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1. GENERAL DESCRIPTION

When ordered, the OC2-500 open chassis control can be supplied in a NEMA 12 enclosure. When supplied in this manner, the basic OC2-500 control is furnished with the following additional features, and is designated by model number OC2E-500:

a) Power "Off-On" switch with separate pilot light indication.
b) "Run-Off-Jog" (momentary position) mode selection switch.
c) Speed Adjust Potentiometer.

The OC2-500 open chassis motor control has been designed as a basic building block solid state regulated power unit. The OC2 open chassis, unit, which uses state of the art control circuitry, can be used by itself, by wiring in the provided speed potentiometer, as a straight forward speed regulated control, or can be incorporated into much more sophisticated system designs utilizing contactor operation, external speed programming, tach feedback, etc. (These applications and others are discussed later in this manual.

The control circuitry incorporates a sophisticated regulator scheme that maintains motor speed precisely at the set level within the advertised motor and control speed rages. There are two control loops, speed and torque, that operate simultaneously and independently of each other. In most cases the speed loop is in control. (The speed loop can use either armature voltage or tachometer voltage feedback.) When in control, the speed loop maintains speed constant at the desired value until the motor load (torque) requirements exceed a preset value, normally 150% of rated motor torque. As this occurs, the torque regulator assumes control of the SCR's and allows speed to drop as is necessary in order to maintain and not exceed the preset limit value. If the motor load continues to increase, as would the case if a driven machine had jammed, the torque limit is capable of holding this preset value of torque precisely without run out down to a locked rotor or zero speed condition. Operation in both the speed and torque modes is smooth and stable, and through the use of optimized networks transfer between the two loops is smooth and bump less. Figure I is a block diagram of the OC2-500 control system.

In the speed mode the control hold the motor speed constant at a valued determined by the voltage present at the speed input. In a basic control this voltage is set by a Speed Adjust potentiometer. In most controls armature voltage is used as feedback in the speed (velocity) loop. When using armature

Voltage feedback, load changes are compensated for by an “IR” compensation circuit which senses any increase in armature current and raises the armature voltage to compensate for the increased voltage drop in the motor armature. This circuit thus controls the regulation (speed changes) due to load changes. The motor current is continuously monitored by a very low resistance current shunt. The signal from this shunt, which is also used in the torque loop, is then fed to the “IR”circuit, which permits the achievement of no load to full load regulation of less than 1% of base speed. In applications requiring load regulation better than 1% of base speed, tachometer feedback must be used.

The OC2 unit is protected against excessive current overloads by the outstanding OC2 torque (current) limit circuitry. In addition, the OC2 unit is protected against damage due to accidental wiring shorts or grounds by fast-acting rectifier-protection type fuses inserted in the AC input lines.

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WARNING

IF FUSE REPLACEMENT BECOMES NECESSARY, USE ONLY THE SPECIFIED FUSES. THE USE OF SUBSTITUTE FUSES MAY VOID CONTROL WARRANTY

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2. CONTROL SPECIFICATIONS

TABLE I

Horsepower	5
Model Numbers	OC2-500 (OPEN CHASSIS) OC2E-500 (ENCLOSED)
Normal RMS Input Current	43 Amps RMS
Rated Motor Current	24 Amps DC
Input Voltage (Single Phase)	230VAC +/- 20 Volts
Fuses (1FU & 2FU)	A50P60 (Shawmut) or SF5060 (IR)
(3FU & 4FU)	3AG, 5 Amp
Input Frequency	50 / 60 Hz
Output Voltage to Armature (Rectified and Unfiltered)	0 – 180VDC
Output Voltage to Field (Rectified and Unfiltered)	200VDC
Speed Range	0 – 100%
Load Regulation for 100% Load Change	
a) With Armature Feedback	Adjustable to +/- 1% of base speed
b) With Tachometer Feedback	+/- 0.1 of base speed typical
Speed range for Specified Regulation	20:1
Speed Dial Characteristics	Linear
Linear Acceleration Time	0.5 to 15 Seconds adjustable
Torque Limit (% of Rated Motor Current)	Approx. 75 to 150% adjustable
Maximum Ambient Temperature	40°C
External Signal Capability	See Section 13

3. INSPECTION

Check for shipping damages. If damage is found, report it to the carrier immediately. Do not attempt to operate the drive if visible damage exists to the circuit board or other components.

4. INSTALLATION

4.1 MOUNTING OF OPEN CHASSIS OC2-500 CONTROL

Four holes are provided in the base plate for mounting purposes. There is no preferred mounting position for the OC2-500 control. Four holes for mounting the OC2-500 should be drilled in the enclosure wall or sub-panel per the mounting dimension shown in A1501-100-DD (Figure 2).
Apply an even, thin coat of Dow Corning Compound #4 or equivalent to the

bottom side of the base plate on the OC2-500 control to facilitate heat transfer.

When mounting in the enclosure, select an area that will minimize the possibility of metal parts falling between the PC board and OC2-500 base plate, or on the PC board and thereby causing shorts. Since the enclosure wall or sub-panel is actually used by the OC2-500 as a heat sink, it is necessary that the panel be of sufficient size to furnish adequate cooling. If a single OC2-500 is placed in an unventilated enclosure with no other heat-generating equipment, a 20”x20” enclosure of minimum clearance depth is of adequate size. The top edge of the OC2-500 base plate must be located at least 4” below the top surface of the enclosure. If these conditions are met, no fans need to be used.

If other equipment which generates significant heat is installed in the cabinet with the OC2-500, however, increase enclosure size or add a circulating fan to distribute heat within the enclosure. In all cases, though, it can be determined if a larger enclosure and/or fan will be needed by measuring the power cube base plate temperature. The power cube base plate temperature under all conditions cannot exceed 100°C.

4.2 **MOUNTING OF ENCLOSED OC2E-500 CONTROL**

The enclosed OC2E-500 control must be mounted in an environment that does not exceed 40°C. Since this control uses the back of the box for cooling, the control must be mounted in a location to permit airflow over the back of the enclosure. It is mandatory that the OC2E-500 enclosure back be spaced at least one-half inch from any air restricting or thermally non-conductive walls. Spacers are provided with the control to permit proper mounting. Refer to Figure 3.

4.3 **WIRING PROCEDURE**

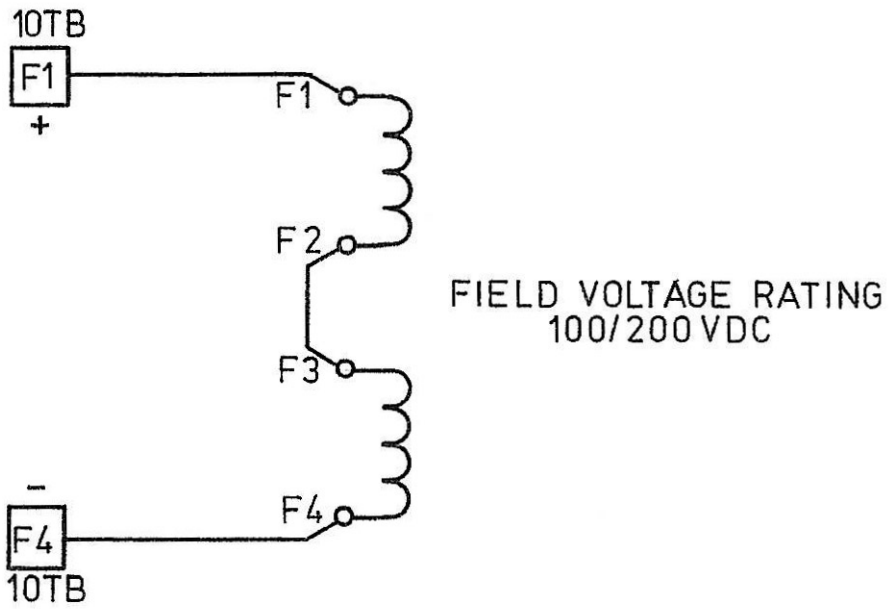
Use drawing A1501-100-ES (Figure 4) on open chassis controls and A1436-000-WD (figure 3) on enclosed controls for proper external wiring connections. The rated RMS current for 5 horsepower control is given in these wiring diagrams. All wires which carry armature current are sized the same as those carrying AC line current. (This is necessary to account for the form factor of the current being supplied to the armature of the motor.) All other wire connections may be # 18 AWG.

