



FOR:	230V	460V
GPD 503	15-100 HP	25-500 HP
GPD 515	15-100 HP	30-500 HP
VCD 703	15-50 HP	25-400HP

# 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.

### **UL/cUL Compliance**

For this Dynamic Braking (DB) unit to comply with UL/cUL regulations, a fuse must be used in conjunction with it. The fuse specified must be a semiconductor device, which must be wired in series with the DC negative bus, between the drive and the DB unit, as shown in Figures 2 and 3. The fuse and fuse holder information is as follows;

Drive Input Voltage	Yaskawa Part number	
	Fuse	Fuse Holder
230v/460v	05P00017-0525	05P00019-0149
600v	05P00017-0526	05P00019-0150

*For applications requiring multiple DB Units, multiple fuses and holders; See Figure 3.*

### **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 Yaskawa sales representative.

### **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.

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, 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 1 or 2) to disconnect the drive when the high input voltage exists for a long period of time.

### **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.

CHANGE RECORD			
1	STD-6654	7/12/96	4 MarCom Chg 9/11/98
2	STD-7093	3/4/97	5 MarCom Chg 12/22/98
3	STD-7483	12/3/97	

DWG. NO. 02Y00025-0393  
SHEET NO. 1 OF 10  
REL. 4/26/96

**Table 1. Yaskawa Dynamic Braking Components**

Section A. For 10% Duty Cycle								
Drive		Braking Module (1)		Braking Resistor Unit (2)				
Voltage	HP (CT)	Part Number	Qty	Part Number	Qty Req.	Watts (each)	Ohms (each)	Size
2 3 0	15	46S03331-0010	1	5P41-0831	1	1500	13.6	2
	20	46S03331-0020	1	5P41-0832	1	1920	10	3
	25	46S03331-0020	1	5P41-0833	1	2592	8	3
	30	46S03331-0020	1	5P41-0833	1	2592	8	3
	40	46S03331-0010	2	5P41-0834	2	2760	6.8	4
	50	46S03331-0010	2	5P41-0834	2	2760	6.8	4
	60	46S03331-0020	2	5P41-0834	2	2760	6.8	4
	75	46S03331-0020	3	5P41-0834	3	2760	6.8	4
	100	46S03331-0020	3	5P41-0834	3	2760	6.8	4
	4 6 0	25	46S03331-0050	1	5P41-0844	1	3000	27.2
30		46S03331-0050	1	5P41-0844	1	3000	27.2	3
40		46S03331-0060	1	5P41-0845	1	3850	20	4
50		46S03331-0060	1	5P41-0846	1	5440	16	4
60		46S03331-0060	1	5P41-0847	1	5715	13.6	5
75		46S03331-0060	2	5P41-0845	2	3850	20	4
100		46S03331-0060	2	5P41-0847	2	5715	13.6	5
150		46S03331-0060	3	5P41-0847	3	5715	13.6	5
200		46S03331-0060	4	5P41-0847	4	5715	13.6	5
250		46S03331-0060	5	5P41-0847	5	5715	13.6	5
300		46S03331-0060	5	5P41-0847	5	5715	13.6	5
400		46S03331-0060	6	5P41-0847	6	5715	13.6	5
Section B. For 50% Duty Cycle								
Drive		Braking Module (1)		Braking Resistor Unit (2)				
Voltage	HP (CT)	Part Number	Qty	Part Number	Qty Req.	Watts (each)	Ohms (each)	Size
2 3 0	15	46S03331-0010	2	5P41-0865	2	4775	20	5
	20	46S03331-0010	2	5P41-0865	2	4775	20	5
	25	46S03331-0020	2	5P41-0866	2	7344	13.6	5
	30	46S03331-0020	2	5P41-0866	2	7344	13.6	5
	40	46S03331-0020	3	5P41-0866	3	7344	13.6	5
	50	46S03331-0020	3	5P41-0866	3	7344	13.6	5
	60	46S03331-0020	3	5P41-0866	3	7344	13.6	5
	75	46S03331-0020	4	5P41-0866	4	7344	13.6	5
	100	46S03331-0020	4	5P41-0866	4	7344	13.6	5

(1) See Figure 1 for dimensions  
 (2) See Figure 1A for dimensions

Refer to Sheet 1 for latest change.

