select LOCAL Mode by pressing LOCAL/REMOTE key** - **REMOTE SEQ** & **REF** LEDs will go out.
3. **Enter Frequency Reference** - Pressing the “up arrow” key will increase displayed frequency value; pressing the “down arrow” will decrease the displayed value. Increase the frequency reference display to " ***6.0*** " (Hz). Press the **ENTER** key to store or write this value to the drive.
4. **View the Drive Output Frequency** - Press the **DSPL** key once. The **Fref** Function LED will go out, and the **Fout** Function LED will turn on.
5. **Run Forward** - Press the **RUN** key. The motor should run at 10% (6/60) of its base speed; the **RUN** LED will turn on, and the **STOP/RESET** LED will go out.
   NOTE: If the direction of motor rotation is incorrect, press the **STOP/RESET** key. When motor has stopped, remove power, wait for the “CHARGE” light to go out, remove the drive cover and switch the motor leads at terminals T1 & T2. Replace drive cover and re-apply input power.
6. **Change Frequency** - Press the **DSPL** key repeatedly until the **Fref** Function LED turns on. A new frequency reference can be set by using the “up arrow” and “down arrow” keys as in step 3. Note that the drive responds to each new value only after the **ENTER** key is pressed (unless parameter ***n009*** is set to " 0 ", in which case the **ENTER** key-press is not needed).

7. **Reversing** - can be selected either while stopped or while running. With the drive stopped, press the **DSPL** key repeatedly until the **F / R** Function LED turns on, then press the **ENTER** key. Display will read " ***For*** ". Press either the “up arrow” or “down arrow” key to toggle this display to " ***rEu*** ", for reverse motor operation. Then press **ENTER** again to store the new selection. If the drive is running when this change is entered, the drive will decelerate the motor to 0 Hz, then accelerate the motor to the same speed in the opposite direction. This can be done while running, provided your machine can be operated in reverse direction without damage.

8. **Displays** - With the drive stopped, each time the **DSPL** key is pressed, a different function display appears (as indicated by the Function LED which is turned on). The first function on power-up is the **Fref** LED and " ***0.0*** " display, discussed above. Press **DSPL**, and the **Fout** LED turns on and **Fref** goes out; the display now shows output frequency (speed). The next function is **Iout**, and indicates drive output current (in Amps). For more information, refer to Section 4 of this manual.

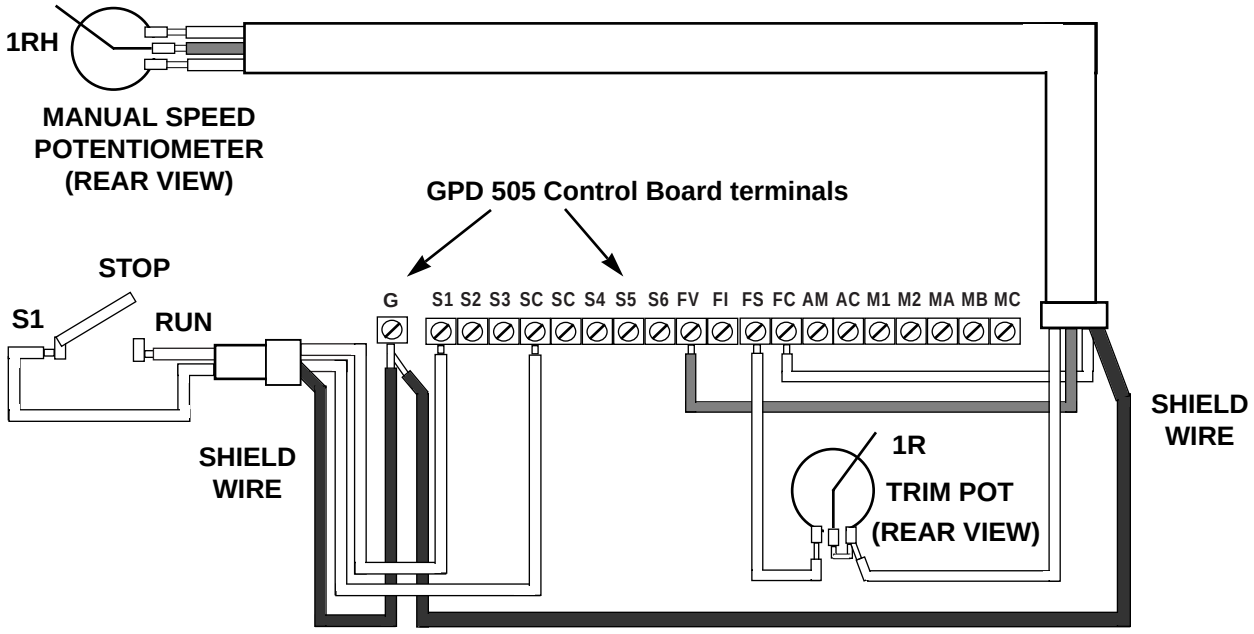
9. **Faults** - If an unacceptable operating condition such as code **Ou** (overvoltage), **Uu** (under-voltage), **OC** (overcurrent), etc. occurs, the drive will trip, and the motor will coast to a stop. The appropriate fault code will be displayed. Examine the fault code; then consult Sections 6 & 7 for fault correction procedure.

INSTALLATION OF EXTERNAL RUN/STOP SWITCH AND SPEED POTENTIOMETERS

IMPORTANT: Complete the INSTALLATION and KEYPAD OPERATION instructions before attempting external control.

1. Disconnect power, remove drive front cover with Digital Operator, and wait for “CHARGE” light to go out.

2. Refer to the diagram below and connect a switch to terminals S1 and SC using two conductor shielded wire. This circuit is 24Vdc, very low current; use a quality rotary or toggle switch (all wire should be 16-20AWG). Connect the shield to terminal G on the drive end only.



3. Connect a manual speed potentiometer rated 2000-3000 ohms, 1 watt minimum, using three conductor shielded wire, with shield connected at terminal G. Connect wires to the potentiometer as shown, viewing potentiometer from the back. Trace wire shown closest to the top in diagram (right side of potentiometer) and connect to terminal FC. Trace center wire of potentiometer through and connect to terminal FV. The remaining wire will be connected to the trim pot in step 4.

4. Connect a trim potentiometer rated 2000-3000 ohms, 1 watt minimum, as close to the drive terminals as possible. Viewing the potentiometer from the back, connect a single conductor wire from the left terminal to terminal FS of the drive. Connect a short jumper wire between the center and right terminals. Connect remaining wire from manual speed pot as shown.

5. Replace drive front cover and Digital Operator. Make sure remote switch S1 is in “Stop” position, then apply power. Note that the **STOP** lamp is on. Press **LOCAL/REMOTE** key, so that the **REMOTE SEQ** & **REF** LEDs turn on.

6. Calibrate manual speed pot for maximum speed at maximum rotation. With switch S1 in the “Stop” position, press **DISPL** key repeatedly until the **Fref** LED turns on. The display will indicate the combined setting of the trim and manual speed pots; it should read " ***60.0*** " with both pots (as viewed from the back) turned to their fully CW (maximum) settings. Turn the trim pot slowly (CCW) until the **Fref** display begins to decrease, then turn it back just enough to display " ***60.0*** ". Now the display should decrease as soon as the manual speed pot is turned slightly CCW.

7. Press **DISPL** key repeatedly until the **Fout** LED turns on. Turn switch S1 to “Run”, and adjust motor speed with manual speed pot.

QUICK REFERENCE FOR GPD 505 PARAMETERS (FACTORY SET)

PARAMETER NUMBER (7)	FACTORY SETTING	USER SETTING	PARA. REF.
n001	1		5.23
n002	3		**p. A1-1**
n003	230.0 (230V) or 460.0 (460V)		5.29 A
n004	0		5.25
n005	0		**p. A1-1**
n006	0		**p. A1-1**
n007	1		**p. A1-1**
n008	1		**p. A1-2**
n009	1		**p. A1-2**
n010	1		5.28
n011	230.0 (230V) or 460.0 (460V) *(2)*		5.29 C
n012	60.0 *(2)*		5.29
n013	230.0 (230V) or 460.0 (460V) *(2)*		**p. A1-2**
n014	60.0 *(2)*		**p. A1-2**
n015	3.0 *(2)*		**p. A1-2**
n016	17.2 *(2)*		**p. A1-2**
n017	1.5 *(2)*		**p. A1-2**
n018	11.5 *(2)*		**p. A1-2**
n019	10.0		5.2
n020	10.0		5.2
n021	10.0		5.2
n022	10.0		5.2
n023	1		5.3
n024	0		5.8
n025	0.0		5.19 B
n026	0.0		5.19 B
n027	0.0		5.19 B
n028	0.0		5.19 B
n029	6.0		5.15
n030	100		5.12
n031	0		5.12
n032	*(1)*		5.26
n033	1		5.26
n034	3		**p. A1-4**
n035	0		5.19
n036	2		5.19
n037	4		5.19
n038	9		5.19
n039	10		5.19
n040	0		5.20
n041	1		5.20
n042	0		5.11
n043	1		5.11
n044	0		5.14
n045	0		5.13
n046	100		5.10
n047	0		5.10
n048	0		5.18
n049	1.00		5.18
n050	*(1)*		5.5
n051	0		5.17
n052	110		5.19 E
n053	*(1)*		5.19 E
n054	*(1)*		5.19 E
n055	*(1)*		5.17
n056	0		5.4
n057	0		5.4
n058	0.0		5.6
n059	0.0		5.6
n060	1.0		5.6
n061	1		**p. A1-7**
n062	*(5)*		4.4
n063	*(5)*		4.4
n064	50		5.7
n065	0.0		5.7
n066	0.0		5.7
n067	1.0		5.27
n068	*(1)*		5.27
n069	*(1)*		5.27
n070	1		5.24
n071	170		5.24
n072	160		5.24
n073	0.0		5.20
n074	0		5.21
n075	160		5.21
n076	0.1		5.21
n077	0.0		5.19 F
n078	0.0		5.19 F
n079	0		*(4)*
n080	7		5.30
n081	8		5.30
n082	0		5.31
n083	0.2		5.21
n084	0		5.22 A
n085	1.00		5.22 D
n086	1.0		5.22 F
n087	10.0		5.22 F
n088	0.00		5.22 F
n089	0		5.22 G
n090	100		5.22 G
n091	0.0		5.22 G
n092	0		5.22 E
n093	0		5.22 E
n094	1.0		5.22 E
n095	0		5.9
n096	*(1)*		5.9
n097	50		5.9
n098	12		5.9
n099	1		5.9
n100	0		5.9
n101	0.5		5.9
n102	0.2		5.9
n103	1		5.16
n104	1		5.16
n105	0		5.16
n106	0		5.16
n107	2		5.16
n108	1		5.16
n109	0.0		5.23.1
n110	30		5.26
n111	2.0		5.23.1
n112	0		5.16.1
n113	2.0		5.20
n114	0		5.15.1
n115	*(1)*		A3-1
n116	*(1)*		A1-11
n117	6.0		
n118	50		

(1) Factory setting depends on GPD 505 rating. See Table A3-1.
(2) Initial value is related to V/f curve selected by ***n010*** setting.
(3) Motor rated current (***n032***) is factory set at to a value related to the drive rating (see Table A3-1). User must program this parameter to the actual FLA of the motor being used. See “Thermal Overload Protection”, on page 5-50.
(4) Only effective when Dynamic Braking components are wired to drive terminals; see Appendix 7.
(5) The user cannot program these two parameters. They are used for the automatic Elapsed Timer function of the drive; see paragraph 4.4.

Current Ratings & Horsepower Range

RATED INPUT	CURRENT RATING (AMPS)	NOMINAL HORSEPOWER (120% OL)	MODEL NO. GPD505V-
2 3 0 V	3.2	0.75	A003
	6	1 / 1.5	A006
	8	2	A008
	11	3	A011
	17.5	5	A017
	27	7.5 / 10	A027
	36	15	A036
	54	20	A054
	68	25	A068
	80	30	A080
	104	40	A104
	130	50	A130
	160	60	A160
	192	75	A192
	248	100	A248
	312	125	A312
4 6 0 V	1.8	0.75	B001
	3.4	1 / 2	B003
	4.8	3	B004
	8	5	B008
	11	7.5	B011
	14	10	B014
	21	15	B021
	27	20	B027
	34	25	B034
	41	30	B041
	52	40	B052
	65	50	B065
	80	60	B080
	96	75	B096
	128	100	B128
	180	125 / 150	B180
	240	200	B240
	302	250	B302
	380	300	B380
	506	350 / 400	B506
	675	500	B675

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

Know your application before using either Initialization function of *n001* . This parameter must be set to " 0 ", " 1 ", " 2 ", or " 3 " to operate the drive. (See paragraph 5.23 for additional information.)

8 = Factory 2-Wire Control Initialization (Maintained RUN Contact)

9 = Factory 3-Wire Control Initialization (Momentary START/STOP Contact)

Entering either Initialization code resets all parameters, and automatically returns *n001* setting to " 1 ". If the GPD 505 is connected for 3-Wire control and this constant is set to " 8 " (2-Wire Control Initialization), the motor may run in reverse direction WITHOUT A RUN COMMAND APPLIED. Equipment damage or personal injury may result.

CAUTION

When drive is programmed for auto-restart (*n056* = " 1 " – " 10 "), the motor may restart unexpectedly — personal injury may result.

IMPORTANT

Wiring should be performed only by qualified personnel.

Always ground the GPD 505 using ground terminal (⏚). See paragraph 1.4.3, "Grounding".

Verify that the rated voltage of the drive matches the voltage of the incoming power.

Never connect main circuit output terminals T1, T2, and T3 to AC main circuit power supply.

All parameters have been factory set. Do not change their settings unnecessarily.

Do not perform a "HIPOT" or withstand voltage test on any part of the GPD 505. Equipment uses semi-conductors and is vulnerable to high voltage.

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

Any modification of the product by the user is not the responsibility of MagneTek, and will void the warranty.

Data subject to change without notice.

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Section 1. RECEIVING AND INSTALLATION

1.1 GENERAL

The GPD 505 is a high performance sine-coded pulse width modulated special purpose AC motor drive which generates an adjustable voltage/frequency three phase output for complete speed control of most conventional squirrel cage induction motors. Automatic stall prevention and voltage boost prevents nuisance tripping during load or line side transient conditions. The GPD 505 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 505 will provide a lifetime of service. It is mandatory that the person who operates, inspects, or maintains this equipment thoroughly read and understand this manual before proceeding.

This manual primarily describes the GPD 505, but contains basic information for the operator control station as well. For details of the operation of other units in the drive system, refer to their respective manuals.

1.2 RECEIVING

The GPD 505 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.

If the drive will be stored after receiving, keep it in its original packaging and store according to storage temperature specifications in Appendix 2.

1.3 PHYSICAL INSTALLATION

Location of the GPD 505 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.

When preparing to mount the GPD 505, lift it by its base, ***never*** by the front cover. For effective cooling as well as proper maintenance, the GPD 505 must be installed on a flat, non-flammable vertical surface (wall or panel) using four mounting screws. There MUST be a MINIMUM 4.7 in. clearance above and below the GPD 505 to allow air flow over the heat sink fins. A minimum 1.2 in. clearance is required on each side on the GPD 505.

A GPD 505 in a free-standing floor-mount cabinet must be positioned with enough clearance for opening the door of the cabinet; this will ensure sufficient air space for cooling. Make sure air entering the drive is below 113°F (45°C) (for protected chassis drives), or below 104°F (40°C) (for NEMA 1 drives), by adding a fan or other cooling device, if needed. See environmental specifications in Appendix 2.

1.4 ELECTRICAL INSTALLATION

All basic interconnections (using the Digital Operator) are shown in Figures 1-3 and 1-4.

1.4.1 Main Circuit Input/Output

Complete wiring interconnections for the main circuit according to Tables 1-1 and 1-2, while observing the following:

- Use 600 V vinyl-sheathed wire or equivalent. Wire size should be determined considering voltage drop of leads.

- NEVER connect AC main power to output terminals T1 (U), T2 (V), and T3 (W).

- NEVER allow wire leads to contact metal surfaces. Short-circuit may result.

- NEVER connect power factor correction capacitors or noise filters to GPD 505 output.

- SIZE OF WIRE MUST BE SUITABLE FOR CLASS I CIRCUITS.

- It is recommended that motor lead length NOT EXCEED 164 feet (50 meters), and motor wiring should be run in a separate conduit from the power wiring. If lead length must exceed this distance, reduce carrier frequency (see paragraph 5.5) and consult factory for proper installation procedures.

- Use UL listed closed loop connectors or CSA certified ring 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	CLAMPING TORQUE			
				STEEL		COPPER	
AWG	mm^2			lb-in	N-m	lb-in	N-m
20	0.5	M3.5	1.25 - 3.5	7.8	0.9	7.0	0.8
18	0.75	M4	1.25 - 4	13.0	1.5	10.4	1.2
16	1.25	M4	1.25 - 4	13.0	1.5	10.4	1.2
14	2	M4	2 - 4	13.0	1.5	10.4	1.2
		M5	2 - 5	26.1	2.9	3.1	0.4
12	3.5	M4	3.5 - 4	13.0	1.5	10.4	1.2
		M5	3.5 - 5	26.1	2.9	3.1	0.4
10	5.5	M4	5.5 - 4	13.0	1.5	10.4	1.2
		M5	5.5 - 5	26.1	2.9	3.1	0.4
8	8	M5	8 - 5	26.1	2.9	3.1	0.4
		M6	8 - 6	40.9	4.6	4.8	0.5
6	14	M6	14 - 6	40.9	4.6	4.8	0.5
4	22	M8	22 - 8	100.0	11.3	11.7	1.3
2	38	M8	38 - 8	100.0	11.3	11.7	1.3
		M10	38 - 10	182.6	20.6	21.4	2.4
1/0	60	M10	60 - 10	182.6	20.6	21.4	2.4
3/0	80	M10	80 - 10	182.6	20.6	21.4	2.4
4/0	100	M10	100 - 10	182.6	20.6	21.4	2.4
		M12	100 - 12	313.0	35.4	36.7	4.2
MCM300	150	M12	150 - 12	313.0	35.4	36.7	4.2
MCM400	200	M12	200 - 12	313.0	35.4	36.7	4.2
MCM650	325	M12	325 - 12	313.0	35.4	36.7	4.2

Table 1-1. Wire Sizing For Main Circuit

SECTION A. 230V				
DRIVE MODEL NO. GPD505V–	TERMINAL SYMBOL	TERMINAL SCREW	WIRE SIZE	
			AWG	mm^2
A003, A006	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W), ⏚	M4	14 - 10	2 - 5.5
A008	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M4	14 - 10	2 - 5.5
	⏚	M4	12 - 10	3.5 - 5.5
A011	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W), ⏚	M4	12 - 10	3.5 - 5.5
A017	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W), ⏚	M4	10	5.5
A027, A036	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M5	8	8
	⏚	M5	10 - 8	5.5 - 8
A054	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, ⊕3, T1 (U), T2 (V), T3 (W)	M6	4	22
	⏚	M6	8	8
A068	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, ⊕3, T1 (U), T2 (V), T3 (W)	M8	3	30
	⏚	M6	8	8
A080	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M8	3	30
	⏚	M8	6	14
A104	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M8	2	38
	⏚	M8	6	14
A130	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M10	4/0	100
	⏚	M8	4	22
A160	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M10	1/0 x 2P	60 x 2P
	⏚	M8	4	22
A192	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M10	1/0 x 2P	60 x 2P
	⏚	M8	4	22
A248	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M10	1/0 x 2P	60 x 2P
	⏚	M8	3	30
A312	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M12	4/0 x 2P	100 x 2P
	⏚	M8	1	50
Section B. 460V				
DRIVE MODEL NO. GPD505V–	TERMINAL SYMBOL	TERMINAL SCREW	WIRE SIZE	
			AWG	mm^2
B001	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W), ⏚	M4	14 - 10	2 - 5.5
B003, B004, B008	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M4	14 - 10	2 - 5.5
	⏚	M4	12 - 10	3.5 - 5.5
B011	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M4	14 - 10	2 - 5.5
	⏚	M4	12 - 10	3.5 - 5.5

Table 1-1. Wire Sizing For Main Circuit - Continued

Section B. 460V - Continued				
DRIVE MODEL NO. GPD505V–	TERMINAL SYMBOL	TERMINAL SCREW	WIRE SIZE	
			AWG	mm^2
B014	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M4	12 - 10	3.5 - 5.5
	⏚	M4	12 - 10	3.5 - 5.5
B021	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M4	8 - 6	8 - 14
	⏚	M4	8 - 6	8 - 14
B027	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M5	8 - 6	8 - 14
	⏚	M6	8	8
B034	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕2, B1, B2, T1 (U), T2 (V), T3 (W)	M5	8 - 6	8 - 14
	⏚	M6	8	8
B041	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M6	6	14
	⏚	M8	8	8
B052	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M6	4	22
	⏚	M8	8	8
B065	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M8	4	22
	⏚	M8	8	8
B080	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M8	3	30
	⏚	M8	6	14
B096	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M8	1	50
	⏚	M8	6	14
B128	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M10	4/0	100
	⏚	M8	4	22
B180	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M10	1/0 x 2P	60 x 2P
	⏚	M8	4	22
B240	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M10	1/0 x 2P	60 x 2P
	⏚	M8	3	30
B302	L1 (R), L2 (S), L3 (T), L11, L21, L31, T1 (U), T2 (V), T3 (W)	M12	4/0 x 2P	100 x 2P
	⏚	M8	1	50
B380	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕3, T1 (U), T2 (V), T3 (W)	M16	MCM650 x 2P	325 x 2P
	⏚	M8	1	50
	I1 (r), I2 200 (s200), I2 400 (s400)	M4	20 - 10	0.5 - 5.5
B506	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕3, T1 (U), T2 (V), T3 (W)	M16	MCM650 x 2P	325 x 2P
	⏚	M8	1/0	60
	I1 (r), I2 200 (s200), I2 400 (s400)	M4	20 - 10	0.5 - 5.5
B675	L1 (R), L2 (S), L3 (T), ⊖, ⊕1, ⊕3, T1 (U), T2 (V), T3 (W)	M16	MCM650 x 2P	325 x 2P
	⏚	M8	1/0	60

Table 1-2. Terminal Functions and Voltages of Main Circuit

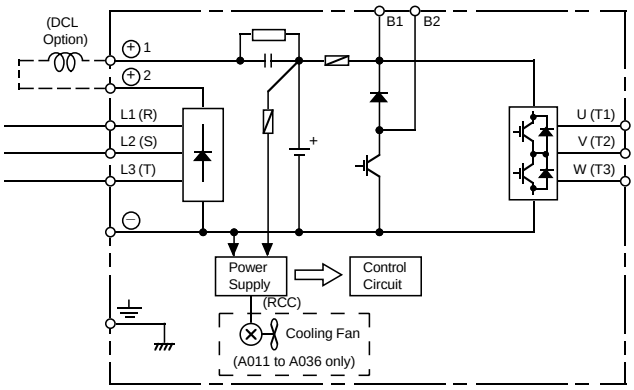
SECTION A. 230V			
TERMINAL	**FUNCTION**		
	A003 - A036	**A054 - A068**	**A080 - A312**
L1 (R) L2 (S) L3 (T)	Three phase Main circuit input power supply 200 / 208 / 220V at 50 Hz; 200 / 208 / 220 / 230V at 60 Hz		
L11 L21 L31	– – – – – –		Three phase Main circuit input power supply (same as at L1, L2 & L3)
T1 (U) T2 (V) T3 (W)	Three phase AC output to motor 0V to max. input voltage level		
B1 B2	DB Unit terminals (B1 & B2)	– – – – – –	
⊖ ⊕1 ⊕2	DC Reactor terminals (⊕1 & ⊕2) DC Bus terminals (⊕1 & ⊖)		– – – – – –
⊕3	– – – – – –	DB Unit terminals (⊕3 & ⊖) *	– – – – – –
⏚	Ground terminal (100 ohms or less)		

SECTION B. 460V			
TERMINAL	**FUNCTION**		
	B001 - B034	**B041 - B302**	**B380 - B675**
L1 (R) L2 (S) L3 (T)	Three phase Main circuit input power supply 380 / 400 / 415 / 460V at 50/60 Hz		
L11 L21 L31	– – – – – –	Three phase Main circuit input power supply (same as at L1, L2 & L3)	– – – – – –
T1 (U) T2 (V) T3 (W)	Three phase AC output to motor 0V to max. input voltage level		
B1 B2	DB Unit terminals (B1 & B2)	– – – – – –	
⊖ ⊕1 ⊕2	DC Reactor terminals (⊕1 & ⊕2) DC Bus terminals (⊕1 & ⊖)	– – – – – –	
⊕3	– – – – – –		DB Unit terminals (⊕3 & ⊖)
l_1 (r) l_2 200 (s200) l_2 400 (s400)	– – – – – –		Power for heat sink fan: l_1 to l_2 200: 230 Vac l_1 to l_2 400: 460 Vac
⏚	Ground terminal (10 ohms or less)		

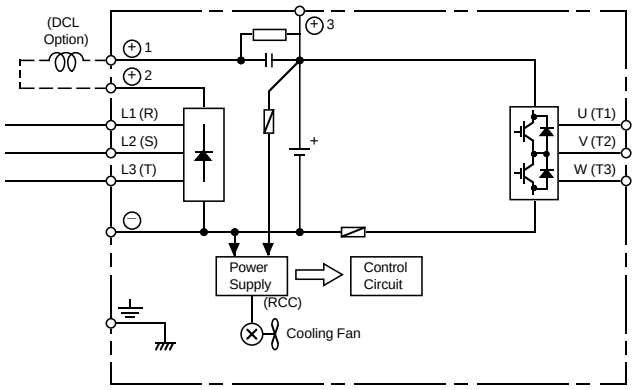
– – – – – indicates that terminals are not present.

Main Circuit Configuration Block Diagrams 230V

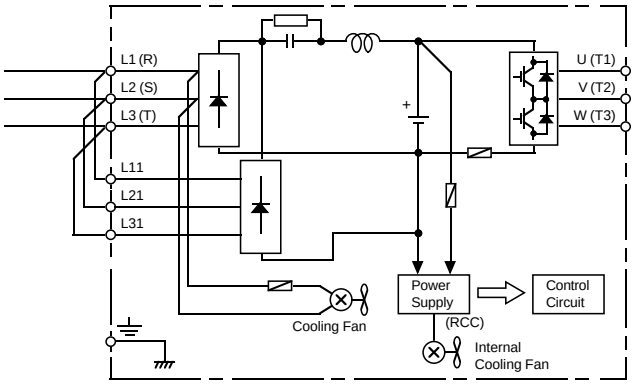
GPD505V-A003 to -A036



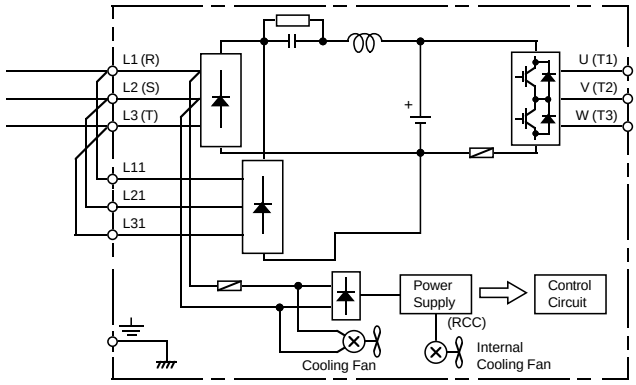
GPD505V-A054 to -A068



GPD505V-A080 to -A104

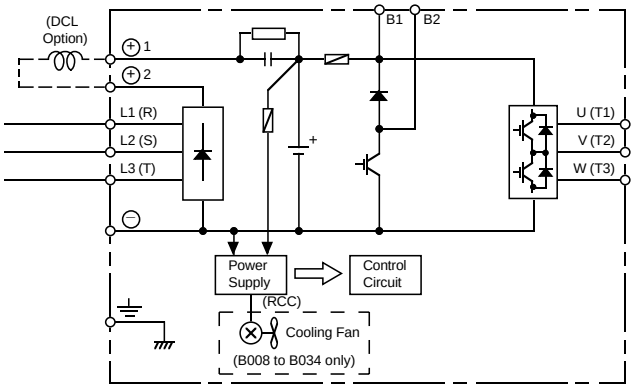


GPD505V-A130 to -A312

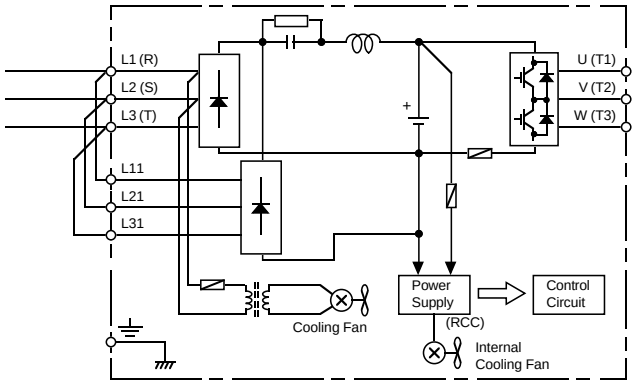


Main Circuit Configuration Block Diagrams 460V

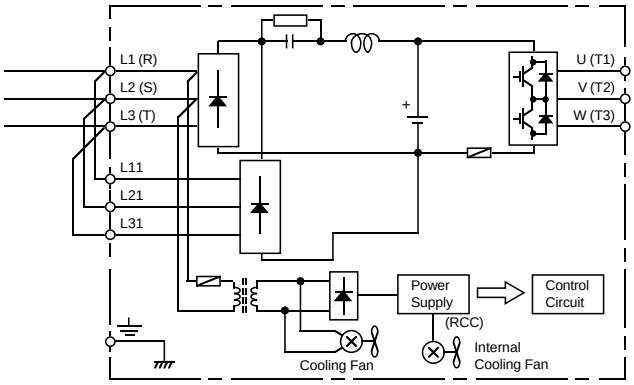
GPD505V-B001 to -B034



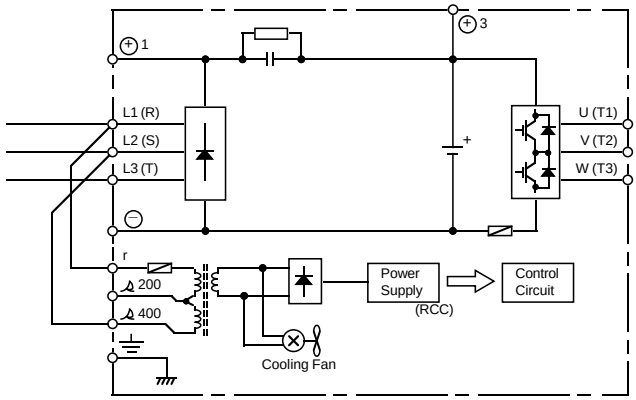
GPD505V-B041 to -B096



GPD505V-B128 to -B302



GPD505V-B380 to -B675



When using DC input as main circuit power, connect control power transformer terminals (r, s400) to L1 and L2, respectively.

1.4.2 Control Circuit

All basic control circuit (signal) interconnections are shown in the appropriate diagram:

- Interconnections for external two-wire control in combination with the Digital Operator are shown in Figure 1-3 (for 230V or 460V rated drives).

- Interconnections for external three-wire control in combination with the Digital Operator are shown in Figure 1-4 (for 230V or 460V rated drives).

Make wiring connections according to Figures 1-1 thru 1-4 and Table 1-3, observing the following :

- Signal Leads : Terminals S1-S6 & SC; FS, FV, FI, FC & G; and AM & AC.

- Control Leads : Terminals M1 & M2 and MA, MB & MC.

- Power Leads : Input Terminals L1 (R), L2 (S), and L3 (T), and Output Terminals T1 (U), T2 (V), and T3 (W).

- Use twisted shielded or twisted-pair shielded wire (20-16 AWG (0.5-1.25mm^2)) for control and signal circuit leads. Use twisted shielded or twisted-pair shielded wire (20-14 AWG (0.5-2mm^2)) for shield sheath terminal (terminal G). When using shielded wire, the shield sheath MUST be connected at the GPD 505 ONLY (terminal G). The other end should be dressed neatly and left unconnected (floating). See Figure 1-1.

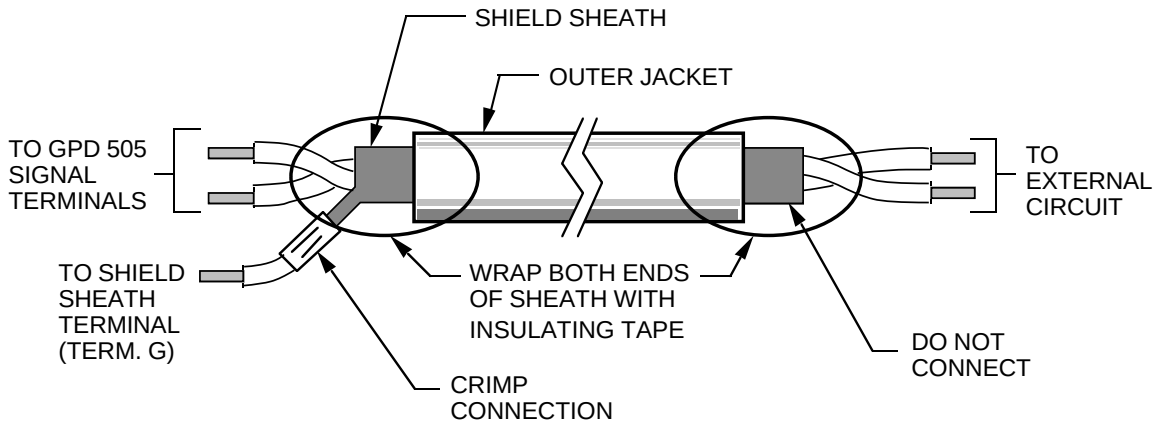


Figure 1-1. Shielded Sheath Termination

Table 1-3. Terminal Functions and Signals of Control Circuit

TERMINAL	FUNCTIONS		DESCRIPTION / SIGNAL LEVELS
S1	2-WIRE CONTROL: Forward Run / Stop signal (See NOTE 1)		Run at closed, stop at open (See NOTE 2)
	3-WIRE CONTROL: Run signal		Run at closed (See NOTE 2)
S2	2-WIRE CONTROL: Reverse Run / Stop signal (See NOTE 1)		Run at closed, stop at open (See NOTES 2 & 3)
	3-WIRE CONTROL: Stop signal		Stop at open (See NOTES 2 & 3)
S3	External fault input		Fault at closed (see NOTES 2 & 3). When the External Fault input is applied, the GPD 505's Fault relay trips (shutdown) and the motor coasts to a stop. The Digital Operator displays " ***EF3*** " failure.
S4	Fault Reset input (external)		Fault Reset at closed (see NOTES 2 & 3). The Fault Reset input will reset the Fault relay, if the GPD 505 is in "stopped" condition. Both Forward Run/Stop signal and Reverse Run/Stop signal must be OPEN.
S5	Multi-step Speed Reference 1		Effective when closed (See NOTES 2 & 3)
S6	Multi-step Speed Reference 2		Effective when closed (See NOTES 2 & 3)
SC	Sequence control input common for terminals S1-S6.		Sequence control input 0 V
M1 **M2**	Multi-function contact output (N.O.). One of 18 functions are available, by setting of parameter ***n041*** .		Contact capacity: 250 Vac at 1A or below 30 Vdc at 1A or below
G	Connection for shield sheath of signal leads		– – – –
FS	Frequency reference power supply		+15V (Control power supply for frequency setting: max 20 mA)
FV	Frequency reference analog input (voltage); auto input – can be changed to manual by setting of parameter ***n042*** .		0 to +10V/100% (20K ohms) **See paragraph 5.11.**
FI	Frequency reference analog input (current); can be changed to voltage input by setting of parameter ***n043*** , and status of jumper J1.		4-20mA/100% (250 ohms) **See paragraph 5.11.**
FC	Frequency reference analog input common		0 V
MA	Multi-function contact output (N.O./N.C.). One of 18 functions are available, by setting of parameter ***n040*** .	Closed at fault	Contact capacity: 250 Vac at 1A or below 30 Vdc at 1A or below
MB		Open at fault	
MC		Common	

Table 1-3. Terminal Functions and Signals of Control Circuit - Continued

TERMINAL	FUNCTIONS	DESCRIPTION / SIGNAL LEVELS	
AM	Multi-function analog monitor (+)	Output current or output frequency is selectable	Type of analog signal (operating parameter) to be output is selected by setting of parameter ***n048*** . Monitor output: 0 to +11V; 2 mA maximum
AC	Multi-function analog monitor (-)		

NOTES:

1. When Forward Run and Reverse Run inputs are both closed for more than 500 ms, the Digital Operator displays a blinking " ***EF*** " alarm code and the motor (if rotating) is decelerated by the GPD 505 to a stop. This stop condition is not stored by the GPD 505 (on Digital Operator, red LED at **STOP** key does not light); **IF ONE OF THE INPUTS IS OPENED, THE MOTOR WILL IMMEDIATELY START UP AGAIN.**

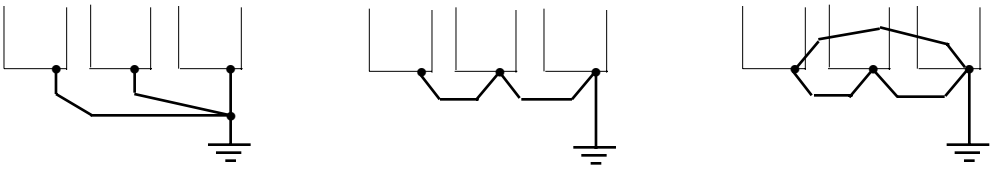
2. Terminals S1-S6 source +24 Vdc (8mA max.) and operate in a Low = True (ON) configuration when connected to terminal SC.

   When using relays for input to terminals S1-S6, use relays with highly reliable contacts (for very small current) with a capacity of 30 Vdc or more and rated current of 100mA or higher. When using transistor (open collector) input, use transistors with rated voltage of 35 Vdc or more and rated current of 100mA or more.

3. These terminals are multi-function inputs. The indicated functions are their settings, based on a 2-Wire reset. For 3-Wire reset definitions, and other settings, see descriptions for "Multi-Function Input Terminals", parameters ***n035*** thru ***n039*** , in paragraph 5.19.

1.4.3 Grounding

- The GPD 505 must be solidly grounded using main circuit ground terminal ⏚. Ground resistance should be 100 ohms or less. Select lead size suitable for size of terminal screw (refer to Table 1-1). Make the length as short as possible.
- NEVER ground the GPD 505 in common with welding machines, motors, or other large-current electrical equipment.
- Where several GPD 505s are used, ground each directly or daisy-chain to the ground pole(s). DO NOT FORM A LOOP WITH THE GROUND LEADS.

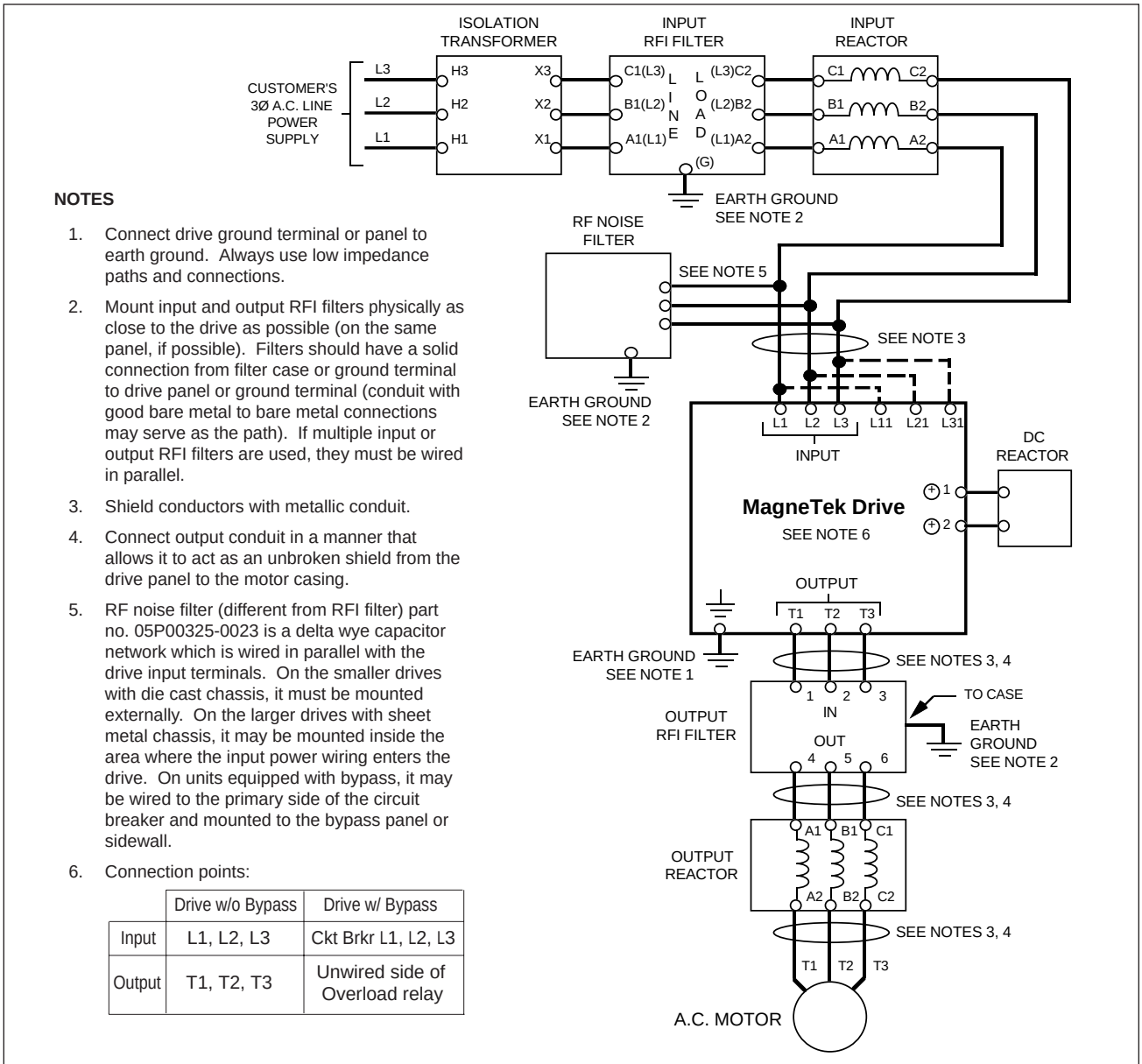


CORRECT CORRECT NOT ACCEPTABLE

1.4.4 Auxiliary Input and Output Power Option Devices

Figure 1-2 is a factory guideline for proper wiring practices and relative locations within the electrical path from the line to the load. It does not imply what devices are needed for a particular application, nor does it show what devices were shipped with a particular order. Therefore, disregard those items in the diagram which are not being used in your installation. However, it ***is*** recommended that an input or DC reactor be used with models GPD505V-A003 thru -A068 and -B001 thru -B034 when wired to a source of 600 kVA or greater. Mount all power option devices as close to the drive, and keep electrical connections as short as possible.

DO NOT run input and output wiring in the same conduit.



NOTES

1. Connect drive ground terminal or panel to earth ground. Always use low impedance paths and connections.
2. Mount input and output RFI filters physically as close to the drive as possible (on the same panel, if possible). Filters should have a solid connection from filter case or ground terminal to drive panel or ground terminal (conduit with good bare metal to bare metal connections may serve as the path). If multiple input or output RFI filters are used, they must be wired in parallel.
3. Shield conductors with metallic conduit.
4. Connect output conduit in a manner that allows it to act as an unbroken shield from the drive panel to the motor casing.
5. RF noise filter (different from RFI filter) part no. 05P00325-0023 is a delta wye capacitor network which is wired in parallel with the drive input terminals. On the smaller drives with die cast chassis, it must be mounted externally. On the larger drives with sheet metal chassis, it may be mounted inside the area where the input power wiring enters the drive. On units equipped with bypass, it may be wired to the primary side of the circuit breaker and mounted to the bypass panel or sidewall.
6. Connection points:

	Drive w/o Bypass	Drive w/ Bypass
Input	L1, L2, L3	Ckt Brkr L1, L2, L3
Output	T1, T2, T3	Unwired side of Overload relay

Figure 1-2. Customer Connection Diagram For Isolation Transformers, Input Reactors, Input RFI Filters, DC Reactors, Output Reactors and Output RFI FIlters

1.4.5 Conformance to European EMC Directive

In order to conform to EMC standards, the exclusive-use methods are required for line filter application, cable shielding and drive installation. The following explains the outline of the methods.

The line filter and GPD 505 drive must be mounted on the same metal plate. The filter should be mounted as close to the drive as practical. Keep cable as short as possible. The metal plate should be securely grounded. The ground of line filter and drive must be bonded to the metal plate with as much area as possible.

For mains input cables, screened cable is recommended at least within the panel. The screen of the cable should be connected to a solid ground. For motor cable, screened cable (max. 20 m) must be used and the screen of the motor cable should be connected to ground at both ends by a short connection, using as large an area as practical.