On enclosed controls the AC input connections are made to 3TB. On open chassis controls the input connections are made directly to the double fuse holder. For open chassis controls, wire connections to terminal strip 1TB on the printed circuit board are not to be lugged.

Strip ½" insulation from the ends of the wires to be connected to 1TB, and insert wires under the wire clamps of the terminals. It is not recommended that wires smaller than #18 AWG be used to make connections to the terminal strip 1TB. Since smaller wires may not be adequately held by the wire clamping plates on the terminals. After wiring, make sure that there are no short to the chassis or shorts between terminals.

Caution should be observed when connecting the motor shunt field. Some DC motors are provided with dual field windings, which are connectable for high or low voltage.

The field voltage supplied on the OC2-500 control is 200 VDC. A typical dual voltage field winding connection is shown below:



Refer to the wiring information plate found on the motor, and connect field windings for the proper voltage of the OC2-500. Some motors have permanent magnet fields. In this case no connections are made to terminals F1 and F4 on 10TB

5. INITIAL TURN-ON PROCEDURE

Recheck all wiring. Accidental grounds on any of the motor leads or speed potentiometer wires may damage the unit when power is applied. Make sure that the AC service is of the correct voltage, as indicated by the voltage warning label located on the control.

Before applying power, check to make sure the feedback select jumper on 2PL is in the "Arm" position, pins 1 and 2 on 2PL jumpered together, for controls using armature voltage feedback. On controls that will use tachometer feedback, refer to the Tachometer Feedback Section 14 in this manual.

Turn the speed potentiometer to zero. Apply power from the AC disconnect switch (S1 on enclosed controls). An LED located on the PC board will light indicating power is applied. (In contactor operated systems, also energize the DC contactor.) Slowly advance the speed potentiometer while observing the motor. If motor rotation is incorrect, turn power off at the AC disconnect and reverse the A1 and A2 connections to terminals A1 and A2 on 10TB of the OC2-500 control. If the motor runs at maximum seed with the potentiometer fully counterclockwise, and slows down as the potentiometer is rotated clockwise, the potentiometer is wired in backward. With power off, reverse the outer leads of the speed potentiometer.

The control should be checked for satisfactory operation throughout the entire speed range. If instability is observed, maximum speed is higher than normal, or if acceleration time is not as desired, adjust the control as described in the following section. If initial operation is satisfactory, no readjustments are necessary.

6. ADJUSTMENTS

Five internal adjustments are provided.

a) Minimum speed ("MIN")
b) Maximum speed ("MAX")
c) IR (load) compensation ("IR")
d) Torque Limit ("TORQ")
e) Acceleration ("ACC")

The function of these adjustments is described in Table II.
All adjustments, except "IR", are preset at the factory. A 'typical' test motor is utilized. The "MAX" and "TORQ" adjustments do not depend on individual motor characteristics and therefore should be correct as received. The "IR" and "MIN" adjustments, however, are somewhat dependent on

Characteristics of the particular motor used, and should there fore be made by the user when the drive is installed. Jobsite adjustment of “IR” is necessary to achieve specified regulation. The adjustments are permanent; periodic readjustment is not necessary. (The IR adjustment is set fully counter clockwise when using tachometer feedback.)

Perform adjustments per Table II and in the order listed in Table II. The adjustments are completely independent of each other except as noted below:

a) “IR” has a slight effect on “MIN”, but “MIN” does not effect “IR”

b) “MIN” has a slight effect on “MAX”

Performing adjustments in the order listed in Table II thus eliminates any necessity for repeating a calibration operation.

Note that torque limit (“TORQ”) is independent of the other adjustments. Since this is basically a protective adjustment, preset at the factory, it should not be readjusted except to decrease the limit point.

6.1 ADJUSTMENT PROCEDURE CHART

TABLE II

ADJUTMENT NAME	DESCRIPTION OF FUNCTION: NOTES		ADJUSTEMENT PROCEDURE:
"IR"	Sets the load regulation (% slowdown of motor as shaft load is changed from zero to If load slow down is of no concern, rotate "IR" trim pot fully counterclockwise. [In tach feedback systems this pot must be turned fully counterclockwise.]		Appoximate method:
		a)	Set speed control knob for 20% speed.
		b)	Rotate "IR" trim pot clockwise until motor begins to hunt.
		c)	Back off "IR" trim pot 1/3rd of the span between this setting and zero setting. This method usually results in slight over compensation.
			Exact method:
		a)	Turn drive power off and connect a DC ammeter in series with the A1 motor lead between motor and control. Do not use clamp-on meter.
		b)	Set speed control knob for 20% speed.
		c)	Load the motor shaft until ammeter reads rated motor current [see nameplate]. Read motor speed with strobe light or tachometer.
		e)	If motor speed decreased as motor was loaded, adjust the "IR" trim pot and repeat (c) and (d) until little or no speed decrease is noted.
		f)	In performing (d) and (e), be sure motor is not loaded heavily enough to cause torque limiting to occur.
		g)	Remove ammeter and reconnect A1 motor lead. Recheck control at very low speed for cogging.
"MIN"	Sets the zero calibration of the speed control knob. Clockwise rotation of "MIN" trim pot increases speed.	a)	Set the speed control knob to zero.
		b)	Rotate the "MIN" trim pot clockwise until motor starts to rotate.
		c)	Decrease the "MIN" trim pot setting until rotation stops.

"MAX"	Calibrates the speed at which motor turns when speed control knob is fully clockwise. Clockwise rotation of the "MAX" trim pot increases maximum motor speed.	a) Turn drive power off. b) Connect a DC voltmeter between A1 and A2 motor leads at the motor. c) Set meter scale so that rated armature voltage (180 volts as noted on motor name plated) may be read. d) Turn power on. Turn speed control knob fully clockwise. e) Adjust "MAX" trim pot until meter reads name plate rated voltage (180 volts) NOTE: If desired, a tachometer or strobe light may be used in lieu of the DC voltmeter. Proceed as described above, except adjust the "MAX" trim pot until tachometer or strobe light indicates that motor is turning at base speed.
"TORQ"	**TORQUE LIMIT** Sets the maximum torque that can be obtained from the motor, and the maximum armature current that the control unit will deliver. Torque adjustment is preset at the factory usually for 150% of rated motor torque (current). Clockwise rotation of the "TORQ" trim pot increases the torque that the motor will deliver.	a) Turn drive power off. b) Connect a DC ammeter (NOT a clamp-on type) in series with the A1 motor lead between motor and control unit. c) Turn power on. d) Set speed control knob for a low speed (e.g., 10% setting). e) Apply friction braking to the motor shaft until until motor stalls out. CAUTION: Watch ammeter to assure that control is limiting current. f) Stall current should read roughtly 150% of rated armature current (see motor nameplate). g) If current is to high, rotate the "TORQ" pot counter clockwise to decrease.
"ACC"	Accerleration adjustment sets time for motor to reach set speed.	a) Adjust to desired acceleration time. Clockwise rotation increases time.

7. CONTROL OPERATION

Prior to shipment, all OC2-500 and OC2E-500 controls are tested and completely adjusted at the Polyspede factory. Therefore, after properly wiring and following the "Initial Turn-On Procedure" section, the control should be functioning properly. If the motor speed cannot be controlled, fuses blow, or other problems are experienced with the control, refer to the Troubleshooting Chart, the Troubleshooting in Case of Fuse Blowing Section, and/or the Motor Test Section.

8. TROUBLESHOOTING

8.1 TROUBLESHOOTING TABLE

The majority of major malfunctions which are normally encountered, can be summarized as stated below:

a) Motor does not run.
b) Motor runs only at full speed or over speed.
c) System blows fuses or breakers repeatedly.

