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YASKAWA

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For GPD 503 230V 15-100HP, 460V 25-400HP, 575V, 25-200HP Adjustable Frequency Drives and VCD 703 230V, 15-50HP, 460V, 25-400HP Vector Control Drives

DYNAMIC BRAKING (DB) OPTION

(BRAKING UNIT(S) AND BRAKING RESISTOR UNIT(S))

(PART NUMBERS DETERMINED BY DRIVE RATING)

Before installing this option, a TECHNICALLY QUALIFIED INDIVIDUAL who is familiar with this type of equipment and the hazards involved, should READ this ENTIRE INSTRUCTION SHEET.

IMPORTANT

This option may have been installed by the factory. However, certain steps can only be completed at the installation site. Therefore, review and perform those steps which complete the installation process.

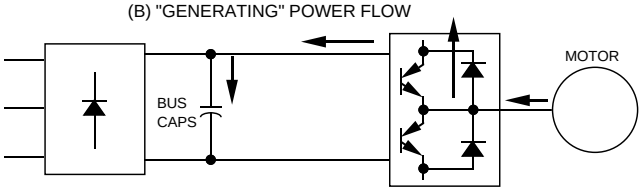
DESCRIPTION

Installation of this option 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.

Dynamic Braking Operation

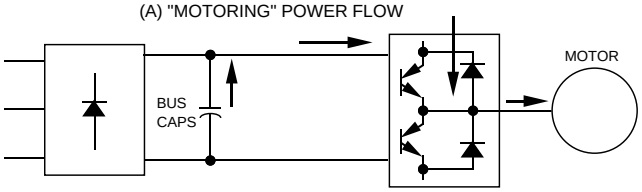
Whenever an excited motor is operated in the negative slip region (or is subjected to an overhauling load), the motor will behave as an induction generator. In this mode, energy will actually flow from the motor back into the drive, as shown in illustrations (A) and (B).

(B) "GENERATING" POWER FLOW

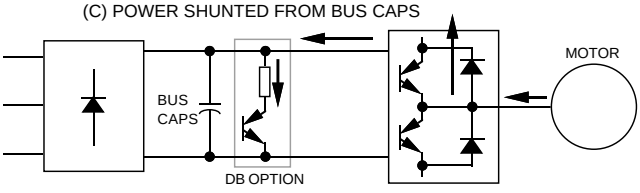


This energy will cause the DC Bus voltage to rise. Another condition that will cause the DC Bus voltage to rise is when the input voltage to the drive is high. When the DC Bus voltage reaches a certain level, the Dynamic Braking option will activate. The option will actually “shunt” the regenerative energy away from the Bus capacitors, as shown in illustration (C), and will dissipate it as heat in the DB resistors. Since the regenerative energy is dissipated in the resistors, the Overvoltage (OV) trip is prevented; thus the motor remains excited and continues to produce braking torque. However, for the high input voltage condition, an input contactor (1M) should be used (see Figure 4 or 5) to disconnect the drive when the high input voltage exists for a long period of time.