For more detailed explanation, refer to MagneTek document TD 4077, “Installation Guidelines For EMC Directive using MagneTek AC Drive Products.”

Table 1-4 and Figure 1-2A show the line filter list for ECM standards and the installation/wiring of GPD 505 drive and line filter.

Table 1-4. Line Filters for GPD 505

Drive Model Number GPD505V-	Line Filter			
	MagneTek Part Number	Rated Current (A)	Mass (kg)	Dimensions in mm(1) H x W x D (2)
B001	5P325-0030	7	1.1	255 x 50 x 126
B003				
B004				
B008	5P325-0031	18	1.7	305 x 55 x 142
B011				
B014	5P325-0032	30	1.8	335 x 60 x 150
B021				
B027	5P325-0033	42	2.8	329 x 70 x 185
B034				
B041	5P325-0034	55	3.1	329 x 80 x 185
B052	5P325-0035	75	4.0	329 x 80 x 220
B065				
B080	5P325-0036	100	5.5	379 x 90 x 220
B096	5P325-0037	130	7.5	429 x 110 x 240
B128	5P325-0038	180	11	438 x 110 x 240
B180	5P325-0039	300	15	160 x 300 x 564
B240	5P325-0040	400	22	160 x 300 x 564
B302				

(1) 1mm = 0.0394 inches

(2) D is the distance the filter will extend outward from the surface of the metal plate.

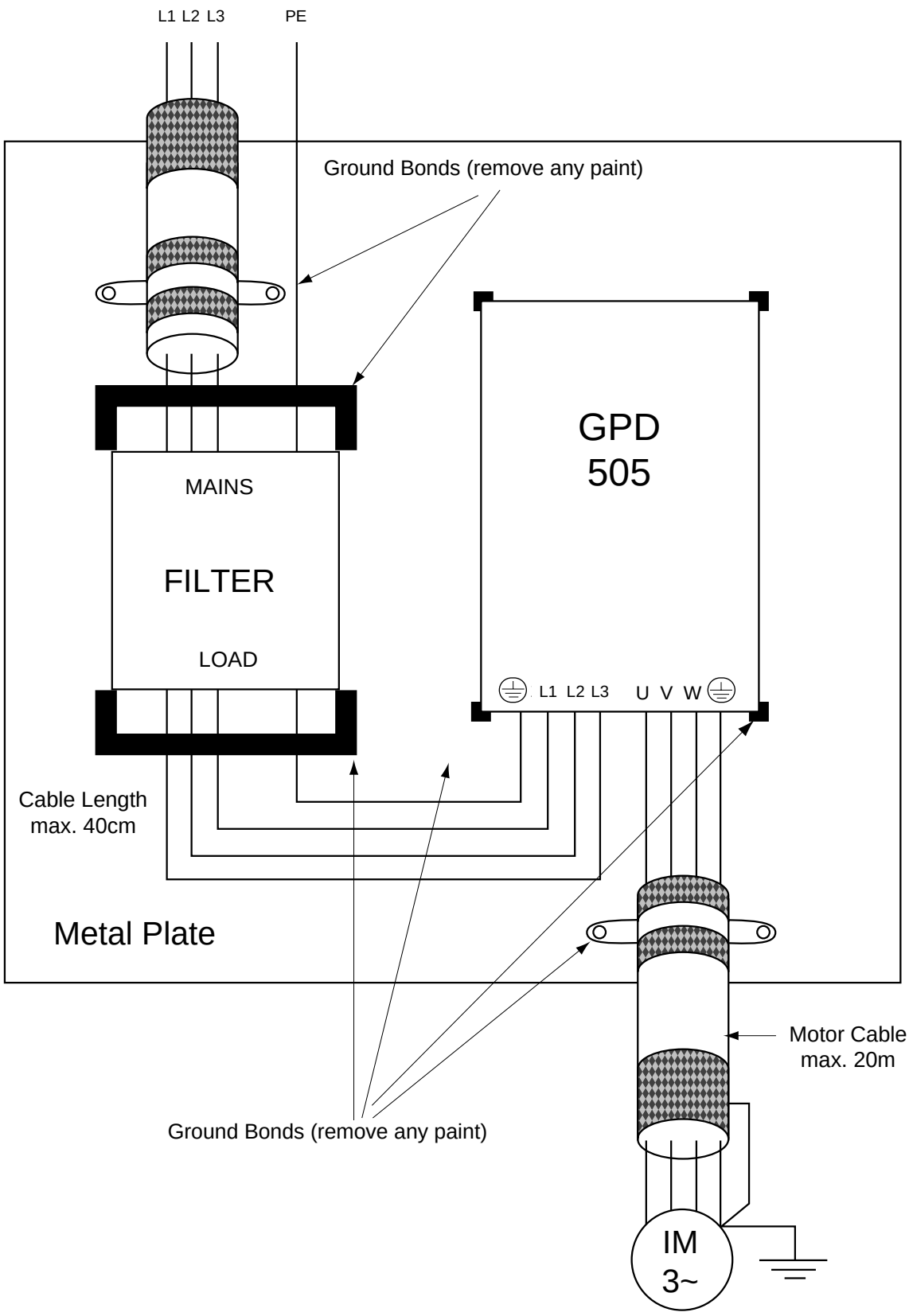


Figure 1-2A. Installation of Line Filter and GPD 505 Drive

NOTES FOR FIGURE 1-3

■ – Indicates components not supplied.

◎ ○ – Indicates customer connection terminal. Wire only to terminals shown. Note that not all terminals shown are available in all ratings – see pages 1-3 thru 1-5.

( ) – Indicates alternate terminal marking, i.e., (R) and L1.

▲ – Function labels shown for these terminals are determined by factory settings of ***n035*** through ***n039*** (see paragraph 5.19).

● – Function labels shown for these terminals are determined by factory settings of ***n040*** & ***n041*** (see paragraph 5.20).

★ – Function labels shown for these terminals are determined by factory setting of ***n048*** (see paragraph 5.18).

♦ – Function label shown for this terminal is determined by factory setting of ***n042*** & ***n043*** (see paragraph 5.11).

1. Multiple combinations of frequency references are possible – see paragraph 5.11.

2. The GPD 505 Electronic Thermal Overload function (***n032***, ***n033***) meets standards set by UL and CSA for motor thermal overload protection. If local code requires separate mechanical overload protection, an overload relay should be installed, interlocked with the GPD 505 as shown. It should be the manual reset type to prevent automatic restart following a motor fault and subsequent contact reclosure after cool down.

3. Insulated twisted shielded wire is required.
   2-conductor #18 GA. (Belden #8760 or equivalent).
   3-conductor #18 GA. (Belden #8770 of equivalent).
   Connect shield ONLY AT GPD 505 END. Stub and isolate other end.

4. The Digital Operator is standard on every GPD 505. Remote operators, as shown, may not be required.

5. Customer to connect terminal ⏚ to earth ground (100 Ω or less, 230V; 10 Ω or less, 460V).

6. An optional DC reactor may be added for harmonic attenuation, if needed; see separate instruction sheet for wiring.

7. If application does not allow reverse operation, ***n006***, Reverse Run Prohibit Selection, should be set to " 1 " (Reverse Run Disabled), and the Reverse Run/Stop input can be eliminated.

8. These terminals are not present on all drive ratings – refer to Table 1-1.

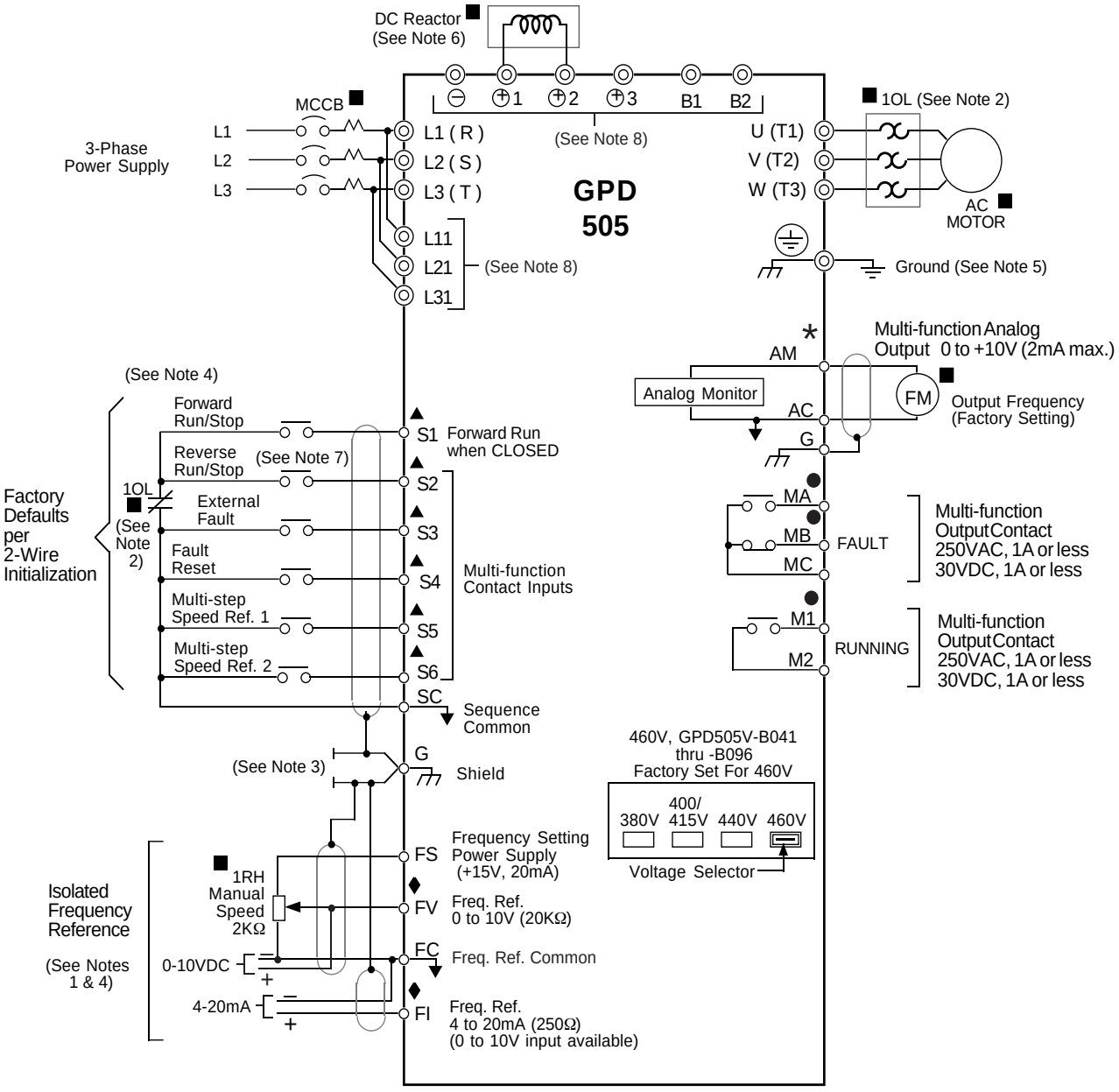


Figure 1-3. 230V or 460V Interconnections - 2-Wire Control (n001 = 8) (with parameters n035 = 0, n036 = 2, n037 = 4, n038 = 9, and n039 = 10)

NOTES FOR FIGURE 1-4

■ – Indicates components not supplied.

◎ ○ – Indicates customer connection terminal. Wire only to terminals shown. Note that not all terminals shown are available in all ratings – see pages 1-3 thru 1-5.

( ) – Indicates alternate terminal marking, i.e., (R) and L1.

▲ – Function labels shown for these terminals are determined by 3-Wire control factory settings of ***n035*** through ***n039***; ***n035*** = 1, ***n036*** = --, ***n037*** = 2, ***n038*** = 4, ***n039*** =9 (see paragraph 5.19).

● – Function labels shown for these terminals are determined by factory settings of ***n040*** & ***n041*** (see paragraph 5.20).

✶ – Function labels shown for these terminals are determined by factory setting of ***n048*** (see paragrph 5.18).

♦ – Function label shown for this terminal is determined by factory setting of ***n042*** & ***n043*** (see paragraph 5.11).

1. Multiple combinations of frequency references are possible – see paragraph 5.11.

2. The GPD 505 Electronic Thermal Overload function (***n032***, ***n033***) meets standards set by UL and CSA for motor thermal overload protection. If local code requires separate mechanical overload protection, an overload relay should be installed, interlocked with the GPD 505 as shown. It should be the manual reset type to prevent automatic restart following a motor fault and subsequent contact reclosure after cool down.

3. Insulated twisted shielded wire is required.
   2-conductor #18 GA. (Belden #8760 or equivalent).
   3-conductor #18 GA. (Belden #8770 of equivalent).
   Connect shield ONLY AT GPD 505 END. Stub and isolate other end.

4. The Digital Operator is standard on every GPD 505. Remote operators, as shown, may not be required.

5. Customer to connect terminal ⏚ to earth ground (10 Ω or less, 230V; 10 Ω or less, 460V).

6. An optional DC reactor may be added for harmonic attenuation, if needed; see separate instruction sheet for wiring.

7. If application does not allow reverse operation, ***n006***, Reverse Run Prohibit Selection, should be set to " 1 " (Reverse Run Disabled), and the Forward/Reverse input can be eliminated.

8. These terminals are not present on all drive ratings – refer to Table 1-1.

CAUTION

Before running, *n001* must be set to " 0 ", " 1 ", " 2 ", or " 3 ". Resetting drive constant *n001* to " 8 " may cause the motor to run in the reverse direction WITHOUT A RUN COMMAND, and possibly result in damage to the equipment or personal injury.

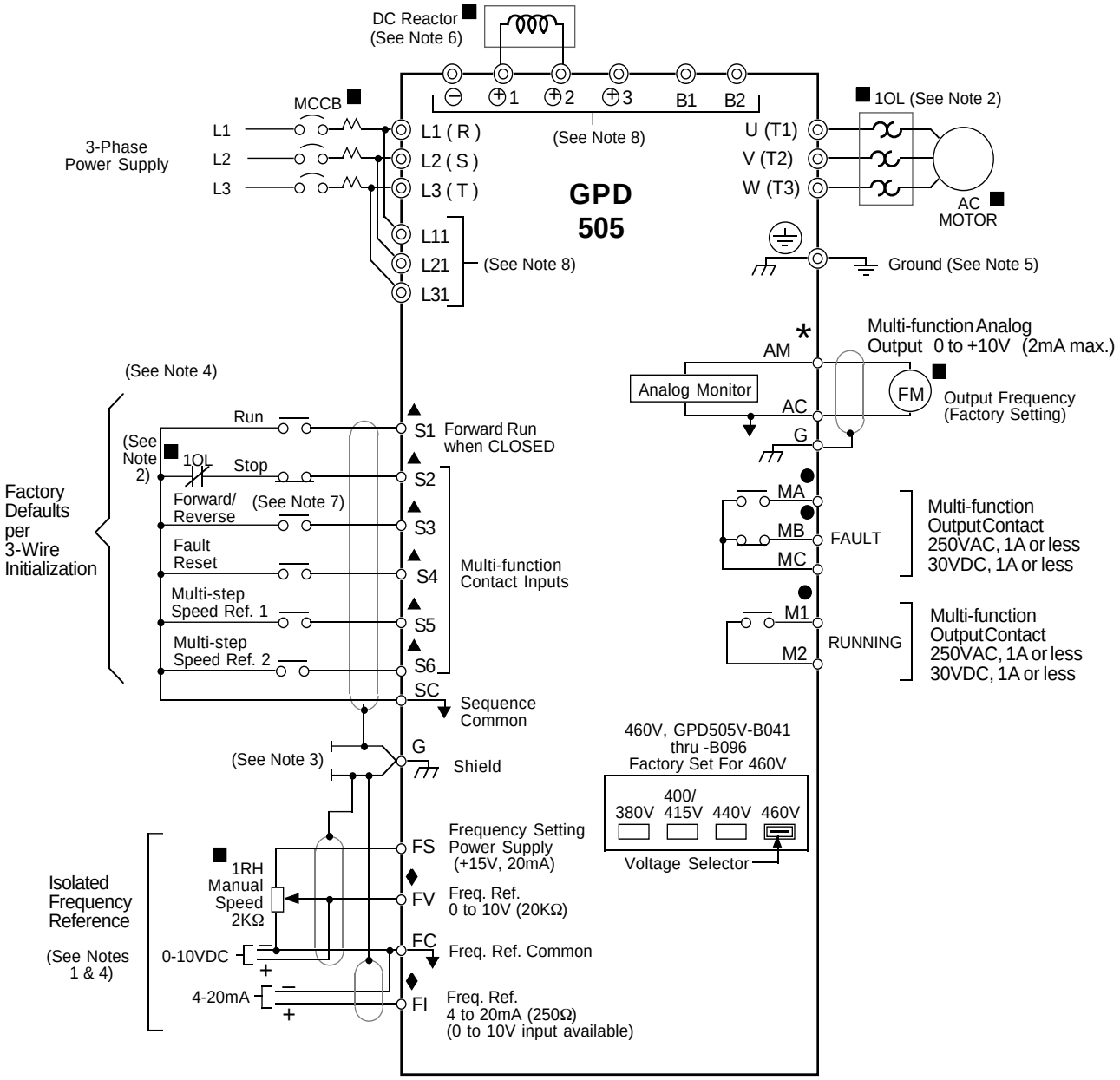


Figure 1-4. 230V or 460V Interconnections - 3-Wire Control (n001 = 9) (with parameters n035 = 1, n036 = --, n037 = 2, n038 = 4, and n039 = 9)

Section 2. INITIAL START-UP ("LOCAL" CONTROL)

2.1 PRE-POWER CHECKS

- Verify wires are properly connected and no erroneous grounds exist.

- Remove all debris from the GPD 505 enclosure. Check for loose wire clippings, metal shavings, etc.

- Verify all mechanical connections inside the GPD 505 are tight.

- Verify motor is not connected to load.

- Apply input power only after the front cover is in place. DO NOT remove the front cover or Digital Operator while input power is on.

- *For 460V, GPD505V-B041 thru -B096*: Verify that the GPD 505 power voltage select connector, located at lower left corner inside drive chassis (see Figure 2-1), is positioned correctly for the input power line voltage. Voltage is preset to 460V at the factory. Reposition, if required, to match nominal line voltage.

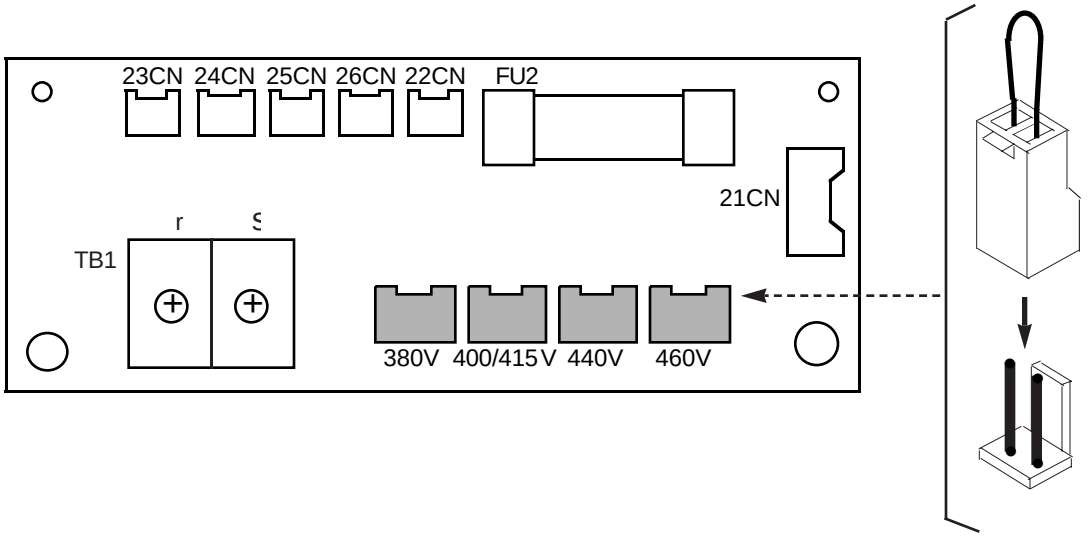


Figure 2-1. Power Voltage Selection in 460V GPD 505

2.2 TEST RUN USING DIGITAL OPERATOR ("LOCAL" CONTROL)

The operation described in Table 2-1 and shown in Figure 2-2 is for a standard 60 Hz motor.

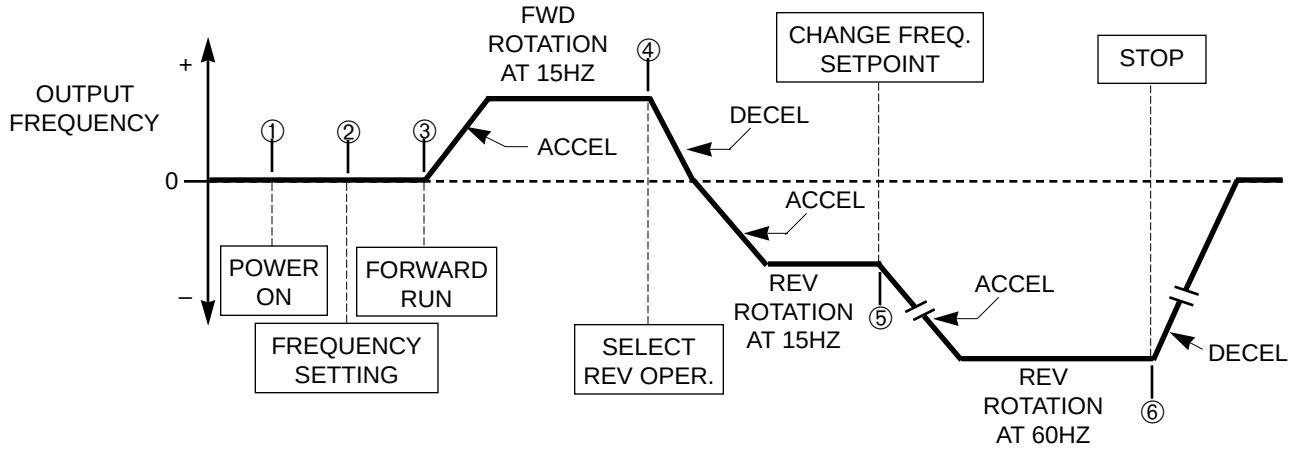


Figure 2-2. Example of Simple Operation

Table 2-1. Test Run With Digital Operator

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY	FUNCTION LEDs DISPLAY
① Power ON • Displays frequency reference setting.		**SEQ** & **REF** LEDs "ON" 0.0	**Fref** turns "ON"
Operation Condition Setting • Select LOCAL mode.	Press LOCAL/REMOTE	**SEQ** & **REF** LEDs "OFF" 0.0	**Fref** still "ON"
② Frequency Setting • Change reference value.	Change value by pressing either ∧ ∨	\ | / 15.0 / | \	**Fref** still "ON"
• Write-in set value.	Press ENTER	15.0	
• Select output frequency monitor display.	Press DSPL	0.0	**Fref** turns "OFF"; **Fout** turns "ON"

Table 2-1. Test Run With Digital Operator - Continued

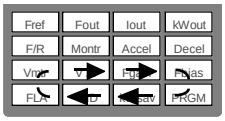
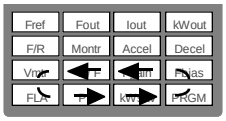
DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY	FUNCTION LEDs DISPLAY
③ Forward Run • Forward run (15 Hz)	Press RUN	**RUN** LED turns "ON" 15.0 (after motor reaches set frequency)	**Fout** still "ON"  Lower 8 LEDs turn "ON" and "OFF" in rotating sequence
④ Reverse Run • Select reverse run.	Press DSPL 3 times	For	**Fout** turns "OFF"; after third key-press, **F / R** is "ON"
	Switch to "rev" by pressing either ▲ ▼	rEv	
• Write-in set value.	Press ENTER	rEv	After motor decelerates to stop and begins reverse rotation, lower 8  LEDs turn "ON" and "OFF" in reverse sequence
• Select output frequency monitor display.	Press DSPL 5 times	- 15.0	**F / R** turns "OFF"; after fifth key-press, **Fout** is "ON"
⑤ Frequency Reference Value Change (15 Hz to 60 Hz) • Select frequency reference value display.	Press DSPL 7 times	15.0	**Fout** turns "OFF"; after seventh key-press, **Fref** is "ON"
• Change set value.	Change value by pressing either ▲ ▼	60.0	

Table 2-1. Test Run With Digital Operator - Continued

DESCRIPTION	KEY SEQUENCE	DIGITAL OPERATOR DISPLAY	FUNCTION LEDs DISPLAY
⑤ (Continued) • Write-in set value	Press ENTER	60.0	
• Select output frequency monitor display.	Press DSPL	-60.0	**Fref** turns "OFF"; **Fout** turns "ON"
⑥ Stop • Decelerates to a stop.	Press STOP RESET	**RUN** LED blinks while motor is being decelerated; then **RUN** LED 0.0 turns "OFF" and **STOP/RESET** LED turns "ON"	**Fout** still "ON"

2.3 PRE-OPERATION CONSIDERATIONS

- After completing the start-up, connect the motor to the load.

- Additional control circuit wiring can be added, and parameters in the GPD 505 can be programmed to configure the drive system to your specific application, including “Remote” (2-wire or 3-wire) Control. (See Table 5-1 for listing of Programmable Features descriptions.)

2.4 STORAGE FUNCTION

The GPD 505 uses internal NV-RAM to store information when power is removed or in the event of a power failure. Therefore, when power is reapplied, operation will begin at the same state as when power was removed.

The following information is stored:

1. Last frequency command setting and forward/reverse selection from Digital Operator.
2. The sequence of failure conditions that occurred before power was removed.

Section 3. OPERATION AT LOAD

After completing the start-up, and programming of constants, turn off the AC main circuit power. Make additional wiring connections required for the external control functions selected by the constant programming. Connect the driven machine to the motor. Verify that the driven machine is in running condition, and that no dangerous conditions exist around the drive system.

OPERATING PRECAUTIONS

- Before applying a RUN command to the GPD 505, verify that the motor is stopped. If the application requires the capability of restarting a coasting motor, parameter ***n066*** must be set to give DC Braking Time at Start.

- The motor cooling effect is reduced during low-speed running. The torque needs to be reduced in accordance with the frequency. For the reduction ratio, refer to the motor catalog or technical sheet.

- **NEVER** use a motor whose full-load amps exceeds the GPD 505 rating.

- When two or more motors are operated by one GPD 505, verify that the total motor current **DOES NOT EXCEED** the GPD 505 rating.

- When starting and stopping the motor, use the operation signals (RUN/STOP, FWD/REV), NOT the magnetic contactor on the power supply side.

Run the motor under load with control by the Digital Operator using the same procedure as for the Test Run (Table 2-1). If the Digital Operator is used in combination with external commands or external commands only are used, the procedure must be altered accordingly.

For preset starting (one-touch operation after setting the frequency), perform the following:

1. Set the frequency and press **RUN**. Motor accelerates, at the rate corresponding to the preset accel time, to the preset frequency. The accel time is set too short relative to the load if the RPM of the accelerating motor does not increase smoothly (stall prevention during acceleration is functioning) or if a fault indication is displayed on the Digital Operator.

2. Press **STOP**. Motor decelerates, at the rate corresponding to the preset decel time, to a stop. The decel time is set too short relative to the load if the RPM of the decelerating motor does not decrease smoothly (stall prevention during deceleration is functioning) or if a fault indication is displayed on the Digital Operator.

Section 4. DIGITAL OPERATOR

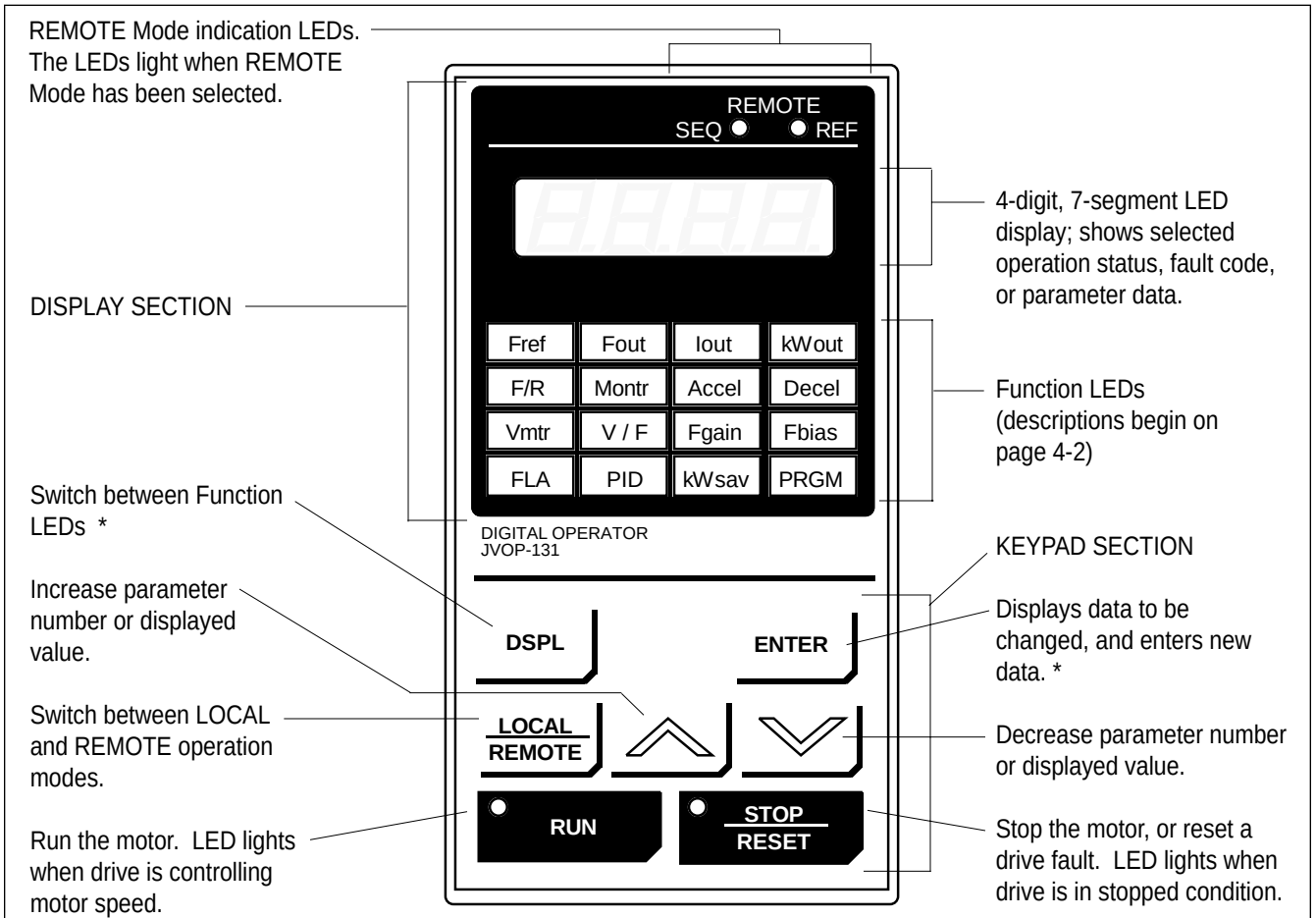
4.1 GENERAL

All functions of the GPD 505 are accessed using the Digital Operator. In addition to controlling motor operation, the operator can enter information into the GPD 505 memory to configure the GPD 505 to the application, either by using the Function LEDs, or by entering the Program (PRGM) mode.

4.2 DISPLAY AND KEYPAD

The Digital Operator has a 4 digit LED display. Both numeric and alpha-numeric data can appear on the display, but because 7-segment LEDs are used, the number of alphabetic characters is limited.

Indicator lamps and keys on the Digital Operator are described in Figure 4-1.

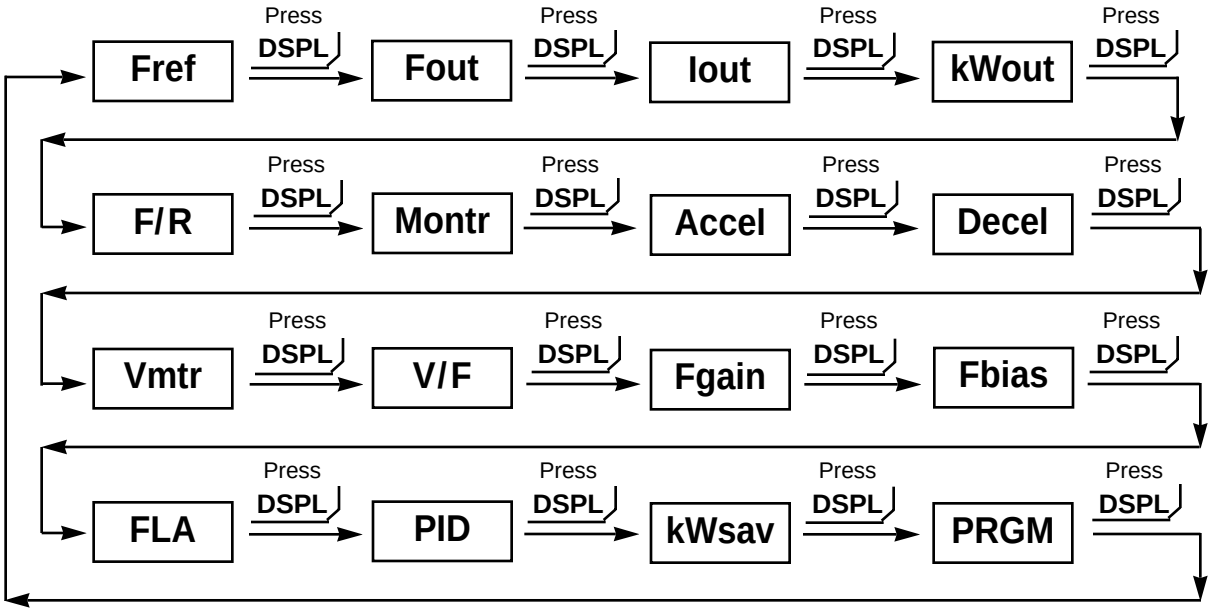


* Note that pressing DSPL and ENTER keys simultaneously allows all parameter data to be read, ***but not set*** , while the the drive is running. While the drive is stopped, pressing DSPL and ENTER keys simultaneously immediately places the drive into program mode.

Figure 4-1. Digital Operator

4.2.1 Description of Function LEDs

By pressing the **DSPL** key on the Digital Operator while the drive is stopped or running, the operator can step to each of the sixteen Function LEDs and its associated display/setting function:



Fref — **Frequency Reference Setting** [***n025***]
Sets the GPD 505 operation speed (Hz), unless the drive has been programmed for REMOTE Mode operation with run from external analog speed reference signal. Programmable during run command.

Fout — **Output Frequency Monitor**
Displays the output frequency (Hz) at which the GPD 505 is currently operating. This is a **monitor only** function; the operator cannot change the displayed value by use of the keypad.

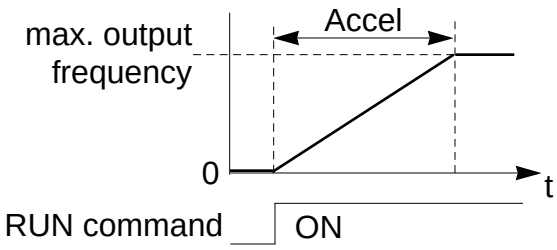
Iout — **Output Current Monitor**
Displays the level of output current (Amps) that the GPD 505 is currently producing. This is a **monitor only** function; the operator cannot change the displayed value by use of the keypad.

kWout — **Output Kilowatt Monitor**
Displays the output power (kW) that the GPD 505 is currently producing. This is a **monitor only** function; the operator cannot change the displayed value by use of the keypad.

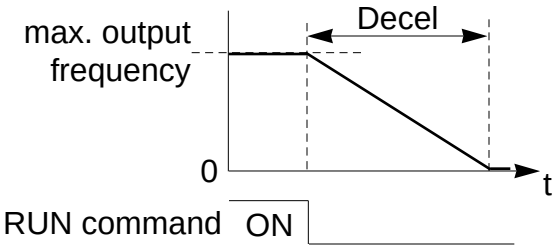
F/R — **FWD/REV Run Selection**
Sets the rotation direction of the motor when a Run command is given by the Digital Operator keypad. Display of ***For*** = forward run, ***rEu*** = reverse run. Use of this Function LED toggles between these two presets; the operator cannot enter a value.

Montr — **Monitor Selection**
Pressing **ENTER** allows access to the various Monitor parameters, ***U-01*** through ***U-13***. These are monitor only functions; the operator cannot change the displayed value. See paragraph 4.4 for list of Monitor parameters. Programmable during run command.

Accel — **Acceleration Time 1** [***n019***]
Sets the time (in seconds) it will take the drive to accelerate the motor from a stopped condition to maximum output frequency (i.e. sets the slope of the accel ramp). Programmable during run command.



Decel — **Deceleration Time 1** [***n021***]
Sets the time (in seconds) it will take the drive to decelerate the motor from maximum output frequency to a stopped condition (i.e. sets the slope of the decel ramp). Programmable during run command.



Vmtr — **Motor Rated Voltage** [***n011***]
Sets the rated voltage (V) of the motor. (Part of V/f pattern setup; see paragraph 5.29.)

V/F — **V/f Pattern Selection** [***n010***]
Sets a preset V/f pattern or allows a custom V/f pattern to be set for the application. (Part of V/f pattern set-up; see paragraph 5.28.)

Fgain — **Frequency Reference Gain** [***n046***]
Sets the gain (%) for the analog frequency reference, input at terminal FV and/or FI; see paragraph 5.10. Programmable during run command.

Fbias — **Frequency Reference Bias** [***n047***]
Sets the bias (%) for the analog frequency reference, input at terminal FV and/or FI; see paragraph 5.10. Programmable during run command.

FLA — Motor Rated Current [***n032***]
Sets the Amps used for detecting motor overload. This is normally set to the motor rated current value (nameplate full-load amps). When set to " 0.0 ", motor overload protection is disabled. The factory settings are listed in Appendix 1.

PID — PID Selection [***n084***]
Setting data to " 0 " (factory setting) disables the PID function. Setting to " 1 " enables PID; setting to " 2 " enables the “Feed Forward” function; setting to “ 3 “ enables the “Inverted PID” function. See “PID Control”, paragraph 5.22.

kWsav — Energy Saving Selection [***n095***]
Setting data to " 0 " (factory setting) disables the energy saving function; and setting to " 1 " enables this function. See “Energy Saving Control”, paragraph 5.9.

PRGM — Parameter Programming
Selects or reads data using parameter number (***nXXX***). Data is displayed by pressing the **ENTER** key, and can be changed by pressing the “up arrow” or “down arrow” keys. Any changes can be saved by again pressing the **ENTER** key. Pressing the **DSPL** key exits the Programming mode.

4.3 BASIC PROGRAMMING

By using the Function LEDs on the Digital Operator, simple programming of the GPD 505 is possible. Following are examples of two methods for setting the acceleration time (***n019***). The first example shows how to utilize the **Accel** Function LED, and the second example shows how to access parameter ***n019*** through the **PRGM** Function LED.

EXAMPLE 1: **Using Accel LED**

	Display
• Press the **DSPL** key repeatedly until the [Accel] LED turns on.	
• To set the acceleration time to 5 seconds, press the “down arrow” key until the Digital Operator display reads " 5.0 ".	
• Press the **ENTER** key.	

EXAMPLE 2: **Using PRGM LED**

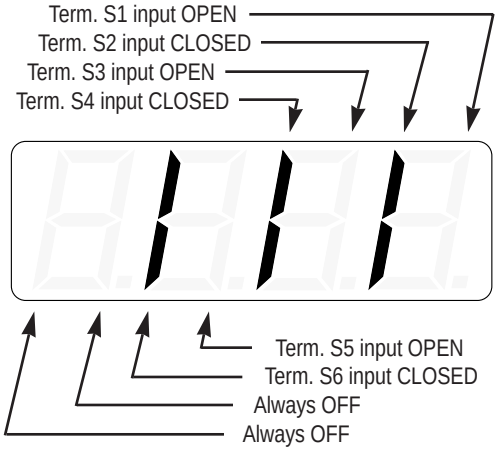
• Press the **DSPL** key repeatedly until the [PRGM] LED turns on.	
• Press the “up arrow” key to access ***n019***.	
• Press the **ENTER** key. The current set value is displayed.	
• To set the acceleration time to 15 seconds, press the “up arrow” key until the Digital Operator display reads " 15.0 ".	
• Press the **ENTER** key. Note: Once changed, data will blink until the **ENTER** key is pressed.	
• Press the **DSPL** key until the [Fref] LED turns on.	

4.4 MONITOR DISPLAYS

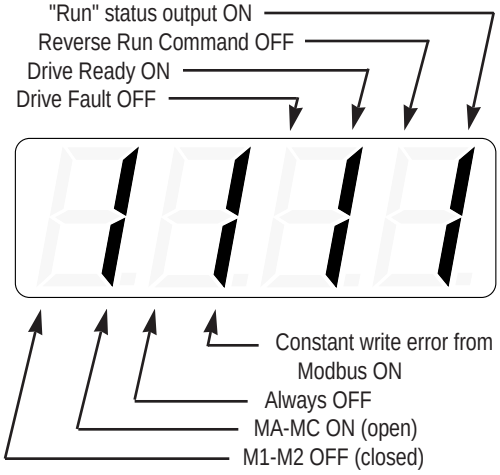
When using the **Montr** Function LED, a variety of information will appear on the Digital Operator display when each of the U-XX (display only) parameters is selected.

CONSTANT U -	MONITORED ITEM	DISPLAY EXAMPLE
0 1	Frequency reference (Hz)	***60.0***
0 2	Output frequency (Hz)	***60.0***
0 3	Output current (A)	***12.5***
0 4	AC output voltage (V)	***230***
0 5	DC Bus voltage (VPN)	***325***
0 6	Output power (kW)	(–) ***12.5***
0 7	Input terminal status	***I I I*** (1)
0 8	Drive status	***I I I I*** (2)
0 9	Fault log (last 4 faults) (3)	***oC***
1 0	Software number (last 4 digits): 10XXXX	***3011***
1 1	Elapsed time meter (Hrs) (lower 4 digits, recorded in parameter ***n 0 6 2***)	***3456***
1 2	Elapsed time meter (Hrs) (upper 2 digits, recorded in parameter ***n 0 6 3***)	***12***
1 3	PID feedback (Hz)	***45.0***

(1) Actual display appearance:



(2) Actual display appearance:



(3) See paragraph 6.2 for viewing of fault log contents.

Section 5. PROGRAMMABLE FEATURES

5.1 GENERAL

This section describes features of the GPD 505 which are defined by programmed settings in the various parameters in memory. Since most features use more than one parameter, the descriptions appear in alphabetical order by the function name. In Table 5-1, the functions are grouped into operational categories. To cross reference a particular parameter to the features to which it applies, see the listings in Appendix 1, or the Index.