Table III tabulates these malfunctions, probable causes, and actions required for testing. If fuse blowing is the problem, read Table III and then follow the checkout procedure of Section 8.2

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WARNING

DANGEROUS VOLTAGES ARE PRESENT ON THE CONTROL CIRCUIT BOARD AND TERMINALS. ONLY PERSONNEL FAMILIAR WITH ELECTRICAL TEST PROCEDURES, TEST EQUIPMENT, AND SAFETY PRECAUTIONS SHOULD ATTEMPT THESE TESTS

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TABLE III
TROUBLESHOOTING

	MALFUNCTION	POSSIBLE CAUSE	ACTION
a)	Motor does not run or will not run to top speed.	a) AC input to control missing. "PWR ON" LED also will not light.	Check AC Line voltage.
		b) Fuse blown ("PWR ON" LED aslo will not light).	Remove, check, and if necessary replace fuse(s).
		c) Motor Jammed mechanically.	Check by rotating the shaft manually.
		d) Field voltage low or missing, causing insufficient torque under heavy loads. [Does not appy to PM motors.]	Check field voltage between terminasl F1 and F4 on 10TB. Should read 200 VDC.
		e) Motor field open or disconnected and operating under heavy load. [Does not apply to PM motors.]	Check motor field wiring. Check resistance as given in motor tests with the power off.
		f) Terminals 10 and 11 on 1TB not connected.	Either a permanent jumper or contact closure must be used to permit control operation. See the external wiring diagrams and contactor operated systems section
b)	Motor runs only at full speed. (In tach feedback systems, proper maximum voltage cannot be adjusted.)	a) Motor field open or disconnected and operating under light load. [Does not apply to PM motors.]	Check motor field wiring. Check resistance of the field as given in the motor tests with the power off
		b) Motor field voltage low or missing and operating under light load. [Does not apply to PM motors.]	Check field voltage. Field voltage should be 200 VDC.
		c) Tach feedback: Control board improperly set up for tach and motor combination, or mini jumper is missing between pins 2 and 3 on FB SELECT plug 2PL. (For armature feedback pins 1 and 2 are jumpered together..)	Refer to the tach feedback section for Proper board set-up.

	d) External speed potentiometer not properly connected (open chassis controls).	Speed potentiometer resistorance should measure 1K. With potentiometer wired voltage between terminal 6(+) and 5 should vary zero to 6 VDC.
	e) Problems in the control board circuitry.	Return to the factory for repair.
c) Repeated control fuse blowing	a) Incorrect AC input voltage.	Check that voltage supplied agrees with the voltage warning label.
	b) Incorrect connections between motor and control.	Recheck all motor connections as given on:
		A1501-100-ES (open chassis)
		A1436-000-WD (enclosed)
	c) Shorts between internal control wiring and mounting base.	Visual inspection and routine checks.
	d) Shorts in external wiring.	Refer to section on testing in case of fuse blowing.
	e) Faulty SCR power diodes and/or field diodes	Refer to section on testing in case of fuse blowing.

8.2 TROUBLESHOOTING PROCEDURE – IN CASE OF FUSE BLOWING

If fuses blow, a light bulb checkout procedure may be used without danger of damaging the control and without excessive fuse blowing during checkout. Proceed as follows:

a) Turn power off at the source disconnect ahead of the control

b) Connect two 120 volt, 100 watt bulbs in series with the ungrounded AC input line (L1)

c) Replace any blown control fuse(s) with a good fuse(s)

d) Disconnect A1, A2, and field wires at the motor. Insulate wire ends.

e) Turn power on at the service disconnect.

On controls without a DC loop contactor, make sure terminals 10 and 11 on 1TB are shorted together. On controls with a DC loop contactor make sure that an auxiliary contact working in conjunction with the contactor is closed when the DC contactor is energized. The bulb should not burn at any setting of the speed control pot. If the bulb does not light, move on to step (g). If the bulb does light, turn off the power and remove all connections to 10TB. Reapply 230 volts to the control. If bulb does not glow, trouble is probably a short in the external wiring. Rewire the external wiring, one wire at a time until the wire(s) causing the problem are located. Replace any defective wires. If the bulb still burns After all external connections have been removed, move on to step (f). If the problem has been corrected, move on to step (g).

f) This step is to be done if step (e) shows that the light bulb still lights with all external connections removed from 10TB including A1, A2, F1, and F2. This probably indicates that the OC2 SCR's, field diodes, and/or power diodes are defective.

Only the power cubes and the free-wheeling diode (D50) are considered field replaceable. The power cubes and D50 should be checked per Section 9. Replace a power cube or D50 if found to be defective. After replacement, the control should again be rechecked with all external connections removed. If the light bulb still lights the field diodes, D1

and D2 on the E1507 PC board, are probably the cause of the problem. Since these components are not recommended as field replaceable, the E1507 PC board should be replaced or the entire control should be returned to Polyspede factory for repair. If the bulb does not light, turn power off and reconnect the connections to10TB if they are presently not connected. (A1, A2, and motor field leads are still disconnected at the motor.) Reapply power. If, with the speed pot at zero, the bulb burns, go back to step (e). If the bulb does not burn, go to step (g).

g) If no faults are located in the preceding steps, or if they have already been corrected, leave light bulb connected as in the preceding steps and reconnect A1 and A2 wires at the motor. Leave field wires disconnected and insulated. All wires at this point should be connected except the field wires. Set the speed control pot at zero and turn on all power. Light should not burn. Increase the speed setting to 20%. Lamp brilliance should increase smoothly to nearly full brilliance. [NOTE: Lamp flicker and erratic brilliance may be observed at settings about 15-20%; this is normal.] The FB SELECT plus 2PL should have pins 1 and 2 jumpered together during this step.

h) Repeat step (g) with motor field wires connected. Results should be similar except that the bulb will burn at about one-half brilliance with speed control set to zero due to motor field current, and will increase to nearly full brilliance at 15% or 20% setting of the speed pot.

i) If operation is normal in all preceding steps, remove the light bulb and reconnect all wiring for normal operation.

j) If occasional fuse blowing occurs, an intermittent short or ground is indicated. Inspect motor leads and motor brush pigtails for possible faults. Inspect the OC2 control unit for loose foreign objects (washers, nuts, wire clippings, etc.). Test all internal wiring. If the problem seems to be in the DC motor, refer to the Motor Tests, Section 10.

9. POWER MODULES AND D50 TESTING

The power module houses one SCR and one diode per module, in a configuration shown in Figure 5. Simple tests with an ohmmeter cannot conclusively show that an SCR or a rectifier is good, but shorted SCR's or open or shorted rectifiers can be detected. Remove all wires connected to the power cube. Refer to Figure 5. Using a Simpson 260 meter or equivalent, make the following measurements:

a) With the meter between the "AC" and "+" terminals on POWER MODULE # 1, the meter should read high (several hundred K ohms) when "AC" is either plus or minus in respect to the "+" terminal. Repeat this step for POWER MODULE # 2.

b) POWER MODULE #1 diodes can be checked by putting one lead on the "-" terminal. The other lead should be put on the "AC" terminal. With the meter leads on the "AC" and "-" terminals the Simpson on the RX1 resistance scale, the meter should read between 5-15 ohms when the "-" terminal is positive in respect to the 'AC" terminal. With the meter voltage polarity reversed, the meter will read high. Going to a higher meter resistance scale such as RX100 or RX10000 will indicate a resistance greater than 100K ohms. Repeat this step for POWER MODULE #2.

   Replace the module if found to be faulty.

c) Check D50 by connecting the plus lead of the meter to the anode of D50 and the minus lead of the meter on the cathode of D50. Refer to Figure 5. With the meter on the RX1 resistance scale, the meter should read between 5-15 ohms. When the meter leads are reversed, the meter should read high (on the RX10000 scale reading will be greater than 100k ohms).

10. MOTOR TESTS

The following tests will be helpful in pinpointing possible motor problems. Before making any test, **remove the armature and field leads from the control.**

a) Shorts to the Frame – Using a Megger set for 400 volt test potential, check leakage resistance between the A1, A2, motor field leads and the motor frame. Readings of less than 10000 ohms indicate the possible problems. A dead short indicates need for immediate repair. Checks for dead shorts may be made with an ohmmeter or a continuity tester if a Megger is not available. Retest while rotating armature by hand.

b) Open or Shorted Field – A resistance check between F1 and F2 (also F3 and F4) should indicate a resistance between 100 and 600 ohms.

c) Open Armature – An ohmmeter between A1 and A2 should indicate a resistance of less than 10 ohms. Rotate the motor shaft very slowly, while observing the ohmmeter. Because of the residual magnetism on shunt field motors or the field on permanent magnet motors, a CEMF will be produced in rotating. This will cause the ohmmeter readings to change during rotation. Therefore, after moving the shaft a small amount, stop and check the resistance reading. A high resistance reading at any position of the rotated motor shaft when it is stopped is a trouble indication. Armature opens are usually the result of bad brushes, burned commutator segments, or severed wires.