(A) "MOTORING" POWER FLOW



(C) POWER SHUNTED FROM BUS CAPS



CHANGE RECORD					
1	STD-4814 5-17-91	4	STD-5536 5-19-93		
2	STD-5243 7-20-91	5	STD-5980 2-16-95		
3	STD-5398 12-21-92				

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Table 1

Drive		Braking Unit						
Voltage	HP(CT)	Part Number	Qty	H1	W1	H2	W2	D
230	15	50185034	1	10.24	3.94	11.02	5.51	6.30
	20	50185034	1	10.24	3.94	11.02	5.51	6.30
	25	50185035	1	10.24	3.94	11.02	5.51	6.30
	30	50185035	1	10.24	3.94	11.02	5.51	6.30
	40	50185034	2	10.24	3.94	11.02	5.51	6.30
	50	50185034	2	10.24	3.94	11.02	5.51	6.30
	60	50185035	2	10.24	3.94	11.02	5.51	6.30
	75	50185035	2	10.24	3.94	11.02	5.51	6.30
	100	50185035	3	10.24	3.94	11.02	5.51	6.30
460	25	50185234	1	10.24	3.94	11.02	5.51	6.30
	30	50185234	1	10.24	3.94	11.02	5.51	6.30
	40	50185234	1	10.24	3.94	11.02	5.51	6.30
	50	50185235	1	10.24	3.94	11.02	5.51	6.30
	60	50185235	1	10.24	3.94	11.02	5.51	6.30
	75	50185234	2	10.24	3.94	11.02	5.51	6.30
	100	50185235	2	10.24	3.94	11.02	5.51	6.30
	150	50185234	3	10.24	3.94	11.02	5.51	6.30
	200	50185235	4	10.24	3.94	11.02	5.51	6.30
	250	50185235	5	10.24	3.94	11.02	5.51	6.30
	300	50185235	5	10.24	3.94	11.02	5.51	6.30
	400	50185235	6	10.24	3.94	11.02	5.51	6.30
575	25 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	30 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	40 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	50 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	60 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	75 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	100 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	125 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	150 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30
	200 (1)	50185236	1	10.24	3.94	11.02	5.51	6.30

Drive		Braking Resistor Unit							
Voltage	HP(CT)	Part Number	Qty	H1	W1	H2	W2	D	Mtg Screws
230	15	5P41-0748	1	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	20	5P41-0748	1	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	25	5P41-0750	1	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	30	5P41-0751	1	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	40	5P41-0749	2	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	50	5P41-0749	2	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	60	5P41-0751	2	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	75	5P41-0751	2	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	100	5P41-0751	3	26.00	12.00	10.00	22.00	11.00	3/4 (4)

(1) 150% UL rated.

Refer to Sheet 1 for latest change.

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Table 1 (Continued)

Drive		Braking Resistor Unit							
Voltage	HP(CT)	Part Number	Qty	H	W	D	H1	W1	Mtg Screws
460	25	5P41-0760	4	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	30	5P41-0761	4	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	40	5P41-0762	3	13.00	18.00	10.00	9.00	17.00	3/4 (4)
	50	5P41-0763	5	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	60	5P41-0764	5	26.00	12.00	10.00	22.00	11.00	3/4 (4)
	75	5P41-0762	3	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	100	5P41-0764	5	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	150	5P41-0762	3	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	200	5P41-0764	5	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	250	5P41-0764	5	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	300	5P41-0764	5	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	400	5P41-0764	5	26.00	18.00	10.00	22.00	17.00	3/4 (4)
575	25 *(1)*	5P41-0769	1	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	30 *(1)*	5P41-0770	1	13.00	12.00	10.00	9.00	11.00	3/4 (4)
	40 *(1)*	5P41-0771	1	13.00	18.00	10.00	9.00	17.00	3/4 (4)
	50 *(1)*	5P41-0772	1	13.00	18.00	10.00	9.00	17.00	3/4 (4)
	60 *(1)*	5P41-0773	1	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	75 *(1)*	5P41-0774	1	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	100 *(1)*	5P41-0775	1	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	125 *(1)*	5P41-0776	1	26.00	18.00	10.00	22.00	17.00	3/4 (4)
	150 *(1)*	5P41-0777	1	26.00	18.00	15.00	22.00	17.00	3/4 (4)
	200 *(1)*	5P41-0778	1	26.00	18.00	15.00	22.00	17.00	3/4 (4)

(1) 150% UL rated.