Table 5-1. List of Features Defined By Parameters

FUNCTION	PARAGRAPH REFERENCE	PARAMETER(S)
SET-UP		
Initialization (Reset), 2-Wire or 3-Wire	5.23	*n001*
Drive Capacity, Parameters Affected By	Table A3-1	———
Volts/Hertz Patterns, Standard	5.28	*n010*
Volts/Hertz Pattern, Custom	5.29	*n012 - n018*
Input & Output Voltage Setting	5.29	*n003, n011*
Thermal Motor Overload Protection	5.26	*n032, n033*
Digital Operator Display, Re-scaling	5.8	*n024*
Input Phase Loss Dectection	5.30	*n080, n081*
Output Phase Loss Detection	5.31	*n082, n083*
STARTING		
Accel Time	5.2	*n019, n021*
S-Curve Characteristics	5.3	*n023*
DC Injection Braking at Start	5.7	*n017, n064, n066*
STOPPING		
Stopping Method	5.25	*n004*
Decel Time	5.2	*n020, n022*
DC Injection Braking at Stop	5.7	*n017, n064, n065*
Local/Remote Changeover	5.15.1	*n114*
SPEED CONTROL		
Frequency Reference, Upper & Lower Limits	5.12	*n030, n031*
Jog Reference	5.15	*n029, n035 - n039*
Speed Reference Selection (Remote/Local)	5.19A	*n002*
Multi-step Speed Setting	5.19B	*n025 - n028, n035 - n039*
Sample/Hold	5.19G	*n035 - n039*

Table 5-1. List of Features Defined By Parameters - Continued

FUNCTION	PARAGRAPH REFERENCE	PARAMETER(S)
SPEED CONTROL (continued)		
Up/Down Frequency Setting	5.19H	*n039*
Modbus Control	5.16	*n002, n103 - n108*
PID Control	5.22	*n002, n042, n043, n084 - n094*
REVERSE		
Reverse Run Disabled	Table A1-1	*n006*
RUNNING		
Critical Frequency Rejection	5.6	*n058, n059, n060*
Carrier Frequency	5.5	*n050*
Speed Search	5.19E	*n035 - n038, n052 - n054*
Speed Coincidence	5.20B	*n073*
Energy Saving	5.9	*n095 - n102*
Slip Compensation	5.23.1	*n008, n111*
RUNNING IMPROVEMENTS		
Torque Compensation	5.27	*n067, n068, n069*
Stall Prevention	5.24	*n070, n071, n072*
PROTECTIVE FEATURES		
Momentary Power Loss Ride-thru	5.17	*n051*
Auto Restart	5.4	*n056, n057*
Frequency Reference Loss Detection	5.13	*n045*
Overtorque Detection	5.21	*n074, n075, n076*
Miscellaneous Protective Functions	5.16.1	*n112*
DRIVE CONTROLS, INPUT		
Multi-function Analog Input (Auto/Manual)	5.11	*n042, n043*
Frequency Reference Bias and Gain	5.10	*n046, n047*
Multi-function Input Terminals	5.19	*n035 - n039*
External Fault Terminals	5.19	*n035 - n039*
DRIVE OUTPUT		
Multi-function Output Terminals	5.20	*n040, n041, n073*
Analog Monitor Output (Multi-function)	5.18	*n048, n049*
MONITOR DISPLAY		
Digital Operator Display Selection	5.8	*n024*

5.2 ACCEL/DECEL TIME

A. ***n019*** **:** Accel Time 1
n020 **:** Decel Time 1
n021 **:** Accel Time 2
n022 **:** Decel Time 2

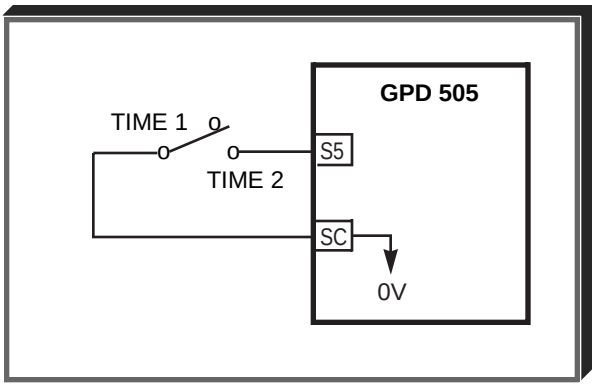
Factory setting (each): ***10.0*** seconds
Range (each): 0.0 to 3600 seconds

The GPD 505 incorporates two sets of individually programmable acceleration and deceleration times.

B. ***n035*** **thru** ***n039*** **:** Multi-function Inputs (Term. S2 thru S6)

Data ***12*** **:** Accel/Decel Time Selection

By programming data 12 into one of the multi-function parameters (***n035*** thru ***n039***), one of the multi-function input terminals (S2 thru S6) becomes a time selection input. When the input terminal (i.e. external contact) is open, Time 1 (***n019***/***n020***) is selected. When the input terminal is closed, Time 2 (***n021***/***n022***) is selected.



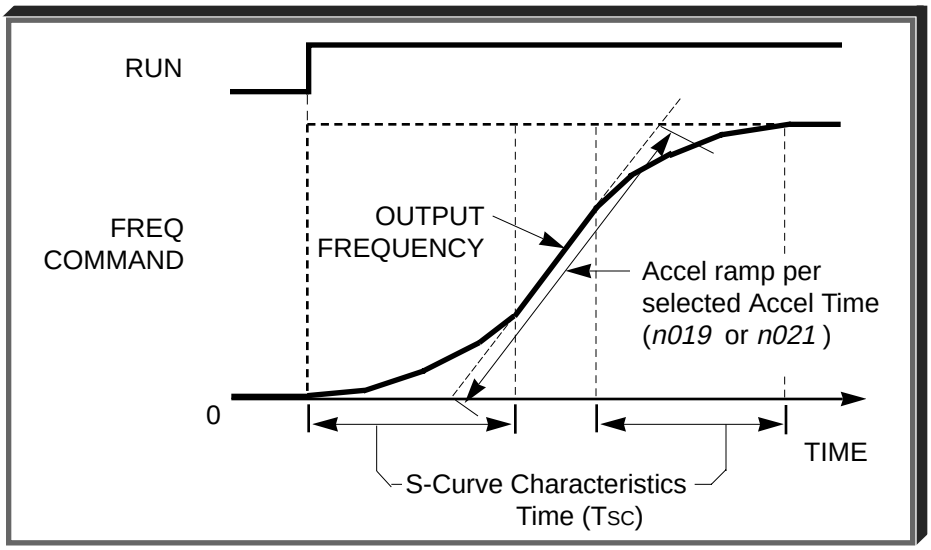
5.3 ACCEL/DECEL: S-CURVE CHARACTERISTICS

n023 **:** Soft Start Characteristics

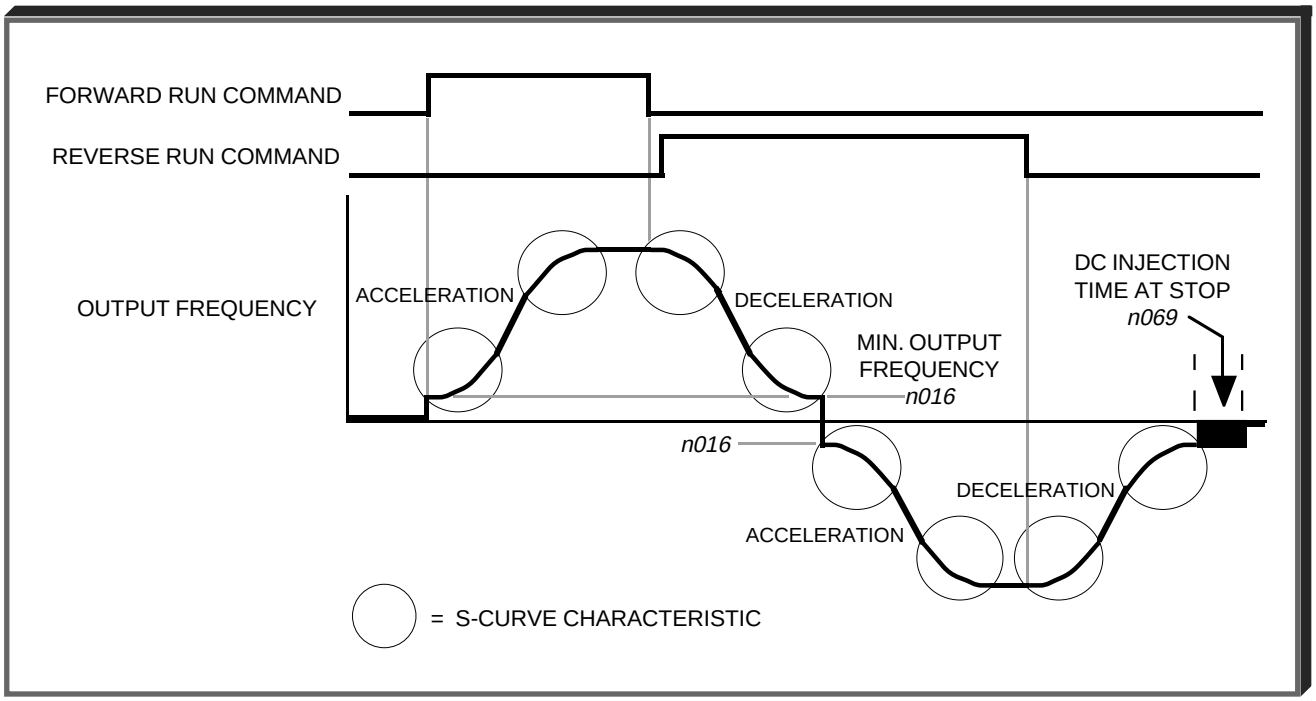
Factory setting: ***1***

Setting of this parameter determines the S-curve (starting) characteristics of the acceleration ramp.

- ***0*** = S-curve disabled
- ***1*** = S-curve of 0.2 seconds
- ***2*** = S-curve time of 0.5 seconds
- ***3*** = S-curve time of 1.0 seconds



The following figure shows FWD/REV switching and acceleration & deceleration to a stop with S-curve active.



5.4 AUTO-RESTART

A. ***n056*** **:** Number of Auto-Restart Attempts

Factory setting: ***0***
Range: 0 - 10

When a fault occurs during operation, the GPD 505 can be programmed for an auto-restart operation to automatically reset the fault. Auto-restart operation will use the number of reset attempts set in this parameter, up to the maximum of 10. When set to " 0 ", no auto-restarts will be attempted.

- The following faults can be automatically reset:

oC:	Overcurrent	GF:	Ground fault
ou:	Overvoltage (OV)	Uu1:	Undervoltage (Power UV)

- The following conditions WILL NOT initiate auto-restart:

  1. oL, EF_ , PUF or CPF_ fault.
  2. When OC or UV occurs during deceleration.
  3. When ***n051*** is programmed to stop during momentary power failure (data = " 0 "). (See paragraph 5.17, **MOMENTARY POWER LOSS RIDE-THRU**.)

- The number of restart attempts available will be reset to the ***n056*** setting when:

  1. 10 minutes has elapsed without a fault occurring.
  2. The **RESET** key, or external Fault Reset push button, is pressed.
  3. Power is removed from the Drive.

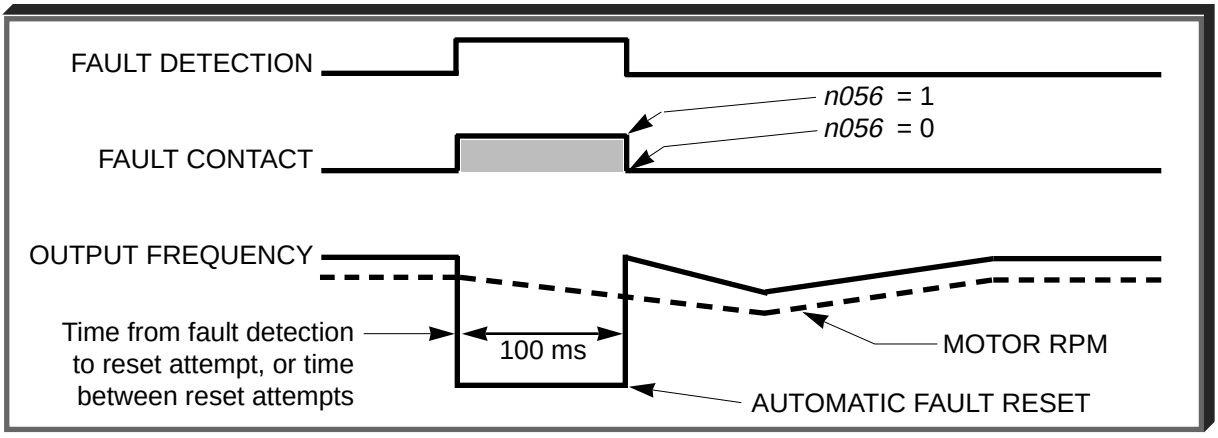
B. ***n057*** **:** Fault Contact Status During Auto-Restart

Factory setting: ***0***
Range: 0, 1

This digit controls how the fault contact responds to a GPD 505 fault during the auto-restart operation.

0 = Fault contact will not actuate during auto-restart attempts

1 = Fault contact actuates during auto-restart attempts



Auto-Restart Operation Timing

5.5 CARRIER FREQUENCY

n050 **:** Carrier Frequency Upper Limit

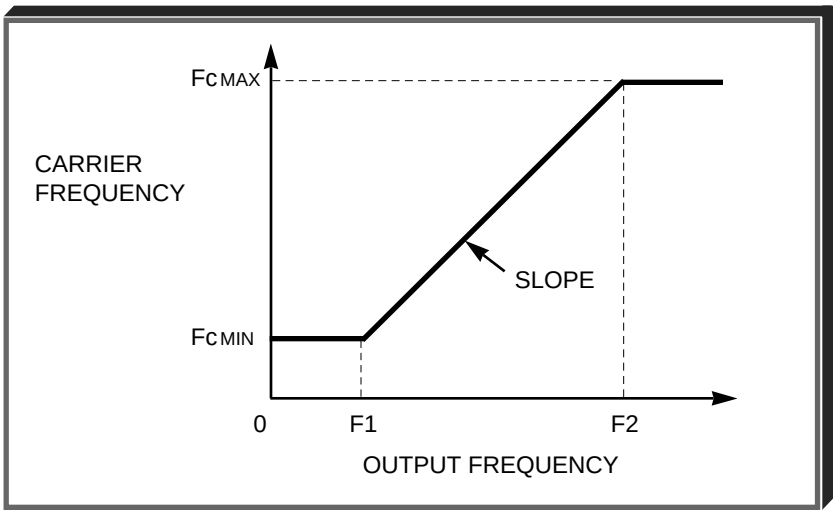
Factory Setting: *See Table A3-1*
Range: 1 to 6 (x 2.5 kHz); 7, 8, 9

The relationship between output frequency and carrier frequency is determined from the set value of ***n050***.

(a) For constant carrier frequency, set to " 1 ", " 2 ", " 3 ", " 4 ", " 5 ", or " 6 ".

(b) For synchronous mode, set ***n050*** to " 7 ", " 8 ", or " 9 ". These setting values establish carrier frequencies of 12f, 24f, or 36f, respectively.

n050 SETTING	CARRIER FREQUENCY (kHz)		SLOPE (= Fc / Fo)	OUTPUT FREQUENCY (Hz)		MODE
	Maximum (F_{CMAX})	Minimum (F_{CMIN})		F1	F2	
1	2.5	2.5	0	NA	NA	CONSTANT
2	5.0	5.0	0	NA	NA	
3	8.0	8.0	0	NA	NA	
4	10.0	10.0	0	NA	NA	
5	12.5	12.5	0	NA	NA	
6	15.0	15.0	0	NA	NA	
7	2.5	1.0	12	83.3	208.3	SYNCHRONOUS
8	2.5	1.0	24	41.6	104.1	
9	2.5	1.0	36	27.7	69.4	



Maximum carrier frequency is dependent upon drive rating; see Appendix 1.

Carrier frequency should be decreased as the distance between the drive and the motor increases, to reduce capacitive coupling in the motor leads.

- For wiring distances up to 50m (164 ft.), ***n050*** should be set to 15 kHz (data " 6 ") or less.
- For wiring distances from 50m (164 ft.) to 100m (328 ft.), ***n050*** should be set to 10 kHz (data " 4 ") or less.
- For wiring distances greater than 100m (328 ft.), ***n050*** should be set to 5 kHz (data " 2 ") or less.

5.6 CRITICAL FREQUENCY REJECTION

A. ***n058*** **:** Prohibited Frequency 1
n059 **:** Prohibited Frequency 2

Factory setting (each): ***0.0***
Range (each): 0.0 to 400.0 Hz

These parameters allow programming of up to two prohibited frequency points 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.

B. ***n060*** **:** Prohibited Frequency Deadband

Factory setting: ***1.0***
Range: 0.0 to 25.5 Hz

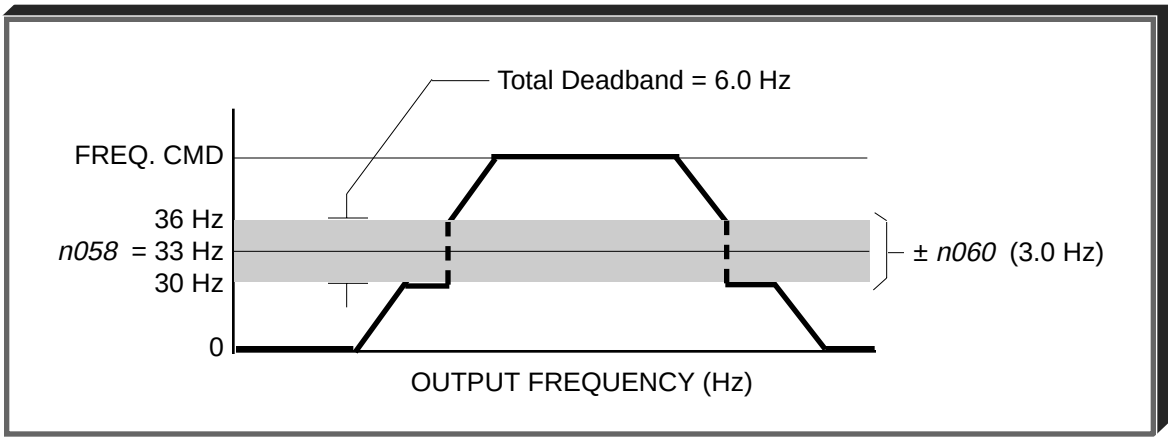
This parameter determines the width of the deadband around each selected prohibited frequency point. The factory setting is " 1.0 ", which establishes a deadband of ± 1.0 Hz.

EXAMPLE:

Vibration encountered between 30.0 and 36.0 Hz.

SOLUTION: Set ***n058*** to " 33.0 ". This is the center of the problem frequency band.
Set ***n060*** to " 3.0 ". This will cause the GPD 505 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.



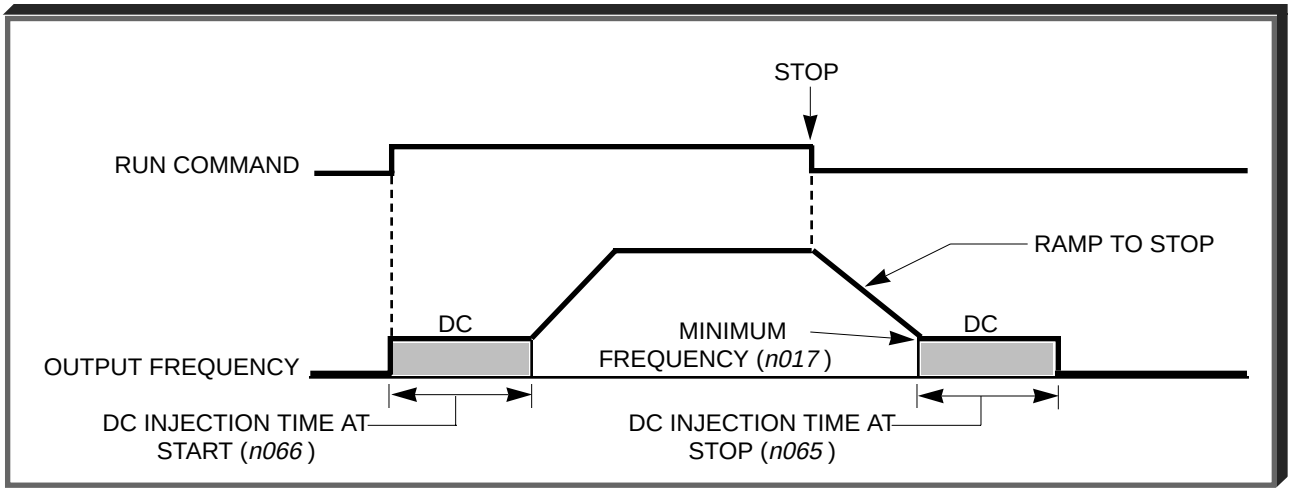
Note that if ***n058*** ≤ ***n059*** is not satisfied, the Digital Operator displays the parameter setting error code " ***OPE6*** ".

5.7 DC INJECTION BRAKING

n017 **:** Minimum Frequency	Range: 0.1 to 10.0 Hz
n064 **:** DC Injection Braking Current (% of Drive Rated Current)	Factory setting: ***50*** % Range: 0 to 100 %
n065 **:** DC Injection Time at Stop	Factory setting: ***0.0*** sec Range: 0.0 to 10.0 sec
n066 **:** DC Injection Time at Start	Factory setting: ***0.0*** sec Range: 0.0 to 10.0 sec

DC injection can be used to stop a motor whose rotational direction is uncertain at start-up, or to help stop a coasting motor.

With ramp to stop enabled (***n004*** = "0"), after a STOP command is received the GPD 505 controls motor deceleration according to the Decel Time setting, until output frequency reaches the DC injection braking start frequency (or Minimum Frequency, ***n017***). Then the GPD 505 output is turned off and DC injection current is applied to the motor. The effective DC injection time and current should be set to provide adequate stopping without excessive motor heating. The DC injection voltage is determined by the DC injection braking current and motor impedance.



DC Braking Sequence

5.8 DIGITAL OPERATOR DISPLAY SELECTION

n024 **:** Operator Display Mode
Reference and Indication

Factory setting: ***0***
Range: 0 to 3999

This parameter determines the scaling of the Digital Operator display, for both Output Frequency and all Frequency References.

DATA	DISPLAY
0 (factory setting)	Output frequency, in increments of 0.1 Hz.
1	Output frequency, in increments of 0.1 %.
2 to ***39*** (no. of motor poles)	Motor synchronous speed ($P = \frac{120 \times F}{N_S}$) in increments of 1 RPM (3999 max). P = no. of motor poles F = Frequency N_S = motor synchronous speed NOTE: If motor synchronous speed exceeds 3999 RPM, display holds at ***3999*** .
40 to ***3999***	Line speed or other parameter. X X X X Parameter value at maximum frequency (***n012***) (include leading zeroes if necessary) Location of decimal point: _ = _ X X X ***1*** = X X X**.** X ***2*** = X X**.** X X ***3*** = X**.** X X X (See **CAUTION** on next page) **EXAMPLE:** To display Line Speed, based on 54.3 FPM at 60 Hz: ***n024*** setting = " ***1543*** "

Exceptions to the general format are as follows:

n024		DISPLAY
"*1000*"	=	*100.0*
"*2000*"	=	*10.00*
"*3000*"	=	*1.000*

When setting a value in *n024* , the decimal point position selected will also automatically affect all of the Frequency Reference Memory Settings (*n025 thru n029* ; see Table A1-1).

EXAMPLE:

n024 factory setting: ***0000***
n029 (Jog) factory setting: ***006.0*** (6 Hz)

n024 changed to ***2060***
Decimal point at X X.X X
n029 setting becomes ***0.06***

Therefore, for 10.00 Hz Jog frequency, ***n029*** must be reprogrammed to ***0.10***

5.9 ENERGY SAVING CONTROL

n095 **:** Energy Saving Selection

Factory setting: ***0***
Range: 0 or 1

To enable energy saving control, ***n095*** must be set to " 1 ".

Since the parameters used in the energy saving control mode have been preset to the optimum values, it is not necessary to adjust them under normal operation. If your motor characteristics differ greatly from those of a standard motor, refer to the following description to change the parameters.

A . Energy Saving Control Mode

n096 : Energy Saving Gain K2

Factory setting: *See Table A3-1*
Range: 0.00 to 655.0

Use this gain when running in the energy saving control mode to calculate the voltage at which motor efficiency will be greatest, and set it as the output voltage reference. This value is preset to a typical standard motor value. As energy saving gain increases, output voltage also increases.

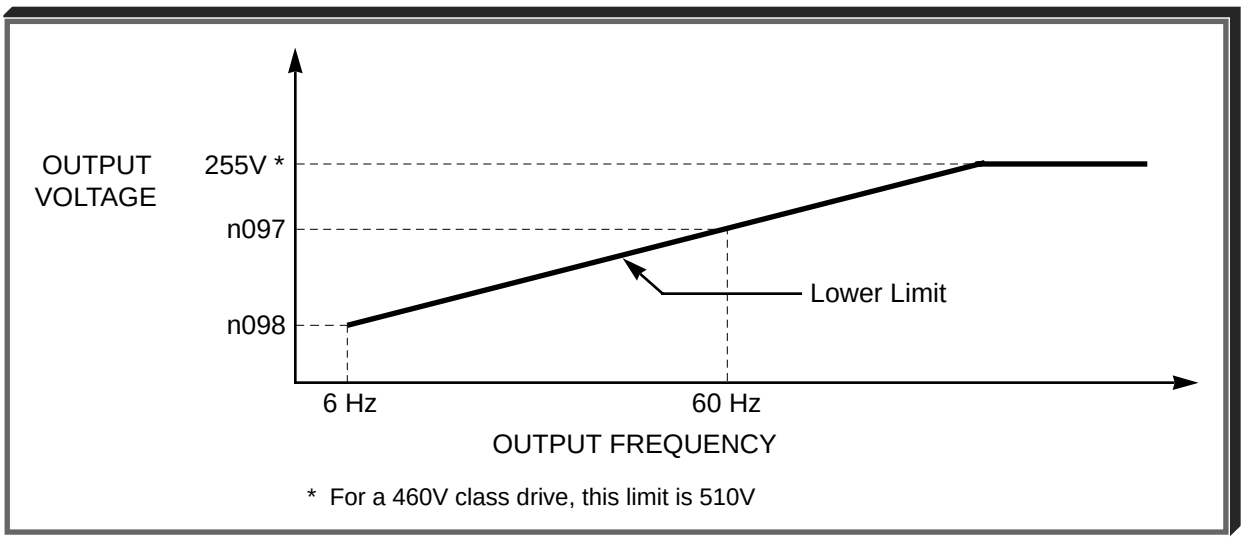
n097 : Energy Saving Voltage Lower Limit at 60Hz

Factory setting: ***50*** %
Range: 0 to 120 %

n098 : Energy Saving Voltage Lower Limit at 6Hz

Factory setting: ***12*** %
Range: 0 to 25 %

Sets the output voltage lower limit. If the voltage reference value calculated in the energy saving mode is below the specified lower limit, this lower limit value is used as the voltage reference value. The lower limit value is set to prevent stalling at light loads. Set voltage limits at 6Hz and 60Hz; a value obtained by linear interpolation should be set to any limit values other than at 6Hz or 60Hz. Setting is made as a percentage of motor rated voltage.



B. Energy Saving Tuning

In the energy saving control mode, the optimum voltage is calculated according to load power, and this voltage is supplied to the load. However, since the set parameter may change due to temperature variations or using other manufacturer's motors, the optimum voltage may not necessarily be supplied. Automatic tuning controls the voltage so that highly efficient operation is maintained.

n099 : Time of Average kW

Factory setting: ***1***
Range: 1 to 200 (x 25 ms)

Sets adjustment time of kW saving. By increasing this value, the response time to a change in load is increased, which may prevent the system from oscillating. However, too long of a response time may starve the motor of voltage.

n100 : Tuning Voltage Limit

Factory setting: ***0*** %
Range: 0 to 100 %

Limits the range to control voltage by tuning. Setting is made as a percentage of motor rated voltage. Tuning is disabled by setting this parameter to " 0.0 ".

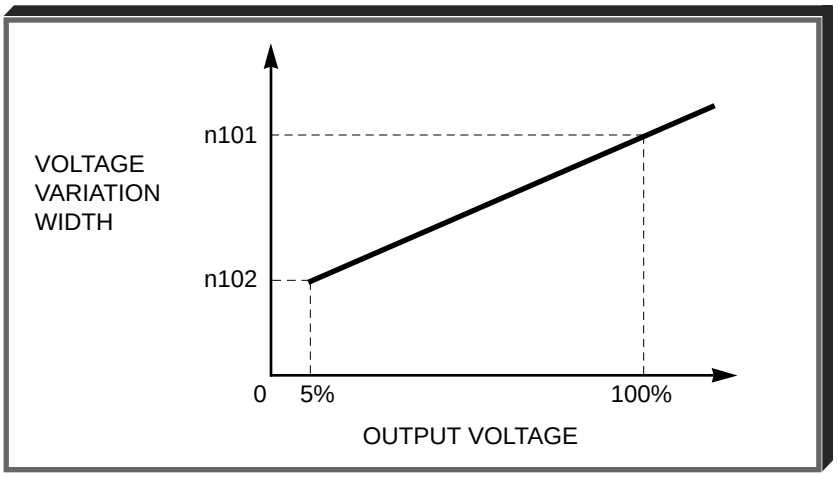
n101 : Tuning Step Voltage to 100% Output

Factory setting: ***0.5*** %
Range: 0.0 to 10.0 %

n102 : Tuning Step Voltage to 5% Output

Factory setting: ***0.2*** %
Range: 0.0 to 10.0 %

Sets voltage variation width of one tuning cycle. Setting is made as a percentage of motor rated voltage. By increasing this value, the rotating speed variation increases. This voltage variation width is set when starting tuning voltage is 100% and motor rated voltage is 5%. Other values may be obtained by linear interpolation.



5.10 FREQUENCY REFERENCE BIAS/GAIN

n046 **:** Frequency Reference Gain

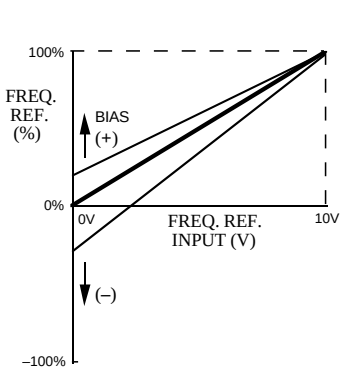
Factory setting: ***100*** %
Range: 0 to 200 %

Sets the auto-speed frequency command gain, in increments of 1%.

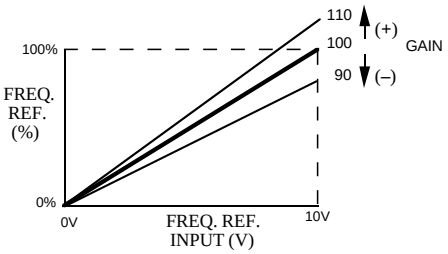
n047 **:** Frequency Reference Bias

Factory setting: ***0*** %
Range: -100 to 100 %

Sets the auto-speed frequency command bias, in increments of 1%.



BIAS



GAIN

NOTE: Frequency Reference Gain (***n046***) and Bias (***n047***) **only** affect the Analog Input selected by ***n042***.

ADJUSTMENT PROCEDURE:

A. For 0-10 Vdc input (term. FV)

1. With no input, adjust Bias (***n047*** setting) until an output of 0.0 Hz is obtained.
2. With full scale input, adjust Gain (***n046*** setting) until an output of 60.0 Hz (or other desired max. output frequency) is obtained.

B. For 4-20mA input (term. FI)

1. With 4mA input, adjust Bias (***n047*** setting) until an output of 0.0 Hz is obtained.
2. With 20mA input, adjust Gain (***n046*** setting) until an output of 60.0 Hz (or other desired max. output frequency) is obtained.

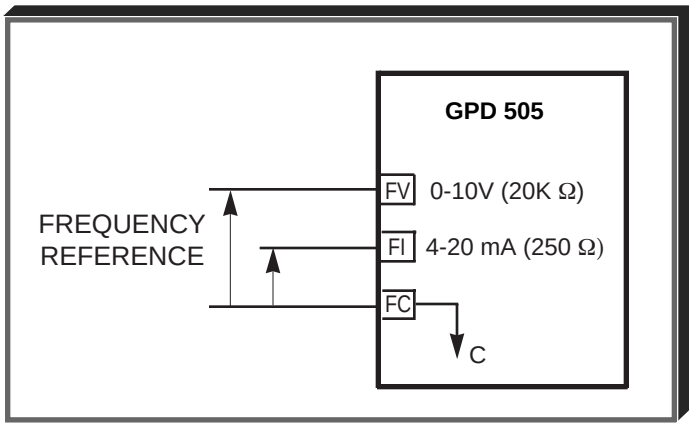
NOTE

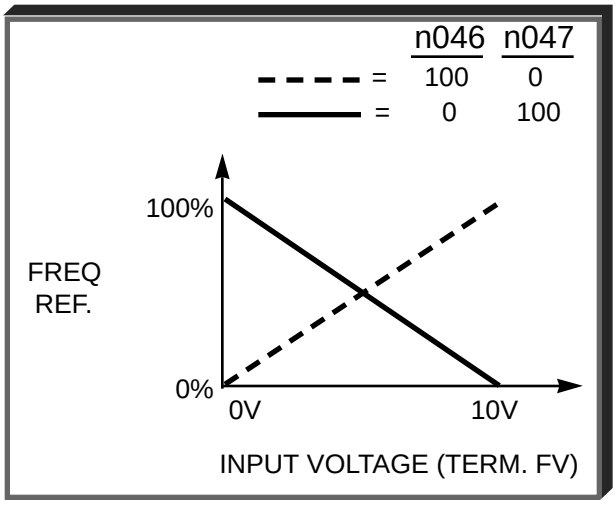
Follow the same adjustment procedure for other desired frequency setpoints.

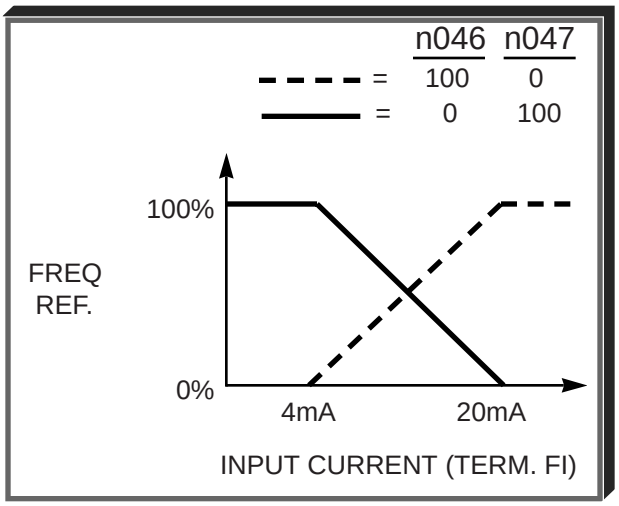
C. For inverse-acting frequency reference

1. Begin with ***n046*** & ***n047*** settings as shown below.
2. Fine tune as indicated in A or B above.

Frequency reference inputs:
terminals FV & FC — 0-10 VDC
terminals FI & FC — 4-20 mA







n042 **:** Auto Analog Input Selection

Factory setting: ***0***
Range: 0 or 1

To input an auto frequency reference from external terminals, program ***n042*** to data " 0 " for a voltage reference (0 to 10V) or to " 1 " for a current reference (4 to 20mA).

Setting	Auto Frequency Reference Terminal	Input Level
0	FV	0 to 10 V input
1	FI	4 to 20 mA input

NOTE: Parameters ***n046*** and ***n047*** affect the Analog Input selected by ***n042*** .

n043 **:** Manual Analog Input Selection

Factory setting: ***1***
Range: 0 or 1

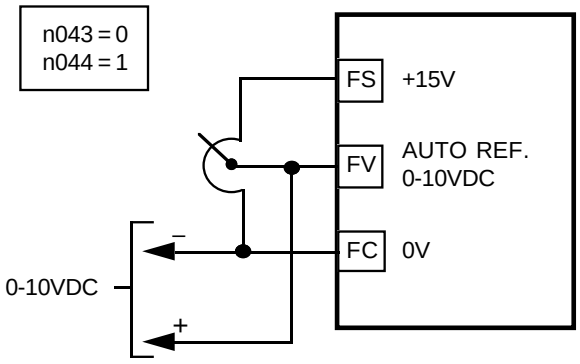
To change the control circuit terminal FI input level, program ***n043*** .

Setting	FI Terminal input Level
0	0 to 10 V input
1	4 to 20 mA input

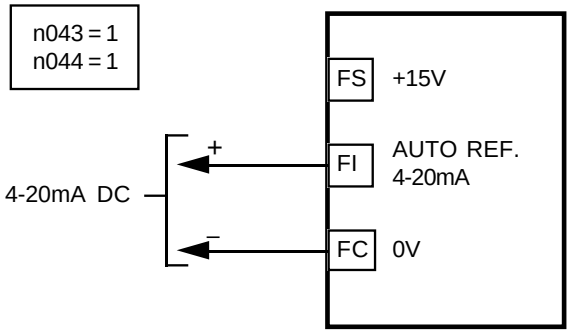
NOTE: In addition to setting parameter ***n043*** to " 0 " for a voltage input, jumper J1 on the drive Control PCB must be cut.

Examples of wiring the drive for frequency references from various sources are shown on the next page.

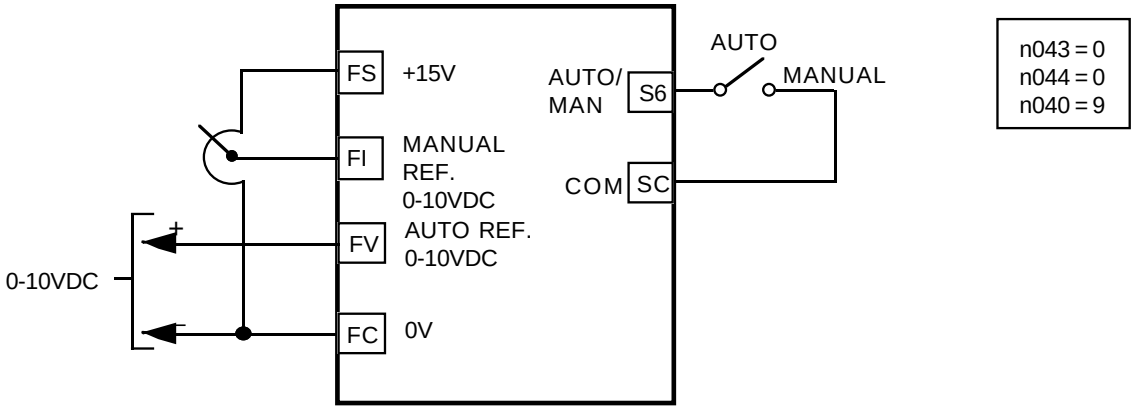
A. Speed pot or 0-10VDC signal only:



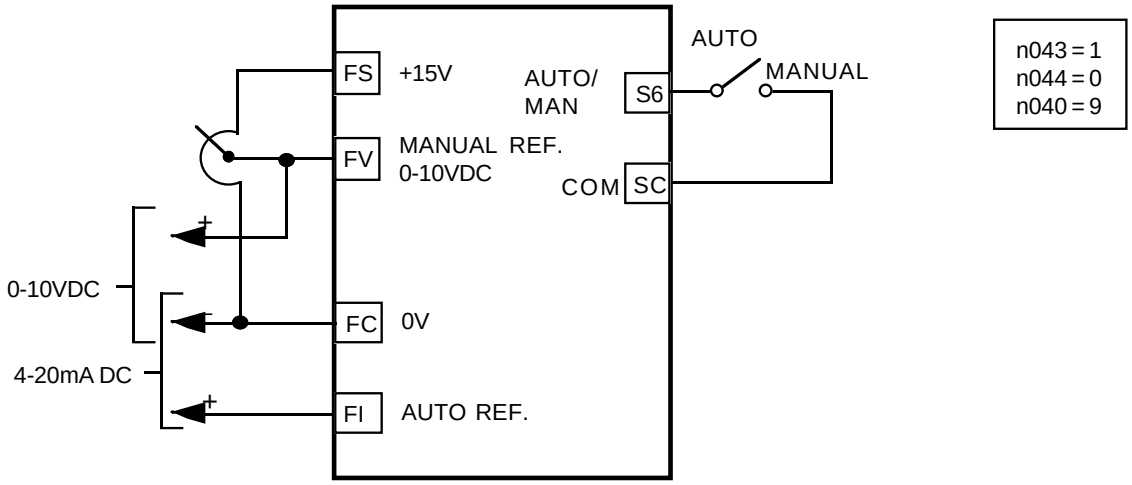
B. 4-20mA signal only:



C. 0-10VDC signal (auto) and speed pot (manual):



D. 4-20mA DC signal (auto) and 0-10VDC signal or speed pot (manual):



5.12 FREQUENCY REFERENCE UPPER & LOWER LIMITS

n030 **:** Frequency Reference Upper Limit

Factory setting: ***100*** %
Range: 0 to 109 %

n031 **:** Frequency Reference Lower Limit

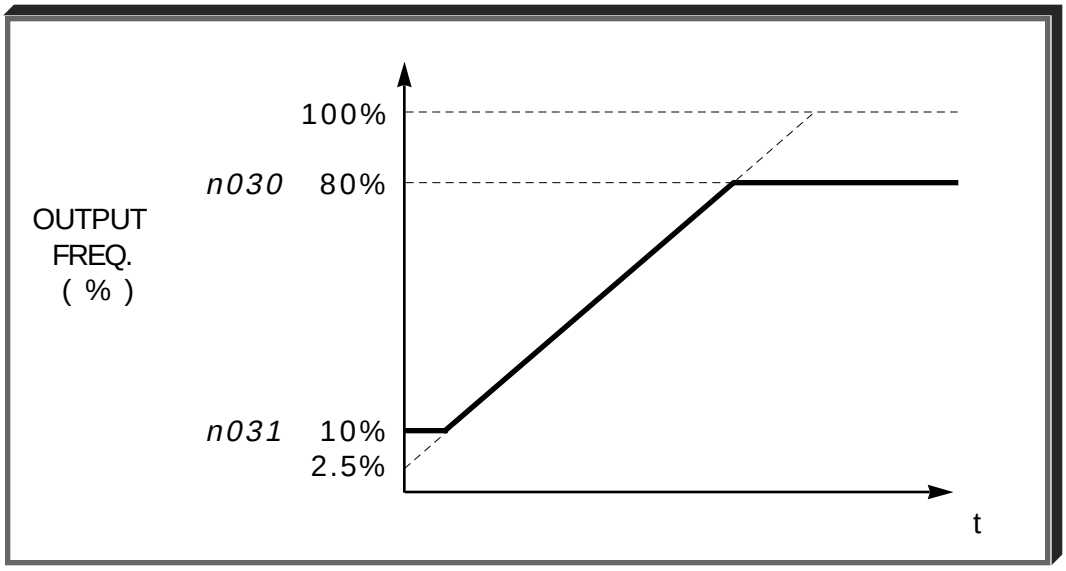
Factory setting: ***0*** %
Range: 0 to 100 %

These two parameters set the range for the frequency command signal. Each is set, in increments of 1%, as a percentage of maximum frequency (Fmax; ***n012***) as established by either the selected standard V/f pattern or custom V/f pattern.

NOTE: All references are affected by the upper and lower limit points.

EXAMPLE:

n012 = "***60***" Hz (100%)
n030 = "***80***" % = 48Hz – Max. speed
n031 = "***10***" % = 6Hz – Min. speed

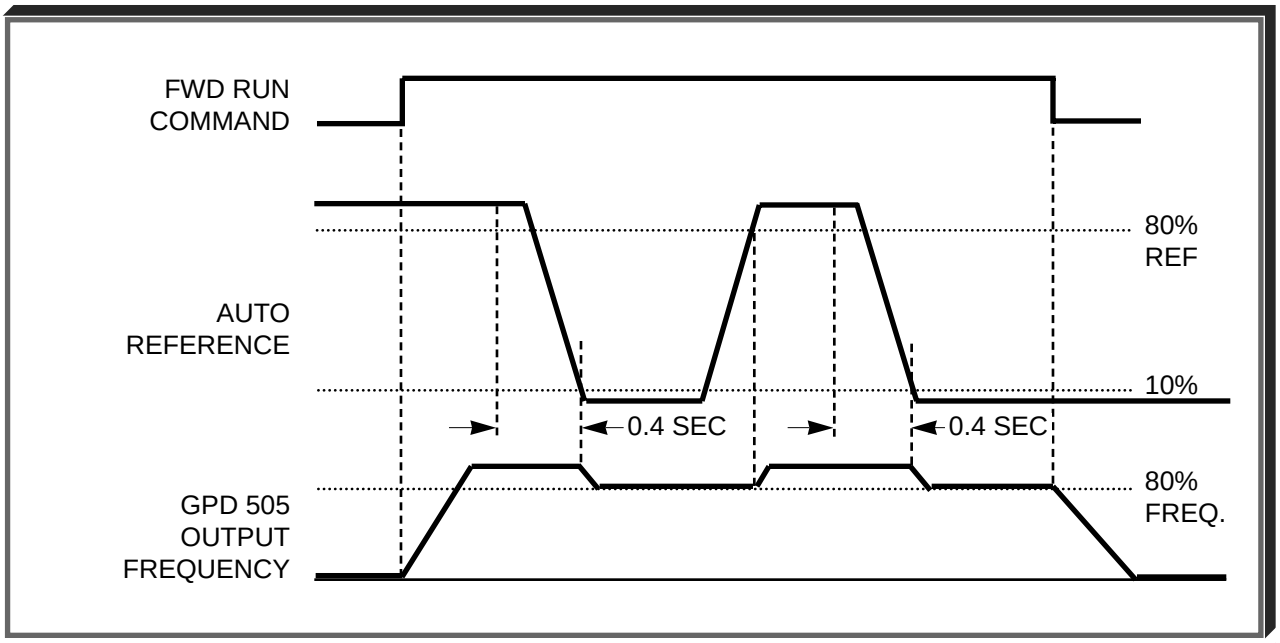


5.13 FREQUENCY REFERENCE - LOSS DETECTION

n045 **:** Frequency Reference Loss Detection

Factory setting: ***0*** (disabled)
Range: 0 or 1

The reference loss detection function is either enabled or disabled, based on the setting of ***n045***. When enabled (data " 1 "), the reference loss detection compares the change in reference with respect to time. If the reference decreases by 90% in more than 0.4 seconds, the GPD 505 will decelerate to the set reference; if the reference decreases by 90% in less than 0.4 seconds, the GPD 505 will continue to operate at 80% of the output frequency. To regain control of output frequency, either exceed the set reference (80% of reference) or initiate a STOP command. If Auto Reference is less than Fmax (***n012***) x .05, this function is not performed.