11. CONTACTOR OPERATED SYSTEMS (OPEN CHASSIS CONTROLS ONLY)

In certain applications it may be necessary to start and stop the OC2-500 motor control through the use of a magnetic contactor. The contactor may be used to make and break the two AC lines, or it may break the two armature lines A1 and A2.

11.1 CONTACTOR OPERTION ON THE DC LINES

If the contactor is connected to make and break the DC lines (A1 and A2), A third set of normally open contactor contacts **must be provided** and connected to 1TB terminals 10 and 11. This contact, which closes to run, replace the factory-installed wire jumper that is normally supplied with the control. This contact should be a signal level contact.

A gold contact is desirable but not mandatory. Opening of the contact between terminals 10 and 11 instantaneously resets the controlled acceleration circuitry and prepares it for restarting when the contactor is again activated. Failure to remove the permanent wire jumper when using this contact could cause fuse blowing and/or sever drive damage.

11.2 CONTACTOR OPERATION ON THE AC LINES

If the contactor is connected to make and break the AC input lines, the reset auxiliary contact is not necessary. In this situation the factory-installed wire jumper must stay connected. It is also necessary to allow two seconds to elapse between contactor activations to allow the controller acceleration circuit to "bleed down" and reset. [Rapid jogging is not permitted.] Failure to allow sufficient time to reset may cause fuses to blow on the next start-up cycle

11.3 CONTACTOR REVERSING

External contactors or manually operated switches may be used to reverse motor rotation. This is accomplished by physically reversing the external connections between 10TB terminals A1 and A2, and the A1 and A2 armature lines to the motor. In designing a reversing setup the following conditions must be met:

a) The contactors (or switches) must be electrically or mechanically interlocked such that forward and reverse contactors cannot be activated simultaneously. Simultaneous operation would short out the control output and cause fuses to blow.
b) Auxiliary contacts must be provided on both the forward and reverse contactors such that 1TB terminals 10 and 11 are activated, but opened when neither contactor is activated (controlled acceleration reset).
c) The motor must be allowed to stop rotation before it is reversed. Reversing electrical power to a rotating motor ("plugging the motor" causes high inrush currents which may damage the control unit, cause fuse blowing, or cause motor commutator damage.

In custom-designed OC2 systems, Polyspede provides an anti-plugging relay, which senses CEMF due to motor rotation and electrically inhibits activation of any contactor until motor rotation ceases.

12. DYNAMIC BRAKING (OPEN CHASSIS CONTROL ONLY)

In a contactor –reversed or high inertial system, it may be desirable to provide braking to cause rapid stopping of the motor and permit quicker reversing. If a power resistor is connected across the motor armature leads, A1 and A2, after the motor has been disconnected from the OC2 unit by contactor release, the motor will act as a generator and brake to a stop. The braking resistor must be removed from the circuit before reconnecting the motor to the OC2 output. In some cases such as high inertial loads, dynamic braking is also used on non-reversing drives to achieve faster stopping times.

13. EXTERNAL SIGNAL PROGRAMMING (OPEN CHASIS CONTROL ONLY)

13.1 SPEED PROGRAMMING

Instead of using the standard speed potentiometer, the OC2 control unit can be programmed by a master reference unit, a current signal from a process instrument controller, an external signal from a DC tachometer or other DC voltage sources. Basically, any DC voltage which is isolated from the AC power lines and which varies from zero to six volts, may be applied between 1TB terminals 6 (+) and 5 on 1TB to vary the speed from zero to 100%. Speed will vary directly and linearly with the applied voltage. Also, the control will not significantly "load" the signal source since its input impedance at terminal 6 is high (approximately 100K) in respect to common. The following general procedure applies to permit external speed programming:

a) Disconnect the 3 speed pot wires from 1TB terminals 5, 6, and 7.

b) Connect the external signal source to terminals 5 and 6 as shown in Figure 6.1

c) If the external signal source is not isolated from the AC lines or if this signal is to be used by more than one drive, the AC power must be supplied to the OC2 control via an isolation transformer, or a signal isolator PC board must be used. When a process instrument controller is used having an output which normally is 1-5, 4-20, or 10-50mA, a signal isolator bard should be used in order to convert to a 0 to 6 volt level and to set the drive minimum speed properly. See Figure 6.2

13.2 TORQUE PROGRAMMING

An external signal may be used to program torque. A voltage of 6 volts will give that torque preset by the internal torque pot when using the 6 volt board power supply. If a larger value of programming voltage is available, it must be scaled down by a voltage divider network so that the maximum voltage that appears at 1TB-8 (+) in respect 1TB-5 (common) is 6 volts. A voltage variation of from zero to 6 volts between terminals 8 (+) and 5 (common) on 1TB will program a maximum torque capability of from zero to that value preset by the internal torque control potentiometer. Normally the internal torque potentiometer is set to limit current at 150% of rated current when internal torque programming is used. When external torque programming is used the "torque" potentiometer on the E1507 PC board is in many cases readjusted so that with 6 volts present at 1TB-8 in respect to common, the control will limit current to 100% of rated current. (The "torque" potentiometer on the E1507 PC board has sufficient range to limit current anywhere from approximately 75% to 150% of rated motor current with 6 volts present at terminal 8 (+) in respect to common. When the control is supplying 100% of rated motor current, there will be, approximately, a 33mV voltage drop across the current shunt 1MSH.) In order to accomplish external torque programming, the yellow jumper on the E1507 PC board must be unsoldered from the "Int. Torq." Position terminal, then resoldered to the "Ext. Torq." Position terminal. Refer to Figure 6.3

14. TACHOMETER FEEDBACK

The OC2 can easily be transferred to tachometer feedback by means of changing the position of the FB select jumper on 2PL. With pins 1 and 2 jumpered together, the OC2 uses armature voltage feedback. With pins 2 and 3 jumpered together, the control uses tachometer voltage feedback. Initially, the drive should be operated in the armature voltage feedback mode. A measurement can be made to determine proper tachometer polarity and approximate magnitude. The procedure to use is as follows:

a) Refer to table IV for necessary board modification if any. The control has been set up to handle the most commonly used base speed motor and tachometer combinations. Table IV gives the base speed and tachometer voltage ratings that will work with the board as designed. For some combinations, a resistor must be clipped from the board. For motor and tachometer combinations not covered in this manual, consult the Polyspede factory.

b) Connect the tachometer leads so that the positive lead connects to terminal 9 (“TACH”) and the negative side to terminal 5 (“COM”). If the drive system is connected for reversing (open chassis control systems), the tachometer leads must be reversed when motor rotation is reversed so that terminal 9 is always positive in respect to common. Polarity can be easily checked by running the control connected for armature voltage feedback, and checking the tachometer for voltage polarity as specified.

c) With the control off, the jumper connecting pins 1 and 2 on the feedback select 2PL should be changed to connect pins 2 and 3. (The jumper can be removed by vertically sliding the jumper off the plug pins.)

d) Set the IR pot to zero, fully counterclockwise position. Failure to do so can cause drive instability when using tachometer feedback.

e) When running using tachometer feed back, it will probably be necessary to readjust the “MAX SPEED” adjustment. Rotate the “MAX” speed fully counterclockwise. Set the speed potentiometer for maximum speed. Adjust the “MAX” potentiometer clockwise until motor reaches desired maximum speed or until voltmeter reads 180 volts, whichever occurs first.

TABLE IV

BASE SPEED OF MOTOR RPM	TACHOMETER VOLTAGE	RESISTOR TO BE CLIPPED FROM BD.
1150	50VDC/1000RPM.	NONE
1750	50VDC/1000RPM	R22
2400	50VDC/1000RPM	R18
1150	100VDC/1000RPM	R18
1750	100VDC/1000RPM	R18

15. MAINTENACE – CONTROL

The control requires practically no maintenance once it has been installed. It is a rugged piece of equipment, but can be damaged if abused.

