

***HAMP*TON**

Installation, Operation and
Maintenance Manual

**Magnapak Mark V
Adjustable Speed Drive**

INTRODUCTION

GENERAL

The Magnapak drive is a DC controller used to adjust the speed of a direct current motor. It may be used on a wide variety of equipment including conveyors, printing presses, packaging machinery, and welding positioners.

Although precautions have been taken in its design to ensure reliability under extreme operating conditions, it is possible to damage the equipment through misuse or misapplication. Therefore, these instructions should be reviewed carefully before installing and operating the equipment.

INSTALLATION

INSPECTION

Unpack the drive system and check to see that all items have been included in the shipment.

Inspect the equipment for loose parts, broken components, dents, and any other evidence of rough handling. Check to see that the model number, input voltage, and horsepower rating match the order description.

MOUNTING THE MAGNAPAK

If the Permanent Magnet DC motor is to be foot mounted, it should be bolted to a firm and flat foundation. If the foundation is not flat, shims should be used to prevent strains when tightening the bolts. The DC motor is equipped with combination radial and thrust bearings; therefore, it may be mounted in any position. If, however, it is "ceiling" mounted, some provision must be made to prevent the entry of foreign matter into the ventilation openings on dripproof-type motors. If the motor is to be directly connected to a driven machine, care should be exercised in aligning the shafts. Pulleys and shafts should slip freely onto the motor shaft. Paint, dirt and burrs should be removed with sandpaper if necessary. Do not hammer the shaft. If the motor is to be face mounted to a flange-type reducer, make sure the motor shaft slips freely into the reducer bore before tightening the bolts. Remove and discard the motor base, if any.

OPTIONAL EQUIPMENT

Mounting and wiring details for reducers, tachometers, transformers and other optional equipment will be found in the individual instructions accompanying such equipment.

WIRE SIZES

The following table of line and motor currents will assist in the selection of wire sizes and conduit runs. The RMS values of currents are used in determining wire sizes.

TABLE I - Line and Motor Currents

HP	Fuse		Line Current (RMS Amps)		Armature Current (DC Amps)		Min. AWG Wire
	120V	240V	120V	240V	90V	180V	
1/8	MDA 6¼		2.3		1.5		16
1/4	MDA 6¼		4.3		2.8		16
1/3	MDA 6¼		5.2		3.4		16
1/2	MDA 15		7.8		5.3		14
3/4	MDA 20	15	10.8	5.4	7.4	3.7	14
1		15		7.3		5.0	14

Use 18 AWG wire for potentiometer connections.