Time Chart

5.14 FREQUENCY REFERENCE RETENTION

n044 **:** Frequency Reference Retention

Factory setting: ***0***
Range: 0 or 1

Useable with the Up/Down or Sample/Hold commands when either is used as a multi-function contact input. To retain the held frequency reference in ***n025*** when power is removed, set ***n044*** to " 1 ".

Setting	Description
0	Not retained
1	Held reference retained in Frequency Reference 1 (***n025***)

5.15 JOG REFERENCE

n029 **:** Jog Reference

Factory setting: ***6.0*** Hz
Range: 0.0 to 400.0 Hz

n035 thru ***n039*** **:** Multi-function Inputs (Term. S2 - S6)

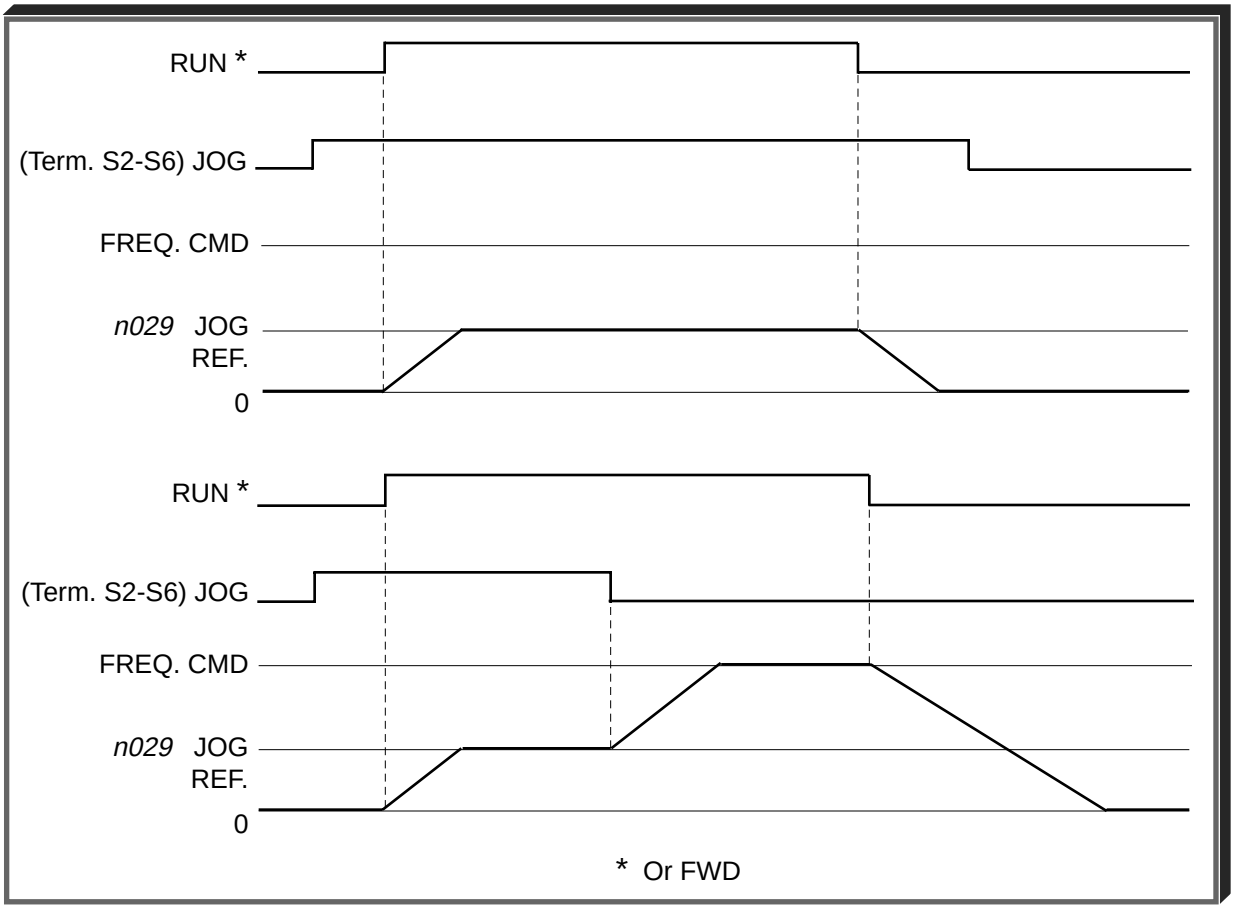
Data ***11*** : Jog Selection

When jog operation is selected (by external Jog and Run signals), the GPD 505 output will ramp to the output level set by this parameter.

When an external Jog signal is present, it will override the existing operation mode and the GPD 505 will ramp to the level set by this parameter.

EXAMPLE:

OPERATION BY REMOTE SIGNAL INPUT (RUN & JOG)



Also see descriptions of **MULTI-FUNCTION INPUT TERMINALS**, paragraph 5.19.

5.15.1 LOCAL/REMOTE CHANGEOVER

n114 **:** Local/Remote Changeover

Factory setting: ***1***
Range: 0 or 1

When ***n114*** = 1, if the **STOP** key of the Digital Operator is pressed during operation at external terminal and function is changed from “Local” to “Remote”, the motor runs after changeover.

When ***n114*** = 0, if the Run comand is changed over by ***n002***, or “Local/Remote” button, the motor does not stop until a Stop command is input.

5.16 MODBUS CONTROL

The GPD 505 can perform serial communication by using a programmable controller (PLC) and MODBUS™ protocol. MODBUS is composed of one master PLC and 1 to 31 (maximum) slave units (GPD 505s). In serial communication between the master and slaves, the master always starts transmission and the slaves respond to it.

The master communicates with one slave at a time. Address numbers are assigned to each slave in advance, and the master specifies an address to communicate with. The slave which receives the command from the master executes the function, and then responds to the master.

A. Communication Specifications

- Interface : RS-232C (standard); RS-485, RS-422 (option - requires communication interface card CM086)
- Synchronization : Asynchronous
- Transmission parameters : *Baud rate* — Selectable from 2400, 4800, 9600 BPS (***n107***)
  Data length — Fixed to 8 bits
  Parity — Parity / no parity, even / odd selectable (***n108***)
  Stop bit — Fixed to 1 bit
- Protocol : MODBUS
- Maximum number to units to be connected : 31 units (when RS-485 is used)

B. Sending/Receiving Data

Data that can be sent and received are run/stop commands, frequency reference, fault reset, drive status, and setting and reading of parameters.

n002 : Operation Mode Selection

Factory setting: ***3***
Range: 0 to 8

Select the run command and frequency reference input method in ***n002***. To provide a run command and frequency reference by communication, set this data to " 4 " thru " 8 ". Monitoring of run status, parameter setting/reading, fault reset and multi-function input command from the PLC are enabled. The multi-function input command is OR'ed with the command input from control circuit terminals S2-S6.

n035 thru ***n039*** : Multi-function Inputs (Term. S2-S6)

Data ***6*** : Serial communication/ Digital Operator

Selects operation by serial communication or by external terminal. If the status of this command input is changed while the drive is running, the selection is ignored until the next time the drive is stopped.

Open : Run according to the setting of Operation Mode Selection (***n002***)
Closed : Run by frequency reference and run command from serial communication

EXAMPLE: ***n002*** setting is " 3 ".

Open : Run by frequency reference from control circuit terminals FV, FI and run command from control circuit terminals S1, S2.
Closed : Run by frequency reference and run command from serial communication.

n105: Modbus Frequency Resolution

Factory setting: ***0***
Range: 0 to 3

The frequency resolution from the PLC and in the frequency reference and output frequency monitor (by communication) are selected with this parameter. The output frequency resolution of the GPD 505 is 0.1 Hz. Even if the Modbus resolution is changed to 0.01 Hz in ***n105***, the value in the hundredths digit of 0.01 Hz of the received frequency reference is rounded off internally. When 30,000/100% in units of 0.1% is selected, the value is also rounded off.

n106: Modbus Slave Address

Factory setting: ***0***
Range: 0 to 31

Each slave GPD 505 on the same transmission line must be given a unique address.

n107: Modbus Baud Rate

Factory setting: ***2***
Range: 0 to 2

Selects the baud rate, as indicated by the following table:

Setting	Baud Rate (BPS)
0	2400
1	4800
2	9600

n108: Modbus Parity Selection

Factory setting: ***1***
Range: 0 to 2

Selects the parity, as indicated by the following table:

Setting	Parity
0	None
1	Even
2	Odd

NOTE: To change the values set in ***n106*** thru ***n108*** and enable the new settings, it is necessary to turn OFF power to the Drive, then turn it ON again.

n103 : Modbus Time Out Detection

Factory setting: ***1***
Range: 0 or 1

If time between Modbus messages exceeds 2.0 seconds, the drive will respond according to the setting of ***n104***. A setting of " 0 " disables this fault condition.

n104 : Stop Method on Modbus Communication Error (CE)

Factory setting: ***1***
Range: 0 to 3

If communications error exists, drive will respond according to the following table:

Setting	Description
0	Ramp to Stop – Decel 1 (fault)
1	Coast to Stop (fault)
2	Ramp to Stop – Decel 2 (fault)
3	Continue operation (alarm)

5.16.1 MISCELLANEOUS PROTECTIVE FUNCTIONS

n112 **:** Operator Connection Fault Detection Selection

Factory setting: ***0***
Range: 0 or 1

Set this parameter to “1” only if the drive should shut down immediately if the Digital Operator is disconnected while the drive is running. When set to “0”, the fault will not occur until after the drive has been stopped.

5.17 MOMENTARY POWER LOSS RIDE-THRU

n051 **:** Momentary Power Loss Ride-thru Protection

0 =	Disabled (Factory setting)
1 =	Enabled – 2 sec. power loss ride-thru
2 =	Enabled – indefinite power loss ride-thru, provided control power is maintained

The setting of this parameter either enables or disables the ride-thru feature of the GPD 505. If disabled, the unit will stop immediately whenever a power loss occurs. If enabled, the GPD 505 will continue to operate during a momentary power loss of up to 80%, but if the loss exceeds the identified time period, the GPD 505 will stop.

n055 **:** Power Loss Ride-Thru Deactivation Time

Factory setting: *See Table A3-1*
Range: 0.0 to 2.0 seconds

If the loss exceeds the length of time identified by ***n055***, the GPD 505 will stop. The factory setting of this parameter, in 0.1 second increments, is related to the GPD 505's rating.

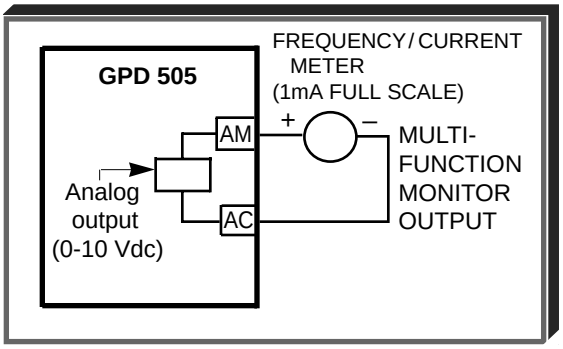
Note that the RUN command must be maintained throughout the ride-thru period. If ***n051*** is set to " 2 ", a " ***Uu*** " alarm is displayed during power loss, and no fault signal is output at terminals M1 & M2 or MA, MB & MC.

5.18 MULTI-FUNCTION ANALOG MONITOR OUTPUT (Term. AM & AC)

n048 **:** Multi-function Analog Output

Factory setting: **0**

The monitor output provides a 0-10 Vdc signal proportional to either output frequency, output current, output voltage reference, or output power between terminals AM & AC:



0 = 0-10 Vdc proportional to output frequency

1 = 0-10 Vdc proportional to output current

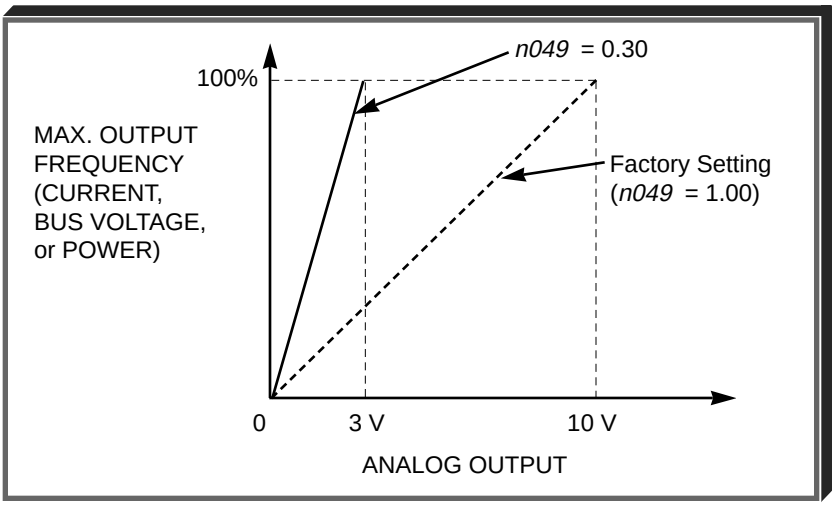
2 = 0-10 Vdc proportional to output power

3 = 0-10 Vdc proportional to DC bus voltage.

n049 **:** Analog Monitor Gain

Factory Setting: ***1.00***
Range: 0.01 to 2.00

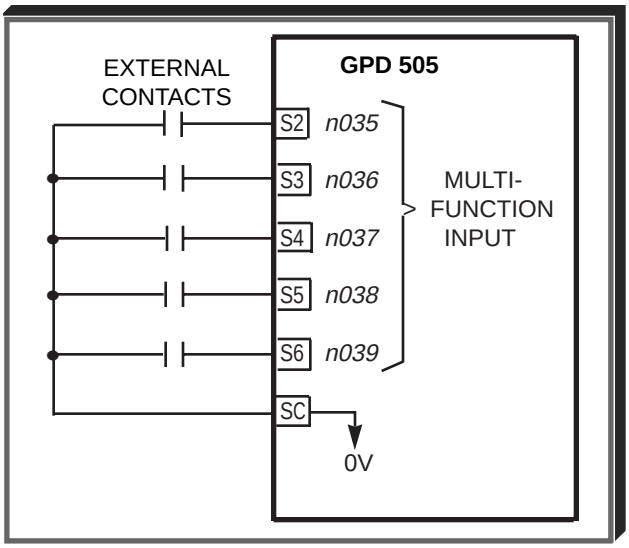
This constant is used to calibrate, in increments of 0.01, either the frequency, current or volt meter connected to terminals AM & AC.



5.19 MULTI-FUNCTION INPUT TERMINALS (Term. S2-S6)

n035 : Terminal S2 Function
n036 : Terminal S3 Function
n037 : Terminal S4 Function
n038 : Terminal S5 Function
n039 : Terminal S6 Function

Factory settings:	2-Wire control	3-Wire control
n035	***0***	***1***
n036	***2***	***––***
n037	***4***	***2***
n038	***9***	***4***
n039	***10***	***9***



These five parameters select the input signal functions for terminals S2 thru S6, and can be independently set.

Parameter settings are checked whenever power is applied to the GPD 505, or upon exiting Program mode. A parameter set value failure (***oPE3***) will occur if any of the following conditions are detected among these five parameters:

(1) Two or more of the parameters contain the same value.

(2) Both Speed Search functions (data ***15*** and ***16***) have been selected.

(3) Both the Sample/Hold (data ***2 2***) and Up/Down (data ***2 5***)functions have been selected.

(4) The Up/Down (data ***25***) or the Loop Test (data ***2 6***) functions have been entered into any parameter ***n035*** thru ***n038*** .

Table 5-2 lists the possible data setting values for these parameters, with the function and a brief description for each one.

For a few of the data settings, a more detailed description is given on the following pages; for others, the description is given in other PROGRAMMABLE FEATURES paragraphs.

5.19 MULTI-FUNCTION INPUT TERMINALS (Term. S2-S6) Continued

Table 5-2. *n035* thru *n039* Data Settings

DATA	FUNCTION	DESCRIPTION *
0	Reverse Run/Stop command (for 2-wire control)	MUST BE SET ONLY IN ***n035***. Redefines terminals: S1 = Run/Stop Forward; S2 = Run/Stop Reverse
1	FWD/REV selection (for 3-wire control)	MUST BE SET ONLY IN ***n035***. Redefines terminals: S1 = Run; S2 = Stop; S3 = FWD/REV select
2	External fault (N.O. contact input)	Drive trips; Digital Operator displays "***EFX***", where X is 2-6, corresponding to the terminal, S2-S6, which is receiving the fault input signal
3	External fault (N.C. contact input)	
4	Fault Reset	Resets fault, only if RUN command is not present
5	Remote/Local selection	Open = Operates according to setting of ***n002*** Closed = Operates from keys of the Digital Operator **See paragraph 5.19A**
6	GPD 505 operation & reference/ serial communication selection	Open = Operates according to setting of ***n002*** Closed = Operates from serial communication **See paragraph 5.16**
7	Quick Stop	Open = Stop according to setting of ***n004*** Closed = Ramp to stop by Decel Time 2 (***n022***)
8	Auto/Manual frequency reference selection	Open = Frequency reference from terminal FV Closed = Frequency reference from terminal FI
9	Multi-step frequency ref. select 1	**See paragraph 5.19B**
10	Multi-step frequency ref. select 2	
11	Jog selection	Closed = Jog selected **See paragraph 5.15**
12	Accel/decel time selection	Open = Accel/decel by ***n019*** / ***n020*** Closed = Accel/decel by ***n021*** / ***n022*** **See paragraph 5.2**
13	External base block (N.O. contact input)	Closed = Shuts off GPD 505 output (frequency command is held) **See paragraphs 5.19C, 5.19D**
14	External base block (N.C. contact input)	
15	Speed Search 1	Closed * = Speed Search operation from maximum frequency **See paragraph 5.19E**
16	Speed Search 2	Closed * = Speed Search operation from set frequency **See paragraph 5.19E**

Table 5-2. *n035* thru *n039* Data Settings - Continued

DATA	FUNCTION	DESCRIPTION *
17	Programming enable	Open = Programming from Digital Operator or serial communication is enabled Closed = All programming is disabled
18	PID integral value reset	Closed = Value of I (***n087***) is reset to " 0 " **See paragraph 5.22I**
19	PID control disable	Closed = PID control is disabled – setpoint becomes frequency reference **See paragraph 5.22I**
20	Timer function	**See paragraph 5.19F**
21	External overheat	Closed = ***oH3*** blinks on the Digital Operator, and operation continues (minor fault)
22	Analog reference sample/hold	Open = Hold frequency reference Closed = Sample frequency reference **See paragraph 5.19G**
23	Inertia ride-thru command (N.O. contact input)	Closed = Inertia ride-thru is enabled
24	Inertia ride-thru command (N.C. contact input)	Closed = Inertia ride-thru is disabled
25	Up/Down function	**See paragraph 5.19H**
26	Loop Test	**See paragraph 5.19J**
27	PID Changeover	**See paragraph 5.19K**

* All contact closures must be maintained, except for speed search, which may be momentary (see paragraph 5.19E).

A. Data ***5*****:** Remote/Local

Set parameter ***n002*** to data " 3 " to select external inputs as the source for frequency reference and operation commands. The use of a Remote/Local command input allows switching between the Digital Operator control and the external terminal input signals, without the need to re-program ***n002***. If the status of the Remote/Local command input is changed while the drive is running, the Remote/Local operation selection is not completed until the next time the GPD 505 is stopped.

Closed = Controlled locally (Digital Operator)

Open = Controlled remotely (external terminal inputs, for Start/Stop and frequency reference)

B. Data ***9***: Multi-step Frequency Ref. Select 1
Data ***10***: Multi-step Frequency Ref. Select 2

n025 thru ***n029***: Frequency Reference 1-4 and Jog Reference

Factory settings: *n029* = ***6.0*** all others = ***0.0***
Range (ea): 0.0 to 9999

In order to use multi-step frequency presets, parameters ***n038***, ***n039*** & ***n037*** must be programmed accordingly for 2-Wire or 3-Wire control. (Parameter ***n002*** must be set for frequency reference from Digital Operator (data " 0 ", " 1 ", or " 7 ") .)

To use the maximum of 5 preset frequencies, ***n038*** must be set to " 9 " (Multi-step Frequency Ref. Select 1), ***n039*** must be set to " 10 " (Multi-step Frequency Ref. Select 2), and ***n037*** must be set to " 11 " (Jog).

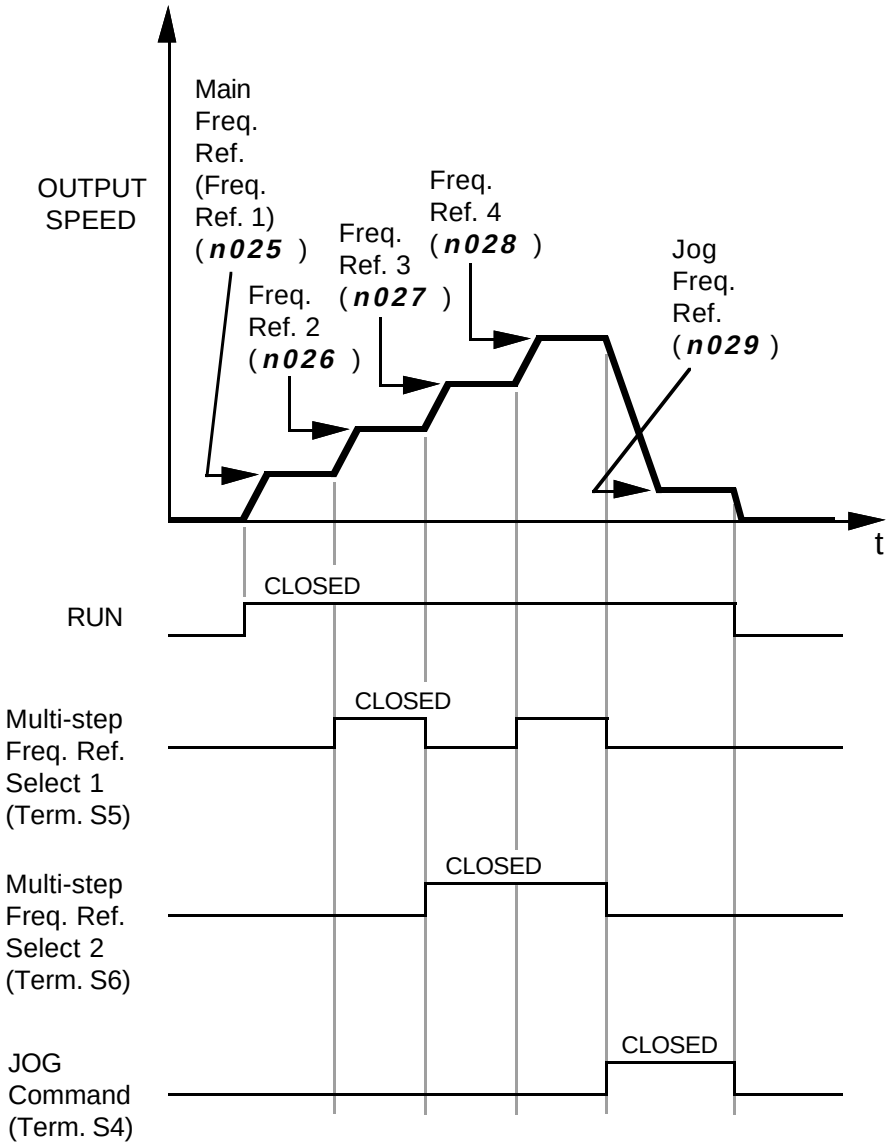
Note that the remote frequency reference (terminal FV) can be substituted for Freq. Ref. 1 by selecting the Remote mode, either with the **LOCAL/REMOTE** key on the Digital Operator, or programming one of the Multi-function inputs for Remote/Local (data " 5 ").

Multi-step (5 preset frequencies) in 2-Wire control

PARAMETER and NAME	EXTERNAL TERMINAL S6	S5	S4	S3
n024 Frequency Ref 1	0	0	0	0
n025 Frequency Ref 2	0	0	0	1
n026 Frequency Ref 3	0	0	1	0
n027 Frequency Ref 4	0	0	1	1
n028 Frequency Ref 5	0	1	0	0
n029 Frequency Ref 6	0	1	0	1
n030 Jog Reference	1	X	X	X

1 = Closed (ref terminal SC) 0 = Open (ref terminal SC)

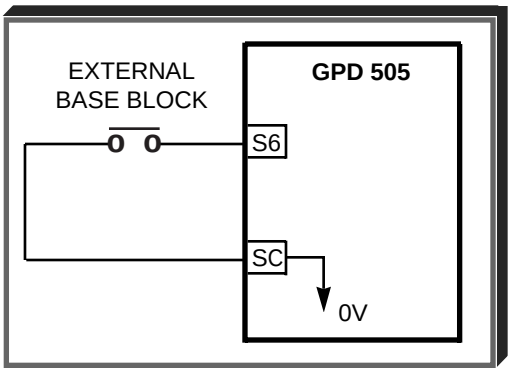
See next page for timing chart of multi-step speed operation.



NOTE: The Jog command takes priority over multi-step frequency select inputs.

Typical Multi-step Speed Operation

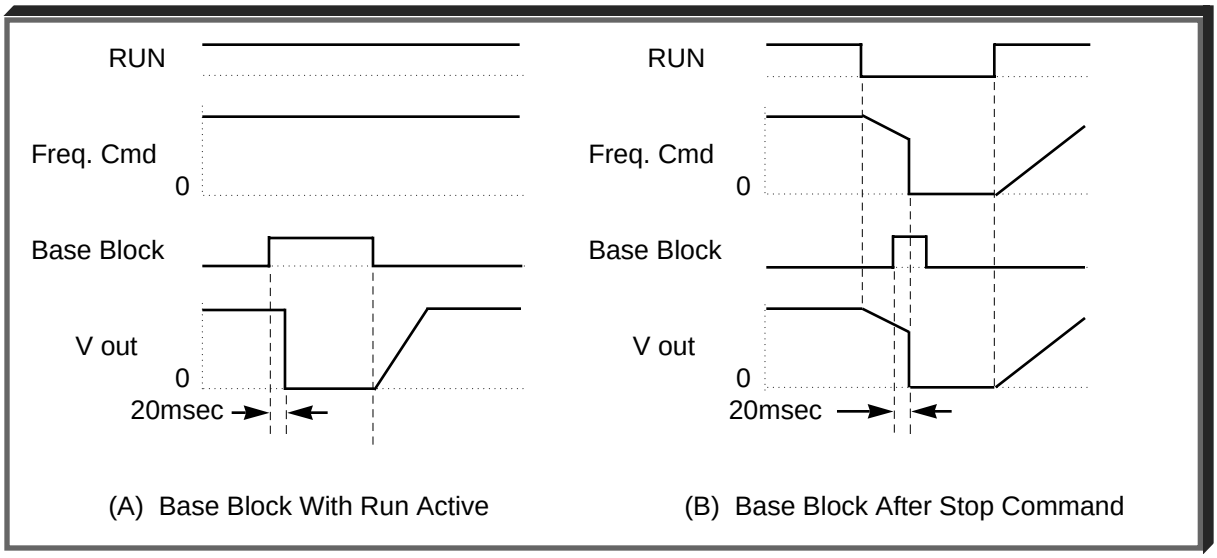
C. Data ***13*****:** External Base Block by N.O. Contact



- When either the Forward Run command or Reverse Run command is present, and the external Base Block command is applied (i.e. contact closed), coast stop is accomplished (after a 20 msec delay), while the frequency command is maintained. When the Base Block command is removed, the drive will recover in a manner similar to that of Speed Search operation.

- When both the Forward Run command and Reverse Run command are open, and the external Base Block command is applied (i.e. contact closed), coast stop is accomplished and after a 20 msec delay the frequency command is changed to 0Hz. When the Base Block command is removed, the drive will remain in stopped condition until Forward Run command or Reverse Run command is again applied.

- When external Base Block command is active, a blinking " ***b b*** " will be displayed on the Digital Operator.



(A) Base Block With Run Active

(B) Base Block After Stop Command

D. Data ***14*****:** External Base Block by N.C. Contact

Base block operation is the same as described above, except that the Base Block contact must be *open* to be recognized.

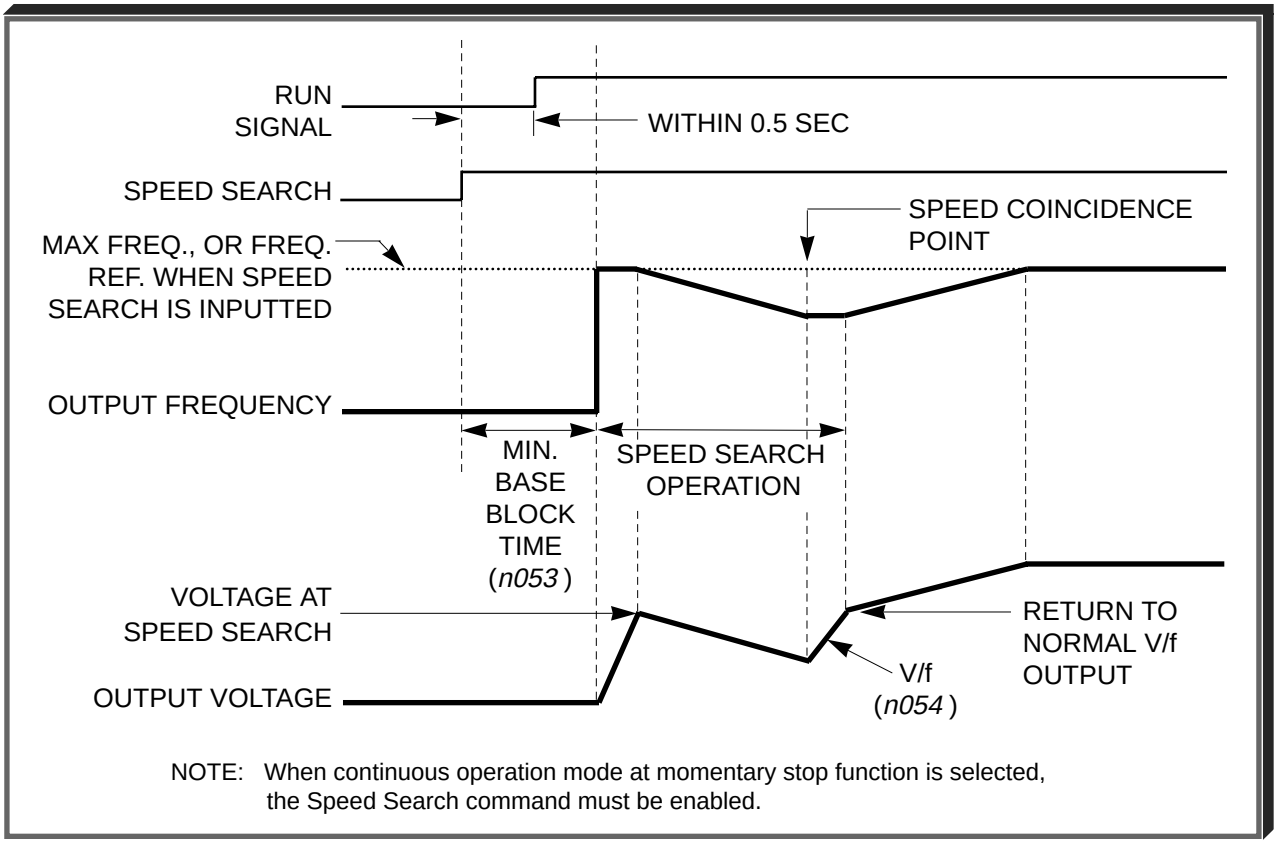
E. Data ***15***: Speed Search From Max Frequency
Data ***16***: Speed Search From Set Frequency

A multi-function input terminal is utilized to activate speed search. When the external speed search command is closed, the base is blocked for the min. base block time, ***n053***, then the speed search is made. The operation depends on the set value.

IMPORTANT

Set values ***15*** and ***16*** CANNOT be selected in combination.

- When ***15*** is set, the speed search begins with the maximum frequency.
- When ***16*** is set, the speed search begins with the frequency command command that has been set after the search command was received.



Speed Search Operation Timing

n052 **:** Speed Search Deactivation Current Level

Factory setting: ***110*** %
Range: 0 to 200 %

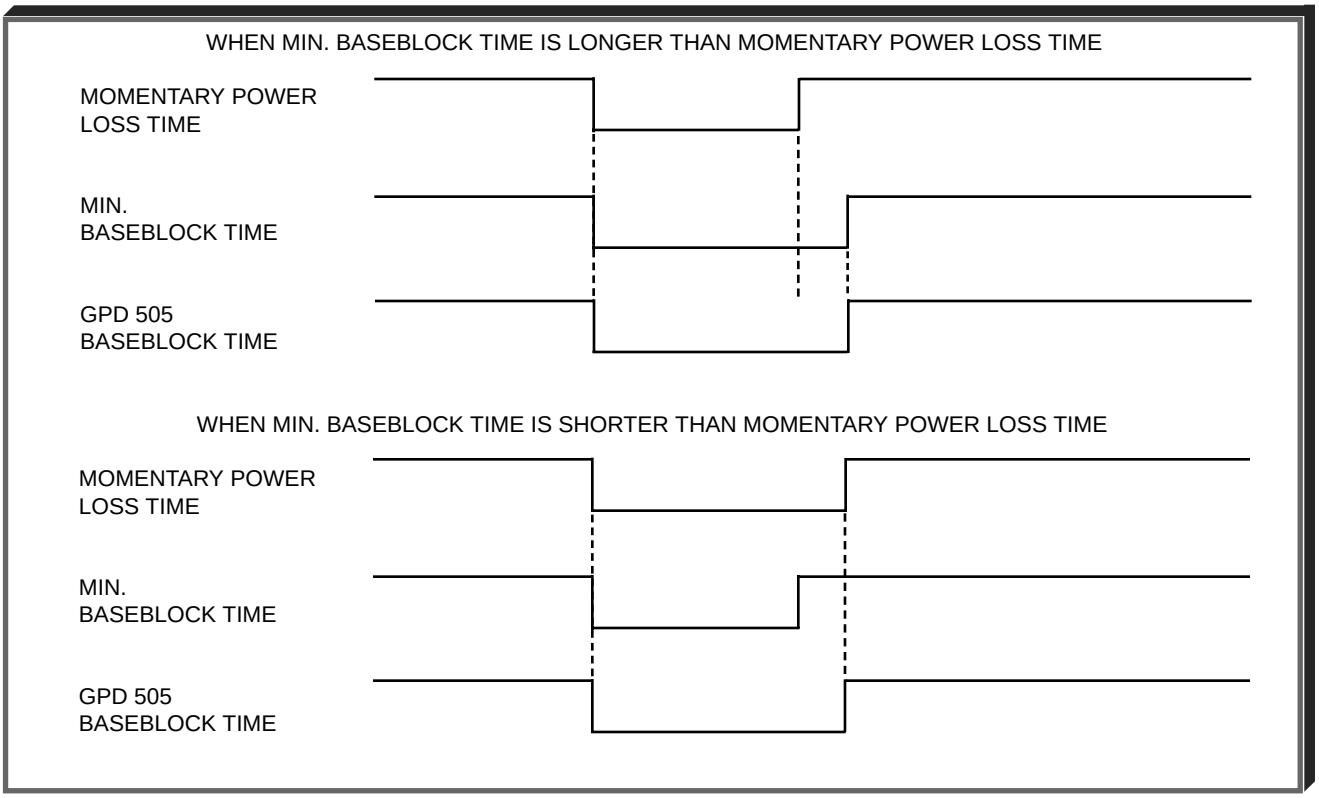
After power recovery, if the GPD 505 output current is larger than the set value of ***n052***, speed search is started, using a decel rate of 2.0 sec. When GPD 505 output current is lower than the set value of ***n052***, speed search is complete and acceleration or deceleration is continued at the normal rate (***n019*** - ***n022***) to set frequency.

n053 **:** Minimum Baseblock Time

Factory setting: *See Table A3-1*
Range: 0.0 to 25.5 sec.

When a momentary power loss is detected, the GPD 505 output transistors are disabled for a period of time determined by the setting of ***n053***. The ***n053*** setting should represent the time required for the motor residual voltage to go to zero.

When the momentary power loss time exceeds the minimum base block time, the speed search operation is started immediately after power recovery.



n054 **:** V/f During Speed Search

Factory setting: *See Table A3-1*
Range: 0 to 100 %

To prevent a fault such as OC from occurring during the speed search operation, V/f must be set to a value lower than that required during normal operation.

V/f during speed search = V/f at normal operation x ***n054***

F. Data ***20*****:** Timer Function

n040 or ***n041*****:** Multi-function Output Terminals (MA, MB, & MC, or M1 & M2)

Data ***11*** : Timer Function

n077 **:** On-delay Timer

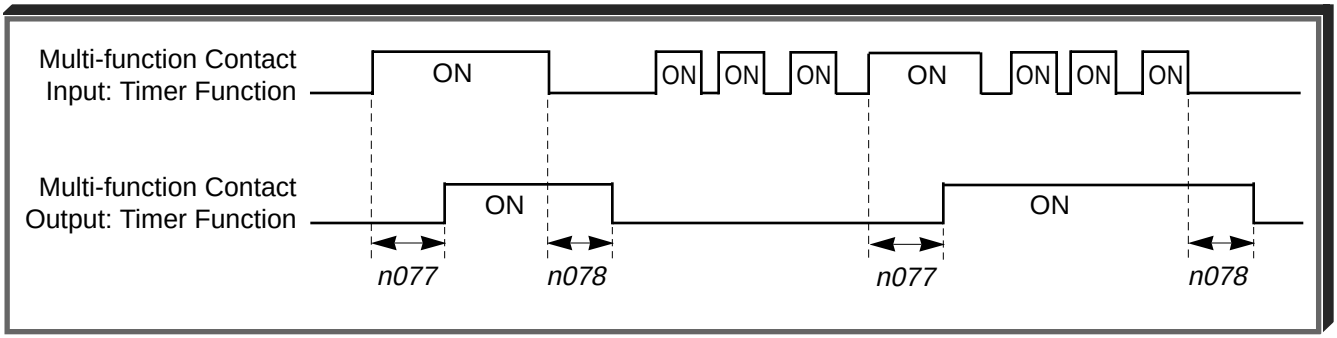
Factory setting: ***0.0*** sec.
Range: 0.0 to 25.5 sec.

n078 **:** Off-delay Timer

Factory setting: ***0.0*** sec.
Range: 0.0 to 25.5 sec.

When the timer function input is “closed” for longer than On-delay Timer (***n077***), the timer function output closes.

When the timer input is “open” for longer than Off-delay Timer (***n078***), the timer function output opens.



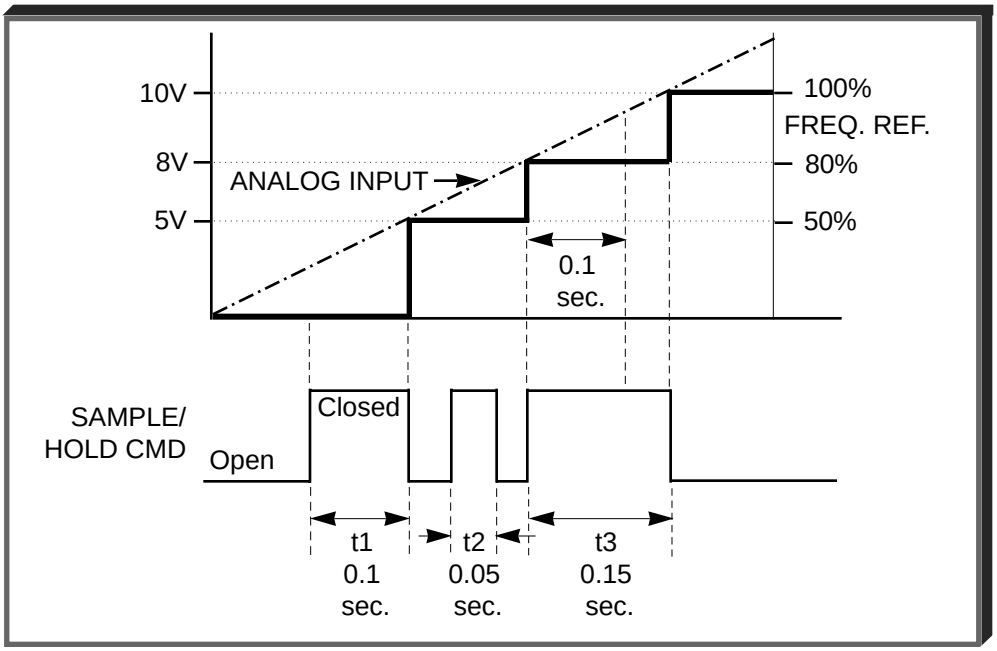
As can be seen, the timer function must be programmed as both a multi-function input **and** an output to be effective.

G. Data ***22*****:** Sample/Hold Command (Accel/Decel Speed Prohibit)

This function applies only to an analog voltage or current input used as a frequency reference at terminals FV or FI.

If the Sample/Hold command is present (contact is closed) for more than 0.1 sec., the frequency reference will follow (sample) the analog signal, e.g. if 5V corresponds to 50% frequency, a 5V analog signal will produce 50% frequency reference if the Sample/Hold command is present.

If the Sample/Hold command is removed (contact is opened) while the Drive is still in Run condition, the frequency reference is held at the level it was at the time the Sample/Hold command was removed, e.g. the frequency reference would remain at 50%, even though the analog signal increased to 8V.



Sample/Hold Function Timing

H. Data ***25*** : Up/Down Function

Programming data " 25 " for ***n039*** (multi-function input terminal) allows the inputs to be used for Up/Down frequency setting.

NOTES:

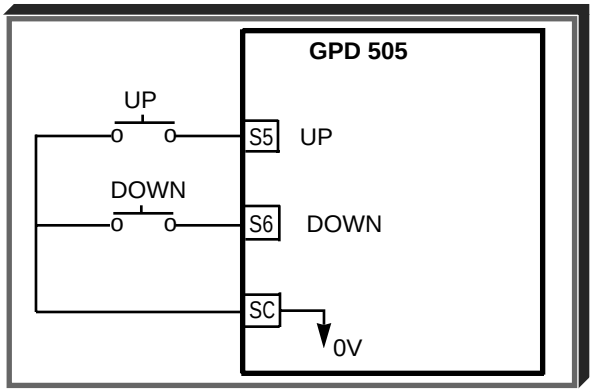
1. ***oPE3*** fault will occur if data " 25 " is programmed into ***n035*** thru ***n038*** .
2. Parameter ***n038*** will display " –– " when ***n039*** is set to " 25 ".
3. Jog has priority over Up/Down.
4. Up/Down has priority over Multi-step Frequency inputs.
5. Up/Down is ineffective when operation is from the Digital Operator.
6. Upper limit speed is set by the formula:

$$\text{n012 (Fmax)} \times \frac{\text{n030 (Freq. Ref. Upper Limit)}}{100}$$

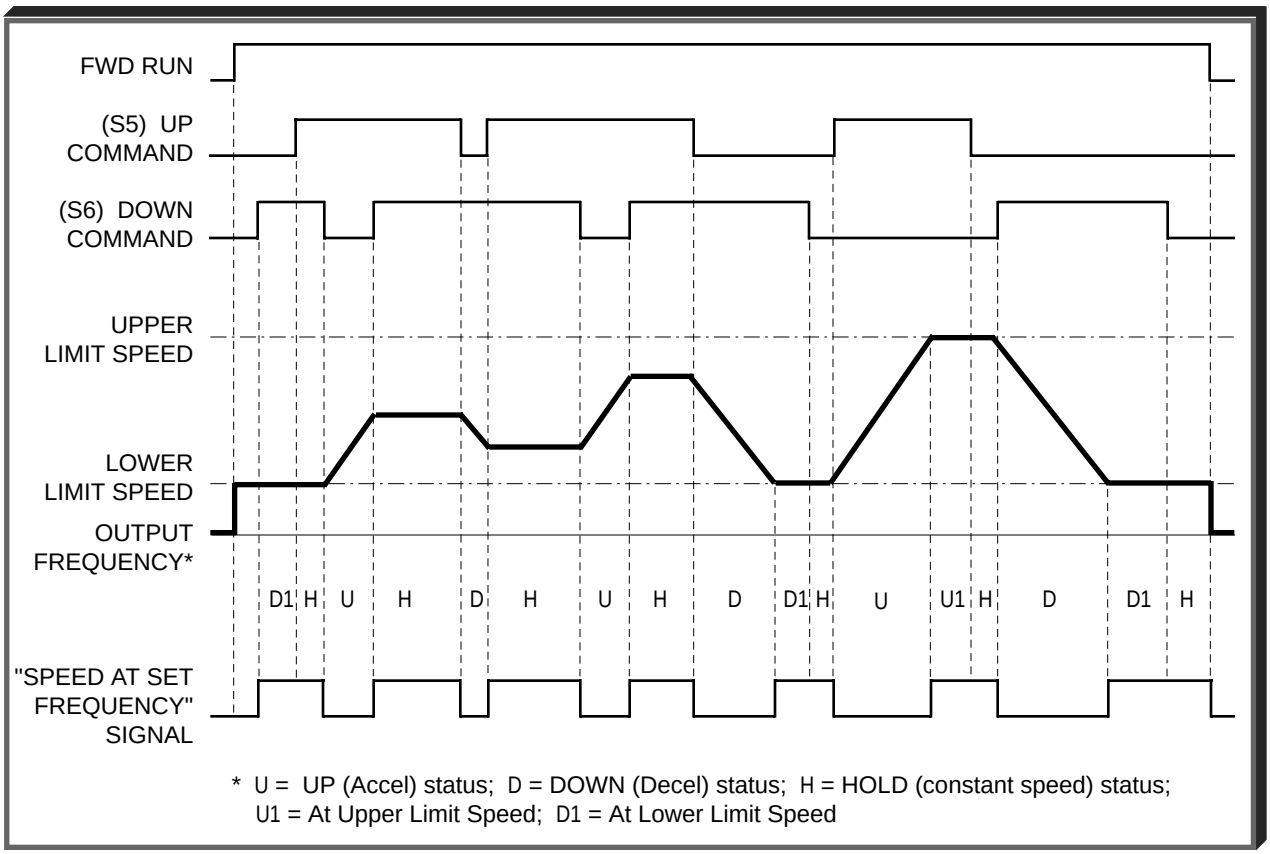
7. Lower limit speed is either the reference from external terminals FV or FI, or from ***n031*** , Frequency Reference Lower Limit, whichever is higher.
8. Upon a Forward (or Reverse) Run command, the drive will operate at the lower limit speed, until an UP command is given.