DWG. NO. 02Y00025-0393  
 SHEET NO. 2 OF 10  
 REL. 4/26/96

**Table 1. Yaskawa Dynamic Braking Components (Continued)**

Section B. For 50% Duty Cycle (Continued)								
Drive		Braking Module (1)		Braking Resistor Unit (2)				
Voltage	HP (CT)	Part Number	Qty	Part Number	Qty Req.	Watts (each)	Ohms (each)	Size
4 6 0	25	46S03331-0060	1	5P41-0879	1	14,050	27.2	7
	30	46S03331-0060	1	5P41-0879	1	14,050	27.2	7
	40	46S03331-0060	2	5P41-0879	2	14,050	27.2	7
	50	46S03331-0060	2	5P41-0879	2	14,050	27.2	7
	60	46S03331-0060	2	5P41-0879	2	14,050	27.2	7
	75	46S03331-0060	2	5P41-0879	2	14,050	27.2	7
	100	46S03331-0060	3	5P41-0879	3	14,050	27.2	7
	150	46S03331-0060	4	5P41-0879	4	14,050	27.2	7
	200	46S03331-0060	5	5P41-0879	5	14,050	27.2	7
	250	46S03331-0060	5	5P41-0879	5	14,050	27.2	7
300	46S03331-0060	6	5P41-0879	6	14,050	27.2	7	
400	46S03331-0060	6	5P41-0879	6	14,050	27.2	7	
Section C. For 100% Duty Cycle								
Drive		Braking Module (1)		Braking Resistor Unit (2)				
Voltage	HP (CT)	Part Number	Qty	Part Number	Qty Req.	Watts (each)	Ohms (each)	Size
2 3 0	15	46S03331-0020	1	5P41-0889	1	4813	30	5
	20	46S03331-0020	2	5P41-0900	2	7220	20	5
	25	46S03331-0020	3	5P41-0900	3	7220	20	5
	30	46S03331-0020	3	5P41-0900	3	7220	20	5
	40	46S03331-0020	4	5P41-0900	4	7220	20	5
	50	46S03331-0020	4	5P41-0900	4	7220	20	5
	60	46S03331-0020	5	5P41-0900	5	7220	20	5
	75	46S03331-0020	5	5P41-0900	5	7220	20	5
	100	46S03331-0020	6	5P41-0900	6	7220	20	5
	4 6 0	25	46S03331-0060	1	5P41-0912	2	14,440	40
30		46S03331-0060	2	5P41-0912	2	14,400	40	7
40		46S03331-0060	2	5P41-0912	2	14,400	40	7
50		46S03331-0060	2	5P41-0912	2	14,400	40	7
60		46S03331-0060	3	5P41-0912	3	14,400	40	7
75		46S03331-0060	3	5P41-0912	3	14,400	40	7
100		46S03331-0060	4	5P41-0912	4	14,400	40	7
150		46S03331-0060	5	5P41-0912	5	14,400	40	7
200		46S03331-0060	6	5P41-0912	6	14,400	40	7
250		46S03331-0060	6	5P41-0912	6	14,400	40	7
300	46S03331-0060	6	5P41-0912	6	14,400	40	7	
400	46S03331-0060	6	5P41-0912	6	14,400	40	7	

(1) See Figure 1 for dimensions

(2) See Figure 1A for dimensions

Refer to Sheet 1 for latest change.