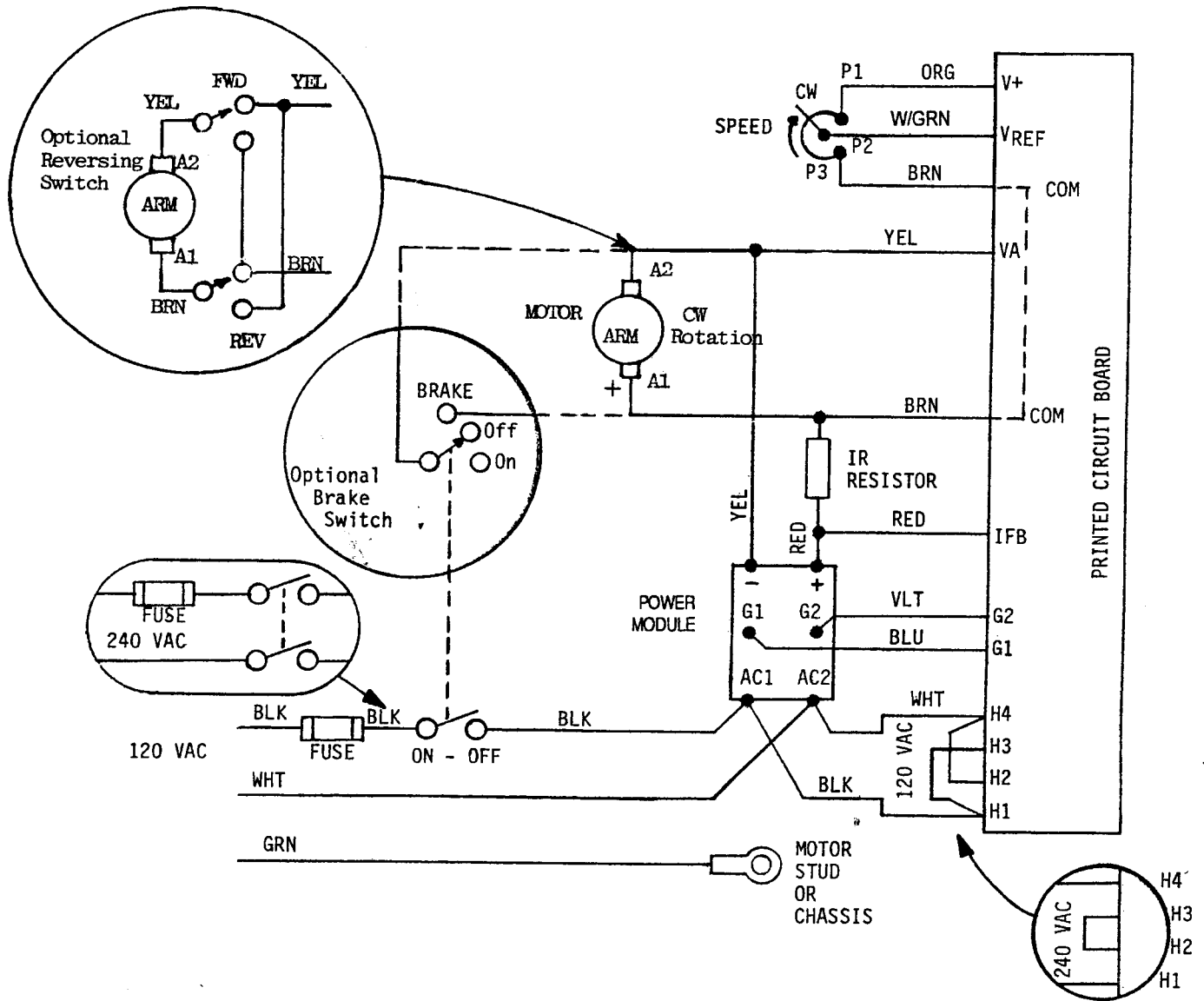
The minimum wire sizes shown above should be used for line or motor armature currents. The remaining wire runs may be 16 AWG. If the installation requires exceptionally long runs, increase the line conductors one wire size for each additional 25 foot run.

WIRING

Some models will operate at 240Vac input. Check the model number and name tag information for proper input voltage. The Magnapak is a dual voltage device, but it must be wired internally for the proper voltage.

Some models are assembled with line cords and complete operator controls factory mounted on the conduit box cover(s). If this is the case, proceed to OPERATION.

If all the wiring is not completely self-contained, consult Figure 1 for the wire colors and connections to operator devices. Remove the two self-tapping screws that retain the cover to the conduit



⚠ DANGER

ALL TERMINALS ARE AT LINE POTENTIAL WITH RESPECT TO EARTH GROUND.
TO REDUCE RISK OF ELECTRIC SHOCK, DO NOT CONTACT LIVE PARTS.

EXTERNAL CONNECTION DIAGRAM
Figure 1

box (on the side of the control assembly tubular housing). All the necessary wires for external connections are available in the conduit box.

Armature and power wires are 14 AWG stranded. Speed potentiometer wires are 20 AWG stranded. All wires are pre-stripped for wire nuts, the most commonly used method of connection.

For feeding power wires in and connecting to remote devices, the conduit box has three 7/8" holes for 1/2" conduit or other appropriate strain relief feed-through methods.

Those operator's devices shown in Figure 1 that are not factory installed may be added at the user's option. Consult the Service - Replacement Parts List for suitable parts. A speed potentiometer, fuse and line power switch are normally the minimal required operators devices.

DYNAMIC BRAKING

An optional type of on/off switch has a contact which (when the AC line is switched off) can short the motor armature, causing a large dynamic braking current to bring the motor swiftly to a stop. The current comes from the stored inertial energy and the motor acting as a generator.

When a motor driving a high inertial load is to be braked or if braking is to be done very frequently, an external dynamic braking resistor may be necessary to limit switch wear due to arcing and to prevent motor magnet demagnetization. Consult factory.

REVERSING

Reversing the rotation of the motor is accomplished by interchanging the motor armature leads (turn off all power first). See Figure 1. Switch reversing is accomplished by using a double-pole, double-throw, three-position, positive-center off switch to interchange the armature leads. With switch reversing, it is possible to damage the motor or controller by plug reversing the Magnapak, unless antiplug precautions are taken. See Operation - Reversing.