IF FUSE REPLACEMENT BECOMES NECESSARY, USE ONLY THE SPECIFIED FUSES. THE USE OF A SUBSTITUE FUSE MAY CAUSE CONTROL DAMAGES AND VOID THE CONTROL WARRANTY.

Correct fuses to be used are listed in Table I on page 3 of this manual.

16. MAINTENACE – MOTOR

Motors supplied by Polyspede are rugged machines specifically designed for SCR controllers. There are no adjustments to make and maintenance is quite simple. All moving parts are subject to wear. Brushes are perhaps the only component requiring periodic maintenance.

Motor brush life is related to motor speed, loading, cycling rate, ambient temperature, and other variables not controlled by Polyspede. Therefore, only guidelines can be given for checking this item. Experience has shown that each application has its own wear rate. Removal of the brushes after each three months of operation during the first year will give an indication of your specific wear rate. After three sets of brushes have been used, remove the motor armature for checking by a competent motor repair shop for possible commutator refacing.

Armature bearings are sealed and require no additional lubrication. Replacement should be performed by a reputable service shop, if they become noisy.

Occasional cleaning of motor vent holes or removal of fan guard to remove dust accumulation from fans is the only additional maintenance required.

17. MAINTENANCE – SPEED REDUCER

a) Use type and grade oil specified on the gear reducer nameplate. Keep in mind proper viscosities for various temperatures.

b) Keep oil at proper level.

c) Drain, flush, and refill reduction unit after initial run-in period.

d) Replace shaft seals at first sign of leakage, not only to avoid damage due to loss of lubricant, but also to eliminate the possible entrance of contaminants into housing

e) If detailed instructions for assembly and disassembly of a particular unit are required, write the speed reducer factory for the information.

f) If your drive is coupling a connected, and requires lubricating, the coupling should be checked on start-up and semiannually.

OC2-500 BLOCK DIAGRAM

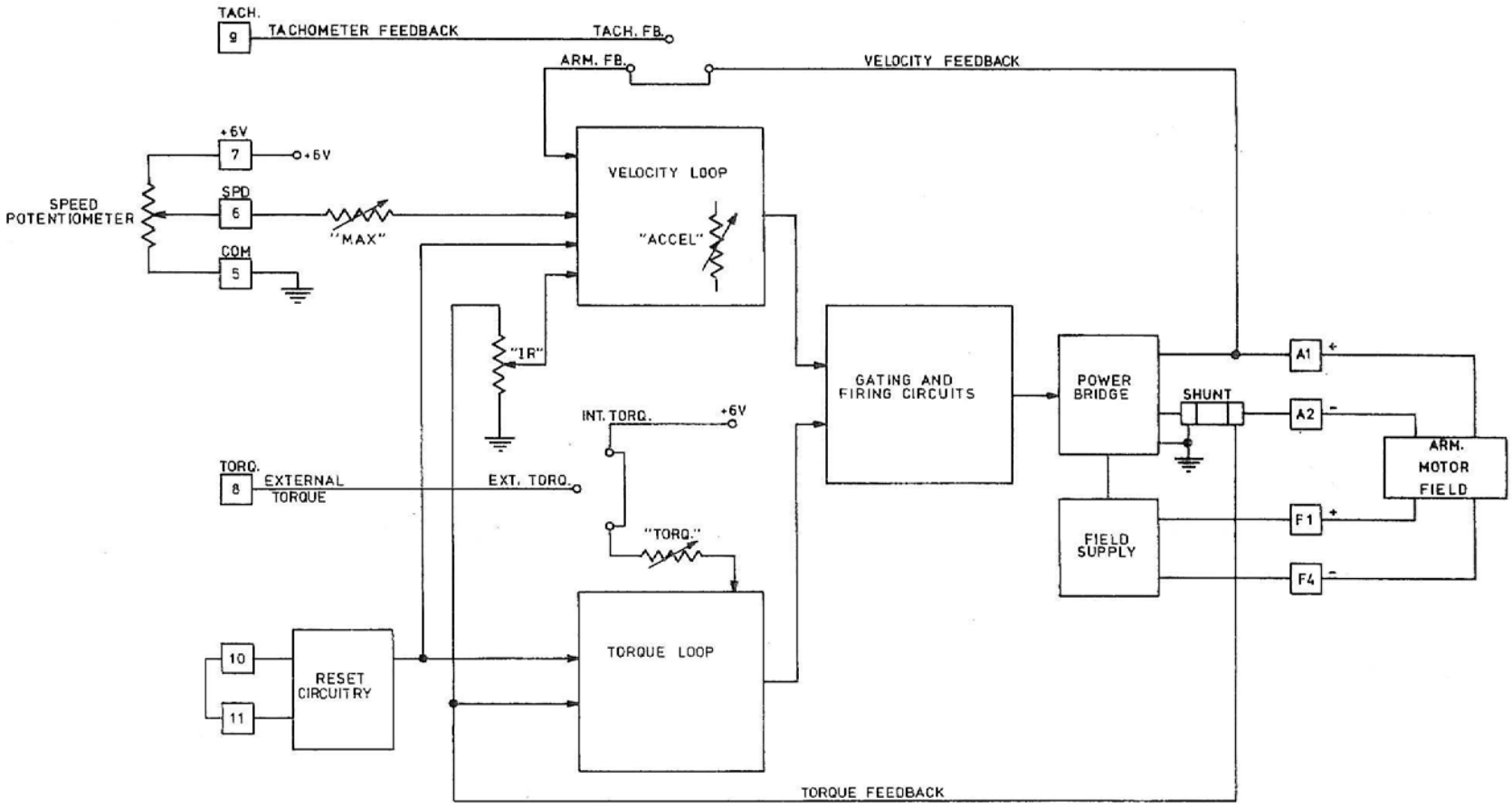
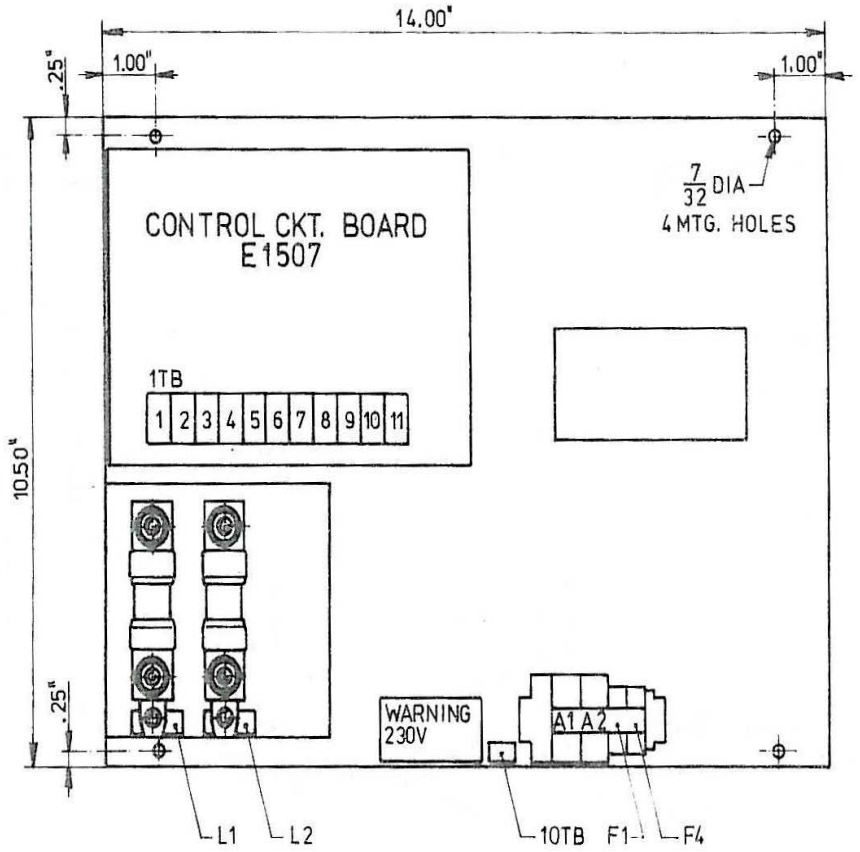


FIGURE 1



HEIGHT CLEARANCE: 4 INCHES

REVISIONS			
REV. LTR.		APP'D	DATE

NOTES: MOUNTING INSTRUCTIONS.