Specifications of Braking Units

Item		230V		460V		575V
		Part Number		Part Number		Part Number
		50185034	50185035	50185234	50185235	50185236
Max. Motor Output Capacity HP (kW)		20 (15)	30 (22)	40 (30)	60 (45)	50 (37)
OUTPUT RATINGS	Max. Current * (A) (peak value)	40	60	40	60	40
	Rated Current (A) (RMS value)	15	20	15	18	15
	Turn-on Level	• 330/345/365/380 VDC (±3V) • Master/Slave Control Available		• 630/660/690/730/760 VDC (±6V) • Master/Slave Control Available		• 825/950 VDC (±8V) • Master/Slave Avail.
	Hysteresis (V)	Approx. 5 VDC		Approx. 10 VDC		Approx. 20 VDC
POWER SUPPLY	Bus Voltage	243 VDC – 400 VDC		460 VDC – 800 VDC		607 VDC – 1000 VDC
PROTECTIVE FUNCTIONS	Overheat Protection	By Thermoswitch Output (N.O. contact): AC 250V, 2A; DC 30V, 2A				
	Charge Indication	"CHARGE" lamp stays on until DC voltage drops below 50 VDC				
ENVIRON-MENTAL CONDITION	Location	Indoor; protected from corrosive gas and dust				
	Ambient Temperature	-10 to +40°C (+14 to +104°F) (not frozen)				
	Storage Temperature	-20 to +60°C (-4 to +140°F)				
	Humidity	90% RH and below (non-condensing)				
	Vibration	1G at less than 20Hz; 0.2G at 20 to 50Hz				
Enclosure		NEMA 1				

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RECEIVING

All equipment is tested against defect at the factory. Report any damages or shortages evident when equipment is received immediately to the commercial carrier who transported the equipment. Assistance, if required, is available from your MagneTek sales representative.

STORAGE

If the option is not to be installed immediately, it must be stored under the following conditions:

- Ambient temperature: -10 to +40° C.
- Protected from rain and moisture.
- Free from corrosive gases or liquids.
- Free from dust or metal particles.
- Clean and dry.
- Free from excessive vibration.

INSTALLATION

Preliminary Procedure

WARNING

HAZARDOUS VOLTAGE CAN CAUSE SEVERE INJURY OR DEATH.

LOCK ALL POWER SOURCES FEEDING DRIVE IN “OFF” POSITION.

1. Disconnect all electrical power to drive.

2. Remove drive front cover.

3. Verify that voltage has been disconnected by using a voltmeter to check for voltage at the incoming power terminals.

Figure 1. Braking Unit

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Figure 2. Braking Resistor Unit

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Mounting and Wiring Units

IMPORTANT

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

IMPORTANT

Select mounting locations so that the wiring distance between the drive and the braking unit, and between the braking unit and the braking resistor unit, is less than 10 meters (33 feet).

4. Both the braking unit (see Figure 1) and the braking resistor unit (see Figure 2) require vertical installation with ample clearance space to achieve high cooling efficiency. Dimensions are given in Table 1.

5. Remove front cover(s) from braking unit(s) to access terminals (see Figure 3), and open terminal box(es) on braking resistor unit(s). Make connections between drive, braking unit(s) and braking resistor unit(s) according to Table 2 and Figure 4 (single units) or Figure 5 (multiple units).

Figure 3. Braking Unit Terminals

NOTE

External control components shown in Figure 4 and Figure 5 are not supplied with the option. These components are necessary for safe operation of the Dynamic Braking option.

Table 2

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

* Power leads for the braking resistor unit generate high levels of electrical noise; these signal leads must be grouped separately.