DWG. NO. 02Y00025-0393  
SHEET NO. 3 OF 10  
REL. 4/26/96

**Table 1. Yaskawa Dynamic Braking Components (Continued)**

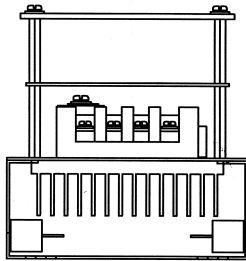
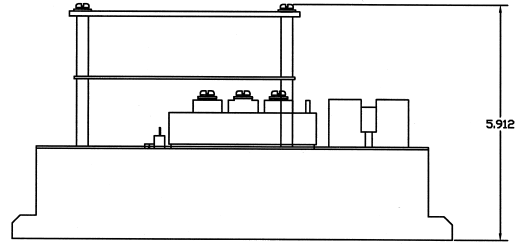
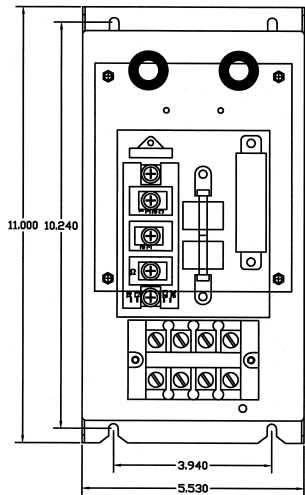
<b>Section A. For 10% Duty Cycle</b>									
<b>Drive</b>		<b>Braking Module (1)</b>		<b>Braking Resistor Unit (2)</b>					
<b>Voltage</b>	<b>HP (CT)</b>	<b>Part Number</b>	<b>Qty</b>	<b>Part Number</b>	<b>Qty Req.</b>	<b>Watts (each)</b>	<b>Ohms (each)</b>	<b>Size</b>	
5	25	46S03331-0080	1	5P41-0855	1	3000	40	3	
	30	46S03331-0080	1	5P41-0856	1	3248	38	3	
	40	46S03331-0080	1	5P41-0857	1	3800	33	4	
	50	46S03331-0080	1	5P41-0858	1	4464	27	4	
	7	60	46S03331-0080	2	5P41-0858	2	4464	27	4
	5	70	46S03331-0080	2	5P41-0858	2	4464	27	4
	100	46S03331-0080	2	5P41-0858	2	4464	27	4	
	125	46S03331-0080	3	5P41-0858	3	4464	27	4	
	150	46S03331-0080	3	5P41-0858	3	4464	27	4	
	200	46S03331-0080	4	5P41-0858	4	4464	27	4	
<b>Section B. For 50% Duty Cycle</b>									
<b>Drive</b>		<b>Braking Module (1)</b>		<b>Braking Resistor Unit (2)</b>					
<b>Voltage</b>	<b>HP (CT)</b>	<b>Part Number</b>	<b>Qty</b>	<b>Part Number</b>	<b>Qty Req.</b>	<b>Watts (each)</b>	<b>Ohms (each)</b>	<b>Size</b>	
5	25	46S03331-0080	1	5P41-0889	1	12,188	50	6	
	30	46S03331-0080	1	5P41-0889	1	12,188	50	6	
	40	46S03331-0080	2	5P41-0889	2	12,188	50	6	
	50	46S03331-0080	2	5P41-0889	2	12,188	50	6	
	7	60	46S03331-0080	2	5P41-0889	2	12,188	50	6
	5	70	46S03331-0080	3	5P41-0889	3	12,188	50	6
	100	46S03331-0080	3	5P41-0889	3	12,188	50	6	
	125	46S03331-0080	4	5P41-0889	4	12,188	50	6	
	150	46S03331-0080	5	5P41-0889	5	12,188	50	6	
	200	46S03331-0080	6	5P41-0889	6	12,188	50	6	
<b>Section C. For 100% Duty Cycle</b>									
<b>Drive</b>		<b>Braking Module (1)</b>		<b>Braking Resistor Unit (2)</b>					
<b>Voltage</b>	<b>HP (CT)</b>	<b>Part Number</b>	<b>Qty</b>	<b>Part Number</b>	<b>Qty Req.</b>	<b>Watts (each)</b>	<b>Ohms (each)</b>	<b>Size</b>	
5	25	46S03331-0080	2	5P41-0923	2	12,300	75	6	
	30	46S03331-0080	2	5P41-0923	2	12,300	75	6	
	40	46S03331-0080	2	5P41-0923	2	12,300	75	6	
	50	46S03331-0080	3	5P41-0923	3	12,300	75	6	
	7	60	46S03331-0080	3	5P41-0923	3	12,300	75	6
	5	70	46S03331-0080	4	5P41-0923	4	12,300	75	6
	100	46S03331-0080	5	5P41-0923	5	12,300	75	6	
	125	46S03331-0080	5	5P41-0923	5	12,300	75	6	
	150	46S03331-0080	6	5P41-0923	6	12,300	75	6	
	200	46S03331-0080	6	5P41-0923	6	12,300	75	6	
Max. Motor Output Capacity HP (kW)					50 (37)				
Output Voltages	Max. Current (A) (peak value)				40				
	Rated Current (A) (RMS value)				15				
	Turn -on Level				825/950 VDC (±8V), Master/Slave Avail.				
	Hysteresis (V)				Approx. 20 VDC				