1. MOUNT CONTROL IN A SUITABLE ENCLOSURE. UNVENTILATED ENCLOSURES (NEMA 4 OR NEMA 12) SHOULD BE NO SMALLER THAN 16"x20"x6". AMBIENT TEMPERATURE SHOULD BE NO HIGHER THAN 40°C (104°F) AT INSTALLATION LOCATION.
2. APPLY A THIN COAT OF DOW-CORNING COMPOUND, #4 OR EQUIVALENT TO THE BOTTOM OF THE BASEPLATE. SECURE THE CONTROL FLUSH ON THE MOUNTING PANEL WITH #10 BOLTS THROUGH ALL FOUR MTG. HOLES IN THE BASEPLATE.

DRAWING SIZE: B		POLYSPEDE ELECTRONICS CORP. 9770 TWIN HILLS AVE. DALLAS, TEXAS
DRAFTSMAN	DATE: 1/25/80	OC2-500 OPEN CHASSIS CONTROL 230VAC, 5HP MOUNTING DIMENSIONS
APP'D	DATE	
MATERIAL	SCALE: 1:2	DRAWING NO: A1501-100-DD,a

FIGURE 2

REV.LTR.	REVISION	APP'D.	DATE

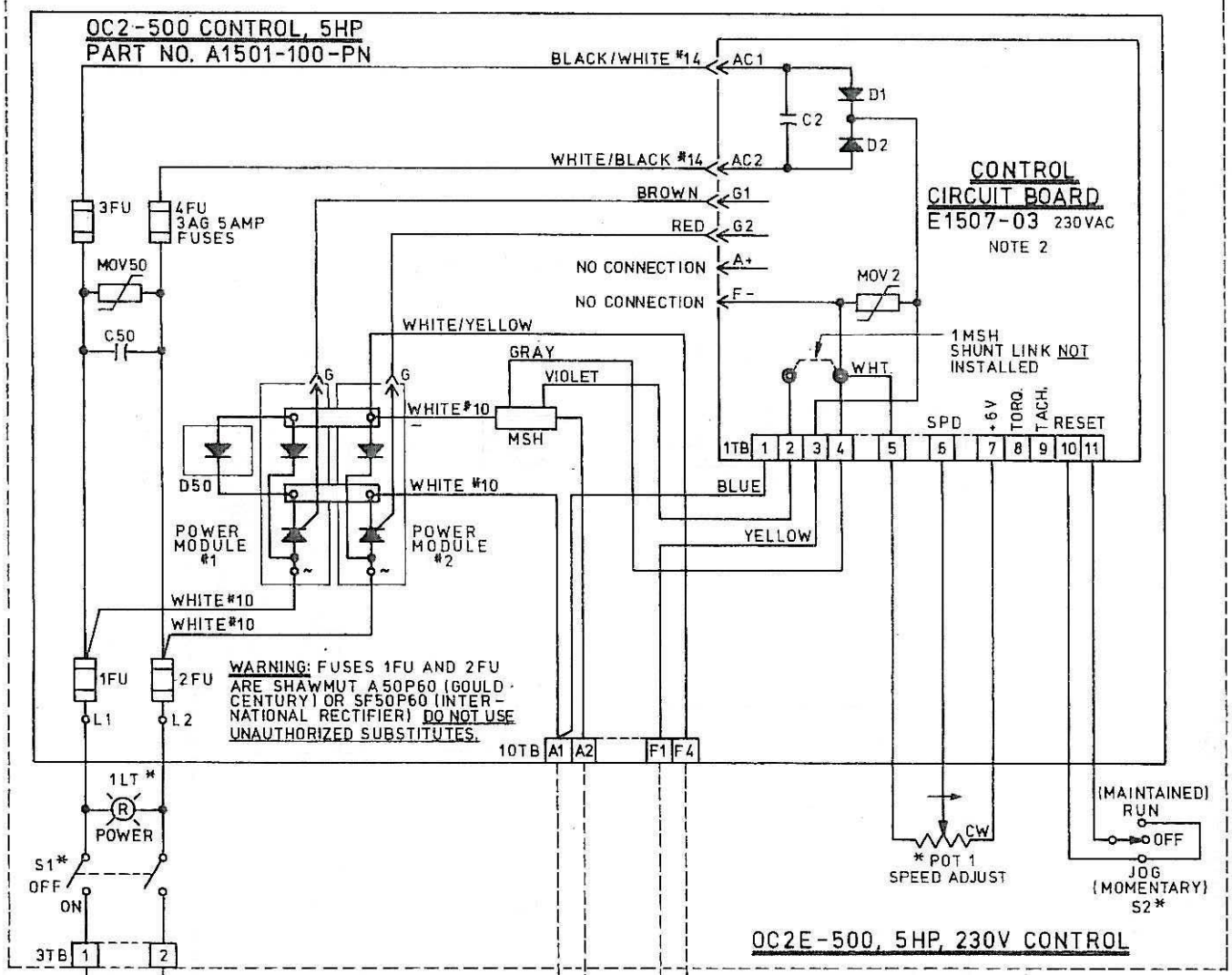
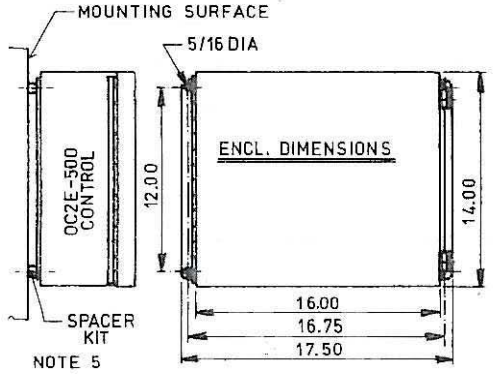