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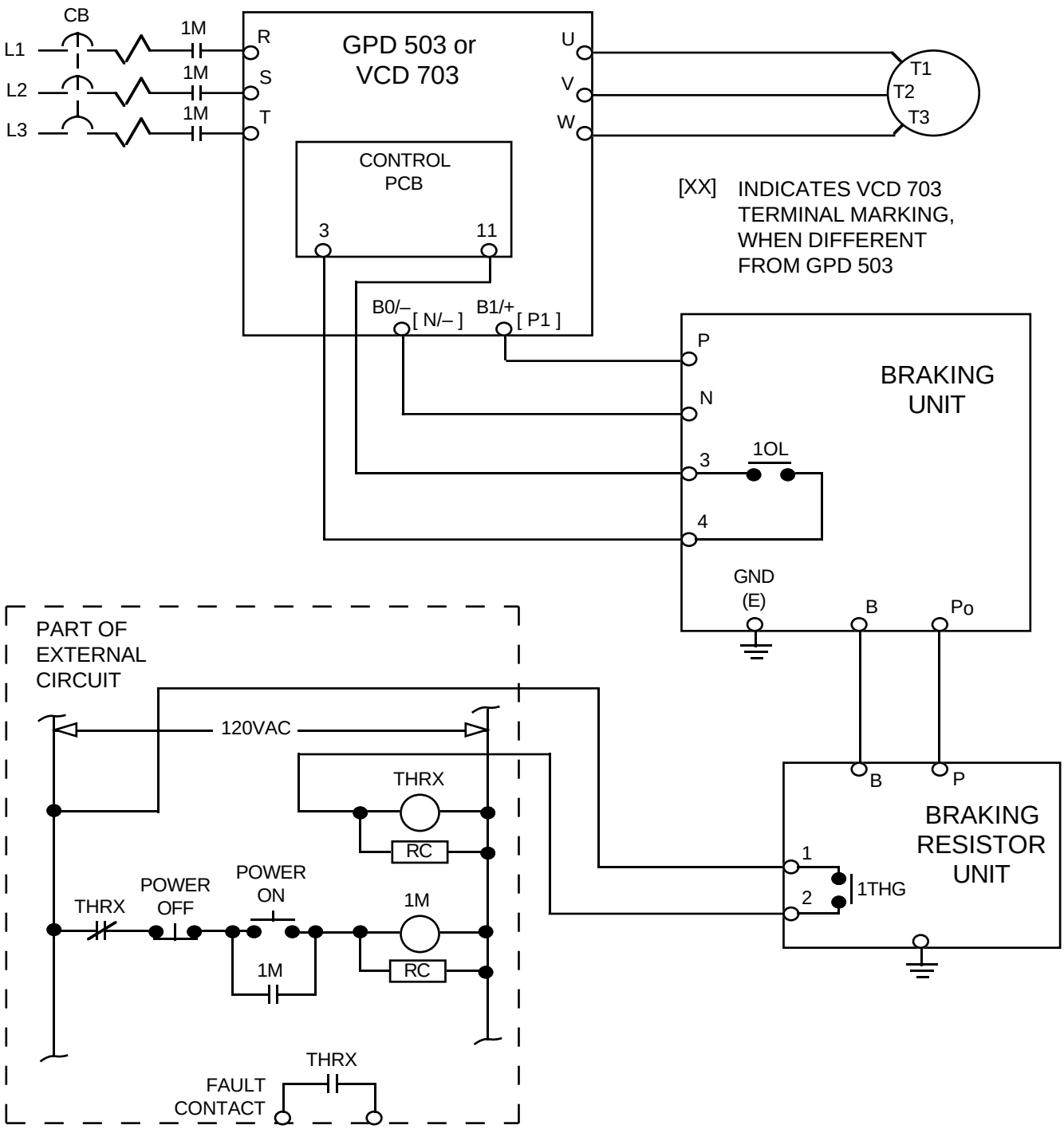