OPERATION

NON-REVERSING

Turn the main speed control knob on the Magnapak to zero. Apply 120 or 240 VAC to the Magnapak, depending on model number and name tag information. Turn the on/off switch to the "on" position. Slowly advance the speed control knob until the motor shaft starts to rotate. When the motor and controller are connected as shown in Figure 1, the motor shaft will turn clockwise (looking at the pulley end). For CCW rotation, turn off all power and reverse the armature leads A1 and A2.

Full torque will be available at any setting of the speed control knob within the normal speed range of the Magnapak.

DYNAMIC BRAKING

When the dynamic braking option is installed, at any time the operator desires, the "on/off/brake" switch may be actuated from the "on" position (through "off") to the "brake" position. This will bring the motor to a sudden stop.

REVERSING

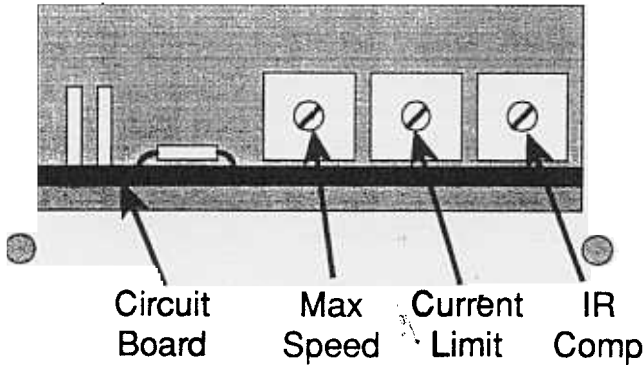
When the reversing option is installed, at any time the operator desires, the forward/reverse switch may be actuated. The special toggle switch incorporates a built-in mechanical anti-plug feature. In going from forward to reverse, hand pressure on the toggle handle must be released momentarily in the neutral position in order to continue into the reverse position. This momentary delay normally allows time for the motor to slow down enough to prevent the serious current surge effects of plug reversing. **However, on high inertia loads, the momentary delay may not be long enough, and the operator to either allow the motor to coast to a stop or to employ dynamic braking in the neutral switch position.** For guaranteed anti-plug protection with relay reversing, consult the factory.

INTERNAL ADJUSTMENTS

GENERAL

The printed circuit board contains three internal adjustments, all of which have been preset at the factory and should not normally require further adjustment. These three controls are Maximum Speed, Regulation IR Compensation (speed regulation), and Current Limit.

To gain access to these adjustments, remove the cover plate opposite the conduit box on the housing.



INTERNAL ADJUSTMENTS
Figure 2

⚠ CAUTION

UNINSULATED LIVE PARTS ARE PRESENT BEHIND THE COVER PLATE. DO NOT USE A METAL SCREWDRIVER TO ADJUST THE CONTROL POTENTIOMETERS. THE USE OF A METAL TOOL MAY RESULT IN A RISK OF ELECTRIC SHOCK, OR DAMAGE TO THE MAGNAPAK THROUGH CONTACT WITH LIVE PARTS OR SHORTING TO THE HOUSING. TO REDUCE THE RISK OF ELECTRIC SHOCK, USE AN ADJUSTMENT TOOL CONSTRUCTED OF PLASTIC OR OTHER INSULATING MATERIAL.

MAXIMUM SPEED

Maximum motor speed can be adjusted by adjustment of the max. speed potentiometer. With the speed control knob set to 100, adjust the max. speed potentiometer to obtain rated speed or less within the available range. Clockwise rotation of the potentiometer increases the motor speed.

Do not adjust the speed of the motor substantially above base speed if it is to be operated on a continuous basis.

REGULATION (IR COMPENSATION)

If improved speed regulation is desired at a given speed, it may be necessary to readjust the regulation potentiometer for optimum setting. The use of a tachometer is desirable in making this adjustment.

At several speed settings, vary the motor load and observe the RPM change. If there is a noticeable drop in RPM as the load is increased, advance the regulation potentiometer clockwise and recheck the regulation. Leave the regulation potentiometer at a setting which will give the best performance throughout the desired speed range.

CURRENT LIMIT

The current limit or torque limit control is set at the factory to 150% of full load motor armature DC current or torque.

This potentiometer is sealed at the factory, and should not be re-adjusted. A broken adjustment seal could invalidate the warranty.