(1) See Figure 1 for dimensions

(2) See Figure 1A for dimensions

Refer to Sheet 1 for latest change.

**DWG. NO. 02Y00025-0393**  
**SHEET NO. 4 OF 10**  
**REL. 4/26/96**

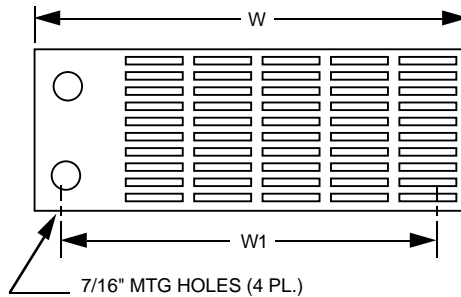
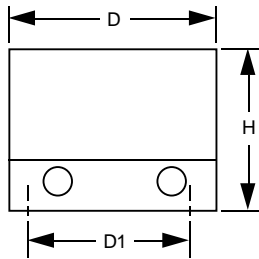


Braking Unit (Wall Mount) – All Part Numbers  
Mounting Hole Spacing : 4 @ 0.236 in. dia

Figure 1 Braking Unit - Wall Mount

SIDE VIEW

FRONT VIEW



Size	Dimensions in inches (mm)			Mounting Hole Dimensions inches (mm)	
	H	x	W x D	W1	D1
1	5 (127)	x	14 (356) x 7 (178)	12 (305)	5 (127)
2	5 (127)	x	14 (356) x 13 (331)	12 (305)	11 (279)
3	5 (127)	x	21 (534) x 13 (331)	19 (483)	11 (279)
4	5 (127)	x	28 (712) x 13 (331)	26 (660)	11 (279)
5	7 (178)	x	29 (737) x 18 (457)	27.5 (699)	14 (356)
6	14 (356)	x	29 (737) x 18 (457)	27.5 (699)	14 (356)
7	21 (534)	x	29 (737) x 18 (457)	27.5 (699)	14 (356)

Figure 1.A Braking Resistor Unit

DWG. NO. 02Y00025-0393  
SHEET NO. 5 OF 10  
REL. 4/26/96

**Table 2. Specifications of Braking Units**

Item	230V		460V		
	Part Number		Part Number		
	46S03331-0010	46S03331-0020	46S03331-0050	46S03331-0060	
Max. Motor Output Capacity HP (kW)	20 (15)	30 (22)	40 (30)	60 (45)	
OUTPUT RATINGS	Max. Current * (A) (peak value)	40	60	40	60
	Rated Current (A) (RMS value)	15	20	15	18
	Turn-on Level	<ul style="list-style-type: none"> <li>• 330/345/365/380 VDC (±3V)</li> <li>• Master/Slave Control Available</li> </ul>		<ul style="list-style-type: none"> <li>• 630/660/690/730/760 VDC (±6V)</li> <li>• Master/Slave Control Available</li> </ul>	
	Hysteresis (V)	Approx. 5 VDC		Approx. 10 VDC	
POWER SUPPLY	Bus Voltage	243 VDC – 400 VDC		460 VDC – 800 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			
ENVIRONMENTAL 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)			