Figure 4. Wiring Single Braking Unit and Braking Resistor Unit to Drive

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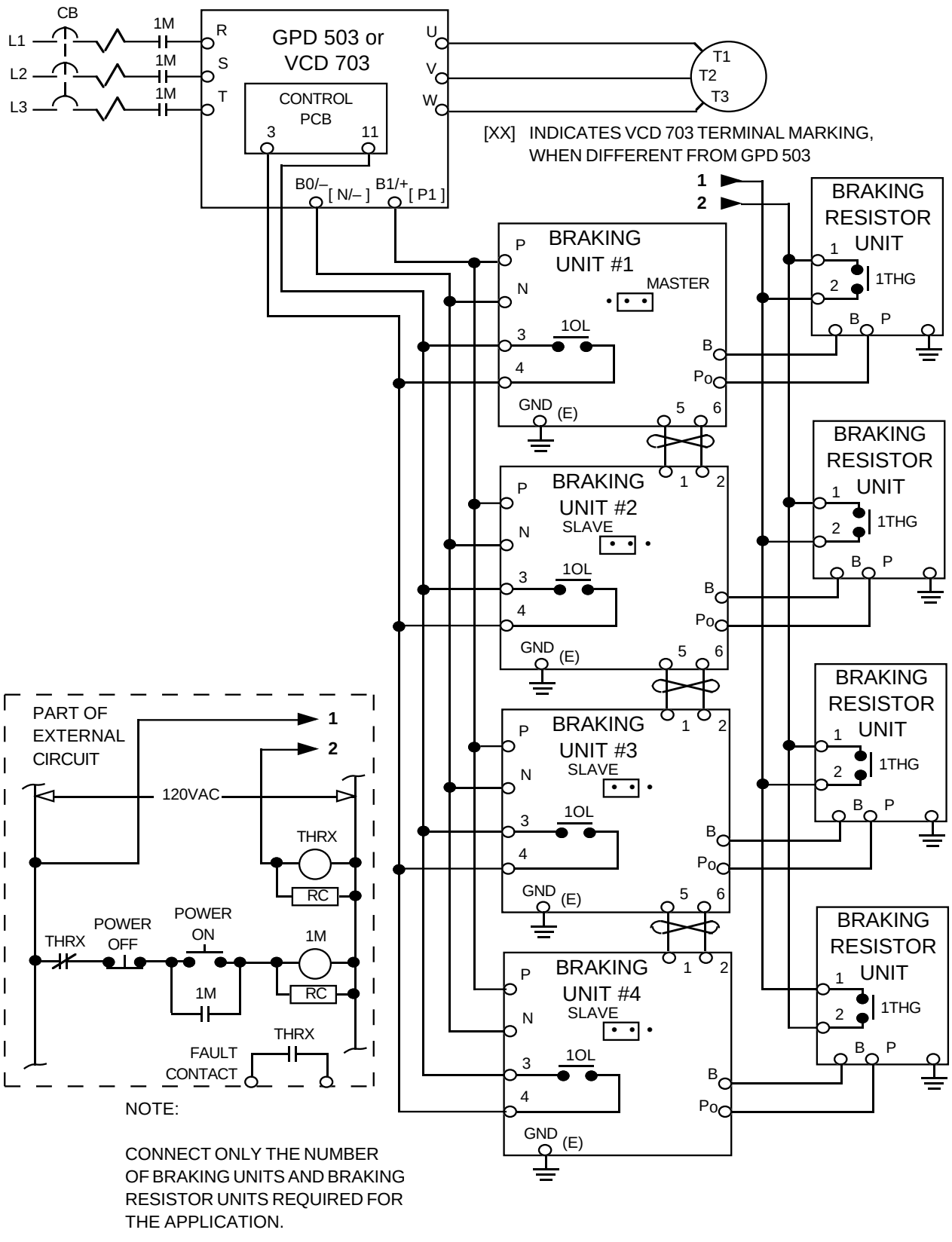


Figure 5. Wiring Multiple Braking Units and Braking Resistor Units to Drive

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Refer to Sheet 1 for latest change.

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Grounding

6. The enclosure of the braking resistor unit must be grounded. If the braking resistor unit cannot be mounted in the grounded enclosure, ground it by using a lead from the mounting screw of the unit.

7. Grounding resistance of the braking unit should be 100 ohms or less.

8. Use grounding lead conforming to your National Electrical Code.

IMPORTANT

After wiring , test the insulation resistance of the braking circuit with a 900V megger as follows:

1. Disconnect leads between the braking unit and the drive. If equipment with semiconductors is connected across terminals 1 and 2 of the braking unit, remove the wiring.