If the current limit potentiometer is set too low, the Magnapak may never get to full speed. If it is set too high, an overload could burn out the controller, motor, or both.

SERVICE

⚠ DANGER

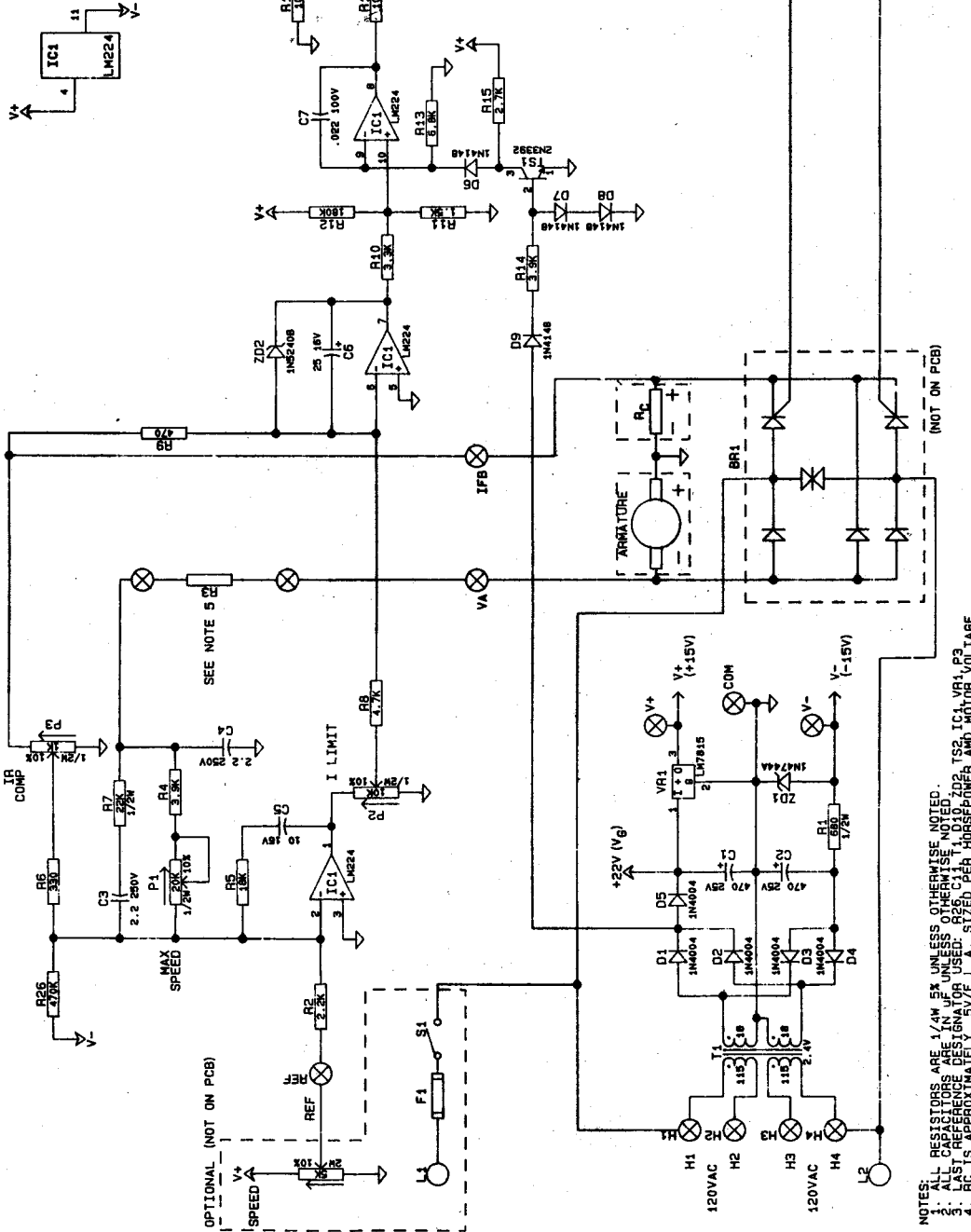
DISCONNECT POWER BEFORE SERVICING. REFER SERVICING TO QUALIFIED PERSONNEL.