FIGURE 3

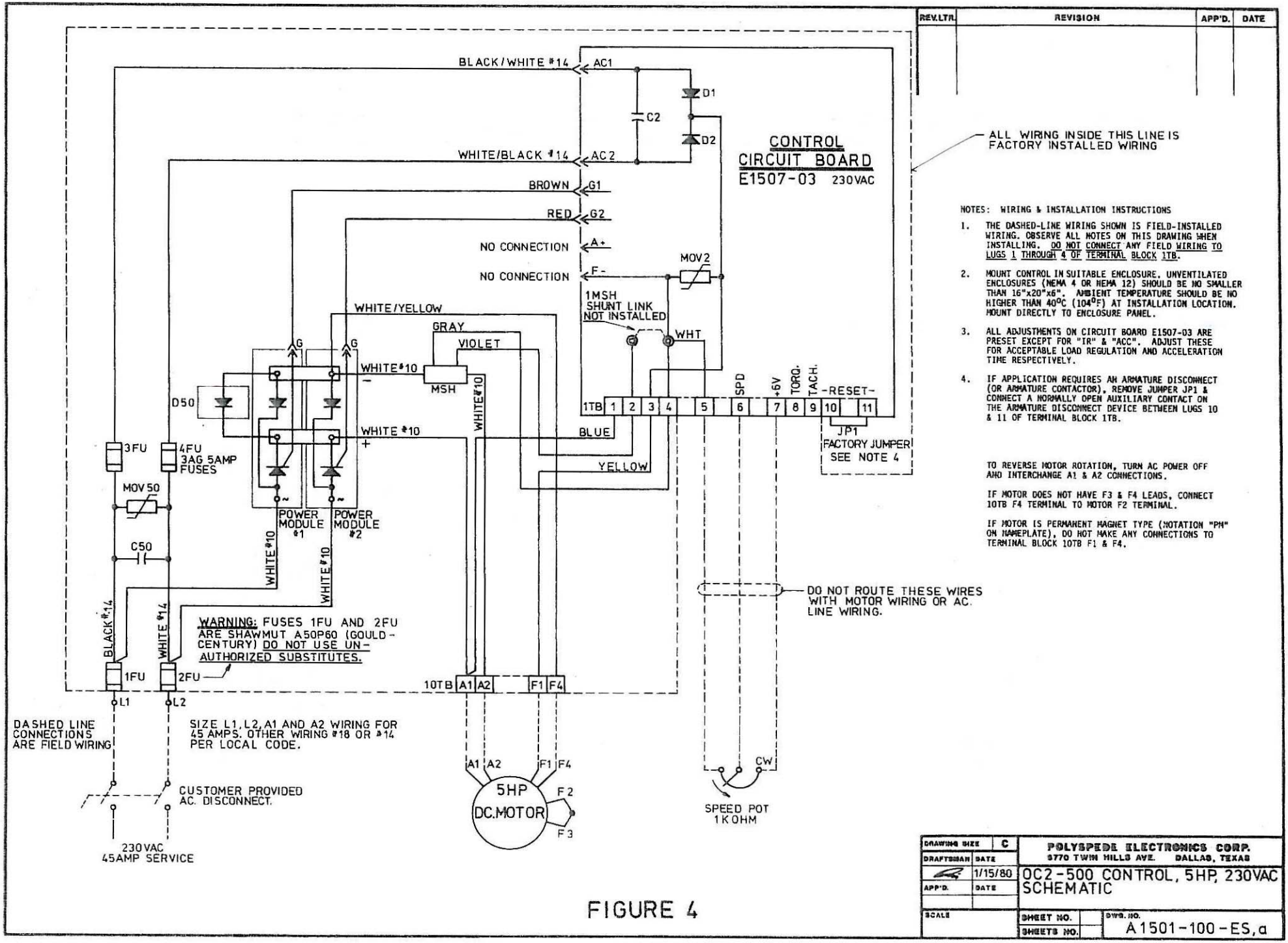


MAXIMUM DEPTH INCLUDING THE FARTHEST PROTUDING COMPONENT ON THE ENCLOSURE DOOR AND THE MOUNTING SPACERS IN THE REAR IS 8.25".

NOTES: WIRING & INSTALLATION INSTRUCTIONS.

1. THE DASHED-LINE WIRING SHOWN IS FIELD-INSTALLED WIRING. OBSERVE ALL NOTES ON THIS DRAWING WHEN INSTALLING. DO NOT CONNECT ANY FIELD WIRING TO LUGS 1 THROUGH 4 OF TERMINAL BLOCK 1TB.
2. ALL ADJUSTMENTS ON CIRCUITBOARD E1507-03 ARE PRESET EXCEPT FOR "IR" & "ACC". ADJUST THESE FOR ACCEPTABLE LOAD REGULATION AND ACCELERATION TIME RESPECTIVELY.
3. SIZE L1, L2, A1 & A2 WIRING FOR 45 AMPS. TO REVERSE MOTOR ROTATION, TURN AC POWER OFF AND INTERCHANGE A1 & A2 CONNECTIONS.
   USE #18 AWG WIRE OR LARGER FOR FIELD LEADS, DEPENDING ON LOCAL CODE.
   IF MOTOR DOES NOT HAVE F3 & F4 LEADS, CONNECT 10TB-F4 TERMINAL TO MOTOR F2 TERMINAL. FIELD VOLTAGE AVAILABLE AT 10TB-F1 & F4 IS 200 VDC.
   IF MOTOR IS PERMANENT MAGNET TYPE (NOTATION "PM" ON NAMEPLATE), DO NOT MAKE ANY CONNECTIONS TO TERMINAL BLOCK 10TB-F1 & F4.
4. * COMPONENTS MOUNTED ON ENCLOSURE DOOR AND PRE-WIRED BY POLYSPEDE.
5. MOUNT OC2E-500 CONTROL TO MOUNTING SURFACE USING THE SPACER KIT, PROVIDED WITH THE CONTROL, AS SHOWN. REFER TO A1436-000-MA SECTION III.

DRAWING SIZE C		POLYSPEDE ELECTRONICS CORP. 6770 TWIN HILLS AVE DALLAS, TEXAS	
DRAFTSMAN	DATE	10/1/82	NEMA 12 ENCLOSED OC2-500, 5HP CONTROL, 230V WIRING DIAGRAM
APP'D.	DATE		
MATERIAL		SCALE	DWG. NO. A1436-000-WD,a
			SHEET OF



REV. LTR.	REVISION	APP'D.	DATE

NOTES: WIRING & INSTALLATION INSTRUCTIONS

1. THE DASHED-LINE WIRING SHOWN IS FIELD-INSTALLED WIRING. OBSERVE ALL NOTES ON THIS DRAWING WHEN INSTALLING. DO NOT CONNECT ANY FIELD WIRING TO LUGS 1 THROUGH 4 OF TERMINAL BLOCK 1TB.
2. MOUNT CONTROL IN SUITABLE ENCLOSURE. UNVENTILATED ENCLOSURES (NEMA 4 OR NEMA 12) SHOULD BE NO SMALLER THAN 16"x20"x6". AMBIENT TEMPERATURE SHOULD BE NO HIGHER THAN 40°C (104°F) AT INSTALLATION LOCATION. MOUNT DIRECTLY TO ENCLOSURE PANEL.
3. ALL ADJUSTMENTS ON CIRCUIT BOARD E1507-03 ARE PRESET EXCEPT FOR "IR" & "ACC". ADJUST THESE FOR ACCEPTABLE LOAD REGULATION AND ACCELERATION TIME RESPECTIVELY.
4. IF APPLICATION REQUIRES AN ARMATURE DISCONNECT (OR ARMATURE CONTACTOR), REMOVE JUMPER JP1 & CONNECT A NORMALLY OPEN AUXILIARY CONTACT ON THE ARMATURE DISCONNECT DEVICE BETWEEN LUGS 10 & 11 OF TERMINAL BLOCK 1TB.

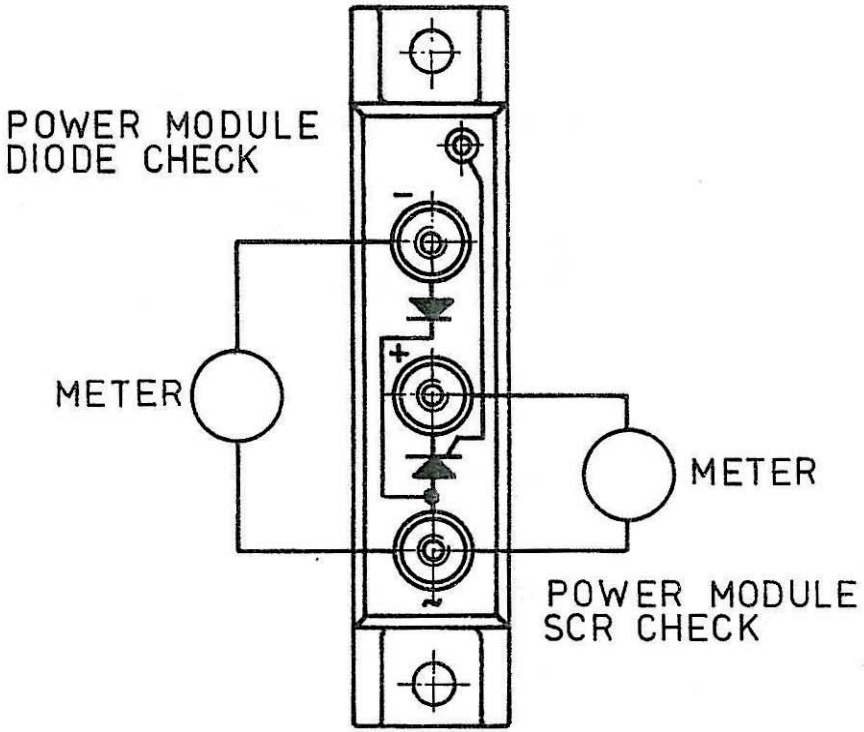
TO REVERSE MOTOR ROTATION, TURN AC POWER OFF AND INTERCHANGE A1 & A2 CONNECTIONS.

IF MOTOR DOES NOT HAVE F3 & F4 LEADS, CONNECT 10TB F4 TERMINAL TO MOTOR F2 TERMINAL.