2. Connect common leads (jumpers) across braking unit terminals N, P, Po and B, and across 3 and 4, as shown in Figure 6.

3. Measure the insulation resistance at a, b, and c (see Figure 6) with a megger.

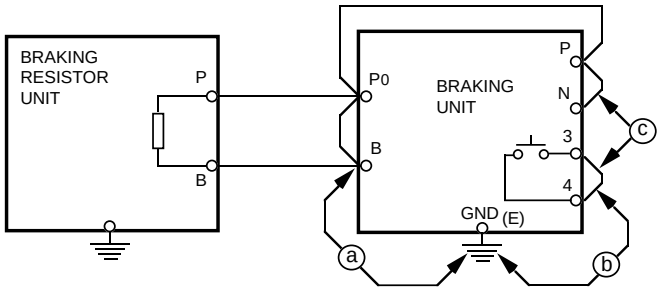


Figure 6. Megger Testing Method

Adjustments

9. The braking unit or braking resistor unit requires drive reprogramming.

(a) For GPD 503: Program Sn-10 to X X **1** X , which disables stall prevention during decel.

(b) For VCD 703: Verify On-03 is set to X **0** X X, which disables overvolatge control function.

NOTE

There are no adjustments to be made in the braking resistor unit.

10. (380 to 460V only). If the braking unit is connected to a GPD 503 that uses an input voltage less than 460V, jumpers located on the PCB of the braking unit should be selected to the appropriate input voltage. Refer to Figure 3.

11. (Multiple Braking Units). If there are 2 or more braking units applied, then a selection is required for MASTER–SLAVE configuration. Refer to Figure 5. On the PCB of braking units, select Unit #1 for MASTER (factory setting), and each of the other units (#2, #3, etc.) for SLAVE.

Operational Check

NOTE

During dynamic braking operation, the operation indicating (“BRAKE”) lamp in the braking unit lights. This lamp can be observed only with the front cover of the braking unit removed.

12. During dynamic braking operations, make sure that the required deceleration characteristic is obtained. If not, contact MagneTek for assistance.

CAUTION

DURING NORMAL OPERATION, THE BRAKING UNIT AND THE BRAKING RESISTOR UNIT MUST BE KEPT CLOSED, SINCE HIGH VOLTAGE IS APPLIED TO THE DYNAMIC BRAKING CIRCUIT.

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13. Reinstall and secure front covers on drive and braking unit(s), and close and secure the terminal box(es) on the braking resistor unit(s).

14. Place this instruction sheet with the drive Technical Manual.

This completes the installation of this option.

TROUBLESHOOTING

To troubleshoot the dynamic braking circuit (braking unit and braking resistor unit), refer to Table 3 and Figure 7.

Table 3

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Thermal relay 1OL trips with no deceleration.	Short circuited main circuit discharging transistor 1TR in braking unit.	– Replace unit. – Remove short circuit across terminals B1 and E1 of 1TR.
Overvoltage (OV) fault trip indicated by drive.	Braking resistor unit capacity too small for load (“BRAKE” lamp lit instantaneously).	Check the braking condition.
	Wrong wiring.	Correct.
	Unsuitable combination of drive and DB units.	Select proper DB units.
	Braking unit failure.	Replace unit.
Thermal relay sometimes trips.	Braking resistor unit capacity too small.	Check the braking condition.
	Wrong thermal relay setting.	Check protective coordination of the braking resistor unit and the thermal relay.
After thermal relay trips, the relay does not reset.	Wrong resetting mode selected in braking unit.	Set reset selection slide switch in braking unit (see Figure 3) for automatic reset.
	Faulty thermal relay.	Replace braking unit.

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Figure 7. Dynamic Braking Unit Schematic

Refer to Sheet 1 for latest change.

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