BRUSH INSPECTION AND REPLACEMENT

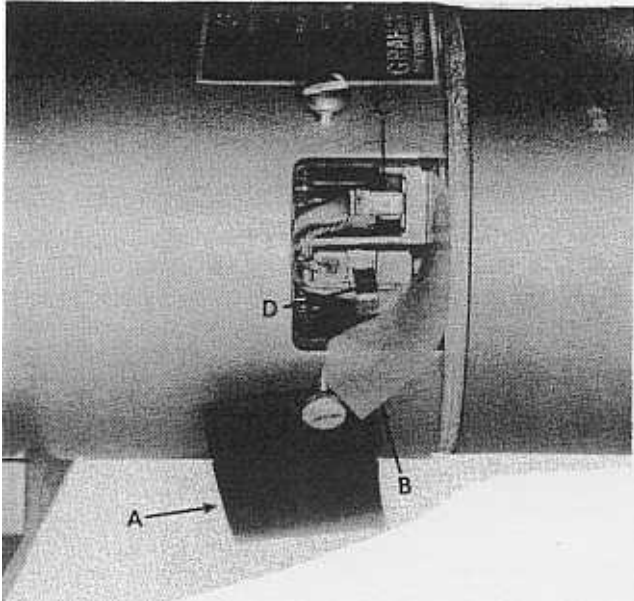
The 1/8 and 1/4 HP Magnapak brushes should be inspected after the first 1000 hours of operation. For horsepower rating of 1/3 or above, inspect after the first 500 hours. Brushes worn to a length of 1/2" should be replaced. To inspect and/or replace, see Figure 3.

DANGER
TO REDUCE RISK OF ELECTRIC SHOCK, DO NOT CONTACT LIVE PARTS.

WARNING
COMMON (↔) IS FLOATING AT LINE POTENTIAL WITH RESPECT TO EARTH GROUND. ISOLATE TEST EQUIPMENT FROM GROUND.



NOTES:
1. ALL RESISTORS ARE 1/4W 5% UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS ARE IN UF UNLESS OTHERWISE NOTED.
3. ALL PARTS PREVIOUSLY TESTED BY THE SIZING CENTER FOR MOTOR NUMBER 30-0569-00.
4. FOR 90V UNIT R3 IS 3.3K 1/2W FOR 180V UNIT R3 IS 1.5K 2W
5. ⓧ DENOTES BARREL TERMINAL.



BRUSH REPLACEMENT Figure 3

1. Unfasten or remove brush access cover (A).
2. Pull back protective film (B) to expose brush.
3. Disconnect clip from Connector (C).
4. Pull spring (D) back - just far enough to clear the brush.
5. Remove brush and replace with new one. Be sure brush slides freely in brush holder. Brush is to be installed so that wire end of brush is towards the shaft end of motor. Replace spring.
6. Connect brush lead at connector (C).

Replace protective film and access cover.

8. When new brushes are installed, run motor near rated speed for at least 1/2 hour with no load to seat new brushes.

CONTROL REPLACEMENT PARTS ALL MODELS

Heat Sink Control Assy.	Power Module
02-7316-00	32-0095-00

Specify horsepower and voltage when ordering.

OPERATOR'S DEVICES

PART	DESCRIPTION	PART NO.
Potentiometer	5k ohms 2 Watt	30-0005-00
Switches	On/Off SPST 2 Pos.	33-0074-00
	On/Off/Brake DPDT 3 Position	33-0075-00
	Fwd/Neut/Rev. DPDT 3 Position Center Off	33-0001-00
		03-6075-00
Fuseholder		34-0008-00

FUSES

HP	AC VOLTS	AMPS	PART #
1/8	120	6¼	34-0027-00
1/4	120	6¼	34-0027-00
1/3	120	6¼	34-0027-00
1/2	120	15	34-0030-00
3/4	120	20	34-0068-00
3/4	240	15	34-0030-00
1	240	15	34-0030-00

IR RESISTORS

HP	DC VOLTS	PART NO	VALUE
1/8	90	30-0483-00	.20 Ω
1/4	90	30-0483-00	.20 Ω
1/3	90	30-0240-00	.15 Ω
1/2	90	30-0484-00	.10 Ω
3/4	90	30-0229-00	.075 Ω
3/4	180	30-0240-00	.15 Ω
1	180	30-0484-00	.10 Ω

MOTOR REPLACEMENT PARTS 300 Series Magnapak

BRUSHES (2 Per Motor)

With brush access 03-6358-00
Without brush access 03-6015-00

BEARINGS (pair) 02-1073-00

TROUBLESHOOTING THE MAGNAPAK

With the following service instructions and parts list, a service man can troubleshoot or find defective parts using a volt ohmmeter and following the procedures listed below. Check the following:

- | Problem | Probable Cause |
|---|--|
| 1. If fuse blows check for: | <ul style="list-style-type: none">a. proper fuse sizeb. grounded or shorted wiringc. shorted power moduled. shorted P.C. board transformere. shorted motor |
| 2. If motor will not turn, check for: | <ul style="list-style-type: none">a. open wiringb. open IR resistorc. current limit adjusted to zerod. open speed potentiometere. defective P.C. boardf. blown fuse or circuit breakerg. defective motor |
| 3. If motor turns too slowly, check for: | <ul style="list-style-type: none">a. maximum speed adjusted too lowb. defective P.C. boardc. defective power moduled. defective speed potentiometere. defective motor |
| 4. If motor turns too fast, check for: | <ul style="list-style-type: none">a. maximum speed set too highb. defective P.C. boardc. defective speed potentiometerd. defective power modulee. defective motor |
| 5. If motor runs too fast, regardless of speed potentiometer setting check for: | <ul style="list-style-type: none">a. shorted speed potentiometer (P1 to P2)b. open speed potentiometer (P3 open)c. open VA wire to P.C. board (yellow)d. shorted power modulee. defective P.C. board |
| 6. If motor speed oscillates, check for: | <ul style="list-style-type: none">a. IR Comp. adjusted too highb. defective P.C. boardc. defective motor |

- d. maximum speed set too high
- e. loose wire connections
- f. worn motor commutator
- g. motor brushes worn or not making contact with commutator

7. If motor speed varies excessively when load is applied, check for:
- a. IR Comp. adjusted too low
 - b. current limit too low
 - c. worn motor brushes
 - d. loose connections
 - e. defective P.C. board
 - f. defective power module

DANGER

TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT CONTACT LIVE PARTS..

CAUTION

ALL TERMINALS ARE AT LINE POTENTIAL WITH RESPECT TO EARTH GROUND. ALL TEST EQUIPMENT MUST BE ISOLATED FROM EARTH GROUND.

Tests To Perform

1. To check speed reference: Measure voltage from V+ to COM, should be +15VDC.
2. To check speed potentiometer: Measure voltage from P1 to P3, should be +15VDC. Measure voltage from P2 to P3, should vary from zero to +15VDC as potentiometer is rotated from 0 to 100.
3. To check reference input to P.C. board: Measure voltage from VREF to COM, should vary from zero input to +15VDC as speed potentiometer is rotated from 0 to 100.

Note: The following test is made by substituting a 100 watt 120 volt lamp (two 100 watt 120 volt lamps wired in series for 240V drives) for the motor armature.

4. To check for full wave firing: Set speed potentiometer to 100. Alternately remove wires from G1 and G2 on power module (be sure unit is disconnected from power when removing any wires and do not allow

loose wires to contact other termination). The lamp should glow at about half brightness, if the lamp will not glow at all when only one gate lead is attached, the power module or the P.C. board is defective.

5. Power module checking procedure:
See table below.

ADJUSTMENT OF ACCEL/DECEL BOARD

The optional Model 63 linear accel/decel board is a separate circuit board mounted inside the Magnapak enclosure. Space limitations prevent mounting both the Special Reference Processor and the Accel/Decel Board in the same Magnapak.

Adjusting the accel potentiometer allows the time to accelerate from zero speed to base speed to be adjusted from approximately 5 to 40 seconds. Adjusting the decel potentiometer allows the time to decelerate from base speed to zero speed to be adjusted from approximately 5 to 40 seconds.

⚠ DANGER REMOVE ALL POWER AND DISCONNECT ALL LEADS FROM POWER MODULE.

Use Simpson 260 or Triplet 60 Meter
Scale = R x 10k

From: Meter Positive (+) Lead To: Power Module Terminal	From: Meter Common Lead To: Power Module Terminal	Ohms
AC1	AC2	∞
AC2	AC1	∞
+	—	∞
—	+	400 to 600
AC1	+	∞
+	AC1	∞
AC2	+	∞
+	AC2	∞
AC1	—	∞
—	AC1	400 to 600
AC2	—	∞
—	AC2	400 to 600
CHANGE SCALE = R x 100		
G1	+	120 to 180
+	G1	120 to 180
G2	+	120 to 180
+	G2	120 to 180

Power Module Checkout Procedure