EXAMPLE:

n039 Data ***25*** : Up/Down function



INPUT SIGNAL Term. S5 UP	Term. S6 DOWN	FUNCTION
Open	Open	HOLD
Closed	Open	UP (Frequency command approaches frequency command upper limit)
Open	Closed	DOWN (Frequency command approaches minimum output frequency or frequency command lower limit, whichever is larger)
Closed	Closed	HOLD



Up/Down Frequency Setting Timing

J. Data ***26*** : Loop Test

Checks operation of the serial interface circuit.

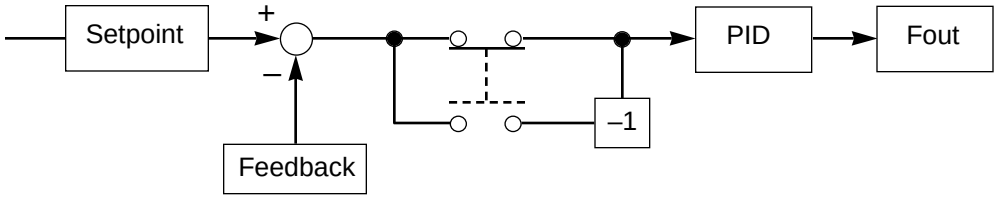
To use this test function:

1. Apply power to drive.
2. Set Multi-function Contact Input Selection (***n039***) to data " 26 ".
3. Remove power from drive.
4. Close terminal S6 to SC.
5. Short connector 2CN, pins 1 & 2 together (unless using Communication Interface Card).
6. Loop test is started by reapplying power to the drive.

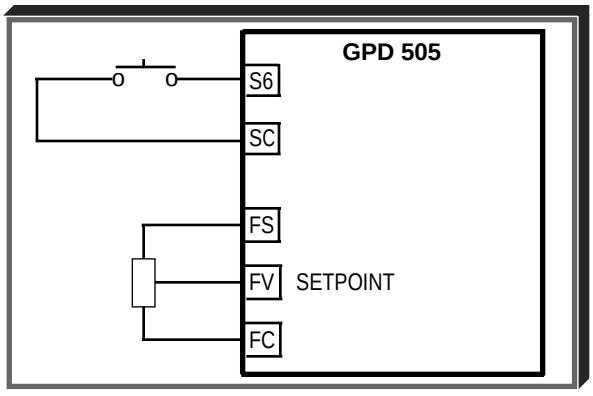
The Digital Operator displays the frequency reference if the loop test is successful, and a ***CE*** fault if not.

K. Data ***27*** : PID Changeover

Programming data " 27 " for ***n039*** alows the PID input characteristic changeover to function as follows:



Multi-function input: Open = As usual
Closed = Polarity of Deviation is changed over



5.20 MULTI-FUNCTION OUTPUT TERMINALS (Term. MA, MB & MC; M1 & M2)

n040 : Contact Output (external terminals MA, MB & MC)
n041 : Contact Output (external terminals M1 & M2)

A Form-C contact, or a N.O. contact, can be programmed to change states during any of the conditions indicated in Table 5-3.

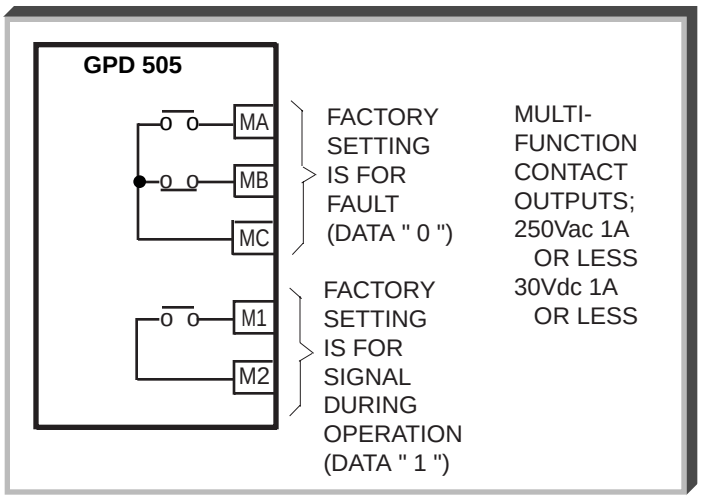


Table 5-3. Multi-function Output Terminals

Set Value	Description	
	Condition	Signal Level
0	Fault	Closed = GPD 505 fault has occurred (except CPF0, CPF1)
1	During operation	Closed = GPD 505 is operating
2	Speed at set frequency	Closed = Frequency Reference = output frequency **See description on next page**
3	Speed coincidence	Closed = Speed at set frequency and output frequency = ***n073*** **See description on next page**
4	Frequency detection - low	Closed = Output frequency ≤ ***n073*** . **See description on next page**
5	Frequency detection - high	Closed = Output frequency ≥ ***n073*** . **See description on next page**
6	Overtorque detection (N.O. contact)	Closed = Overtorque detected
7	Overtorque detection (N.C. contact)	Open = Overtorque detected
8	During coast to stop	Closed = GPD 505 output base block is active; motor is coasting
9	Frequency or Run reference mode	Open = Frequency or Run Command by ext. input; Closed = Frequency or Run Command by Digital Operator
10	Operation ready	Closed = GPD 505 is ready for operation (not faulted)
11	Timer function	**See paragraph 5.19F**
12	Auto-restart	Closed = During auto-restart operation
13	OL warning	Closed = 150% current for 48 sec. (OL1) or 80% time (OL2)
14	Frequency reference missing	Closed = Frequency reference is missing. **See paragraph 5.13**
15	Serial communication	Closed = Command from serial communication
16	PID feedback loss	Closed = Feedback value < detection level (***n093***) for longer than detection delay time (***n094***)
17	OH1 warning	Closed = Heatsink temperature ≥ 90°C (194°F)

n073 : Speed Coincidence Frequency / Frequency Detection Level

Factory setting: ***0.0*** Hz
Range: 0.0 to 400.0 Hz

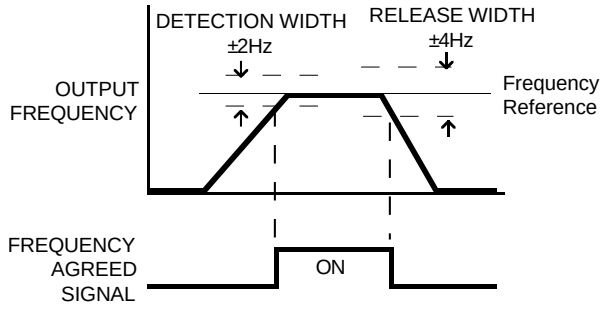
Speed coincidence is used to control an output contact at terminals MA or MB (with respect to terminal MC), or terminals M1 & M2, when selected by ***n040*** and ***n041*** .

n040 or ***n041***

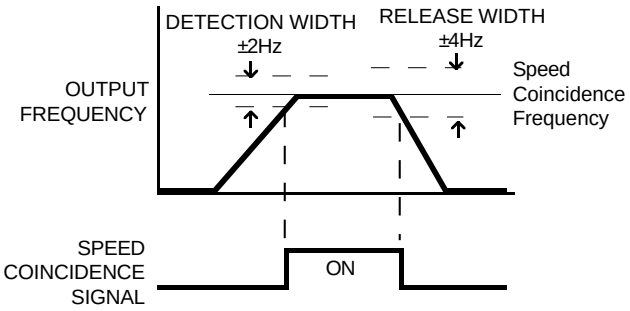
Data ***2*** , ***3*** , ***4*** or ***5***

The output contact will close, dependent upon the data programmed into ***n040*** or ***no41*** . See the appropriate figure below for operation.

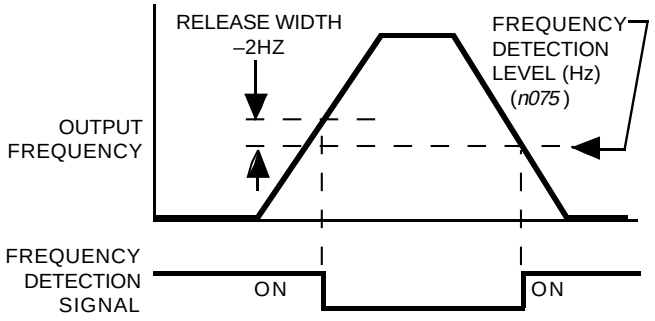
A. Speed at Set Frequency (setting: *n040* or *n041* = " 2 ")



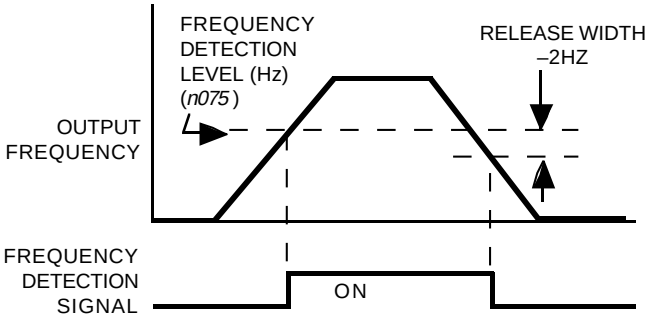
B. Speed Coincidence (setting: *n040* or *n041* = " 3 ")



C. Frequency Detection – Low (setting: *n040* or *n041* = " 4 ")



D. Frequency Detection – High (setting: *n040* or *n041* = " 5 ")



n113 : Frequency Agreed Detection Width

Factory setting: ***2.0*** Hz
Range: 0.0 to 25.50 Hz

This Detection Width setting is used to establish the frequency level at which the output contact activates, when ***n040*** or ***n041*** is set to " 2 " or " 3 ".

5.21 OVERTORQUE DETECTION

Overtorque detection is used to compare GPD 505 rated output current with the overtorque detection level. When the output current is equal to or greater than the defined level, an overtorque condition exists. This will be indicated as an ***oL3*** fault on the Digital Operator. This feature can be selected to operate over a wide range of conditions.

A. *n074*: Overtorque Detection

Factory setting: ***0***

This constant determines whether the overtorque detection function of the GPD 505 is enabled, under what conditions it will detect for overtorque, and what operation it will perform after detecting an overtorque.

Setting	Overtorque Detection	Operation After Detection	Detection Condition
0	Disabled	——	——
1	Enabled	Continues	Only at set frequency
2	Enabled	Continues	At all times except during stopping or DC injection braking
3	Enabled	Coast to stop	Only at set frequency
4	Enabled	Coast to stop	At all times except during stopping or DC injection braking

— For overtorque detection during accel or decel, set to " 2 " or " 4 ".
— For continuous operation after overtorque detection, set to " 1 " or " 2 ". During detection, the Digital Operator displays and " ***oL3*** " alarm (blinking).
— To stop the drive at an overtorque detection fault, set to " 3 " or " 4 ". At detection, the Digital Operator displays an " ***oL3*** " fault.
— To output an overtorque detection signal, set output terminal function selection (***n40*** or ***n41***) to " 6 " or " 7 ".

B. *n075*: Overtorque Detection Level

Factory setting: ***160*** %
Range: 30 to 200 %

This is the reference point for determining that an overtorque condition exists. Set as a percent of GPD 505 rated current (see Appendix 2).

C. n076 : Overtorque Detection Time

Factory setting: ***0.1*** sec.
Range: 0.0 to 10.0 seconds

Determines how long an overtorque condition must exist before another event will occur, e.g. coast to stop, multi-function output change of state, or ***oL3*** warning or fault display.

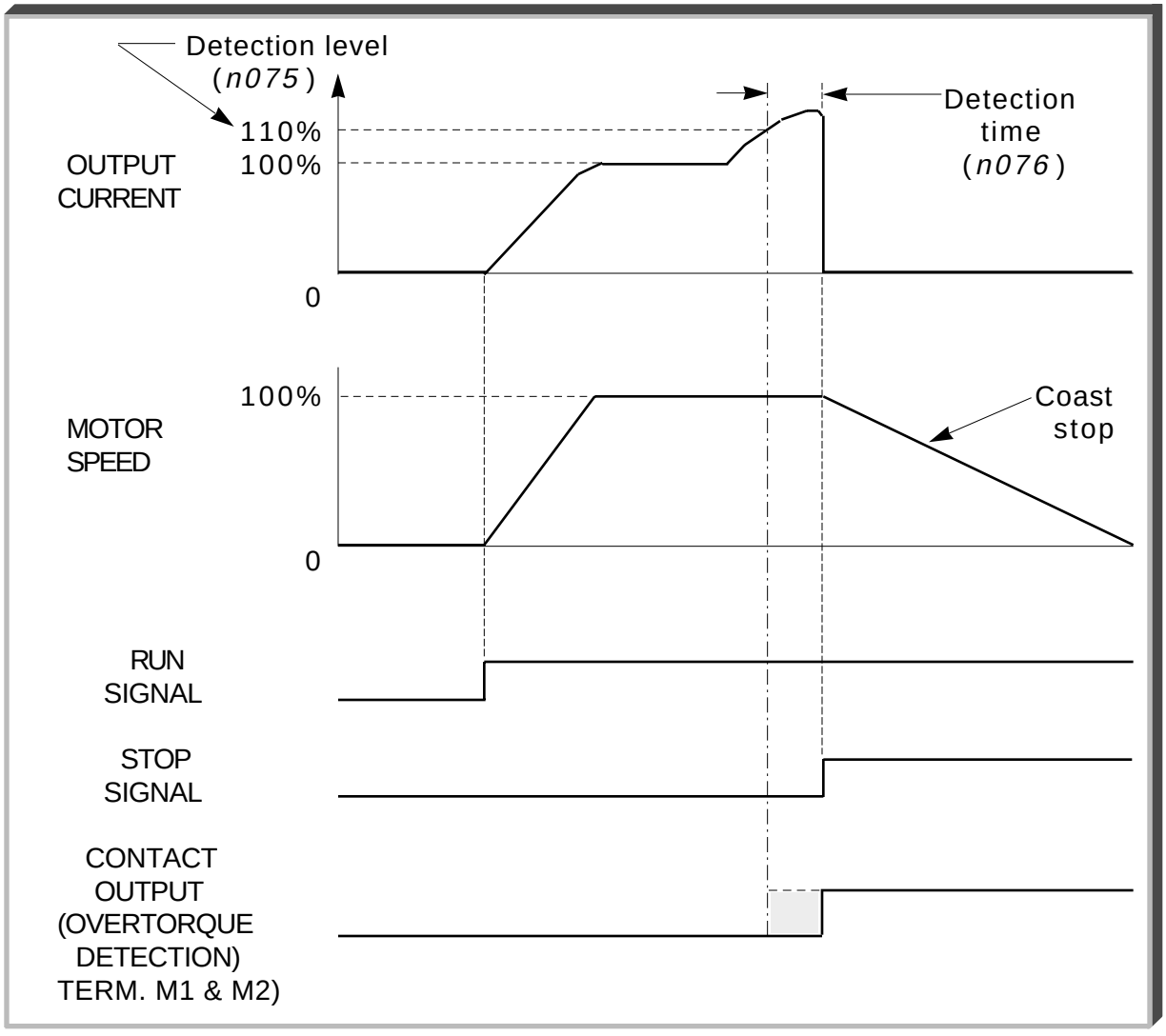
D. ***n040*** **:** Multi-function Output 1 – Contact (terminals MA, MB & MC)
n041 **:** Multi-function Output 2 – Contact (terminals M1 & M2)

Data ***6*** or ***7*** : Overtorque Detection

A Form-C contact, or a N.O. contact, can be programmed to change states during an overtorque detection condition.

EXAMPLE OF OVERTORQUE DETECTION

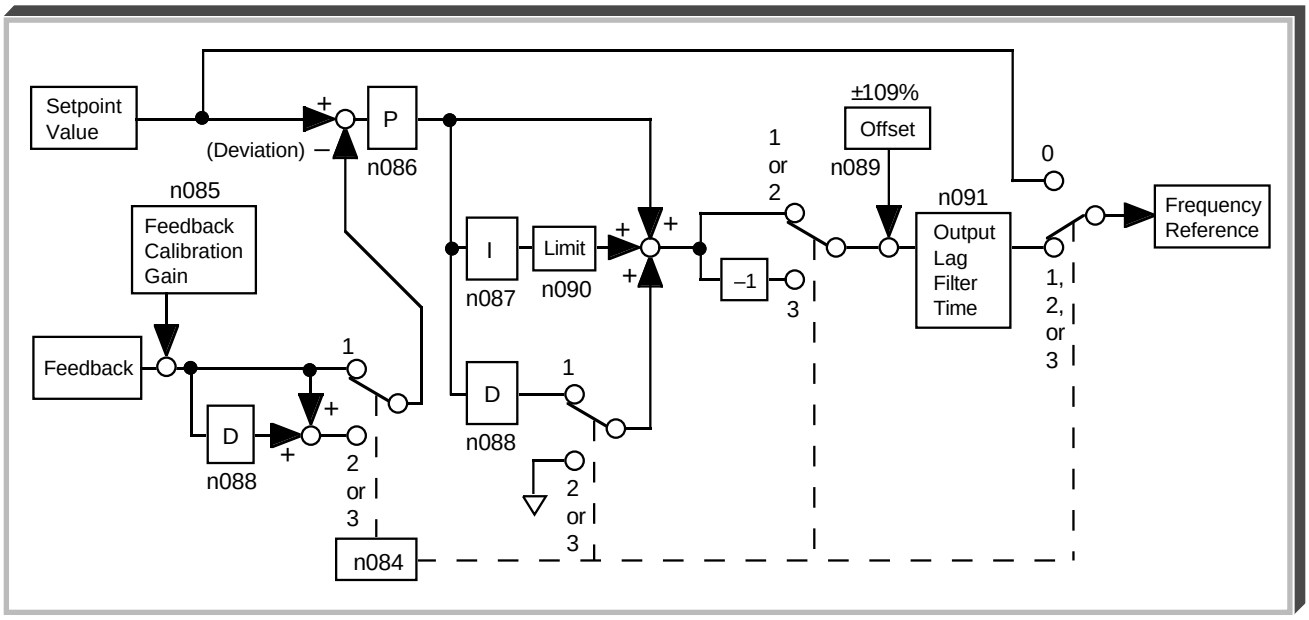
n074 setting: ***3*** — Overtorque enabled, only at set frequency, coast to stop
n041 setting: ***6*** — Output contact programmed for overtorque detection
n075 setting: ***110*** % — Level at which overtorque is sensed
n076 setting: ***1.0*** s — Time delay before overtorque event occurs



Overtorque Detection Timing Diagram

5.22 PID CONTROL

The Proportional, Integral and Derivative control function provides closed-loop control, or regulation, of a system process variable (pressure, temperature, etc.). This regulation is accomplished by comparing a feedback signal to a setpoint reference, which results in an error signal. The PID control algorithm then performs calculations, based upon the PID parameter settings (***n084*** thru ***n094***), on this error signal. The result of the PID algorithm is then used as the new speed reference.



A. *n084* : PID Selection

Factory setting: ***0***
Range: 0, 1, 2

Using this parameter, PID control can be enabled, feed forward function can be activated, or the PID Feedback can be inverted.

Setting	Description
0	PID disabled
1	PID enabled (Deviation is D-controlled)
2	PID with feed forward (Feedback value is D-controlled)
3	Inverted PID Feedback signal

B. Setpoint Reference Selection

n002 : Operation Mode Selection

Factory setting: ***3***
Range: 0 to 8

n042 : Auto Analog Input Selection

Factory setting: ***0***
Range: 0 or 1

n025 thru ***n029*** : Multi-step Frequency Presets

Factory settings: *n029* = ***6.0*** all others = ***0.0***
Range (ea): 0.0 to 9999

Select the PID control Setpoint Reference from either the external terminal FV (for 0-10 VDC), or from multi-step speed parameters, ***n025*** thru ***n029***.

- External terminal FV: Set ***n002*** to data " 2 " or " 3 ".
- Multi-step speed parameters: Set ***n002*** to data " 0 " or " 1 ". (See Operation Mode Selection, page A1-1, and Multi-step Speed Setting, paragraph 5.19B.)

C. Feedback Signal Selection

n043 : Manual Analog Input Selection

Factory setting: ***1***
Range: 0 or 1

Select the PID control Feedback Signal from external terminal FI for either a current signal (4-20mA DC) or a voltage (0-10 VDC).

- Current signal: Set ***n043*** to data " 1 ".
- Voltage signal: Set ***n043*** to data " 0 ".
  (**Must also cut jumper J1 on Control PCB**.)

D. Inverse PID

NOTE: The following applies only when ***n084*** = " 3 ".

If using inverse PID control (***n084*** = "3"), the following adjustments need to be made:

- If a 0-10 VDC reference is used to determine the setpoint, exchange the values in ***n046*** and ***n047***.

  EXAMPLE: If the Frequency Reference Gain (***n046***) = " 100 " % and the Frequency Reference Bias (***n047***) = " 0 " %, these parameters will now need to be set as follows:

  n046 = " 0 " % ***n047*** = " 100 " %

- If the setpoint is entered via the keypad, the entered setpoint needs to be recalculated as follows:

  Entered Setpoint = Max Value (n024) – Desired Setpoint

  This effectively inverts the reference input.

  EXAMPLE: Desired Setpoint is 43.0 Hz, Max. Value (***n024***) = " 60.0 " Hz. Therefore, the entered setpoint is:

  Entered Setpoint = 60.0 Hz – 43.0 Hz = " 17.0 " Hz.

  This setpoint should be entered as " 17.0 " Hz.

- If PID feedback loss detection is used, the *inverse* of the desired feedback loss detection level should be entered in ***n093***.

  EXAMPLE: Deseired Feedback Loss Level = 7%.

  Desired Fdbk Loss Det. Level = 100% – 7% = " 93 " %.

E. ***n085*** : Feedback Calibration Gain

Factory setting: ***1.00***
Range: 0.00 to 10.00

This parameter is used to adjust the Feedback Signal level.

F. Feedback Loss Detection

n092 : Feedback Loss Detection Selection

Factory setting: ***0***
Range: 0 or 1

n093 : Feedback Loss Detection Level

Factory setting: ***0*** %
Range: 0 to 100 %

n094 : Feedback Loss Detection Delay Time

Factory setting: ***1.0*** seconds
Range: 0.0 to 25.5 seconds

When enabled (***n092*** = data " 1 "), the drive will sense if the Feedback Signal falls below the ***n093*** level for more than the ***n094*** delay time.

G. PID Settings

n086 : Proportional Gain

Factory setting: ***1.0***
Range: 0.0 to 10.0

Proportional gain is the value by which the error signal is multiplied to generate the new speed reference.

(continued on next page)

n087 : Integral Time

Factory setting: ***10.0*** seconds
Range: 0.0 to 100.0 seconds

This parameter determines now fast the integral gain increase is added to the control loop.

n088 : Derivative Time

Factory setting: ***0.0*** seconds
Range: 0.00 to 1.00 seconds

Derivative time can be adjusted to dampen initial oscillations and reduce overshoot, which serves to improve stability.

These parameters are all interactive, and will need to be adjusted until the control loop is properly tuned, i.e. stable with minimal stead-state error. A general procedure for tuning these parameters is as follows:

1. Adjust Proportional Gain until continuous oscillations in the Controlled Variable are at a minimum.
2. The addition of Integral Time will cause the steady-state error to approach zero. The time should be adjusted so that this minimal error is attained as fast as possible, without making the system oscillate.
3. If necessary, adjust derivative time to reduce overshoot during startup. The drive's accel and decel rate times can also be used for this purpose.

H. ***n089*** : Offset

Factory setting: ***0*** %
Range: –109 to 109 %

n090 : Integral Value Limit

Factory setting: ***100*** %
Range: 0 to 109 %

n091 : Output Lag Filter Time

Factory setting: ***0.0*** seconds
Range: 0.00 to 1.00 seconds

These parameters are factory set for optimum results for most applications, and generally don't need to be changed. The offset value (***n089***) provides a bias for the PID value. If the control system oscillates and cannot be dampened by adjusting the Integral Time (***n087***), decrease the value of ***n090*** or change the value of ***n091***.

I. ***n035*** thru ***n039*** : Multi-function Input Terminals

Data ***18*** : Integral Value Reset

A Multi-function Input Terminal can be used to reset the value of ***n087*** to data " 0 ". Note that this value is also reset to " 0 " if the drive is given a STOP command.

Data ***19*** : PID Disable

A Multi-function Input Terminal can be used to disable PID control. When this terminal is closed, PID control is disabled, and the Setpoint Reference is used as the frequency reference.

5.23 RESET CODES: 2-WIRE, 3-WIRE INITIALIZATION

n001 **:** Parameter Selection / Initialization

Factory setting: ***1***
Range: 0 to 9

The following table shows which parameters can be programmed (displayed & changed) or only displayed when ***n001*** is selected.

Setting	Programmable Parameters	Display Only Parameters
0	n001	n002 to n108
1	n001 to n034	n035 to n108
2	n001 to n049	n050 to n108
3	n001 to n108	——
4 - 7	Not Used	
8	Initialization: 2-Wire control	
9	Initialization: 3-Wire control	

By entering either initialization code into ***n001*** , a reset to factory configuration (parameter initialization) is accomplished.

Parameter	Terminal	Factory Configuration for 2-Wire Control	Factory Configuration for 3-Wire Control
n035	S2	0 = Reverse Run	1 = Stop Command
n036	S3	2 = External Fault (N.O.)	–– = Forward/Reverse Command
n037	S4	4 = Fault Reset	2 = External Fault (N.O.)
n038	S5	9 = Multi-step Ref. Select 1	4 = Fault Reset
n039	S6	10 = Multi-step Ref. Select 2	9 = Multi-step Ref. Select 1

CAUTION

Know your application before using either Initialization function of *n001* . This parameter must be set to " 0 " to " 3 " for operation.

" 8 " = Factory 2-Wire Control Initialization (Maintained RUN Contact)

" 9 " = Factory 3-Wire Control Initialization (Momentary START/STOP Contact)

Entering either Initialization code resets all parameters to factory settings, and automatically returns *n001* setting to " 1 ". If the GPD 505 is connected for 3-Wire control and this parameter is set to " 8 " (2-Wire Control Initialization), the motor may run in reverse direction WITHOUT A RUN COMMAND APPLIED. Equipment damage or personal injury may result.

IMPORTANT

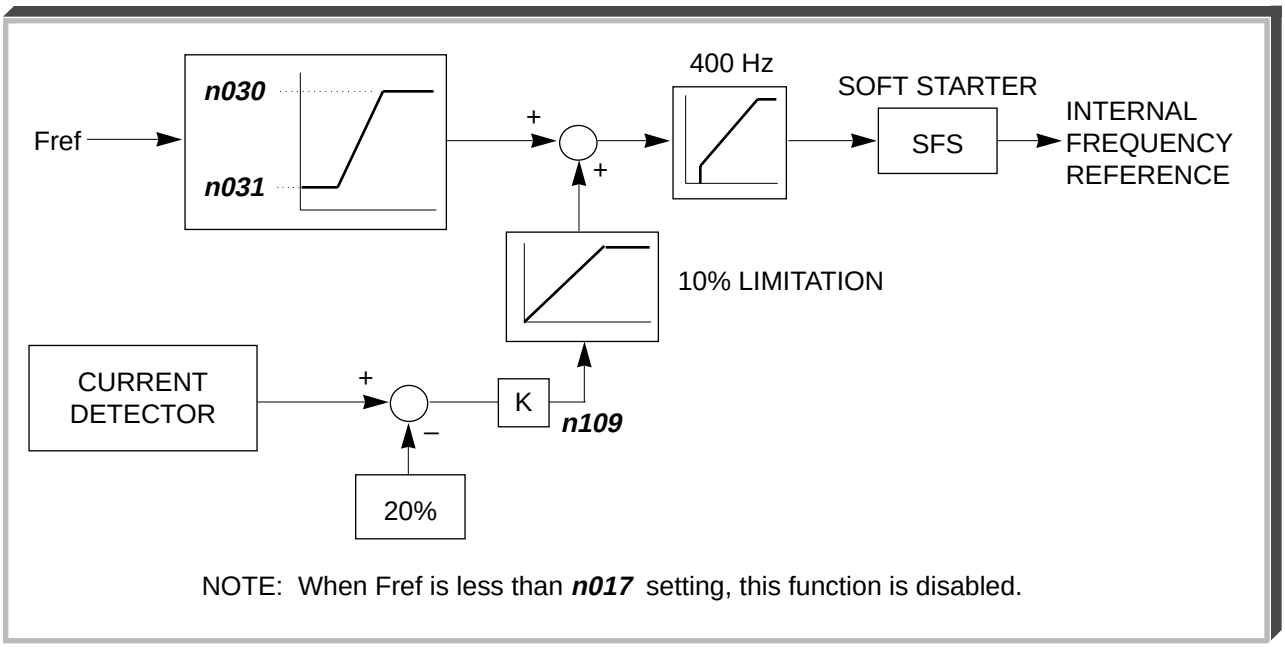
After " 8 " or " 9 " has been entered in ***n001*** , the Motor Rated Current (***n032***) MUST BE REPROGRAMMED to the correct setting for the application. See paragraph 5.26.

5.23.1 SLIP COMPENSATION

n104 : Slip Compensation Gain

Factory setting: ***0.0*** %
Range: 0.0 to 9.9 %

This parameter sets the slip compensation gain, in increments of 0.1%. When the gain is 1.0, the output frequency is increased by 1% of the ***n014*** setting at rated current. A setting of 0.0 results in no slip compensation.

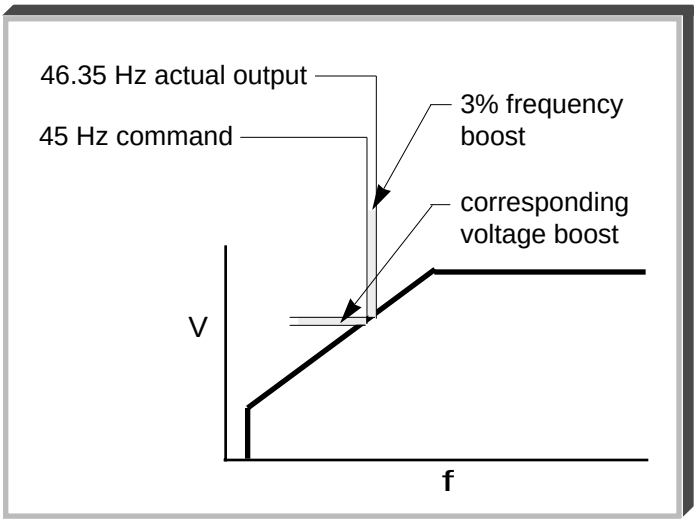


NOTE: When Fref is less than ***n017*** setting, this function is disabled.

Slip Compensation Block Diagram

EXAMPLE:

Desired frequency is 45 Hz
Motor slip = 3% at full load
(***n109*** = ***3.0***)
Actual output frequency at
full load = 46.35 Hz



n111 : Slip Compensation Primary Delay Time Constant

Factory setting: ***2.0*** sec.
Range: 0.0 to 25.5 sec.

5.24 STALL PREVENTION

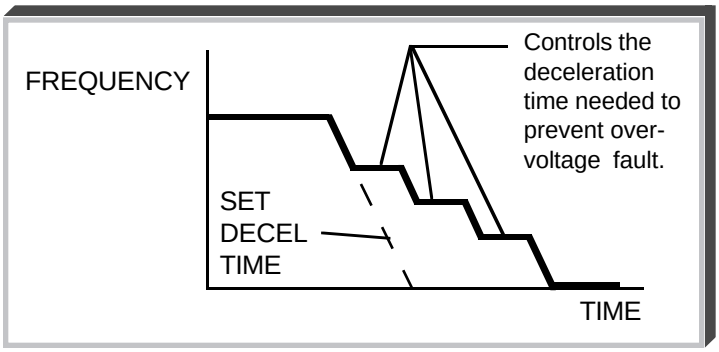
A. *n070*: Stall Prevention During Deceleration

Factory setting: ***1***

Setting	Function
0	Stall prevention during deceleration disabled
1	Stall prevention during deceleration enabled

Stall prevention during deceleration automatically adjusts the deceleration rate while monitoring the DC bus voltage to prevent overvoltage during deceleration.

When the motor load is large or decel time is short, actual decel time may be longer than the set value because of stall prevention.



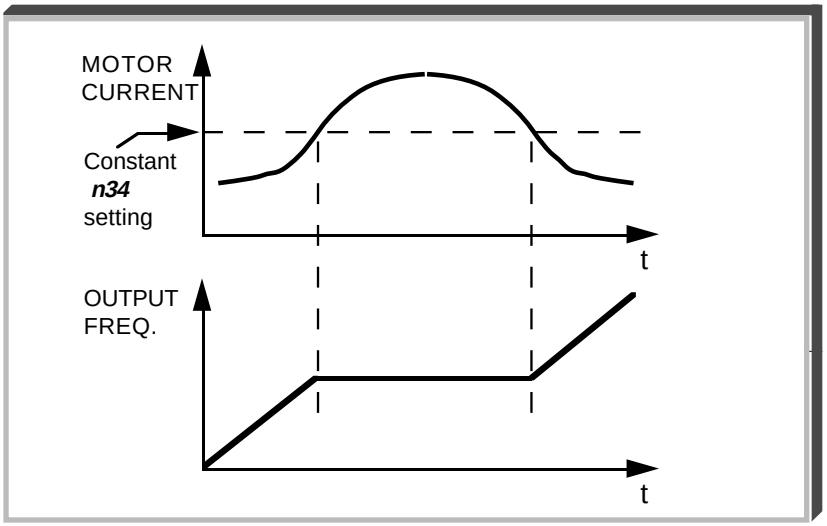
B. *n071*: Stall Prevention Level During Acceleration

Factory setting: See Table A3-1

Range: 30 - 200 %

This parameter determines the actual GPD 505 output current level during an acceleration condition. Set in percent of GPD 505 rated output current (see Appendix 2).

A setting of " 200 " disables stall prevention during acceleration. During acceleration, if the output current exceeds the value in ***n071***, acceleration stops and frequency is maintained. When the output current goes below the value set in ***n071***, acceleration resumes.



In the constant horsepower region [actual output frequency ≥ max. voltage frequency (***n014***)], the stall prevention level during acceleration is changed by the following formula:

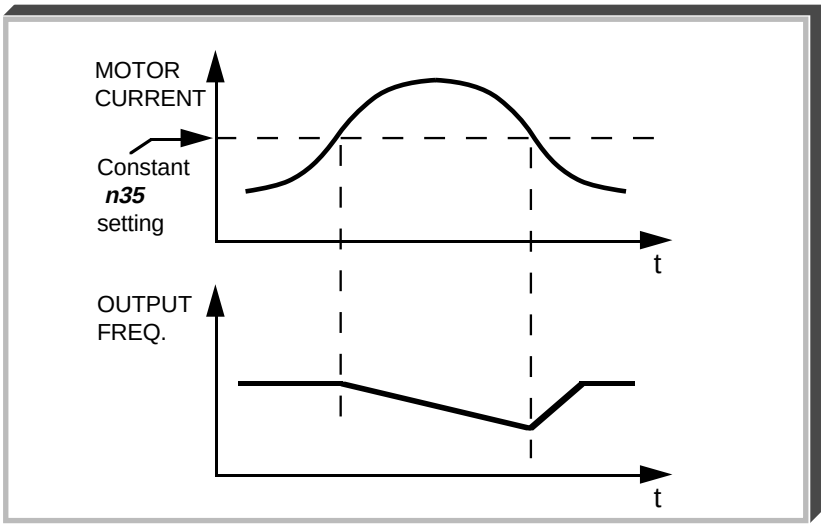
$$\text{Stall prevention level during accel (constant horsepower)} = \text{Stall prevention level during accel} \times \frac{\text{Max. voltage frequency}}{\text{Actual output frequency}}$$

C. ***n072*** **:** Stall Prevention Level At Set Speed

Factory setting: See Table A3-1
Range: 30 - 200 %

This parameter determines the actual GPD 505 output current level while operating at set speed (frequency). Set in percent of GPD 505 rated output current (see Appendix 2).

A setting of " 200 " disables stall prevention at set speed. During running at set speed, if the output current exceeds the value set in ***n072***, the drive will begin to decelerate. When the output current goes below the value set in ***n072***, acceleration begins, up to the set frequency.



5.25 STOPPING METHOD

n004 **:** Stopping Method

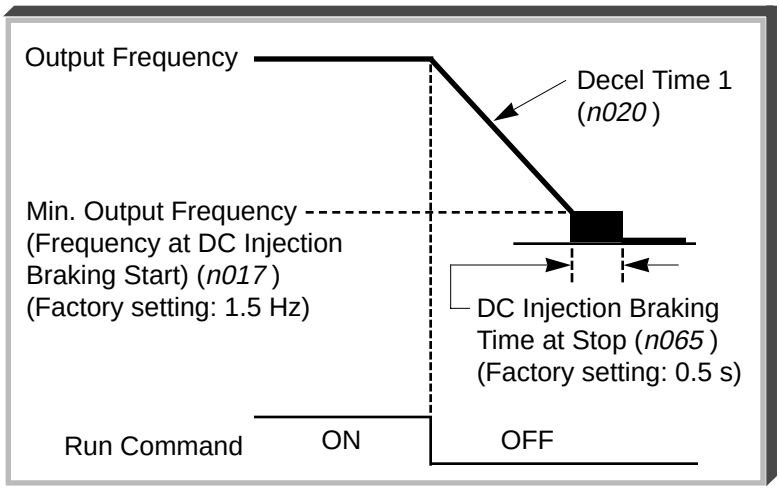
Factory setting: ***0***
Range: 0 to 3

Selects the stopping method suitable for the application.

Setting	Description
0	Deceleration (ramp) to stop
1	Coast to stop
2	Coast to stop with timer 1
3	Coast to stop with timer 3

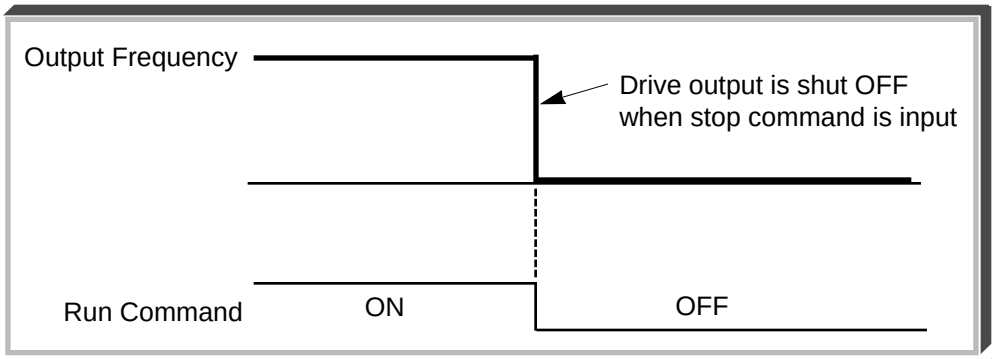
A. Data ***0*** : Deceleration to Stop

Upon removal of the FWD (REV) Run command, the motor decelerates at the deceleration rate determined by the time set in Decel Time 1 (***n020***), and DC injection braking is applied immediately before stop. If the decel time is too short or the load inertia is too large, an overvoltage (OV) fault may occur on a stop command — the decel time must be increased.



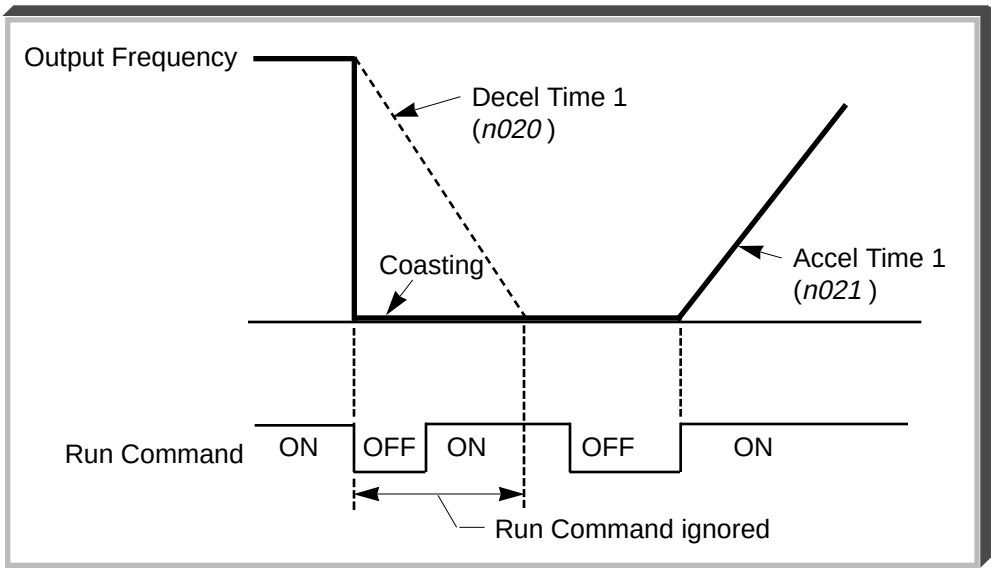
B. Data ***1*** : Coast to Stop

Upon removal of the FWD (REV) Run command, the motor coasts to rest.



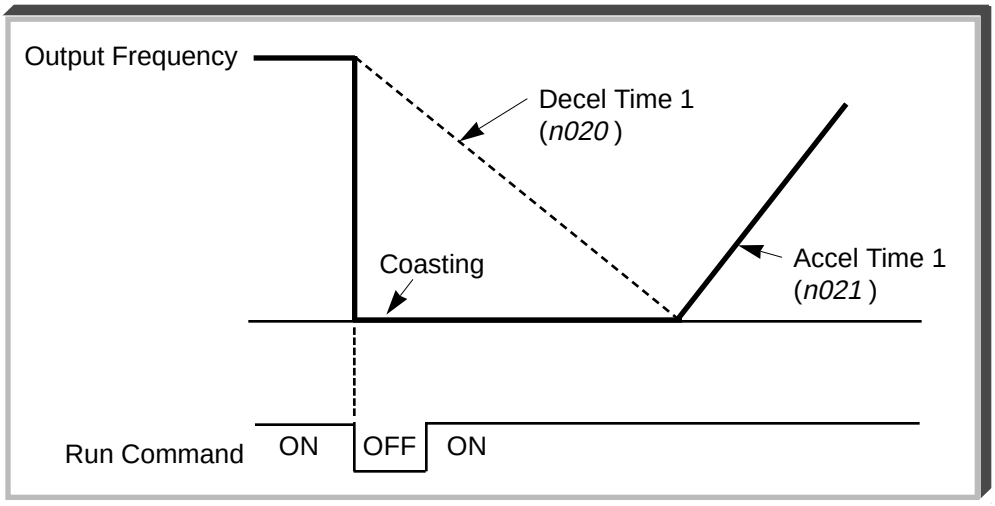
C. Data ***2*** : Coast to Stop With Timer 1

When programmed for coast to stop with timer 1, a Run command is ignored if issued during the time the motor would normally be decelerating (***n020*** or ***n022***), or for the minimum base block time (***n053***), whichever is longer.



D. Data ***3*** : Coast to Stop With Timer 2

When programmed for coast to stop with timer 2, a Run command is retained, but is not responded to, until after the time the motor would normally have decelerated to a stop (***n020*** or ***n022***), or for the minimum base block time (***n053***), whichever is longer.



5.26 THERMAL OVERLOAD PROTECTION

n032 **:** Motor Rated Current

Factory setting: See Table A3-1
Range: see description

This parameter should be set, in increments of 0.1 A, to the rated current (FLA) value shown on the motor nameplate; this value MUST BE between 10% and 120% of the *drive rated current* (refer to Specifications in Appendices 2 & 3 of this manual). If the motor FLA does not fall within this range, a different Model No. drive must be used.