**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.

**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.

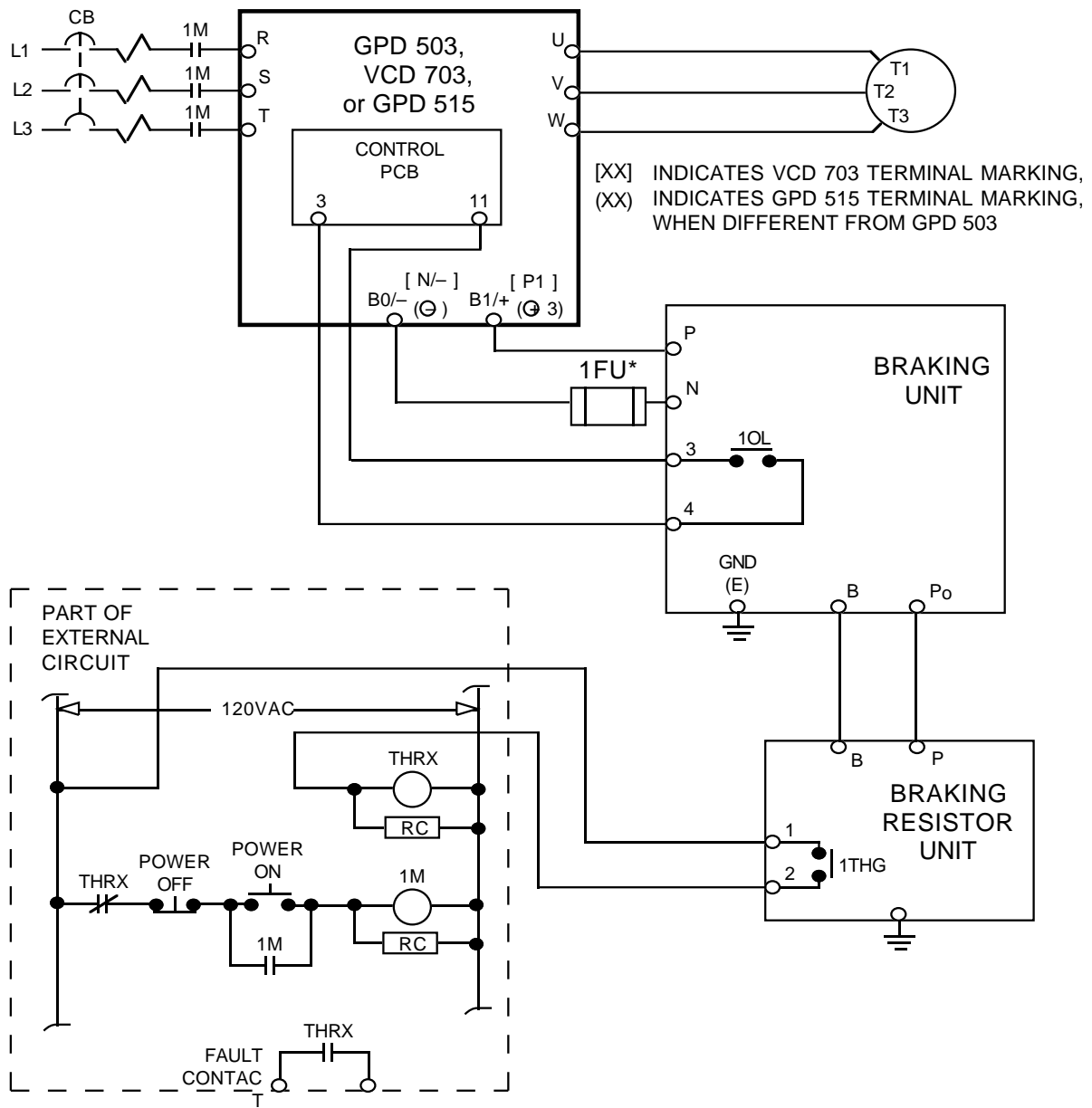
**Table 3**

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.

Refer to Sheet 1 for latest change.