NOTE: Setting ***n032*** to " 0.0 " disables the motor overload protection function, regardless of the setting of ***n033***.

n110 **:** No-load Motor Current

Factory setting: ***30*** %
Range: 0 to 99 %

n033: Electronic Thermal Motor Protection

Factory setting: ***1***
Range: 0 to 4

Setting	Electronic Thermal Characteristics
0	Electronic thermal overload protection disabled
1	General-purpose motor, standard rating (8 min.)
2	General-purpose motor, short-term rating (5 min.)
3	Blower-cooled motor, standard rating (8 min.)
4	Blower-cooled motor, short-term rating (5 min.)

The GPD 505 protects against motor overload with a UL-recognized, built-in electronic thermal overload relay.

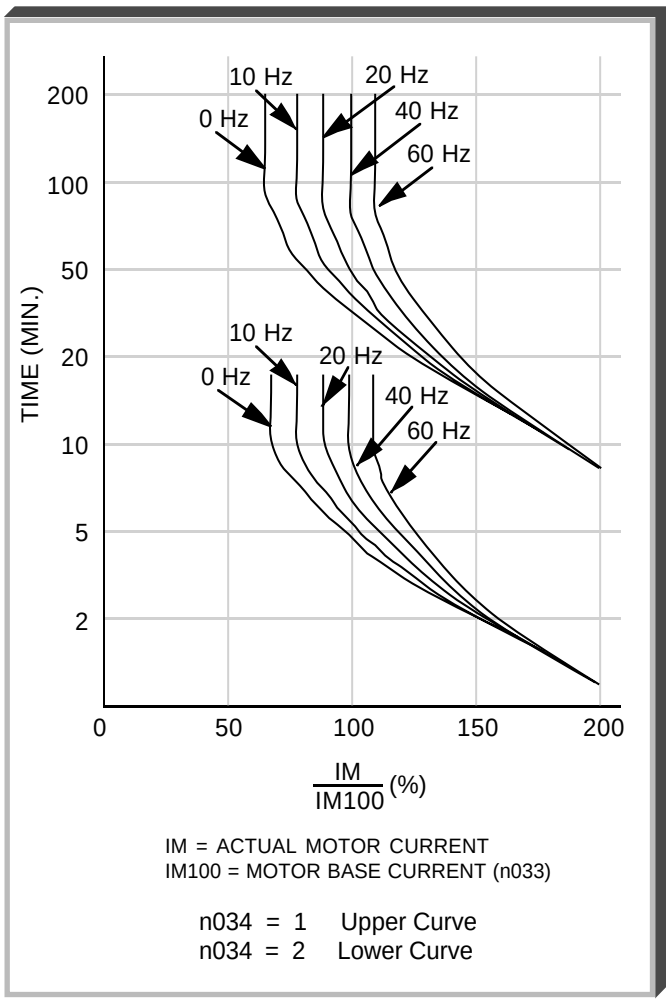
The electronic thermal overload function monitors motor temperature, based on drive output current and time, to protect the motor from overheating. When the electronic thermal overload trips, an " **oL1** " error occurs, shutting OFF the drive output and preventing excessive overheating of the motor.

When operating with one drive connected to only one motor, an external thermal relay is not needed. When operating several motors with one drive, install a thermal overload relay on each motor.

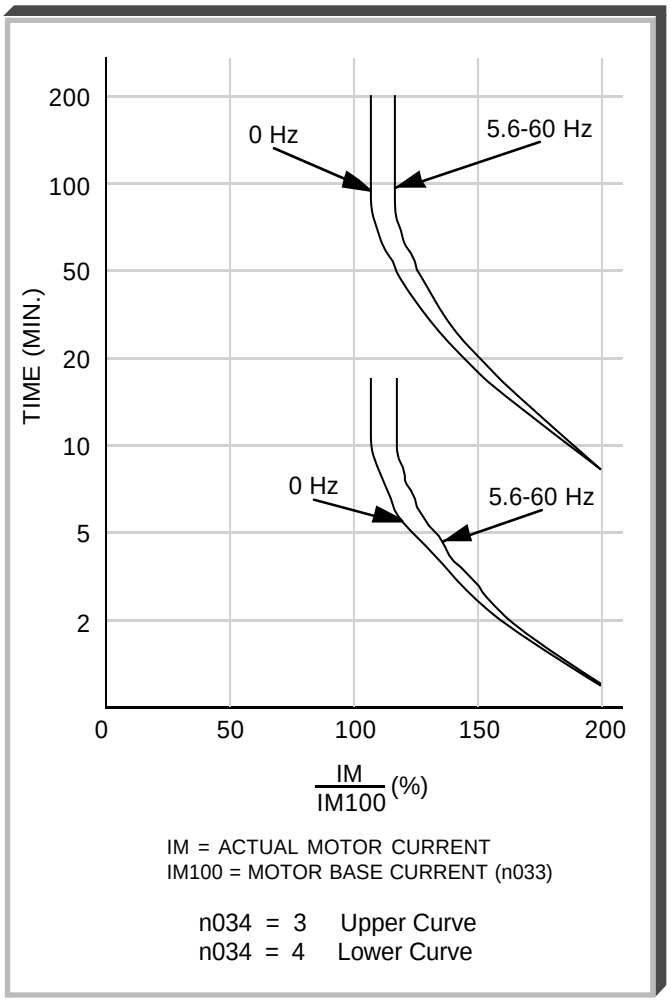
- **General -purpose and blower-cooled motors**

Induction motors are classified as general-purpose or blower-cooled motors, based on their cooling capabilities; the motor overload detection function operates differently, as shown, for each of these two motor types.

NOTE: If a TEFC motor is going to be run at or near 100% of rated current at frequencies below 30 Hz for an extended period of time, select the blower cooled curve (***n033*** = " 3 ").



Electronic Motor Thermal Protection Characteristics For General-Purpose Motor



Electronic Motor Thermal Protection Characteristics For Blower-Cooled Motor

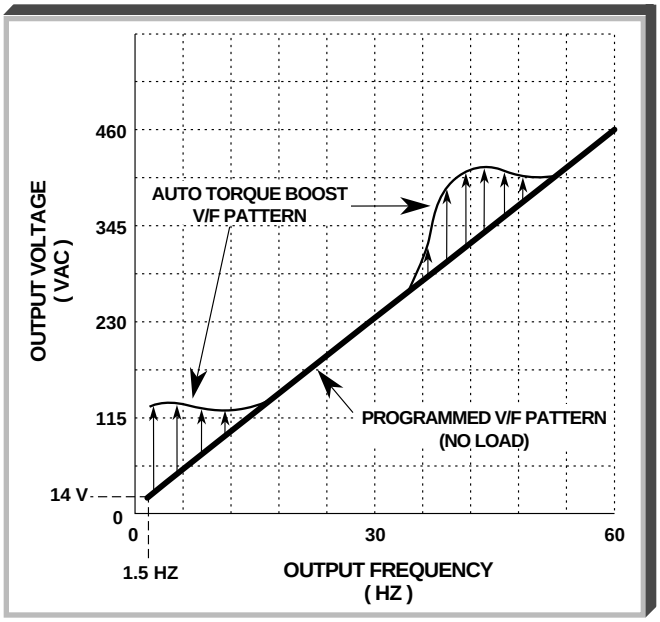
5.27 TORQUE COMPENSATION

n067 **:** Torque Compensation Gain (K_T)

Factory setting: ***1.0***
Range: 0.0 to 3.0

Sets the torque compensation, in increments of 0.1. When the motor has the same capacity as that of the GPD 505, the gain is 1.0. When a smaller motor is used, the gain should be set to 1.5 (typical).

This parameter, in conjunction with ***n068*** (Motor Line-to-Line Resistance) and ***n069*** (Iron Loss), is used by the drive's automatic torque boost function to match the drive's output voltage boost to the motor load. Except for the most demanding of high starting torque applications, the factory settings of these parameters will be adequate. The factory settings are programmed to match the performance characteristics of typical AC motors.



Example of Torque Compensation Operation

The calculation of compensated torque uses the following formula:

$$\text{Compensated Value} \approx \frac{(\sqrt{3} \cdot \text{Vac} \cdot \text{Iac} \cdot \text{Cos}\,\Phi) - \text{WI} - \text{Rcable}}{\text{Frequency}} \times K_T$$

Where

WI = ***n069***

Rcable = ***n068***

K_T = ***n067***

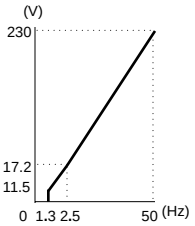
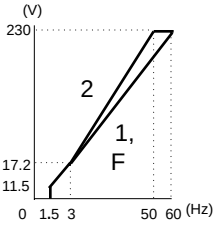
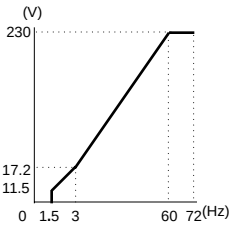
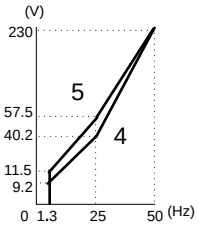
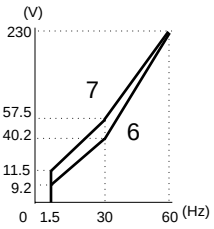
Φ = Power Factor (calculated by the GPD 505)

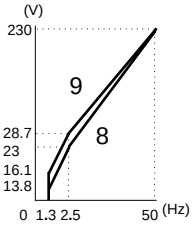
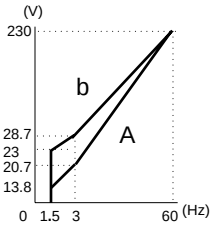
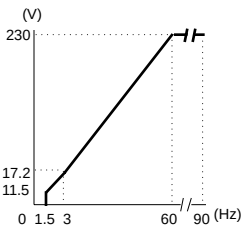
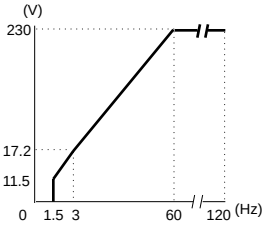
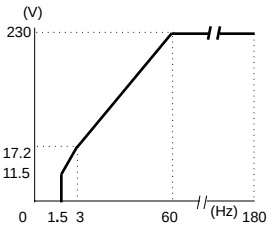
5.28 V/f PATTERN - STANDARD

n010 **:** V/f Pattern

This parameter is factory preset to "***1***". Table 5-4 describes 14 other preset patterns, one of which may be better suited for your specific application and load characteristics. However, if none of these patterns are suitable, this parameter can be set to "***F***" (V/f pattern - custom). The exact pattern is then defined by the settings of ***n012*** thru ***n018***, described in paragraph 5.29.

Table 5-4. Standard (Preset) V/f Patterns

APPLICATION	SPECIFICATION		*n010* DATA	V/f PATTERN (NOTE 3)
GENERAL PURPOSE	50Hz		0	
	60Hz	60Hz Saturation	1 Factory Setting	
		50Hz Saturation	2	
	72Hz		3	
VARIABLE TORQUE *	50Hz	Starting Torque Low	4	
		Starting Torque High	5	
	60Hz	Starting Torque Low	6	
		Starting Torque High	7	

APPLICATION	SPECIFICATION		*n010* DATA	V/f PATTERN (NOTE 3)
HIGH STARTING TORQUE	50Hz	Starting Torque Low	8	
		Starting Torque High	9	
	60Hz	Starting Torque Low	A	
		Starting Torque High	b	
CONSTANT HORSEPOWER OPERATION	90Hz		C	
	120Hz		d	
	180Hz		E	

NOTES:

* Consult MagneTek for assistance when these settings are desired (typically used for blowers, centrifugal pumps, and fans).

1. The following conditions must be considered when selecting a V/f pattern:
   - Pattern matches the voltage-frequency characteristics of the motor.
   - Maximum motor speed.
2. V/f pattern for high starting torque should be selected for:
   - Wiring distance.
   - Large voltage drop at start.
   - AC reactor connected to GPD 505 input or output.
   - Use of motor rated below GPD 505 max. output.
3. Patterns shown are for 230V input; for other input, multiply all (V) values by (V_{IN}/230). i.e., for 460V input, multiply by 460/230 = 2.

5.29 V/f PATTERN - CUSTOM

A. *n003*: Input Voltage

Factory Setting: ***230.0*** or ***460.0*** V
Range: 150.0 to 255.0 V (230V) 150.0 to 510.0 V (460V)

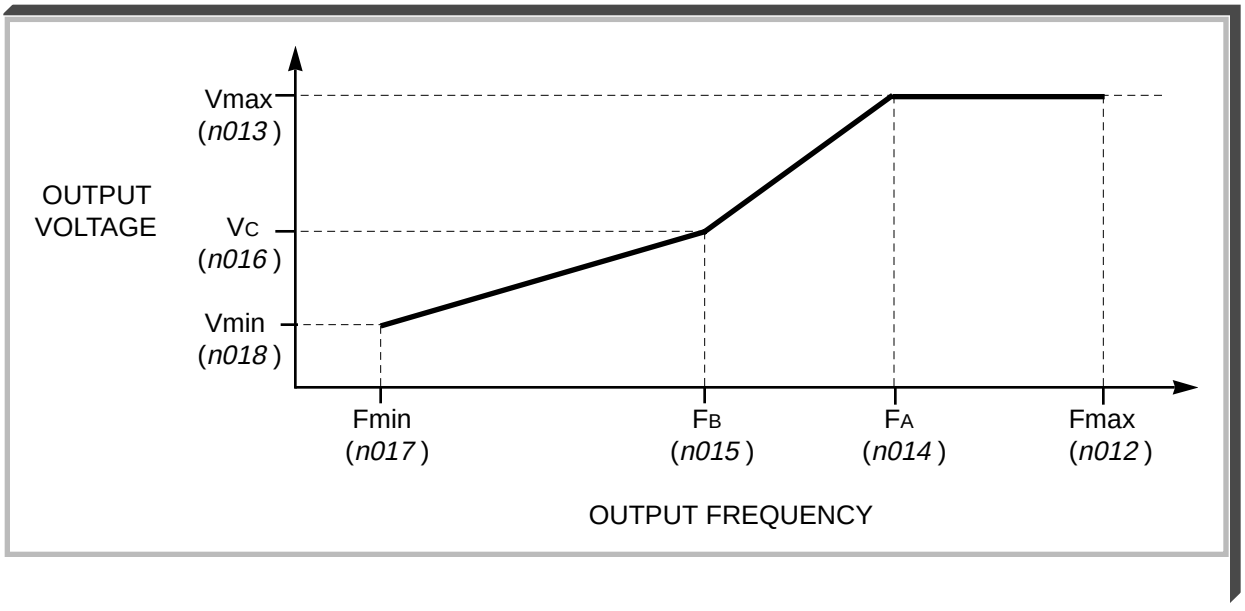
This parameter should be set to match the rated (nominal) input voltage.

B.

		Initial Voltage Values *	
		When *n010* = 1	When *n010* = F
***n012*:**	Frequency – Max. (Fmax)		
***n013*:**	Voltage – Max. (Vmax)	***230.0*** V	***200.0*** V
***n014*:**	Frequency – Max. Voltage point (F_A)		
***n015*:**	Frequency – Midpoint (F_B)		
***n016*:**	Voltage – Midpoint (V_C)	***17.2*** V	***15.0*** V
***n017*:**	Frequency – Min. (Fmin)		
***n018*:**	Voltage – Min. (Vmin)	***11.5*** V	***10.0*** V

* Double indicated values for 460V units

These seven parameters define the custom V/f pattern, **only if *n010* is set to "*F*"**. The illustration below shows how these constants relate to each other in establishing the custom V/f pattern.



V/f Characteristics Set by n012 thru n018

NOTE: To establish a V/f pattern with a straight line from Fmin to F_A, set F_B = Fmin. The setting of V_C is then disregarded and does not affect the V/f pattern.

IMPORTANT

The parameter settings are checked whenever power is applied to the GPD 505, or each time the **ENTER** key is pressed while in the Program (PRGM) mode. A parameter set value failure (***oPE5***) will occur if any part of the following relationships among ***n012*** thru ***n018*** is not TRUE:

(a) $Fmax \geq F_A \geq F_B \geq Fmin$

(b) $Vmax \geq V_C \geq Vmin$

C. ***n011*** **:** Motor Rated Voltage

Factory setting: ***230.0*** or ***460.0*** V
Range: 150.0 to 255.0 V (230V) 150.0 to 510.0 V (460V)

This parameter should be set to match the motor rated (nameplate) voltage.

5.30 INPUT PHASE LOSS DETECTION

n080 : Input Phase Loss Detection Level

Factory setting: ***7*** %
Range: 1 to 100 %

n081 : Input Phase Loss Detection Delay Time

Factory setting: ***8*** (= 10.24 s)
Range: 2 to 255 (x 1.28 s)

The input phase loss detection circuit monitors the DC bus current ripple and activates when one of the input phases is lost. The detection circuit calculates the maximum and minimum values of the DC bus voltage in 1.28 second intervals, and compares the difference (ΔV) between these values with the input phase loss detection level (***n080***). If $\Delta V \geq$ ***n080***, then an input phase loss is detected, and after the input phase loss detection delay time (***n081***), an SPI fault occurs and the motor coasts to stop.

Input phase loss detection is disabled in the following cases:

- Parameter ***n080*** is set to data " 100 ".
- A Stop command is input.
- Magnetic Contactor (MC) shuts OFF.
- CPU A/D converter fault (CPF5).
- During acceleration.
- Output current ≤ drive rated current.

5.31 OUTPUT PHASE LOSS DETECTION

n082 : Output Phase Loss Detection Level

Factory setting: ***0*** %
Range: 0 to 100 %

n083 : Output Phase Loss Detection Delay Time

Factory setting: ***0.2*** seconds
Range: 0.0 to 2.0 seconds

The output phase loss detection circuit monitors the DCCT's and activates when one of the output phases is lost. The detection circuit calculates the RMS current value (I_{RMS}), and compares it with the output phase loss detection level (***n082***). If $I_{RMS} \geq$ ***n082***, then an output phase loss is detected, and after the output phase loss detection delay time (***n083***), an SPO fault occurs and the motor coasts to stop.

Output phase loss detection is disabled in the following cases:

- Parameter ***n082*** is set to data " 0 ".
- Parameter ***n083*** is set to data " 0.0 ".

Section 6. FAULT INDICATION AND DETAILS

6.1 GENERAL

A failure in the GPD 505 can fall into one of two categories, Alarm or Fault.

A blinking "Alarm" indication is a warning that a GPD 505 trouble condition will soon occur, or that a problem exists in the external circuitry. The GPD 505 will continue to operate during an "Alarm" indication. "Alarm" indications are not entered into the fault register.

A steady "Fault" indication is displayed when the GPD 505's Fault relay has tripped (GPD 505 shutdown). The motor coasts to a stop, and a fault signal output is present at control circuit terminals MA, MB, & MC, if parameter ***n040*** is programmed for fault output (data " 0 ").

Table 6-1. Alarm Indication and Details

INDICATION (DISPLAY)	PROBLEM	DESCRIPTION
bb (blinking)	External Base Block command	Base Block command at multi-function terminal is active, shutting off GPD 505 output (motor coasting). Temporary condition, cleared when input command is removed.
CALL (blinking)	Communication ready	Drive is waiting for the PLC to establish communication (only when ***n002*** is set to " 4 "thru " 8 ").
CE (blinking)	Modbus transmission fault	Control data cannot be received normally – condition has lasted longer than 2 seconds.
EF (blinking)	Simultaneous forward and reverse operation commands	Fwd Run and Rev Run commands are both closed for more than 0.5 sec. Removing one of the commands will allow drive operation.
oH1 (blinking)	Heat sink overheated	Fin temperature exceeds 90° C (194° F); drive is programmed for operation to continue.
oH3 (blinking)	External overheat	External temperature monitoring circuit(s) detected an overtemperature condition and produced an input signal. **See paragraph 5.19, Data 21.**
oL3 (blinking)	Overload	GPD 505 output torque exceeds the set Overtorque Detection level (***n075***); GPD 505 is programmed to continue operation at overtorque.
oPE1 *(1)*	kVA parameter setting fault	kVA setting (***n115***) is incorrect.
oPE3 *(1)*	Parameter set value fault	***n035*** to ***n039*** (multi-function input) set value fault. **See paragraph 2.14 for description.**
oPE5 *(1)*	Parameter set value fault	***n012*** to ***n018*** (V/f data) set incorrectly.
oPE6 *(1)*	Parameter set value fault	One of the following conditions was detected: • ***n058*** > ***n059*** • ***n030*** < ***n031***
ou (blinking)	Overvoltage	Internal monitor of DC Bus voltage indicates that input AC power is excessively high, while GPD 505 is in stopped condition.
Uu (blinking)	Low voltage (Power UV)	Internal monitor of DC Bus voltage indicates that input AC power is below Undervoltage detection level, while the GPD 505 is stopped.

NOTES:

(1) These displays occur only when in the Program mode, when exiting from Program mode, or when applying power to the GPD 505.

Table 6-2. Fault Indication and Details

INDICATION (DISPLAY)	FAULT	DESCRIPTION
CE	Modbus transmission error	Control data cannot be received normally — condition has lasted longer than 2 seconds.
CPF0 *(1)*	Transmission error or control function hardware fault (including internal RAM, external RAM or PROM)	Transmission between GPD 505 and remote operator is not established within 5 seconds after the power supply is turned on. (Displayed on the remote operator.)
CPF1 *(1)*	Transmission error	Transmission error occurs 2 seconds or more after transmission has first been established.
CPF4 *(1)*	EPROM fault	GPD 505 failure.
CPF5 *(1)*	A/D converter failure in CPU	GPD 505 failure.
EF0	External fault – serial communication	Fault condition occurred in the external communication circuit(s).
EF_	Ext. fault signal at term. S_ ("_" represents a digit 2-6)	A fault condition has occurred in the external circuit(s) monitored by the contact providing input to the indicated terminal.
Err	Parameter write-in fault	Temporary display, in Program mode, indicating that parameter setting was not written into EPROM memory.
GF	Ground fault protection	Ground current exceeded approx. 50% of the GPD 505 rated current.
oC *(2)*	Overcurrent	GPD 505 output current exceeds 200% (for GPD505V-A107 thru -A068, and -B008 thru -B034), or 180% for all other ratings, of GPD 505 rated current.
oH1	Heat sink overheated	Fin temperature exceeds 95° C (194° F)
oH2	Heat sink overheated	Fin temperature exceeds 105° C (212° F)
oL1	Motor overload	Thermal motor overload protection has tripped.
oL2 *(2)*	Drive overload	GPD 505 overload protection has tripped.
oL3	Overtorque	GPD 505 output torque exceeds the set Overtorque Detection level (***n075***), and GPD 505 is programmed for coast to stop at overtorque detection.
oPR	Operator disconnect	Digital Operator has been disconnected. Check ***n112*** .
ou	Overvoltage (OV)	Detection level: Approx. 400V for 230V GPD 505; Approx. 800V for 460V GPD 505. Reset level: 385V.
PUF	Fuse blown	DC Bus fuse has cleared. Check for short circuit in output, and check main circuit transistors.
rr	Regenerative transistor failure	Dynamic Braking resistor has failed.
rH	Braking resistor unit overheated	Dynamic Braking resistor has overheated.

Table 6-2. Fault Indication and Details - Continued

INDICATION (DISPLAY)	FAULT	DESCRIPTION
SC	Load short-circuit	Drive output has been short-circuited.
SP i	Input open-circuit	Drive input has an open-circuit in one or more phase.
SPo	Output open-circuit	Drive output has an open-circuit in one or more phase.
Uu1	Low voltage (Power UV)	Occurs two seconds after detection of low voltage. Detection level: 230V GPD 505 = 190 VDC or less; 460V GPD 505 = 380 VDC or less.
Uu2	Low voltage (Control UV)	Control circuit voltage levels below acceptable levels during operation.
Uu3	Low voltage (MC fault)	Main circuit (precharge) magnetic contactor not operating correctly.

NOTES:

(1) These are all Control PCB hardware faults – see Troubleshooting Chart 7.9.

(2) Note that circumstances leading to these faults stress the drive's output devices - do not simply reset the fault without following procedure in Troubleshooting Chart 7.5 or 7.6.

6.2 DISPLAYING FAULT SEQUENCE

Whenever the Fault relay trips and shuts down the GPD 505, the display code of the fault that caused the trip (except for Illegal Constant [***oPE*** _] or Control Function Error [***CPF*** _]) 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 failures.

A newly occurring fault code will not change the fault register if it is a recurrence of the most recently entered fault (i.e. no. 1 position in the memory register).

The contents of this register can be displayed by following the steps in Table 6-3.

Table 6-3. Displaying Fault Sequence After Fault Shutdown

STEP	OPERATION PROCEDURE	DIGITAL OPERATOR DISPLAY	FUNCTION LEDs DISPLAY
1	Before a RESET command is entered, the fault that caused Fault trip (shutdown) is displayed.	oC	Last LED that was "ON" remains "ON"
2	Press DSPL until the Montr Function LED is on.	U-01	After last keypress, Montr is "ON"
3	Press ^ until " ***U-09*** " appears on the display.	U-09	Montr still "ON"
4	Press ENTER .	oC	
5	Press ^. The display indicates that this is currently the first code in the memory register.	1 oL	
6	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 oC	

After the fault sequence has been examined, troubleshoot the most recent fault before entering a Fault Reset command (by Digital Operator **STOP/RESET** key or external signal at term. S4) to prepare the GPD 505 for restart of operation.

Section 7. TROUBLESHOOTING

If the GPD 505 malfunctions, locate the cause and take corrective action by following the flowcharts given in this section.

A. TROUBLESHOOTING MOTOR SYMPTOMS

B. TROUBLESHOOTING FOR FAULT CONDITIONS

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.

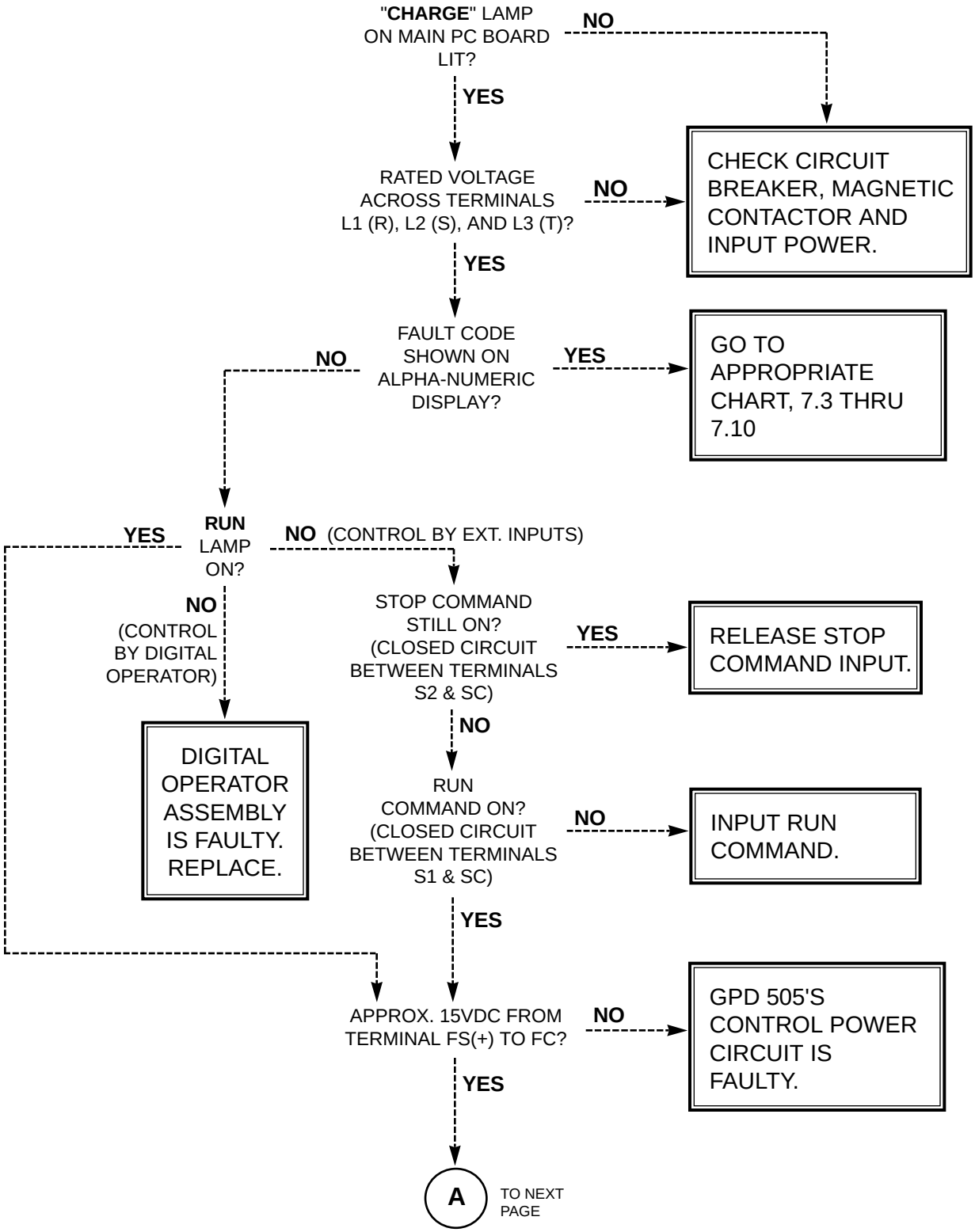
Voltages dangerous to life exist when equipment is open and energized. Do not work alone.

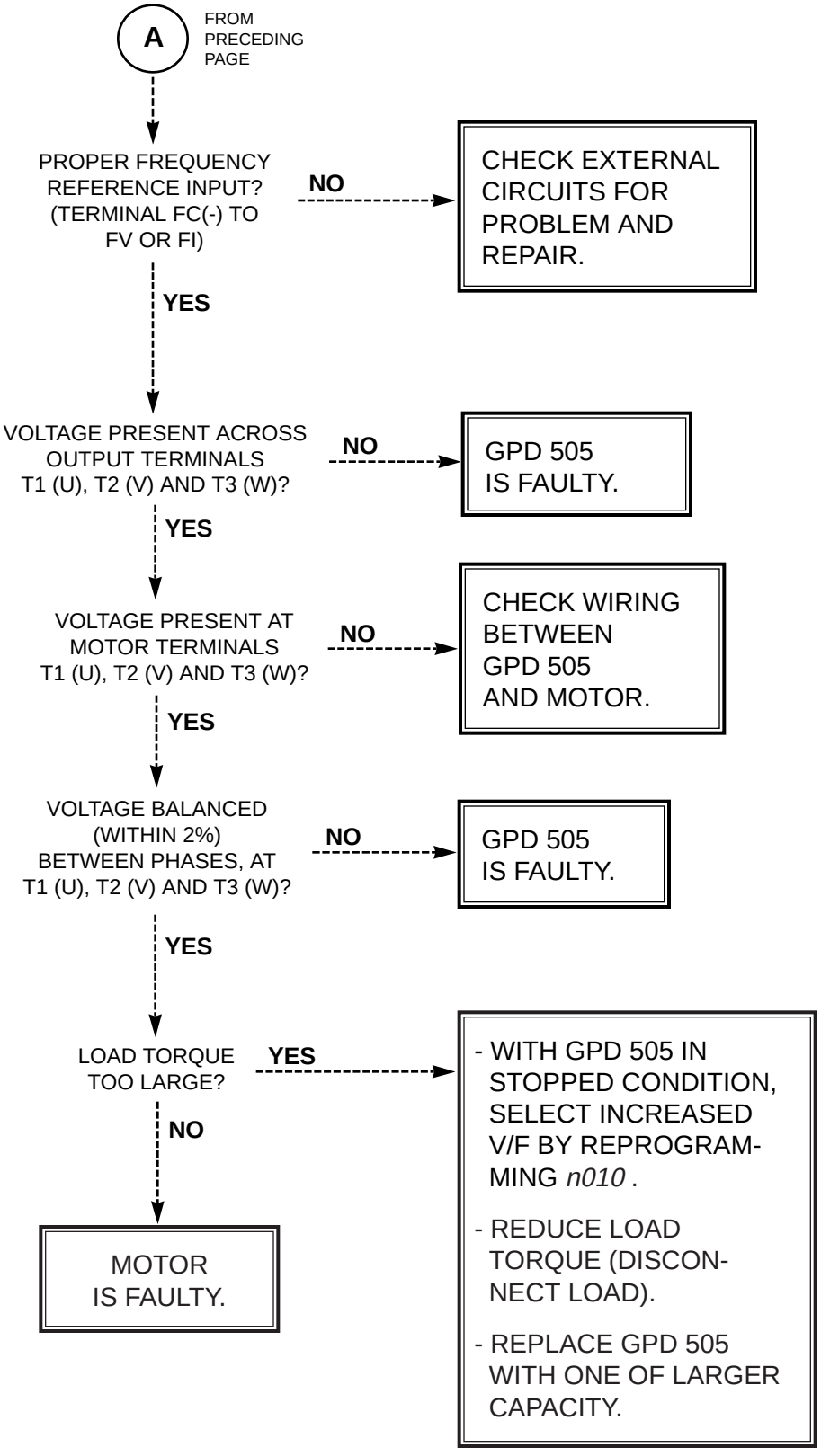
To prevent equipment damage always remove incoming three-phase power before test equipment is connected or removed.

If the GPD 505 Control PCB is replaced, ALL GPD 505 CONSTANTS MUST BE REPROGRAMMED for your application.

TROUBLESHOOTING CHART 7.1

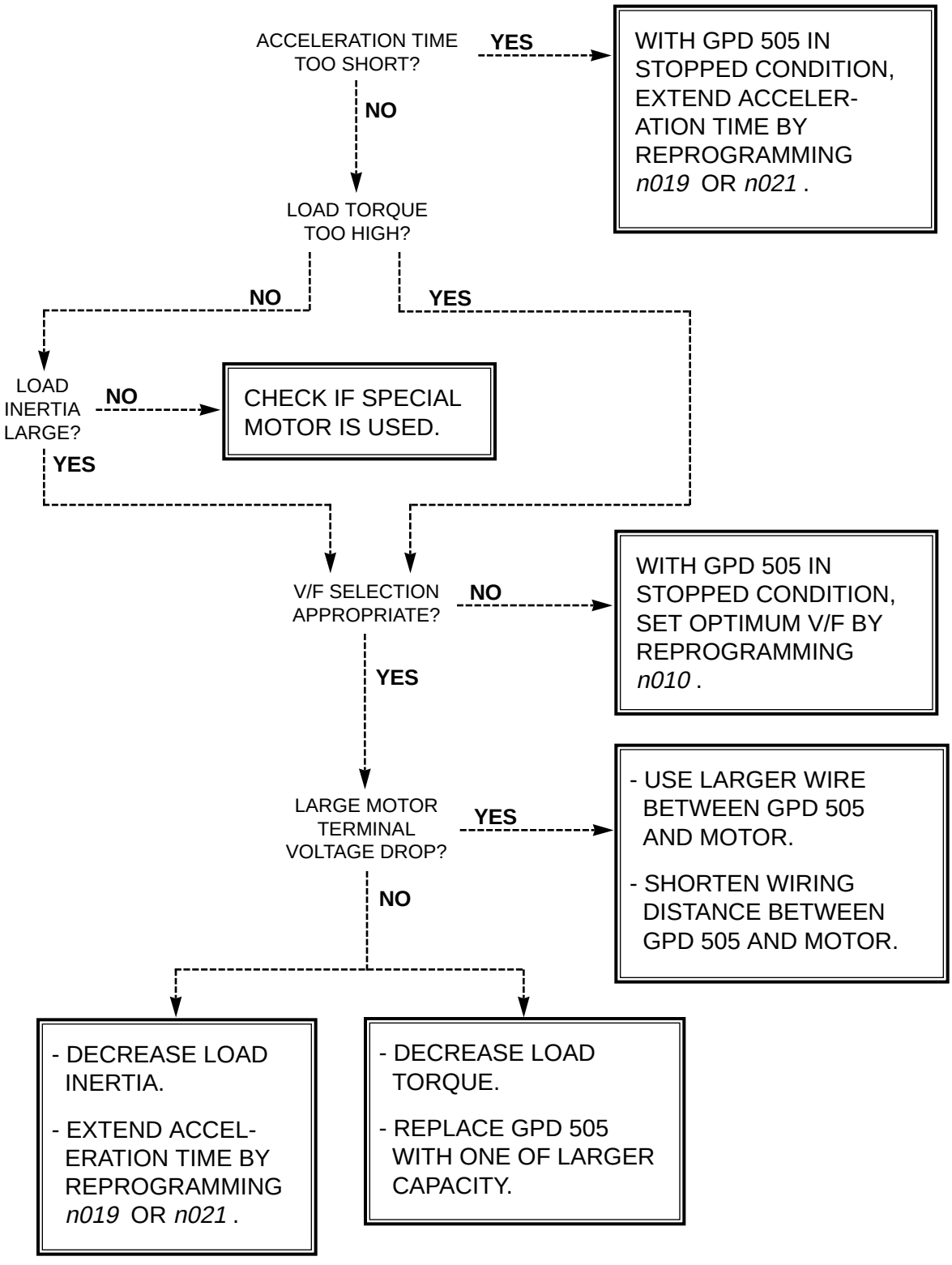
MOTOR WILL NOT RUN




A
FROM PRECEDING PAGE
PROPER FREQUENCY REFERENCE INPUT? (TERMINAL FC(-) TO FV OR FI)
NO
CHECK EXTERNAL CIRCUITS FOR PROBLEM AND REPAIR.
YES
VOLTAGE PRESENT ACROSS OUTPUT TERMINALS T1 (U), T2 (V) AND T3 (W)?
NO
GPD 505 IS FAULTY.
YES
VOLTAGE PRESENT AT MOTOR TERMINALS T1 (U), T2 (V) AND T3 (W)?
NO
CHECK WIRING BETWEEN GPD 505 AND MOTOR.
YES
VOLTAGE BALANCED (WITHIN 2%) BETWEEN PHASES, AT T1 (U), T2 (V) AND T3 (W)?
NO
GPD 505 IS FAULTY.
YES
LOAD TORQUE TOO LARGE?
YES
- WITH GPD 505 IN STOPPED CONDITION, SELECT INCREASED V/F BY REPROGRAMMING n010 .
- REDUCE LOAD TORQUE (DISCONNECT LOAD).
- REPLACE GPD 505 WITH ONE OF LARGER CAPACITY.
NO
MOTOR IS FAULTY.

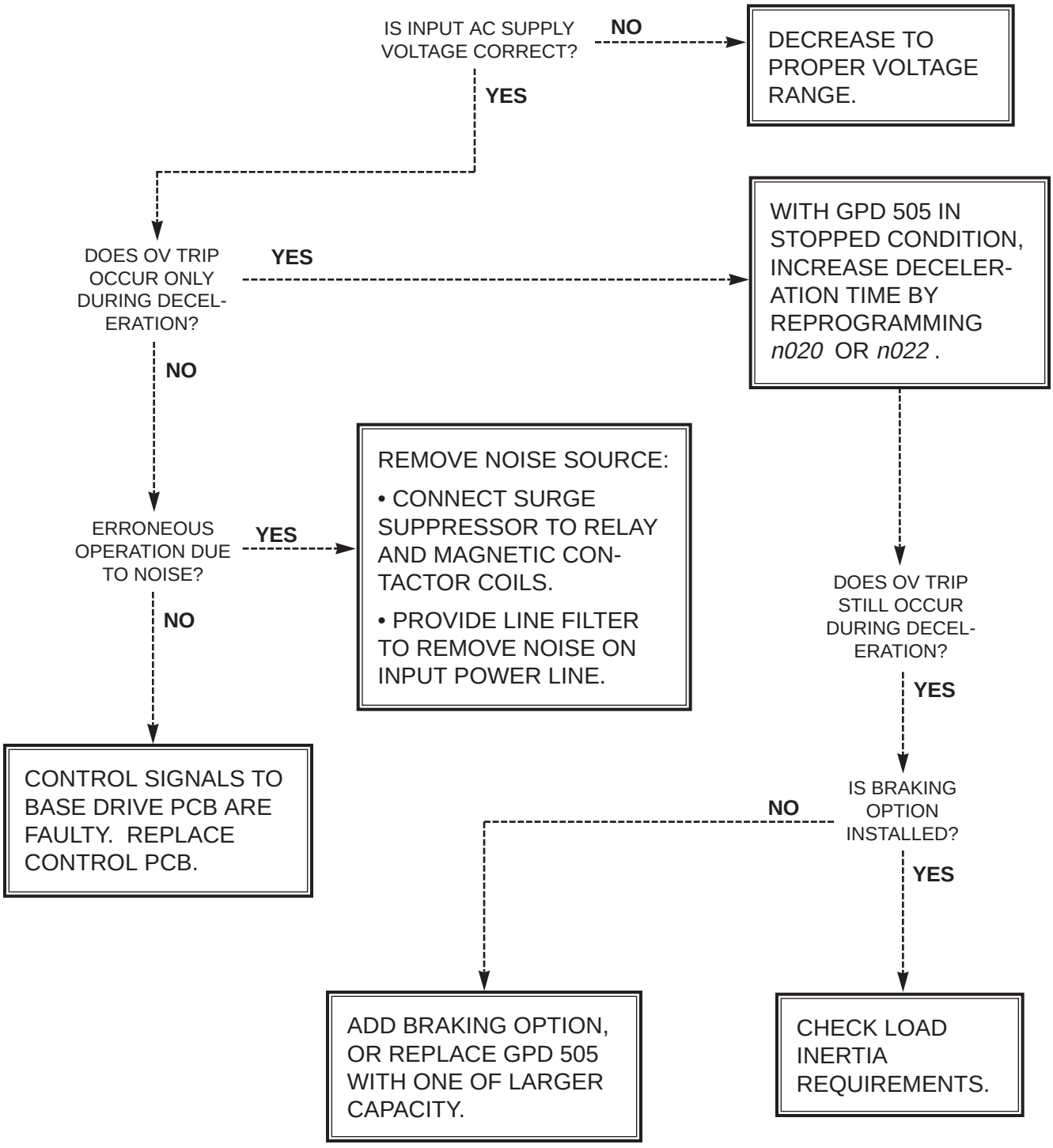
TROUBLESHOOTING CHART 7.2

MOTOR STALLS DURING ACCELERATION



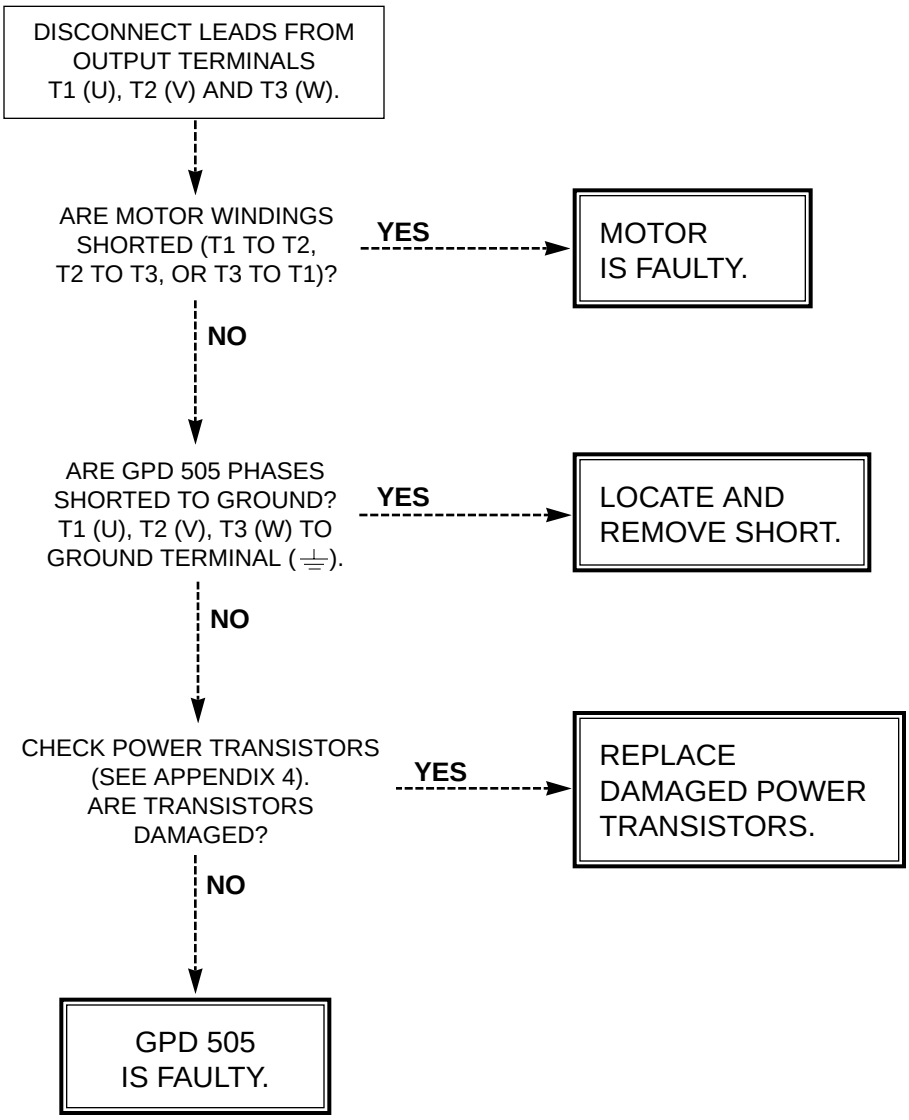
TROUBLESHOOTING CHART 7.3

OVERVOLTAGE (*ou*) FAULT INDICATION



TROUBLESHOOTING CHART 7.4

BLOWN FUSE (*PUF*) FAULT INDICATION

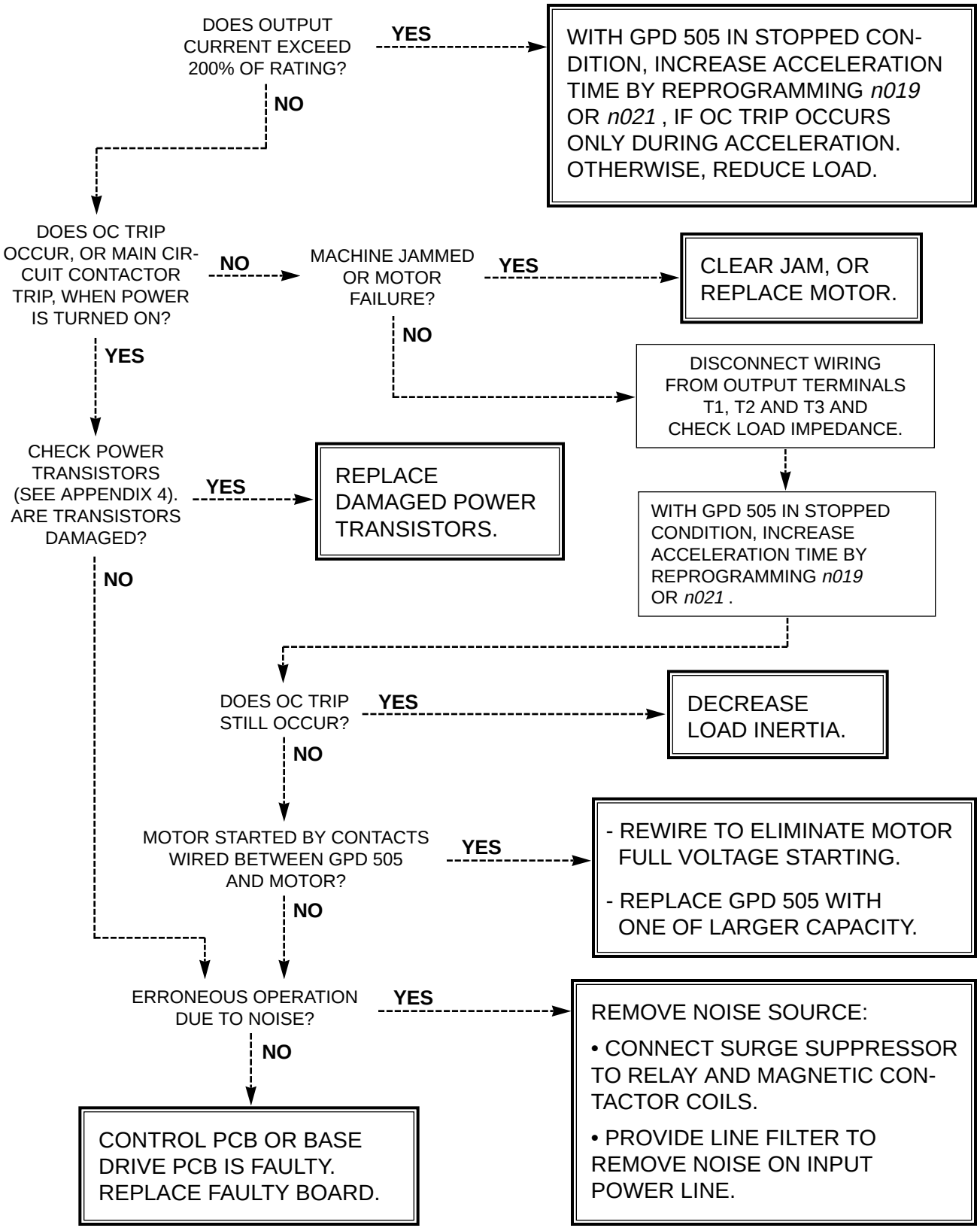


CAUTION

Do not replace DC Bus fuse without first checking output transistors.

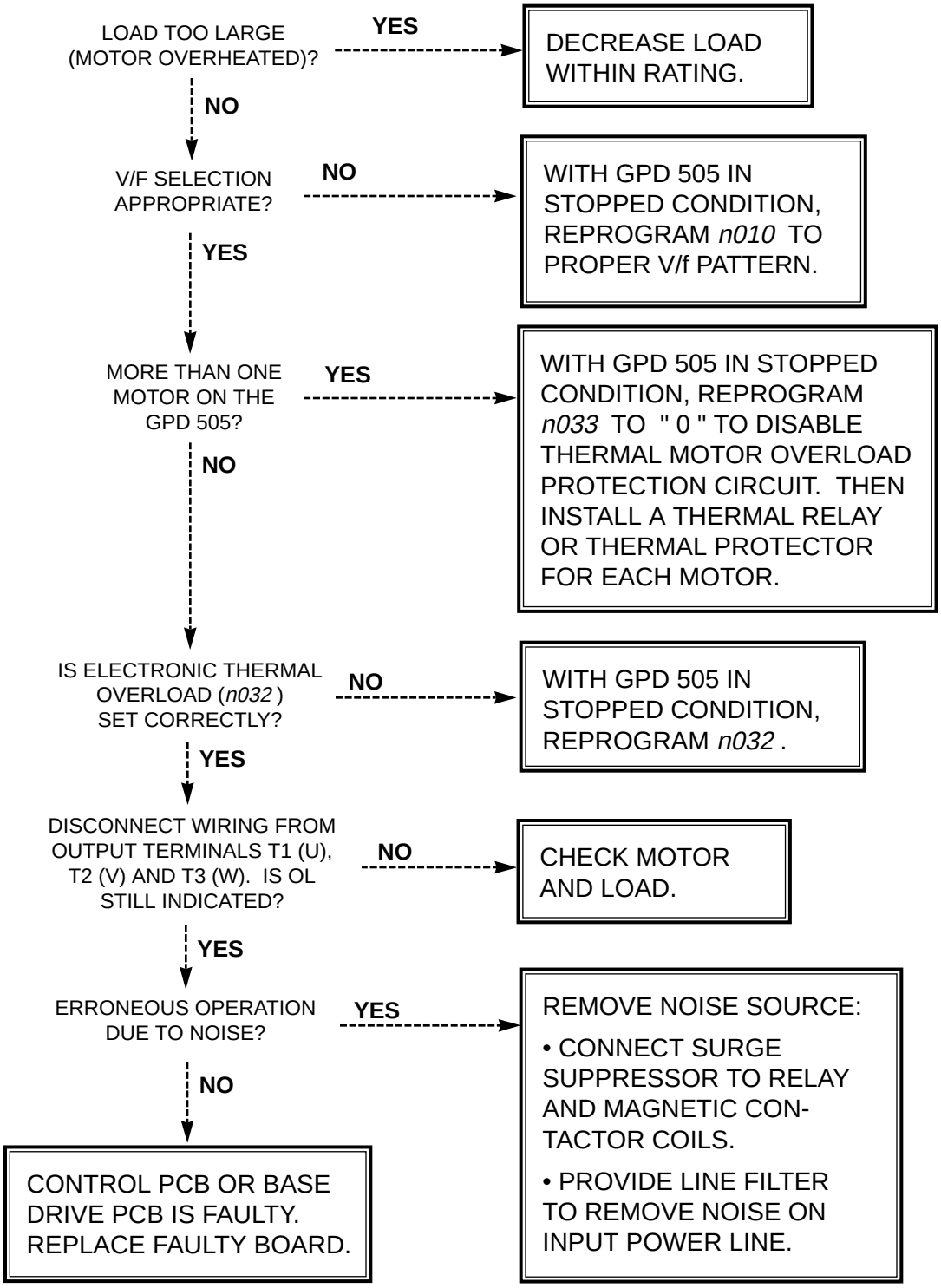
TROUBLESHOOTING CHART 7.5

OVERCURRENT (*oC*) FAULT INDICATION



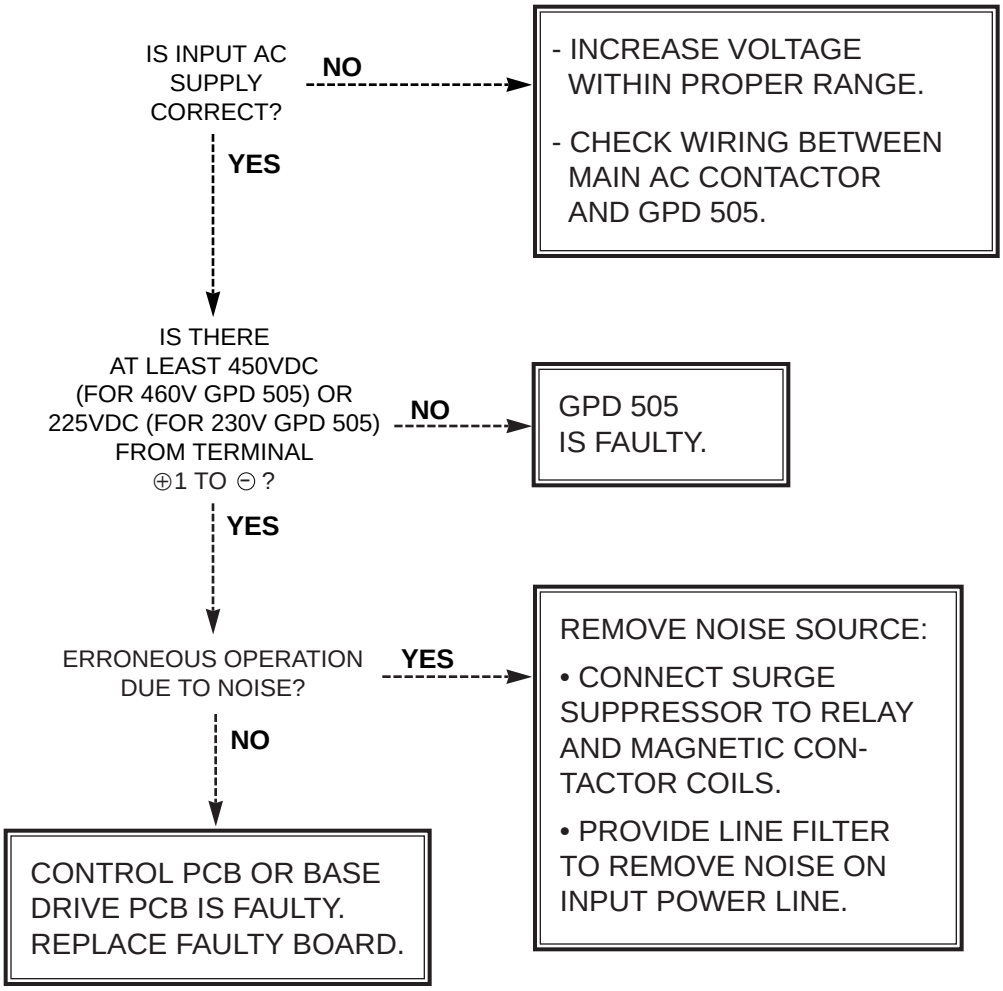
TROUBLESHOOTING CHART 7.6

OVERLOAD (*oL*) FAULT INDICATION



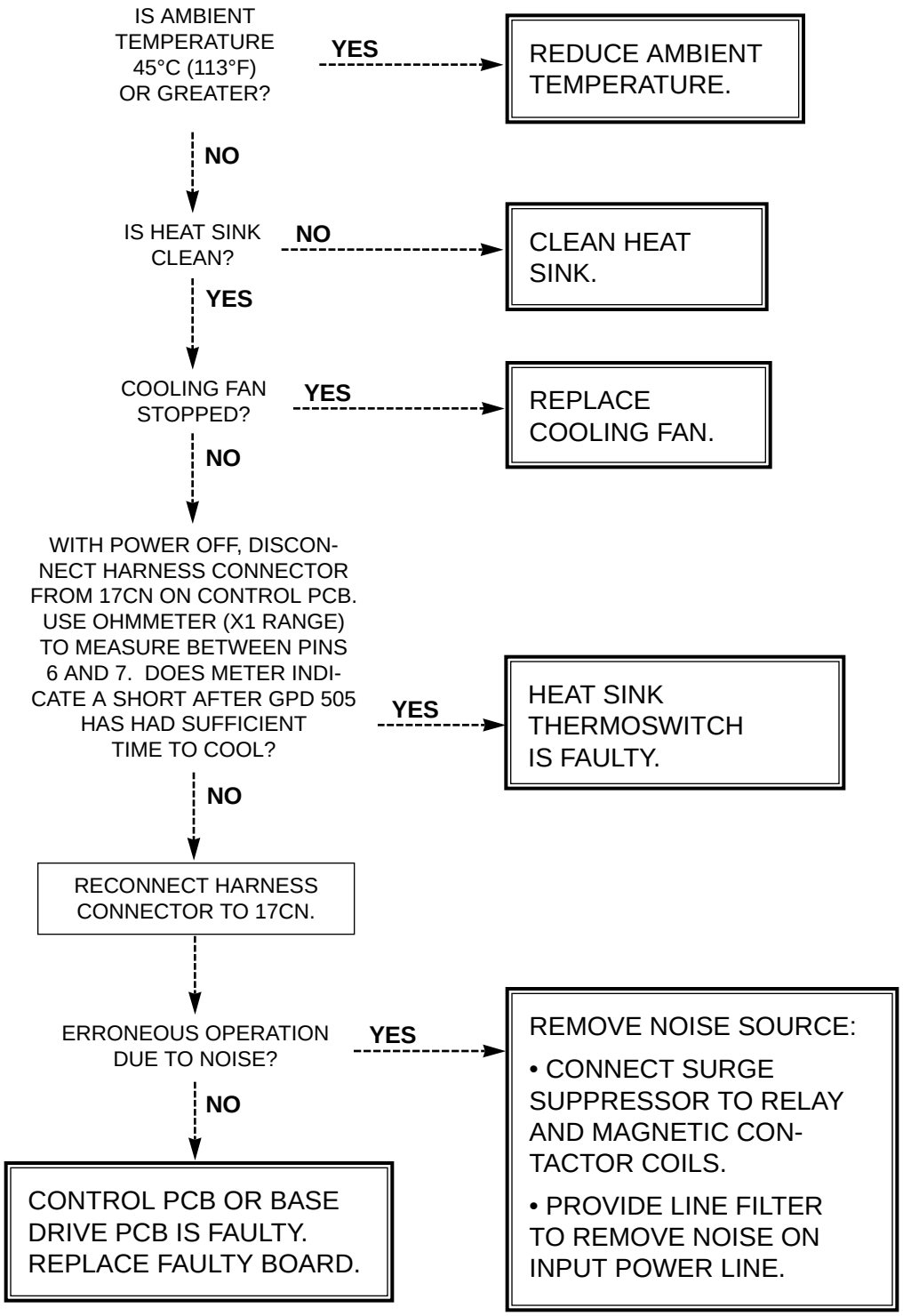
TROUBLESHOOTING CHART 7.7

UNDERVOLTAGE (*Uu*) FAULT INDICATION



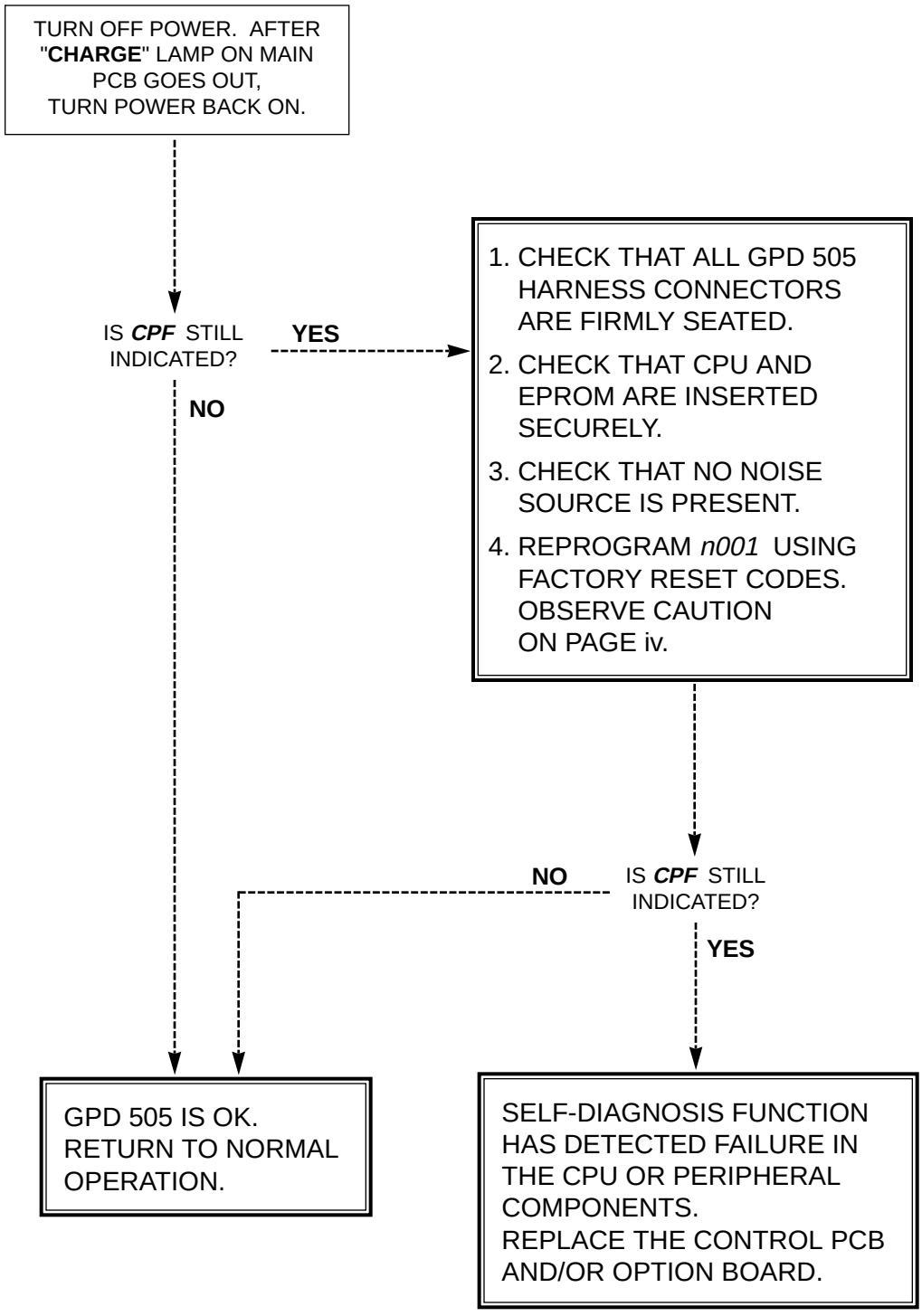
TROUBLESHOOTING CHART 7.8

OVERHEAT (*oH*) FAULT INDICATION



TROUBLESHOOTING CHART 7.9

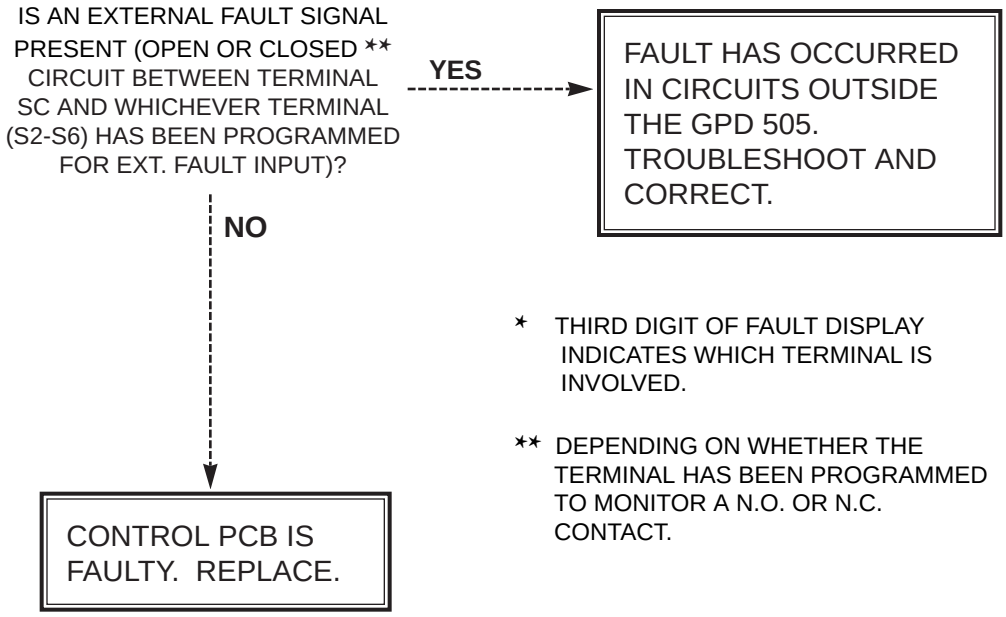
CONTROL FUNCTION ERROR (*CPF_*) FAULT INDICATION



TROUBLESHOOTING CHART 7.10

EXTERNAL FAULT (*EF*_) INDICATION

*



* THIRD DIGIT OF FAULT DISPLAY INDICATES WHICH TERMINAL IS INVOLVED.

** DEPENDING ON WHETHER THE TERMINAL HAS BEEN PROGRAMMED TO MONITOR A N.O. OR N.C. CONTACT.

Appendix 1. LISTING OF PARAMETERS

The GPD 505 control circuits use various parameters to select functions and characteristics of the GPD 505. Changing of parameter settings must be done in the Program mode, or by use of the Function LEDs, if available (see Section 4).

The following table lists all parameters in numerical order. For each parameter, reference paragraph(s) in Section 5 are listed (if applicable) where the features of the GPD 505 affected by that parameter are described.

Table A1-1. GPD 505 Parameters (*nXXX*)

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n001	Parameter Selection / Initialization	0 : ***n001*** can be read and set; ***n002*** -***n118*** read only 1 : ***n001*** -***n034*** read and set; ***n035*** -***n118*** read only 2 : ***n001*** -***n049*** read and set; ***n050*** -***n118*** read only 3 : ***n001*** -***n118*** read and set 4, 5, 6, 7 : Not Used 8 : 2-Wire initialization 9 : 3-Wire initialization	1	0 - 9	1		5.23
n002	Operation Mode Selection	Setting / Sequence / Reference 0 Dig. Oper. Dig. Oper. 1 Ext. Term. Dig. Oper. 2 Dig. Oper. Ext. Term. 3 Ext. Term. Ext. Term. 4 Dig. Oper. Ser. Comm. 5 Ext. Term. Ser. Comm. 6 Ser. Comm. Ser. Comm. 7 Ser. Comm. Dig. Oper. 8 Ser. Comm. Ext. Term.	1	0 - 8	3		5.26A, 5.16B, 5.22B
n003	Input Voltage	Nominal value of input power applied to drive	0.1 (V)	150.0 to 255.0 (230V drive) 150.0 to 510.0 (460V drive)	230.0 460.0		5.29A
n004	Stop Method	0 : Ramp to stop 1 : Coast to stop 2 : Coast to stop with timer 1 3 : Coast to stop with timer 2	1	0 - 3	0		5.25
n005	Phase Rotation	0 : CCW 1 : CW (or opposite direction)	1	0 or 1	0		
n006	Reverse Prohibit	0 : Reverse Run enabled 1 : Reverse Run disabled	1	0 or 1	0		
n007	**LOCAL/ REMOTE** Key Function	0 : Disabled 1 : Enabled	1	0 or 1	1		

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n008	**STOP** Key Function	0 : **STOP** key is effective only when sequence command (per ***n002***) is to be from Digital Operator 1 : **STOP** key is effective regard-less of programming of ***n002***	1	0 or 1	1		
n009	Frequency Reference Setting Method From Digital Operator	0 : **ENTER** key does not have to be pressed to write-in new value 1 : **ENTER** key must be pressed to write-in new value	1	0 or 1	1		
n010 **V / F**	V/f Pattern Selection **See Note 5**	0 to E : One of 15 preset V/f patterns F : Custom V/f pattern	1	0 - F	1		5.28
n011 **Vmtr**	Motor Rated Voltage **See Note 5**	Voltage indicated on motor nameplate	0.1 (V)	150.0 to 255.0 (230V drive) 150.0 to 510.0 (460V drive)	230.0 460.0		5.29C
n012	Frequency – Max.	Maximum level for drive output frequency	0.1 (Hz)	50.0 to 400.0	60.0 **See Note 1**		5.29B
n013	Voltage – Max.	Maximum level of drive output voltage	0.1 (V)	0.1 to 255.0 (230V drive) 0.1 to 510.0 (460V drive)	230 460.0 **See Note 1**		5.29B
n014	Frequency – Max. Voltage Point	Level of frequency at which drive output voltage will reach ***n013*** value	0.1 (Hz)	0.2 to 400.0	60.0 **See Note 1**		5.29B
n015	Frequency – Midpoint	Level of frequency at which drive output voltage will reach ***n016*** value	0.1 (Hz)	0.1 to 399.9	3.0 **See Note 1**		5.29B
n016	Voltage – Midpoint	Level of drive output voltage when output frequency is at ***n015*** value	0.1 (V)	0.1 to 255.0 (230V drive) 0.1 to 510.0 (460V drive)	17.2 **See Note 1**		5.29B
n017	Frequency – Min.	Lowest level of output frequency drive will produce	0.1 (Hz)	0.1 to 10.0	1.5 **See Note 1**		5.29B
n018	Voltage – Min.	Level of drive output voltage output frequency is at ***n017*** value	0.1 (V)	0.1 to 50.0	11.5 **See Note 1**		5.29B
n019 **Accel**	Acceleration Time 1 **See Note 5**	Time for drive output to ramp from Fmin. to Fmax.	0.1 (sec) (≤ 999.9) 1 (sec) (≥1000)	0.0 to 3600	10.0		5.2
n020 **Decel**	Deceleration Time 1 **See Note 5**	Time for drive output to ramp from Fmax. to Fmin.	0.1 (sec) (≤999.9) 1 (sec) (≥1000)	0.0 to 3600	10.0		5.2

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n021	Acceleration Time 2	Alternate time for drive output to ramp from Fmin. to Fmax.	0.1 (sec) (≤ 999.9) 1 (sec) (≥1000)	0.0 to 3600	10.0		5.2
n022	Deceleration Time 2	Alternate time for drive output to ramp from Fmax. to Fmin.	0.1 (sec) (≤ 999.9) 1 (sec) (≥1000)	0.0 to 3600	10.0		5.2
n023	S-curve Selection	Setting / S-curve time 0 No S-curve 1 0.2 sec 2 0.5 sec 3 1.0 sec	1	0 - 3	1		5.3
n024	Digital Operator Display Mode	Setting / Display units 0 0.1 Hz 1 0.1 % 2-39 rpm 40-3999 custom	1	0 - 3999	0		5.8
n025 **Fref** **See Note 5**	Frequency Reference 1	Frequency set by Digital Operator (or value retained by Up/Down or Sample/Hold function)	0.1 (Hz)	0 to 400.0 **See Note 4**	0.0		5.19B
n026	Frequency Reference 2	Additional frequency setpoint for multi-step speed	0.1 (Hz)	0 to 400.0 **See Note 4**	0.0		5.19B
n027	Frequency Reference 3	Additional frequency setpoint for multi-step speed	0.1 (Hz)	0 to 400.0 **See Note 4**	0.0		5.19B
n028	Frequency Reference 4	Additional frequency setpoint for multi-step speed	0.1 (Hz)	0 to 400.0 **See Note 4**	0.0		5.19B
n029	Jog Reference	Operating frequency when a Jog command is input	0.1 (Hz)	0 to 400.0 **See Note 4**	6.0		5.15, 5.19B
n030	Frequency Reference Upper Limit		1 (%)	0 to 109	100		5.12
n031	Frequency Reference Lower Limit		1 (%)	0 to 100	0		5.12
n032 **FLA** **See Note 5**	Motor Rated Current	FLA rating of motor	0.1 (A)	**See Note 2**	**See Note 3**		5.26
n033	Electronic Thermal Overload Protection (for OL1 fault)	Setting / Characteristics 0 No protection 1 Standard motor (8 min.) 2 Standard motor (5 min.) 3 Blower-cooled motor (8 min.) 4 Blower-cooled motor (5 min.)	1	0 - 4	1		5.26

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n034	Overheat Stop Method (for OH1 fault)	Setting / Stop method 0 Ramp to stop – Decel 1 (fault) 1 Coast to stop (fault) 2 Ramp to stop – Decel 2 (fault) 3 Continue operation (alarm)	1	0 - 3	3		
n035	Multi-function Input Selection (Terminal S2)	0 : Reverse run (2-Wire sequence) [**can only be set in *n035***] 1 : Fwd / Rev command (3-Wire sequence) [**can only be set in *n035***] 2 : External fault (N.O.) 3 : External fault (N.C.) 4 : Fault reset 5 : Remote / Local selection 6 : Serial communication/Dig. Op. (Freq. Ref. & Run command) 7 : Stop command using Decel. Time 2 (Fast stop) 8 : Auto freq. ref. selection (FV - open: FI - closed) 9 : Multi-step speed ref. command 1 10 : Multi-step speed ref. command 2 11 : Jog command 12 : Accel/Decel time change command 13 : External base block (N.O.) 14 : External base block (N.C.) 15 : Speed search from maximum frequency 16 : Speed search from set frequency 17 : Parameter change enable 18 : I value reset (PID) 19 : PID control off 20 : Timer function 21 : OH3 (pre-alarm input) 22 : Analog reference Sample/Hold command 23 : Inertia ridethrough command (N.O.) 24 : Inertia ridethrough command (N.C.) 25 : Up / Down command [**can only be set in *n039***] 26 : Loop test (Modbus) [**can only be set in *n039***] 27 : PID changeover [**can only be set in *n039***]	1	0 - 24	0 (1) *		5.19
n036	Multi-function Input Selection (Terminal S3) [When ***n035*** has been set to " 1 ", this parameter will display " – – ", and no value can be entered]		1	2 - 24	2 (– –) *		5.19
n037	Multi-function Input Selection (Terminal S4)		1	2 - 24	4 (2) *		5.19
n038	Multi-function Input Selection (Terminal S5) [When ***n039*** has been set to " 25 ", this parameter will display " – – ", and no value can be entered]		1	2 - 24	9 (4) *		5.19
n039	Multi-function Input Selection (Terminal S6)		1	2 - 27	10 (9) *		5.19

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n040	Multi-function Output (Terminals MA-MB-MC)	0 : Fault 1 : During running 2 : Speed agree 3 : Desired speed agree 4 : Frequency detection 1 5 : Frequency detection 2 6 : Overtorque detection (N.C.) 7 : Overtorque detection (N.O.) 8 : During base block 9 : Operation mode 10 : Ready 11 : Timer function 12 : During auto restart 13 : OL pre-alarm (80% of OL1 or OL2) 14 : Frequency reference loss 15 : Closed by serial comm. 16 : PID feedback loss 17 : OH1 alarm (functions only if ***n034*** has been set to " 3 ")	1	0 - 17	0		5.20
n041	Multi-function Output (Terminals M1-M2)		1	0 - 17	1		5.20
n042	Auto Analog Input Selection	0 : 0-10V input — Terminal FV 1 : 4-20mA input — Terminal FI	1	0 or 1	0		5.11, 5.22B
n043	Manual Analog Input Selection (Terminal FI)	0 : 0-10V input (jumper J1 on Control PCB must be cut) 1 : 4-20mA input	1	0 or 1	1		5.11, 5.22B
n044	Frequency Reference Retention (for Up/Down, Sample/Hold functions)	0 : Not retained 1 : Retained in Frequency Reference 1 (***n025***)	1	0 or 1	0		5.14
n045	Frequency Reference Loss Detection	0 : No detection 1 : Continue to run at 80% of Fmax.	1	0 or 1	0		5.13
n046 **Fgain**	Frequency Reference Gain **See Note 5**		1 (%)	0 to 200	100		5.10
n047 **Fbias**	Frequency Reference Bias		1 (%)	–100 to 100	0		5.10
n048	Multi-function Analog Output (Terminals AM& AC)	Setting / Monitor 0 Output frequency (Hz) 1 Output current (A) 2 Output power (kW) 3 DC bus voltage (VDC)	1	0 - 3	0		5.18

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n049	Analog Monitor Gain		0.01	0.01 to 2.00	1.00		5.18
n050	Carrier Frequency	1 to 6 : (x 2.5 kHz) 7 to 9 : (synchronous)	1	1 - 9	**See Note 3**		5.5
n051	Momentary Power Loss Ride-through Method	Setting Method 0 Not provided 1 Continuous operation after power recovery within 2 sec. 2 Continuous operation after power recovery within control logic time (no fault output)	1	0 - 2	0		5.17
n052	Speed Search Operation Level		1 (%)	0 to 200	110		5.19E
n053	Minimum Base Block Time		0.1 (sec)	0.5 to 5.0	**See Note 3**		5.19E
n054	V/f Reduction Level During Speed Search		1 (%)	0 to 100	**See Note 3**		5.19E
n055	Momentary Power Loss Ride-through Time		0.1 (sec)	0.0 to 2.0	**See Note 3**		5.17
n056	Number of Automatic Restart Attempts		1	0 to 10	0		5.4
n057	Fault Contact Selection at Automatic Restart	0 : Closed during auto restart 1 : Open during auto restart	1	0 or 1	0		5.4
n058	Prohibit Frequency 1		0.1 (Hz)	0.0 to 400.0	0.0		5.6
n059	Prohibit Frequency 2		0.1 (Hz)	0.0 to 400.0	0.0		5.6
n060	Prohibit Frequency Deadband		0.1 (Hz)	0.0 to 25.5	1.0		5.6
n061	Elapsed Timer Selection	0 : Accumulated time during power on 1 : Accumulated time during running	1	0 or 1	1		
n062	Elapsed Timer 1	Reserved for automatic record of drive operating time. Not user programmable.	1 (hour)	0 to 9999	0	N/A	4.4

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n063	Elapsed Timer 2	Reserved for automatic record of drive operating time. Not user programmable.	1 (x 10,000 hours)	0 to 27	0	N/A	4.4
n064	DC Injection Current		1 (%)	0 to 100 [100% = drive rated current]	50		5.7
n065	DC Injection Time at Stop		0.1 (sec)	0.0 to 10.0	0.0		5.7
n066	DC Injection Time at Start		0.1 (sec)	0.0 to 10.0	0.0		5.7
n067	Torque Compensation Gain		0.1	0.0 to 3.0	1.0		5.27
n068	Motor Line-to-Line Resistance		0.001 (Ω) (≤ 9.999) 0.01 (Ω) (≥ 10.00)	0.000 to 65.65	**See Note 3**		5.27
n069	Iron Loss		1 (W)	0 to 9999	**See Note 3**		5.27
n070	Stall Prevention During Deceleration	0 : Disabled 1 : Enabled	1	0 or 1	1		5.24
n071	Stall Prevention Level During Acceleration	[When level is set to 200%, stall prevention during deceleration is disabled]	1 (%)	30 to 200	**See Note 3**		5.24
n072	Stall Prevention Level at Set Frequency	[When level is set to 200%, stall prevention during running is disabled]	1 (%)	30 to 200	**See Note 3**		5.24
n073	Speed Coincidence Frequency		0.1 (Hz)	0.0 to 400.0	0.0		5.20
n074	Overtorque Detection (OL3)	Setting / Method 0 Detection disabled 1 Detect only at set frequency; operation continues 2 Detect during all frequency conditions; operation continues 3 Detect only at set frequency; coast to stop 4 Detect during all frequency conditions; coast to a stop	1	0 - 4	0		5.21

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n075	Overtorque Detection Level (OL3)		1 (%)	30 to 200 [100% = drive rated current]	160		5.21
n076	Overtorque Detection Delay Time (OL3)		0.1 (sec)	0.0 to 10.0	0.1		5.21
n077	On-delay Timer		0.1 (sec)	0.0 to 25.5	0.0		5.19F
n078	Off-delay Timer		0.1 (sec)	0.0 to 25.5	0.0		5.19F
n079	DB Resistor Overheat Function (rH)	0 : No DB protection calculated or provided 1 : Protection provided for installed MagneTek option DB resistor	1	0 or 1	0		
n080	Input Phase Loss Detection Level (SPI)	[When set to 100%, input phase loss detection is disabled]	1 (%)	1 to 100	7		5.30
n081	Input Phase Loss Det. Delay Time (SPI)		1 (x 1.28 sec)	2 to 255	8 (= 10.24 s)		5.30
n082	Output Phase Loss Detection Level (SPO)		1 (%)	0 to 100	0		5.31
n083	Output Phase Loss Detection Time (SPO)		0.1 (sec)	0.0 to 2.0	0.2		5.31
n084 **PID**	PID Selection **See Note 5**	0 : PID disabled 1 : PID enabled 2 : PI with Feed Forward 3 : Inverted PID	1	0 - 3	0		5.22A
n085	Feedback Calibration Gain (PID)		0.01	0.00 to 10.00	1.00		5.22E
n086	Proportional Gain (PID)		0.1	0.0 to 10.0	1.0		5.22G
n087	Integral Gain (PID)		0.1 (sec)	0.0 to 100.0	10.0		5.22G
n088	Derivative Time (PID)		0.01 (sec)	0.00 to 1.00	0.00		5.22G
n089	Offset (PID)		1 (%)	–109 to 109	0		5.22H
n090	Limit of Integral Value (PID)		1 (%)	0 to 109	100		5.22H
n091	Output Lag Filter Time (PID)		0.1 (sec)	0.0 to 2.5	0.0		5.22H

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n092	Feedback Loss Detection (PID)	0 : Detection is disabled. 1 : Detection is enabled.	1	0 or 1	0		5.22F
n093	Feedback Loss Det. Level (PID)		1 (%)	0 to 100	0		5.22F
n094	Feedback Loss Det. Delay Time (PID)		0.1 (sec)	0.0 to 25.5	1.0		5.22F
n095 kWsav	Energy Saving Selection **See Note 5**	0 : Energy saving is disabled. 1 : Energy saving is enabled.	1	0 or 1	0		5.9
n096	Energy Saving Gain K2		0.01 (≤ 99.99) 0.1 (≥ 100.0)	0.00 to 655.0	**See Note 3**		5.9
n097	Energy Saving Voltage Lower Limit at 60 Hz		1 (%)	0 to 120	50		5.9
n098	Energy Saving Voltage Lower Limit at 6 Hz		1 (%)	0 to 25	12		5.9
n099	Time of Average kW (Energy Saving)		1 (x 25ms)	1 to 200	1 (= 25ms)		5.9
n100	Voltage Limit of Tuning (Energy Saving)		1 (%)	0 to 100	0		5.9
n101	Step Voltage of Tuning to 100% Output Voltage (Energy Saving)		0.1 (%)	0.0 to 10.0	0.5		5.9
n102	Step Voltage of Tuning to 5% Output Voltage (Energy Saving)		0.1 (%)	0.0 to 10.0	0.2		5.9
n103	Modbus Time Out Detection	0 : Time out detection is disabled. 1 : Time out detection is enabled	1	0 or 1	1		5.16

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n104	Stop Method on Modbus Communication Error (CE)	Setting / Stop method 0 Ramp to stop – Decel 1 (fault) 1 Coast to stop (fault) 2 Ramp to stop – Decel 2 (fault) 3 Continue operation (alarm)	1	0 - 3	1		5.16
n105	Modbus Frequency Reference Unit	Setting / Frequency unit 0 0.1 Hz / 1 1 0.01 Hz / 1 2 100% / 30000 3 0.01 % / 1	1	0 - 3	0		5.16
n106	Modbus Slave Address		1	0 to 31	0		5.16
n107	Modus BPS Selection	Setting / BPS rate 0 2400 BPS 1 4800 BPS 2 9600 BPS	1	0 - 2	2		5.16
n108	Modbus Parity Selection	Setting / Parity 0 No parity 1 Even parity 2 Odd parity	1	0 - 2	1		5.16
n109	Slip Compensation Gain		0.1 (%)	0.0 to 9.9	0.0		5.23.1
n110	No-load Motor Current		1 (%)	0 to 99	30		5.26
n111	Slip Comp. Primary Delay Time Constant		0.1 (sec)	0.0 to 25.5	2.0		5.23.1
n112	Operator Connection Fault Detection Selection	0 : Cycle Stop 1 : Immediate	1	0 or 1	0		5.16.1
n113	Frequency Agreed Detection Width		0.1 (Hz)	0.0 to 25.5	2.0		5.20
n114	Local/Remote Changeover Fault Detection Selection	0 : Disabled 1 : Enabled	1	0 or 1	0		5.15.1

Table A1-1. GPD 505 Parameters (*nXXX*) – Continued

PARAMETER NUMBER	FUNCTION NAME	DESCRIPTION	INCREMENT	SETTING RANGE	FACTORY SETTING	USER SETTING	PARA. REF.
n115	kVA Selection		1 (H)	00 - 35	**See Note 3**		Table A3-1
n116	CT/VT Selection	0 : CT 1 : VT	1	0 or 1			
n117	Starting Point For OL at Low Frequency		0.1 (Hz)	0.0 to 6.0	6.0		
n118	Continuous Operation Level at 0 Hz		1 (%)	25 to 100	50		

NOTES:

* ( ) values are parameter settings after a 3-Wire reset code has been entered.

1. Initial value differs depending on V/f curve selected (***n010*** setting). Values shown are initial values when ***n010*** is set to " F ".
2. To be accepted, the user setting must be between 10% and 120% of the drive's output current rating. See Table A3-1 and paragraph 5.26.
3. Initial value depends on GPD 505 capacity – see Table A3-1.
4. Range and increment may change due to a "custom" setting of ***n024*** — see paragraph 5.8.
5. When a parameter number is enclosed in a shaded box with a ☐ symbol, that parameter can also be examined and set by means of the indicated Function LED.

Appendix 2. SPECIFICATIONS

Table A2-1. Standard Specifications

SECTION A. Input Voltage Related Specifications

230V Class

Input Power	Voltage : 3 Phase 200 / 208 / 220 / 230 VAC + 10%, – 15% Frequency : 50 / 60 Hz +/– 5%
Output Power	Voltage : 0 - 230V (Output cannot be greater than input) Frequency: 0 - 400 Hz (V/Hz pattern selectable)

MODEL NO. GPD505V-	RATED kVA	NOMINAL HP	100% CONT. OUTPUT AMPS [1]	RATED INPUT AMPS	MCCB RATED * AMPS (minimum)
A003	1.2	0.75	3.2	3.9	7
A006	2.3	1 / 1.5	6	7.2	15
A008	3.0	2	8	9.6	15
A011	4.2	3	11	13.2	15
A017	6.7	5	17.5	21	25
A027	9.5	7.5 / 10	27	33	40
A036	13.0	15	36	44	55
A054	19.0	20	54	65	75
A068	24	25	68	82	100
A080	30	30	80	88	105
A104	37	40	104	115	135
A130	50	50	130	143	165
A160	61	60	160	176	205
A192	70	75	192	212	245
A248	85	100	248	270	315
A312	110	125	312	344	400

460V Class

Input Power	Voltage : 3 Phase 380 / 400 / 415 / 440 / 460 VAC + 10%, – 15% Frequency : 50 / 60 Hz +/– 5%
Output Power	Voltage : 0 - 460V (Output cannot be greater than input) Frequency: 0 - 400 Hz (V/Hz pattern selectable)

MODEL NO. GPD505V-	RATED kVA	NOMINAL HP	100% CONT. OUTPUT AMPS [1]	RATED INPUT AMPS	MCCB RATED * AMPS (minimum)
B001	1.4	0.75	1.8	2.2	3
B003	2.6	1 / 2	3.4	4.1	7
B004	3.7	3	4.8	5.8	7
B008	6.1	5	8	9.6	15
B011	8.6	7.5	11	13.2	20
B014	11	10	14	16.8	20
B021	14	15	21	26	30
B027	21	20	27	33	40
B034	26	25	34	40	50
B041	31	30	41	46	55
B052	40	40	52	58	70
B065	50	50	65	72	85
B080	61	60	80	88	105
B096	73	75	96	106	125
B128	98	100	128	141	165
B180	130	125 / 150	180	198	230
B240	170	200	240	264	305
B302	230	250	302	330	380
B380	260	300	380	456	525
B506	340	350 / 400	506	608	700
B675	460	500	675	810	935

* Molded-case circuit breaker must be rated for at least 18,000 RMS symmetrical amperes interrupting capacity.