DWG. NO. 02Y00025-0393  
SHEET NO. 6 OF 10  
REL. 4/26/96

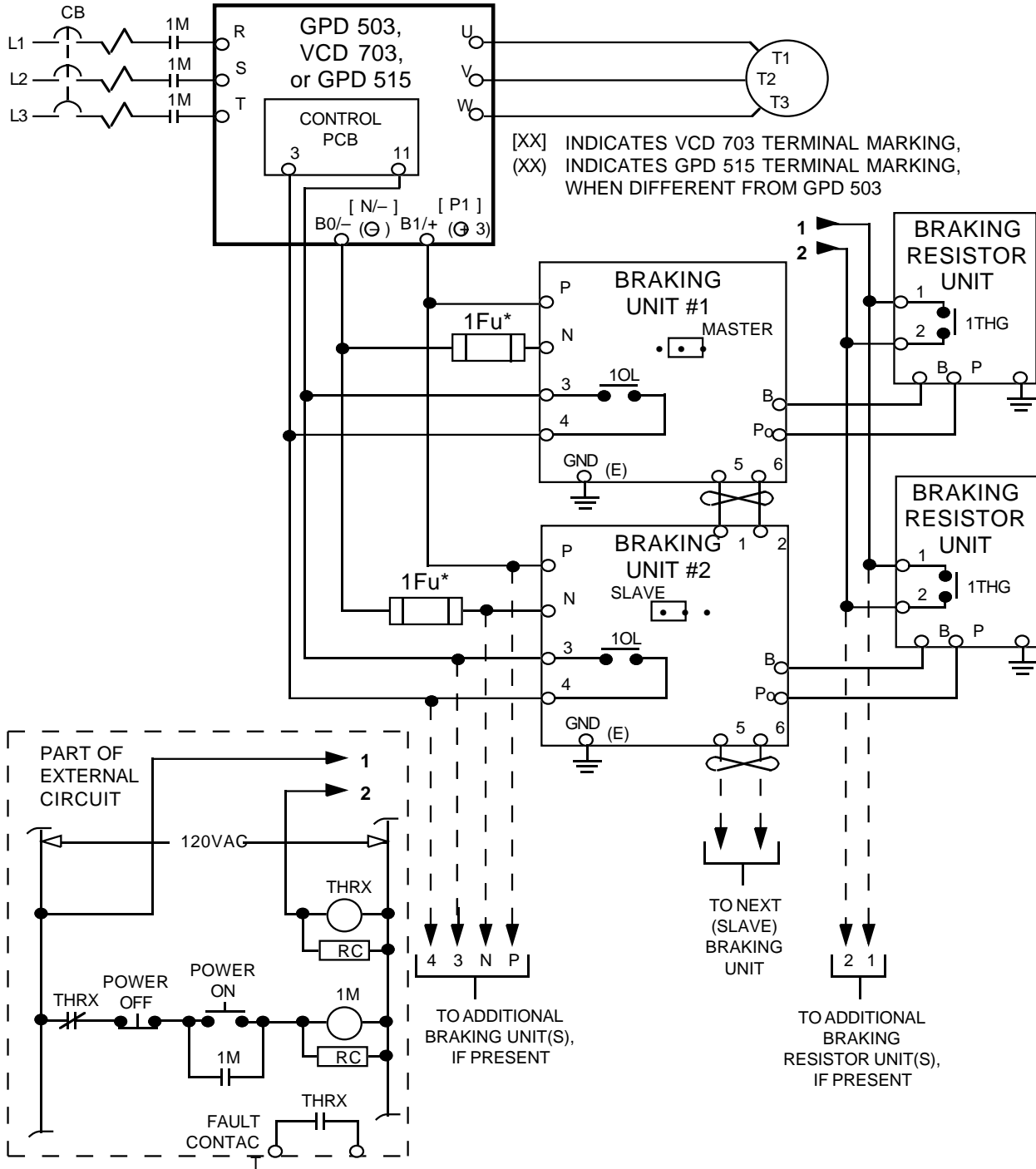


**Figure 2. Wiring Single Braking Unit and Braking Resistor Unit to Drive**

*\* See UL/cUL Compliance information on sheet 1 of 10.*

DWG. NO. 02Y00025-0393  
SHEET NO. 7 OF 10  
REL. 4/26/96

Refer to Sheet 1 for latest change.