(table continued on next page)

Table A2-1. Standard Specifications (Continued)

SECTION B. ALL GPD 505s		
Control Characteristics	Control Method	Sine Wave PWM
	Frequency Regulation	Digital command: 0.01% (-10 to 40°C) (+14 to 104°F)
		Analog command: 0.1% (15 to 35°C) (59 to 95°F)
	Frequency Resolution	Digital Operator reference: 0.1 Hz Analog reference: 0.06 Hz/60Hz
	Output Frequency Resolution	0.01 Hz
	Frequency Setting Signal	0 to 10 VDC (20K Ohms), 4-20mA (250 Ohms)
	Accel / Decel Time	0.1 to 3600 sec (Accel / Decel time setting independently)
	Braking Torque	Approximately 20%
	V/F Pattern Selection	15 Standard Patterns: 4 for general purpose; 4 for high starting torque; 4 for fans and pumps; 3 for constant horsepower. 1 Custom Pattern: defined by parameter settings.
Protective Functions	Motor Overload Protection	Electronic thermal overload relay
	Instantaneous Overcurrent	Motor coasts to a stop at approximately 180% rated current. (200% for Model -A068 & below, -B039 & below)
	Fuse Blown Protection	Motor coasts to a stop by blown fuse.
	Overload	Motor coasts to a stop after 60 sec. of a 120% overload condition.
	Overvoltage	Motor coasts to a stop if GPD 505 DC bus voltage exceeds 410 VDC (230V unit), 820VDC (460V unit).
	Undervoltage	Motor coasts to a stop if GPD 505 DC bus voltage drops to 190 VDC or below (230V unit), 350 VDC or below (460V unit).
	Momentary Power Failure	Factory setting provides for motor to coast to a stop after momentary power failure of more than 15 ms. Can be reprogrammed to allow continuous operation (ride-through) during power failure of up to 2 seconds or longer (see Note 2).
	Heatsink Overheat	Thermostat
	Stall Prevention	Stall prevention at acceleration/deceleration and constant speed operation.
	Ground Fault	Provided by electronic circuit.
	Power Charge Indication	"CHARGE" lamp remains lit until bus voltage drops below 50 V.

Table A2-1. Standard Specifications (Continued)

SECTION B. ALL GPD 505s (Continued)		
Environmental Conditions	Location	Indoor (protected from corrosive gases and dust).
	Ambient Temperature	–10 to 40°C (+14 to 104°F) for NEMA 1; –10 to 45°C (+14 to 113°F) for protected chassis
	Storage Temperature (Note 3)	–20 to 60°C (–4 to 140°F)
	Humidity	95% RH (no condensation)
	Vibration	1 G at less than 20 Hz, up to 0.2 G at 20 to 50 Hz.

NOTES:

1. Overload capacity: 120% of rated for 60 sec.
2. See paragraph 5.17 for detailed information.
3. Temperature during shipping. Storing in this temperature for a long period may deteriorate main circuit capacitor.

Appendix 3. CAPACITY RELATED PARAMETERS

If a Control PCB is changed, the next time the drive is powered up parameter ***n115*** must be set to the appropriate value listed in Table A3-1 for the drive Model No. This will automatically program the values of all other parameters listed in the table to the factory settings for that particular drive rating.

Table A3-1. Parameters Related to GPD 505 Capacity

MODEL NO. GPD505V–	NOMINAL HP	OUTPUT AMPS	PARAMETER										
			n115 (H)	*n032* (Amps)	*n050*	*n053* (sec.)	*n054* (%)	*n055* (sec.)	*n068* (ohms)	*n069* (W)	*n071* (%)	*n072* (%)	*n096*
230V													
A003	0.75	3.2	00	1.9	6 (= 15 kHz)	0.5	100	0.7	9.842	14	170	160	288.2
A006	1 & 1.5	6	01	3.3	6 (= 15 kHz)	0.5	100	1.0	5.156	26	170	160	223.7
A008	2	8	02	6.2	6 (= 15 kHz)	0.5	100	1.0	1.997	53	170	160	169.4
A011	3	11	03	8.5	6 (= 15 kHz)	0.5	100	1.0	1.601	77	170	160	156.8
A017	5	17.5	04	14.0	6 (= 15 kHz)	0.5	100	2.0	0.837	112	170	160	122.9
A027	7.5 & 10	27	05	19.6	4 (= 10 kHz)	0.7	100	2.0	0.434	172	170	160	94.75
A036	15	36	06	26.6	4 (= 10 kHz)	0.7	100	2.0	0.241	262	170	160	72.69
A054	20	54	07	39.7	4 (= 10 kHz)	0.7	100	2.0	0.250	245	170	160	70.44
A068	25	68	08	53.0	4 (= 10 kHz)	0.7	100	2.0	0.149	272	170	160	63.13
A080	30	80	09	65.8	6 (= 15 kHz)	1.0	100	2.0	0.110	505	120	120	57.87
A104	40	104	0A	77.2	6 (= 15 kHz)	1.0	100	2.0	0.086	538	120	120	51.79
A130	50	130	0b	105.0	4 (= 10 kHz)	1.0	80	2.0	0.067	699	120	120	46.27
A160	60	160	0C	131.0	4 (= 10 kHz)	1.0	80	2.0	0.045	823	120	120	38.16
A192	75	192	0d	156.0	4 (= 10 kHz)	1.0	80	2.0	0.035	852	120	120	35.78
A248	100	248	0E	190.0	3 (= 8 kHz)	1.0	80	2.0	0.028	960	120	120	31.35
A312	125	312	0F	224.0	3 (= 8 kHz)	1.0	80	2.0	0.019	1200	120	120	23.10
460V													
B001	0.75	1.8	20	1.0	6 (= 15 kHz)	0.5	100	1.0	38.198	14	170	160	57.6
B003	1 & 2	3.4	21	1.6	6 (= 15 kHz)	0.5	100	1.0	22.459	26	170	160	447.4
B004	3	4.8	22	3.1	6 (= 15 kHz)	0.5	100	1.0	10.100	53	170	160	338.8
B008	5	8	23	7.0	6 (= 15 kHz)	0.5	100	2.0	3.293	77	170	160	313.6
B011	7.5	11	24	7.0	6 (= 15 kHz)	0.7	100	2.0	3.293	130	170	160	245.8
B014	10	14	25	9.8	6 (= 15 kHz)	0.7	100	2.0	1.734	193	170	160	189.5
B021	15	21	27	13.3	4 (= 10 kHz)	0.7	100	2.0	0.964	263	170	160	145.4
B027	20	27	28	19.9	6 (= 15 kHz)	0.7	100	2.0	1.001	385	170	160	140.9
B034	25	34	29	26.5	4 (= 10 kHz)	0.7	100	2.0	0.597	440	170	160	126.3
B041	30	41	2A	32.9	4 (= 10 kHz)	1.0	100	2.0	0.439	508	120	120	115.7
B052	40	52	2b	38.6	3 (= 8 kHz)	1.0	100	2.0	0.344	586	120	120	103.6
B065	50	65	2C	52.3	3 (= 8 kHz)	1.0	100	2.0	0.292	750	120	120	92.54
B080	60	80	2d	65.6	2 (= 5 kHz)	1.0	100	2.0	0.178	925	120	120	76.32
B096	75	96	2E	79.7	2 (= 5 kHz)	1.0	100	2.0	0.140	1125	120	120	71.56

(table continued on next page)

Table A3-1. Parameters Related to GPD 505 Capacity – Continued

MODEL NO. GPD505V–	NOMINAL HP	OUTPUT AMPS	PARAMETER									
			n115 (H)	*n033* (Amps)	*n054*	*n057* (sec.)	*n058* (%)	*n059* (sec.)	*n073* (%)	*n074* (%)	*n097*	*n116*
4 6 0 V (Continued)												
B128	100	128	2F	98.0	2 (= 5 kHz)	1.0	80	2.0	120	120	67.20	1
B180	125 & 150	180	30	120.0	2 (= 5 kHz)	1.0	80	2.0	120	120	46.20	1
B240	200	240	31	175.0	2 (= 5 kHz)	2.0	80	2.0	120	120	36.23	1
B302	250	302	32	245.0	2 (= 5 kHz)	2.0	80	2.0	120	120	30.13	1
B380	300	380	33	302.0	9 (= 2.5 kHz *)	2.0	80	2.0	120	120	30.57	1
B506	350 & 400	506	34	368.0	9 (= 2.5 kHz *)	2.0	80	2.0	120	120	27.13	1
B675	500	675	35	490.0	9 (= 2.5 kHz *)	2.0	80	2.0	120	120	21.76	1

NOTES:

* 2.5 kHz is maximum carrier frequency — see paragraph 5.5 for detailed information.

Appendix 4. POWER CIRCUIT MODULE TESTING

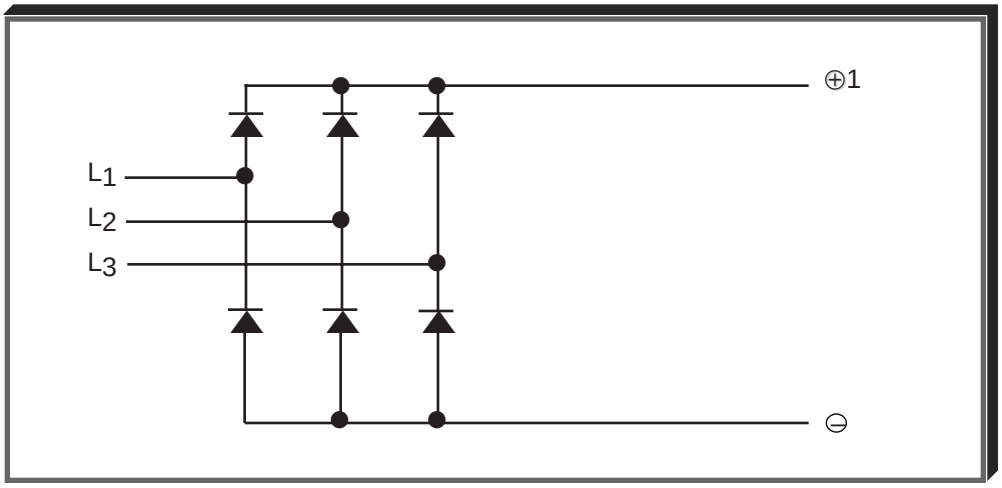
DIODE MODULE

Measure the resistance across the module terminals with a volt-ohm meter or DMM. Set the meter at the X1 range. The measured resistance should be within the values listed in Table A4-1.

Table A4-1. Diode Module Resistances

+ ON	– ON	NORMAL READING (OHMS)	ABNORMAL READING (OHMS)	+ ON	– ON	NORMAL READING (OHMS)	ABNORMAL READING (OHMS)
L1	⊕1			L1	⊖		
L2	⊕1			L2	⊖		
L3	⊕1	10 to 50 (VOM)	0 or INFINITE	L3	⊖	INFINITE	LESS THAN 1M
⊖	L1			⊕1	L1		
⊖	L2	0.3 ot 0.7		⊕1	L2		
⊖	L3	(DMM) *(1)*		⊕1	L3		
				⊕1	⊖	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 *(2)*
– IS THE NEGATIVE POLARITY LEAD

(1) Set meter to —▶|— (diode drop) scale.

(2) 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.

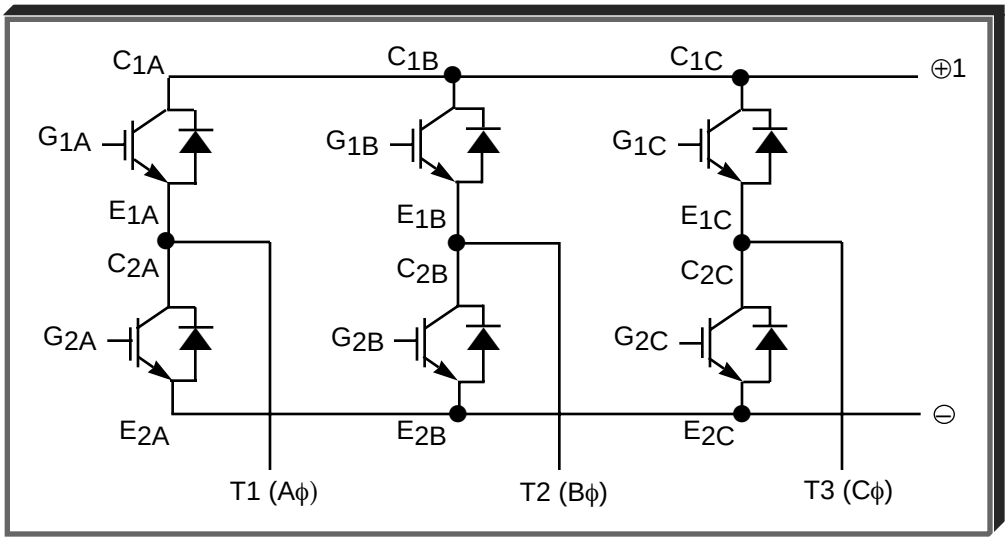
IGBT (TRANSISTOR) MODULE

Measure the resistance across the module terminals with a volt-ohm meter or DMM. Set the meter to the X1 range. Measured resistance should be within the values listed in Table A4-2.

Table A4-2. Transistor Module Resistances

+ ON	– ON	NORMAL READING (OHMS)	ABNORMAL READING (OHMS)
⊕1	T1	INFINITE	0
⊕1	T2		
⊕1	T3		
T1	⊖		
T2	⊖		
T3	⊖		
T1	⊕1	5 to 50 (VOM)	0 or INFINITE
T2	⊕1		
T3	⊕1		
⊖	T1	0.3 to 0.7 (DMM) (1)	
⊖	T2		
⊖	T3		

RESISTANCE TEST FOR 3Ø TRANSISTOR MODULES



VOM RESISTANCE SCALE R x 1
+ IS THE POSITIVE POLARITY LEAD (2)
– IS THE NEGATIVE POLARITY LEAD

(1) Set meter to —▶|— (diode drop) scale.

(2) 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.

Appendix 5. GPD 505 SPARE PARTS

Drive Model No. GPD505V–	Power Module Part No. 5P30–					Transistor Module Part No. 5P30–							Diode Module Part No. 5P50–					
	0174	0175	0178	0154	0155	0156	0157	0158	0159	0160	0161	0182	0477	0478	0479	0480	0481	0482
A003	1												No Diode Module in these Drive Model No's; diodes are contained in Power Module.					
A006		1																
A008		1																
A011			1															
A017				1														
A027				1														
A036					1								1					
A054						3								1				
A068							3								1			
A080								3					2					
A104								3					2					
A130									6							6		
A160										6							6	
A192										6							6	
A248											6						6	
A312												12						6

Drive Model No. GPD505V-	Power PCB Part No. 5P90–									Gate Drive PCB Part No. 5P90–					Control PCB Part No. 5P90–	
	0422	0423	0424	0425	0426	0427	0428	0429	0430	0410	0414	0415	0416	0417	0409	0406
A003	1														1	
A006		1													1	
A008			1												1	
A011				1											1	
A017					1										1	
A027						1									1	
A036							1								1	
A054								1							1	
A068									1						1	
A080										1						1
A104										1						1
A130											1					1
A160												1				1
A192													1			1
A248													1			1
A312														1		1

Drive Model No. GPD505V-	Cooling Fan Part No. 5P16–							DC Bus Fuse Part No. 5P17–										Control Fuse Part No. 5P17-	
	0057	0058	0059	0061	0050	0062	0051	0504	0505	0488	0480	0481	0482	0483	0484	0485	0486	0487	0500	0502
A003								1											1	
A006								1											1	
A008									1										1	
A011	1									1									1	
A017	1										1								1	
A027	1											1							1	
A036	2											1							1	
A054		2											1						1	
A068		2												1					1	
A080			1	1											1				1	
A104			1	1											1				1	
A130					3	1										3				1
A160					3	1										3				1
A192					3	1										3				1
A248					3	1											3			1
A312						1	3											3		1

IMPORTANT

Numbers represent total quantity used in one Drive. To determine adequate inventory of spare parts, MagneTek suggests using listed value for quantities 2 and below. If listed value is greater than 2, factory suggests 1/3 of total listed.

Drive Model No. GPD505V–	Power Module Part No. 5P30–				Transistor Module Part No. 5P30–							Xstr/Heatsink Assy Part No. 5P30–			Diode Module Part No. 5P50–						
	0171	0162	0163	0164	0165	0166	0167	0168	0150	0169	0152	0288	0289	0290	0483	0484	0485	0486	0487	0488	0496
B001	1														No Diode Module in these Drive Model No's; diodes are contained in Power Module.						
B003	1																				
B004	1																				
B008		1																			
B011		1																			
B014			1												1						
B021				1											1						
B027					3											1					
B034					3											1					
B041					3											2					
B052						3										2					
B065						3										2					
B080							3										2				
B096							3											2			
B128								6											6		
B180									6										6		
B240										12										6	
B302											12									6	
B380												3									6
B506													3								6
B675														3							9

Drive Model No. GPD505V-	Power PCB Part No. 5P90–								Gate Drive PCB Part No. 5P90–										Control PCB Part No. 5P90–	
	0431	0432	0433	0435	0436	0437	0438	0439	0411	0412	0413	0418	0419	0420	0421	0465	0468	0471	0409	0406
B001	1																		1	
B003		1																	1	
B004			1																1	
B008				1															1	
B011					1														1	
B014						1													1	
B021							1												1	
B027								1											1	
B034								1											1	
B041									1											1
B052										1										1
B065											1									1
B080											1									1
B096											1									1
B128												1								1
B180													1							1
B240														1						1
B302															1					1
B380																1				1
B506																	1			1
B675																		1		1

IMPORTANT

Numbers represent total quantity used in one Drive. To determine adequate inventory of spare parts, MagneTek suggests using listed value for quantities 2 and below. If listed value is greater than 2, factory suggests 1/3 of total listed.

Drive Model No. GPD505V-	Cooling Fan Part No. 5P16–									DC Bus Fuse Part No. 5P17–										Control Fuse Part No. 5P17–		
	0057	0058	0059	0061	0060	0050	0062	0051	0064	0504	0488	0480	0489	0490	0491	0492	0477	0478	0479	0500	0502	0503
B001										1										1		
B003										1										1		
B004										1										1		
B008	1										1									1		
B011	1										1									1		
B014	1											1								1		
B021	2												1							1		
B027		2												1						1		
B034		2												1						1		
B041			1	1										1						1		
B052			1	1											1					1		
B065				1	2											1				1		
B080				1	2											1				1		
B096				1	2											1				1		
B128						3	1										3			1		
B180						3	1										3			1		
B240						3	1											3		1		
B302							1	3											3		1	
B380									3	No DC Bus Fuse in these Drive Model No's; fuses are contained in Transistor/Heatsink Assembly.											1	
B506									3													1
B675									3													1

IMPORTANT

Numbers represent total quantity used in one Drive. To determine adequate inventory of spare parts, MagneTek suggests using listed value for quantities 2 and below. If listed value is greater than 2, factory suggests 1/3 of total listed.

Appendix 6. GPD 505 DIMENSIONS

Table A6-1 lists dimensions for the GPD 505 in its standard enclosure. For information on other types of enclosures available, consult your MagneTek representative.

Table A6-1. GPD 505 Size and Weight

VOLTS	MODEL NO. GPD505V-	NOMINAL HP	ENCLOSURE TYPE	PHYSICAL DIMENSIONS (IN.)			MOUNTING DIM. (IN.)		WEIGHT (LB)	HEAT LOSS (WATTS)		
				H	W	D	H1	W1		Heatsink	Internal	Total
230	A003	0.75	NEMA 1	11.02	5.51	6.30	10.47	4.96	7	15	50	65
	A006	1 / 1.5		11.02	5.51	6.30	10.47	4.96	7	25	65	90
	A008	2		11.02	5.51	6.30	10.47	4.96	7	40	80	120
	A011	3	NEMA 1	11.02	5.51	7.09	10.47	4.96	10	80	60	140
	A017	5		11.02	5.51	7.09	10.47	4.96	10	135	80	215
	A027	7.5 / 10	NEMA 1	11.81	7.87	8.07	11.22	7.32	12	210	90	300
	A036	15		11.81	7.87	8.07	11.22	7.32	13	235	110	345
	A054	20	NEMA 1	14.96	9.84	8.86	14.37	9.29	24	425	160	585
	A068	25		15.75	9.84	8.86	14.37	9.29	24	525	200	725
	A080	30		24.02	12.99	11.22	17.13	10.83	71	655	230	885
	A104	40		26.57	12.99	11.22	17.13	10.83	71	830	280	1110
	A130	50	Protected Chassis	26.57	16.73	13.78	25.59	12.60	134	1050	500	1550
	A160	60		26.57	16.73	13.78	25.59	12.60	137	1250	700	1950
	A192	75	Protected Chassis	31.50	18.70	13.78	30.51	14.57	176	1550	750	1950
	A248	100		31.50	18.70	13.78	30.51	14.57	176	1950	1000	2950
	A312	125		36.42	22.64	15.75	35.24	17.52	298	2300	1300	3600
460	B001	0.75	NEMA 1	11.02	5.51	6.30	10.47	4.96	7	10	50	60
	B003	1 / 2		11.02	5.51	6.30	10.47	4.96	7	20	65	85
	B004	3	NEMA 1	11.02	5.51	7.09	10.47	4.96	9	30	80	110
	B008	5		11.02	5.51	7.09	10.47	4.96	10	80	65	145
	B011	7.5		11.02	5.51	7.09	10.47	4.96	10	120	80	200
	B014	10	NEMA 1	11.81	7.87	8.07	11.22	7.32	13	135	85	220
	B021	15		11.81	7.87	8.07	11.22	7.32	13	240	120	360
	B027	20	NEMA 1	14.96	9.84	8.86	14.37	9.29	24	305	150	455
	B034	25		14.96	9.84	8.86	14.37	9.29	24	390	180	570
	B041	30	NEMA 1	24.02	12.99	11.22	17.13	10.83	68	465	195	660
	B052	40		24.02	12.99	11.22	17.13	10.83	68	620	260	880
	B065	50		30.91	12.99	11.22	24.02	10.83	106	705	315	1020
	B080	60	NEMA 1	30.91	12.99	11.22	24.02	10.83	106	875	370	1245
	B096	75		33.46	12.99	11.22	24.02	10.83	106	970	415	1385
	B128	100	Protected Chassis	32.28	17.91	13.78	31.30	13.78	174	1110	710	1820
	B180	125 / 150		32.28	17.91	13.78	31.30	13.78	176	1430	890	2320
	B240	200		36.42	22.64	14.76	35.24	17.52	298	1870	1160	3030
	B302	250		36.42	22.64	15.75	35.24	17.52	320	2670	1520	4190
	B380	300	Protected Chassis	57.09	37.40	17.13	55.12	*(1)*	794	3400	1510	4910
	B506	300 / 400		57.09	37.40	17.13	55.12	*(1)*	794	4740	2110	6850
	B675	500		62.99	37.80	17.91	61.02	*(1)*	926	6820	2910	9730

(1) 3 mounting holes top, 3 mounting holes bottom; consult MagneTek for horizontal hole spacing.

Appendix 7. DYNAMIC BRAKING CONNECTIONS

GENERAL. Dynamic braking (DB) enables the motor to be brought to a smooth and rapid stop. This is achieved by dissipating the regenerative energy of the AC motor across the resistive components of the Dynamic Braking option. For further details on dynamic braking operation, see the instruction sheet shipped with dynamic braking components.

The GPD505V-A003 thru -A036 and -B001 thru -B034 have an integral braking transistor; all higher rated drives require the use of external Braking Units (also referred to as Braking Modules) which provide the braking transistor circuitry. In addition, to make use of the Dynamic Braking function requires adding a heat sink mount Braking Resistor (for 3% duty cycle; only available for the GPD505V-A003 thru -A011 and -B001 thru -B004) *or* external Braking Resistor Units (for 10% duty cycle).

For Braking Resistor Units, interconnection to external control circuitry is necessary to ensure that braking resistor overheating is communicated to the drive as a fault condition.

Available MagneTek dynamic braking components are listed in Table A7-1.

Table A7-1. GPD 505 DB Components

For 230V GPD 505s						For 460V GPD 505s					
DRIVE	BRAKING MODULE		HS RESISTOR (1)	BRAKING UNIT		DRIVE	BRAKING MODULE		HS RESISTOR (1)	BRAKING UNIT	
GPD505V-	PART NO.	QTY Reqd	PART NO.	PART NO.	QTY Reqd	GPD505V-	PART NO.	QTY Reqd	PART NO.	PART NO.	QTY Reqd
A003	N/A	—	50185430	5P41-0825	1	B001	N/A	—	50185530	5P41-0835	1
A006			50185431	5P41-0825	1	B003			50185531	5P41-0836	1
A008			50185432	5P41-0826	1	B004			50185531	5P41-0837	1
A011			50185433	5P41-0827	1	B008			N/A	5P41-0838	1
A017			N/A	5P41-0828	1	B011				5P41-0839	1
A027				5P41-0829	1	B014				5P41-0840	1
A036				5P41-0830	1	B021				5P41-0841	1
A054	50185034	1		5P41-0831	1	B027				5P41-0842	1
A068	50185035	1		5P41-0832	1	B034				5P41-0843	1
A080 thru A312	N/A	—		N/A	—	B041 thru B302				N/A	—
						B380	50185239 (2)	1		5P41-0849	1
						B506	50185239 (2)	1		5P41-0849	1
						B605	50185239 (2)	2		5P41-0849	2

(1) When the heat sink mount Braking Resistor is used, DO NOT wire a Braking Unit to the drive.
(2) Requires separate 380-460 VAC / 1 / 50-60Hz power supply for internal cooling fan.

INSTALLATION

This option should only be installed by a TECHNICALLY QUALIFIED INDIVIDUAL who is familiar with this type of equipment and the hazards involved.

WARNING

Hazardous voltage can cause severe injury or death. Lock all power sources feeding the drive in the "OFF" position.

CAUTION

Failure to follow these installation steps may cause equipment damage or personnel injury.

Preliminary Proecdures

1. Disconnect all electrical power to the drive.

2. Remove drive front cover.

3. Use a voltmeter to verify that voltage is disconnected from incoming power terminals.

Braking Resistor (Heat Sink Mount) Installation

1. Remove the drive from its mounting for access to the rear of the heat sink.

2. Mount the Braking Resistor on the back of the drive's heat sink, as shown in Figure A7-1.

3. Reinstall the drive in its mounting position.

4. Connect the leads from the Braking Resistor to drive terminals according to Figure A7-2.

5. Proceed to step 9 on page A7-7.

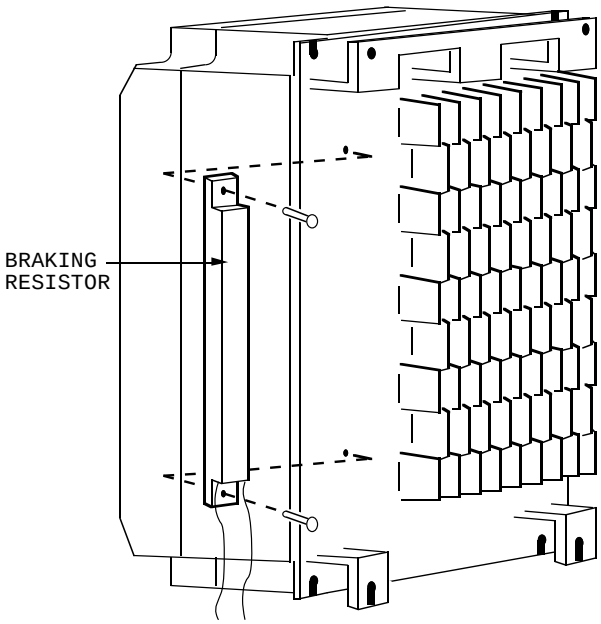


Figure A7-1. Mounting Braking Resistor on Heat SInk

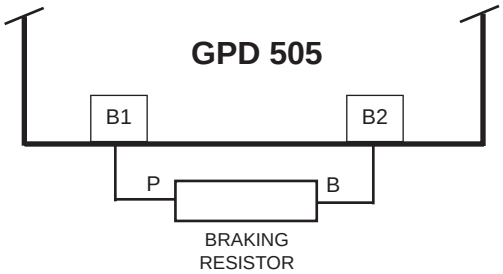


Figure A7-2. Lead Connections For Braking Resistor (Heat Sink Mounted)

Braking Resistor Unit Installation (for GPD505V-A003 thru -A036, -B001 thru -B034)

IMPORTANT

Since the Braking Resistor Unit generates heat during dynamic braking operation, install it in a location away from other equipment which emits heat.

1. Mount the Braking Resistor Unit on a vertical surface, maintaining a minimum 1.18 inch (30 mm) clearance on each side and a minimum 5.91 inch (150 mm) clearance top and bottom.

2. Remove the Braking Resistor Unit front cover to access its terminal block. Connect the Braking Resistor Unit to the drive and to external control circuitry according to the chart at right and Figure A7-3.

Terminals	B, P	1, 2 *
Lead Size (AWG)	12-10	18-14 *
Lead Type	600V etheylene propylene rubber insulated, or equivalent	
Terminal Screw	M4	

* Power leads for the Braking Resistor Unit generate high levels of electrical noise; these signal leads must be grouped separately.

3. Reinstall and secure Braking Resistor Unit front cover and drive front cover.

4. Proceed to step 9 on page A7-7.

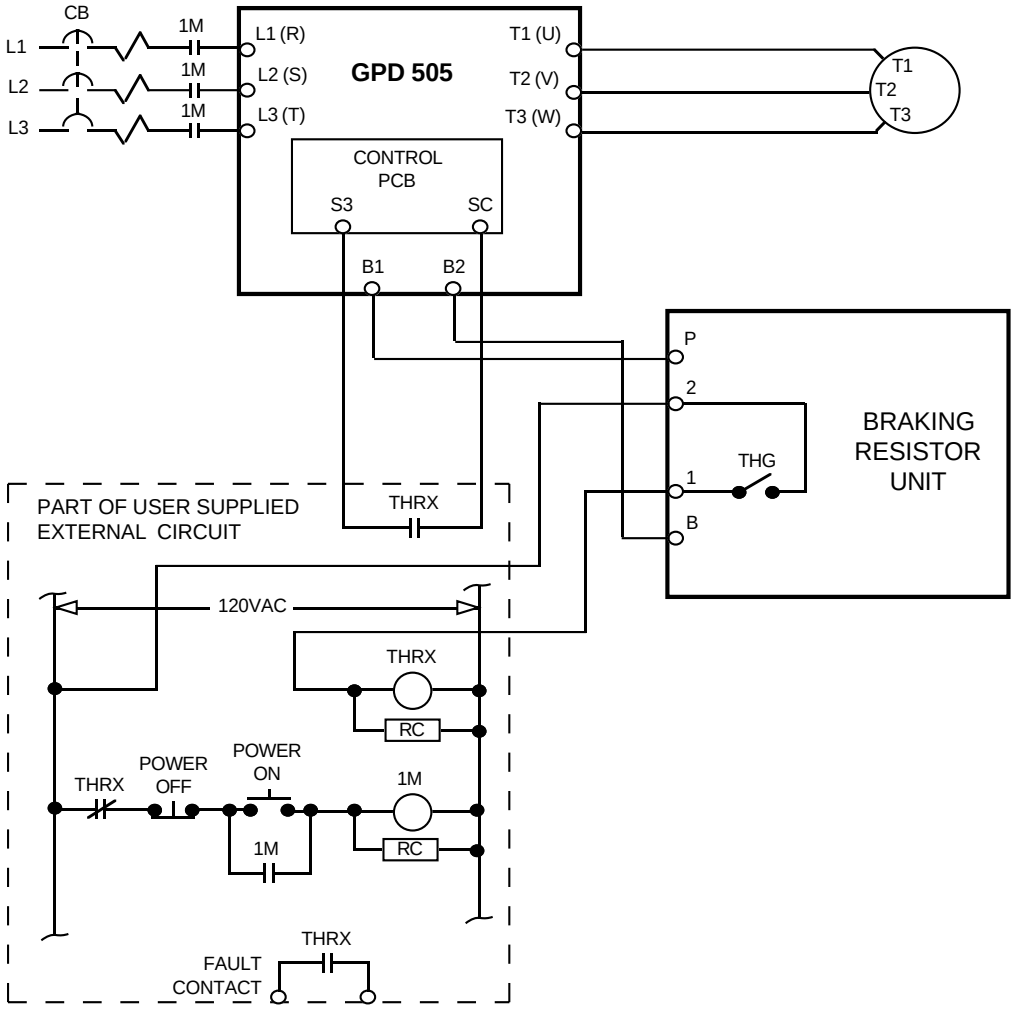


Figure A7-3. Wiring Braking Resistor Unit to Drive

Braking Unit(s) and Braking Resistor Unit(s) Installation (for GPD505V-A054 thru -A068, -B380 thru -B675)

IMPORTANT

Since the Braking Resistor Unit generates heat during dynamic braking operation, install it in a location away from other equipment which emits heat.

Select mounting locations for the Braking Unit(s) and Braking Resistor Unit(s) so that wiring between the drive and the (Master) Braking Unit, and between each Braking Unit and its associated Braking Resistor Unit, is less than 33 feet (10 m).

1. Mount the Braking Unit(s) and Braking Resistor Unit(s) on vertical surfaces. A Braking Unit requires a minimum 1.18 inch (30 mm) clearance on each side and a minimum 3.94 inch (100 mm) clearance top and bottom; a Braking Resistor Unit requires a minimum 1.97 inch (50 mm) clearance in back (i.e. use mounting spacers) and a minimum 7.87 inch (200 mm) clearance in front.

2. Remove DB units' front covers to access their terminals.

3. For 380/460V drives only: In each Braking Unit, set the PCB nominal line voltage jumper plug to the correct setting for the installation; this is factory set at the "460V" position.

4. If multiple Braking Units are being installed, the unit closest to the drive should have the SLAVE/MASTER jumper on its PCB set to the "MASTER" position (factory setting); all others must have this jumper moved to the "SLAVE" position.

5. If a single Braking Unit and Braking Resistor Unit are being installed, connect them to the drive and external control circuitry according to the chart below and Figure A7-4.

   If two or more Braking Units and Braking Resistor Units are being installed, connect them to the drive and to external circuitry according to the chart below and Figure A7-5.

UNIT	TERMINALS	LEAD SIZE (AWG)	LEAD TYPE	TERMINAL SCREWS
Braking Resistor Unit	B, P	12-10	600V ethylene propylene rubber insulated or equivalent	M5
	1, 2 *	18-14 *		M4
Braking Unit	P, Po, N, B	12-10	600V etheylene propylene rubber insulated, or equivalent	M4
	1, 2 *	18-14 *		

* Power leads for the Braking Resistor Unit generate high levels ofelectrical noise; these signal leads must be grouped separately.

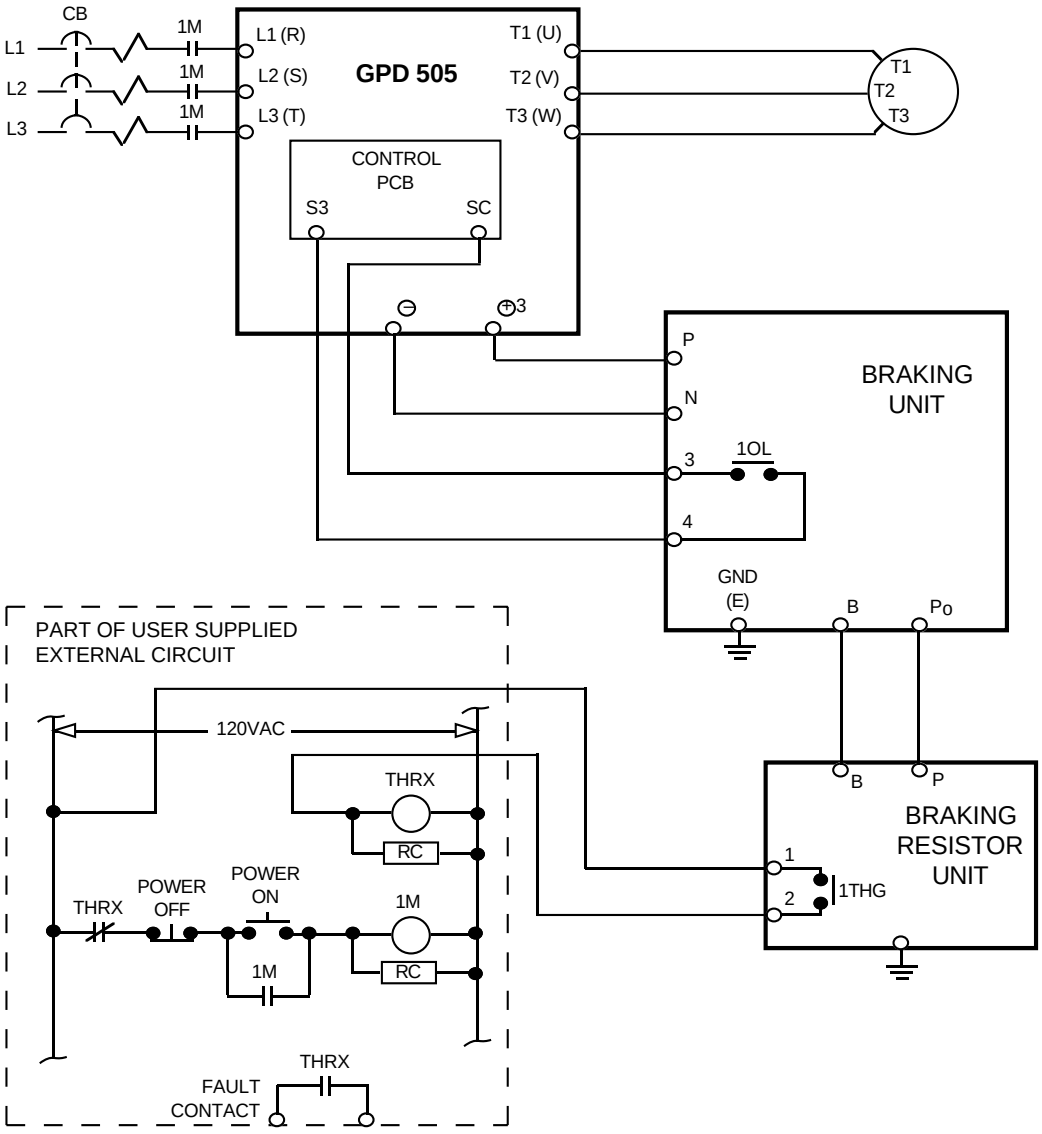


Figure A7-4. Wiring Single Braking Unit and Braking Resistor Unit to Drive

6. The Braking Unit and Braking Resistor Unit MUST BE GROUNDED. Observe the following precautions:

- Use grounding leads conforming to your National Electrical Code.
- If the installation requires the Braking Resistor Unit to be used without its enclosure (with grounding terminal), ground it by attaching a ground lead at one of the mounting screws.
- Grounding resistance of the Braking Unit should be 100 ohms or less.

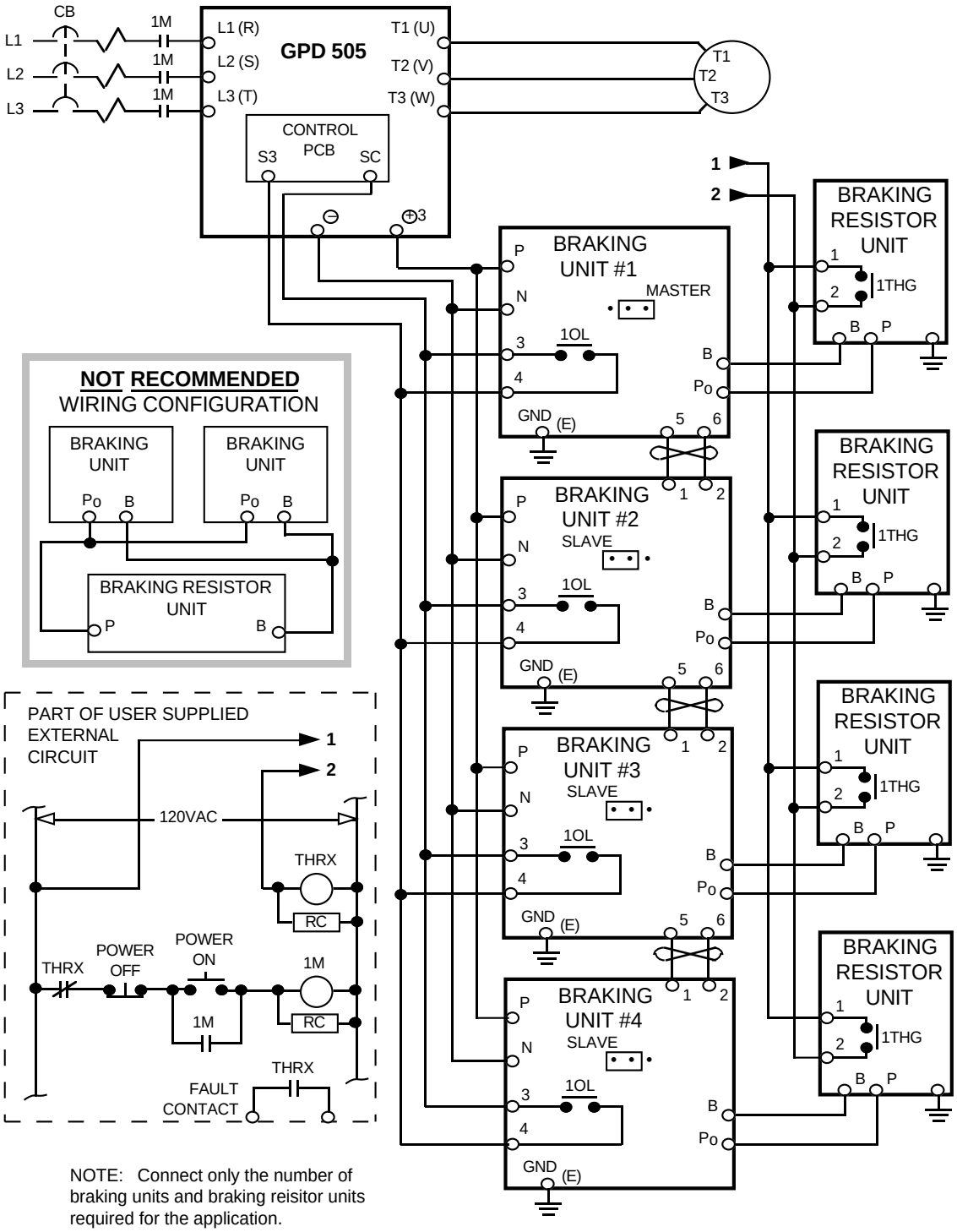


Figure A7-5. Wiring Multiple Braking Units and Braking Resistor Units to Drive

7. **IMPORTANT:** After wiring, test insulation resistance of each Braking Unit/Braking Resistor Unit with a 900V megger as follows:

a. Disconnect leads between the Braking Unit and the drive. If equipment with semiconductors is connected across terminals 1 & 2 of the Braking Unit, remove the wiring.

b. Connect common leads (jumpers) across Braking Unit terminals N, P, Po, and B, and across 3 & 4, as shown in Figure A7-6.

c. Measure the insulation resistance at points a, b, and c in Figure A7-6 with the megger.

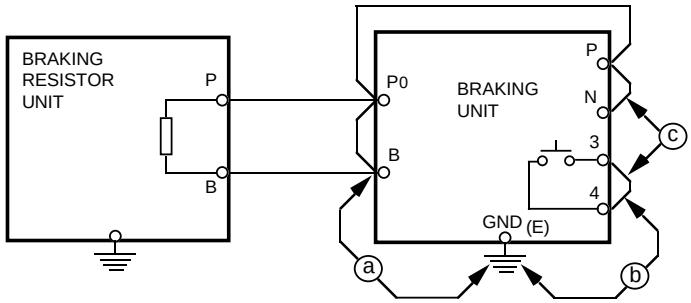


Figure A7-6. Megger Testing Set-up

OPERATION CHECK

8. During dynamic braking operation, verify that the "BRAKE" lamp inside the Braking Unit will be lit.

9. During dynamic braking operations, ensure that the required deceleration characteristic is obtained. If not, contact MagneTek for assistance.

10. Reinstall and secure covers on the DB units and the drive.

CAUTION

During normal operation, the Braking Unit and the Braking Resistor Unit enclosures must be kept closed, since high voltage is applied to the dynamic braking circuit.

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Please send information on the following:

- ❑ **WinDDM (DriveDataManager For Windows)**
  A program to create and edit configuration files for MagneTek AC drives, and to upload/download configuration files for high-speed programming, production change, or backup.

- ❑ **GPD 505 Programming Reference Guide**
  Free pocket-size booklet which provides the user a rapid reference for programming GPD 505 parameters.
  Allow one week for delivery.

- ❑ **Additional Copies of GPD 505 Technical Manual**
  Information will be provided on how to order copies of TM 4505.

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GPD 505

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TM 4505