NOTE:  
 CONNECT ONLY THE NUMBER  
 OF BRAKING UNITS AND BRAKING  
 RESISTOR UNITS REQUIRED FOR  
 THE APPLICATION.

*\*See UL/cUL Compliance information on sheet 1 of 10.*

**Figure 3. Wiring Multiple Braking Units and Braking Resistor Units to Drive**

DWG. NO. 02Y00025-0393  
 SHEET NO. 8 OF 10  
 REL. 4/26/96

Refer to Sheet 1 for latest change.



### 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 and the braking resistor unit require installation with ample clearance space to achieve high cooling efficiency.

5. Remove terminal access cover(s) on braking resistor unit(s). Make connections between drive, braking unit(s) and braking resistor unit(s) according to Table 2 and Figure 2 (single units) or Figure 2 (multiple units).

NOTE: External control components shown in Figure 1 and Figure 2 are not supplied with the option. These components are necessary for safe operation of the Dynamic Braking option.

### 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 4.

(3) Measure the insulation resistance at a, b, and c (see Figure 4) with a megger.

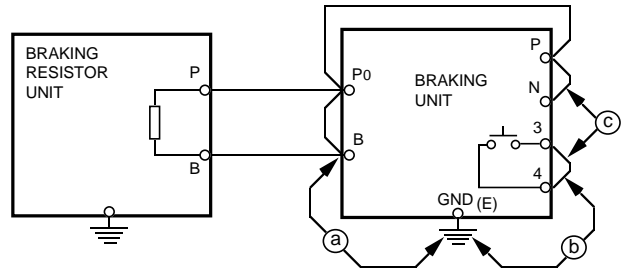


Figure 4. Megger Testing Method

### 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 GPD 515: Program L3-04 to " 0 " to disable stall prevention during decel.

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

The Yaskawa dynamic braking module utilizes a common control board for both 230 volt and 460 volt units. VERIFY the correct positioning of the jumpers on the control PCB with respect to the voltage module voltage class, drive input line voltage and whether the module(s) will be used as either MASTER or SLAVE.

10. Move the jumper indicated by reference designator HD1 to correspond with the 3-phase input voltage of the drive.

11. If two or more braking modules are applied, ensure that unit #1 is set as the MASTER while other unit (#2, #3, etc.) is set for SLAVE. See Figure 2.

12. **For 230 volt modules** (i.e. drive input voltage equal to 190, 200, 208, 220 and 230 volts), move both jumpers indicated by reference designators HD5 and HD6 to the 230 volt position.

**For 460 volt modules** (i.e. drive input voltage equal to 380, 400, 415, 440 and 460 volts), move both jumpers indicated by reference designators HD5 and HD5 to the 460 volt position.

DWG. NO. 02Y00025-0393  
SHEET NO. 9 OF 10  
REL. 4/26/96

13. The trim potentiometer indicated by reference designator P1 is used to adjust the brake module turn on voltage. This level is set at the factory and under normal operation, does not need to be adjusted.

**Operational Check**

NOTE: During the dynamic braking operation, the operation indicating (“BRAKE”) lamp in the braking unit lights.

14. During dynamic braking operations, make sure that the required deceleration characteristic is obtained. If not, contact Yaskawa 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.

15. 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).

16. 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 4.

**Table 4**

<b>SYMPTOM</b>	<b>POSSIBLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
Thermal relay 1OL trips with no deceleration.	Short circuited main circuit discharging transistor 1TR in braking unit.	<ul style="list-style-type: none"> <li>– Replace unit.</li> <li>– Remove short circuit across terminals B1 and E1 of 1TR.</li> </ul>
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 for automatic reset.
	Faulty thermal relay.	Replace braking unit.

DWG. NO. 02Y00025-0393  
 SHEET NO. 10 OF 10  
 REL. 4/26/96

Refer to Sheet 1 for latest change.