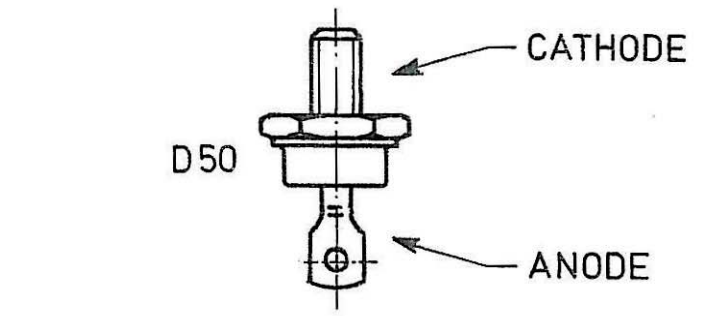
IF MOTOR IS PERMANENT MAGNET TYPE (NOTATION "PM" ON NAMEPLATE), DO NOT MAKE ANY CONNECTIONS TO TERMINAL BLOCK 10TB F1 & F4.

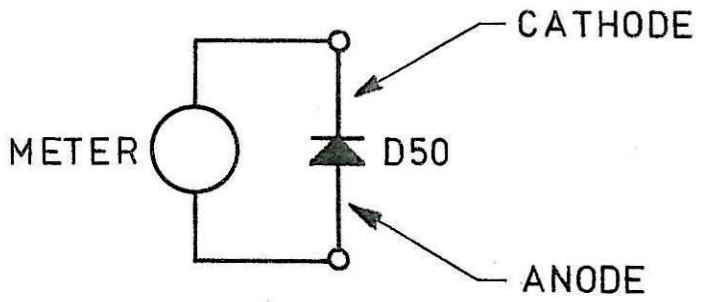
FIGURE 4

DRAWING SIZE	C	POLYSPEDE ELECTRONICS CORP. 9770 TWIN HILLS AVE. DALLAS, TEXAS	
DRAFTSMAN	DATE		
	1/15/80	OC2-500 CONTROL, 5HP, 230VAC SCHEMATIC	
APP'D.	DATE		
SCALE		SHEET NO.	DWG. NO. A1501-100-ES,a
		SHEETS NO.	



POWER MODULE





D50 FREE WHEELING DIODE CHECK

POWER MODULE AND DIODE D50 SEMICONDUCTOR TEST

FIGURE 5

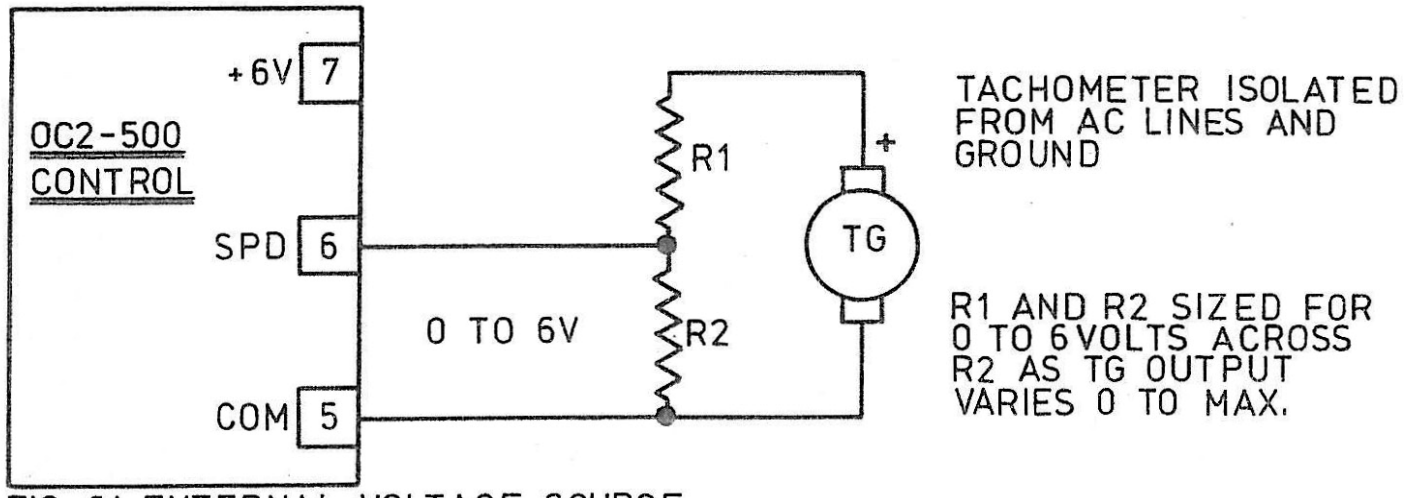


FIG. 6.1 EXTERNAL VOLTAGE SOURCE
(TYPICAL TACHOMETER FOLLOWER CIRCUIT)

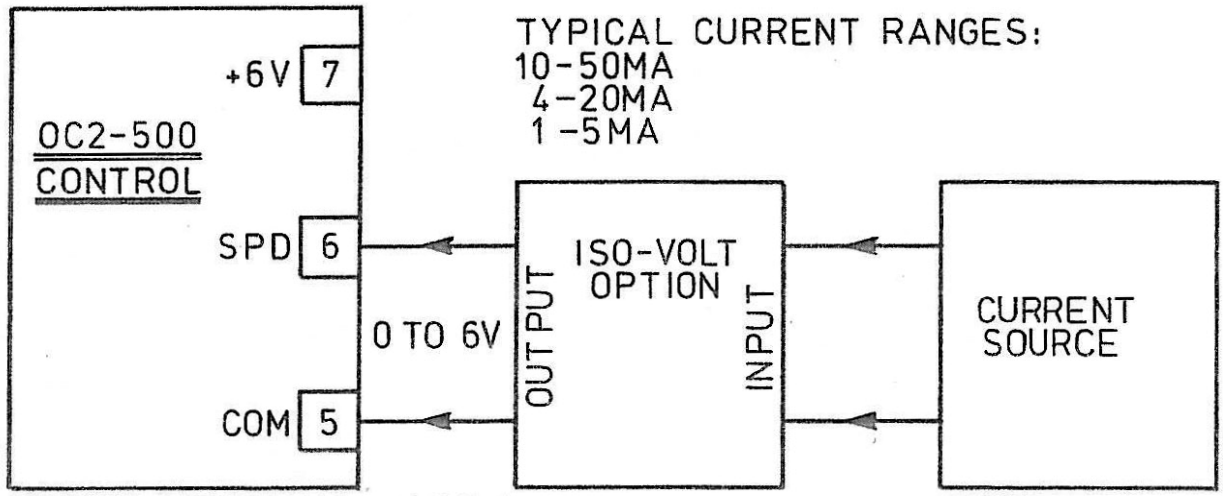


FIG. 6.2 EXTERNAL CURRENT SOURCE
(PROCESS INSTRUMENT)

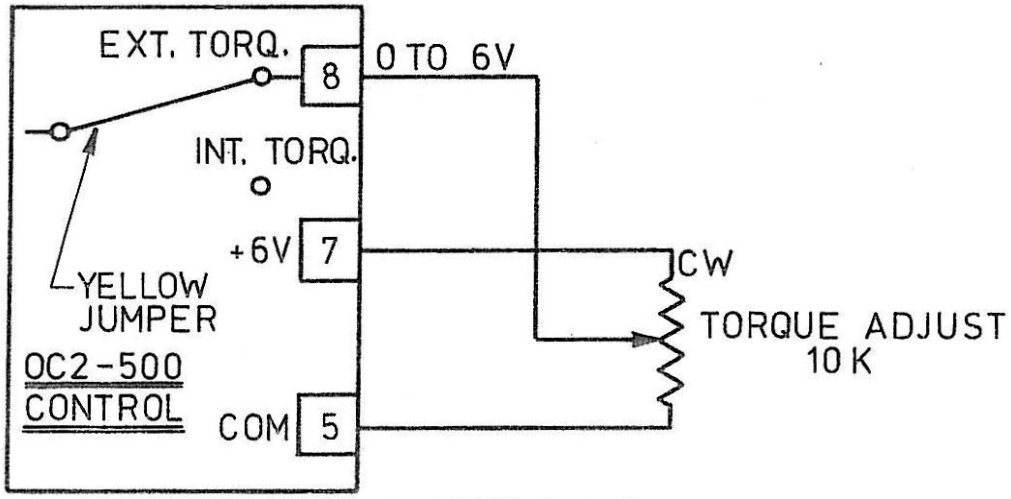
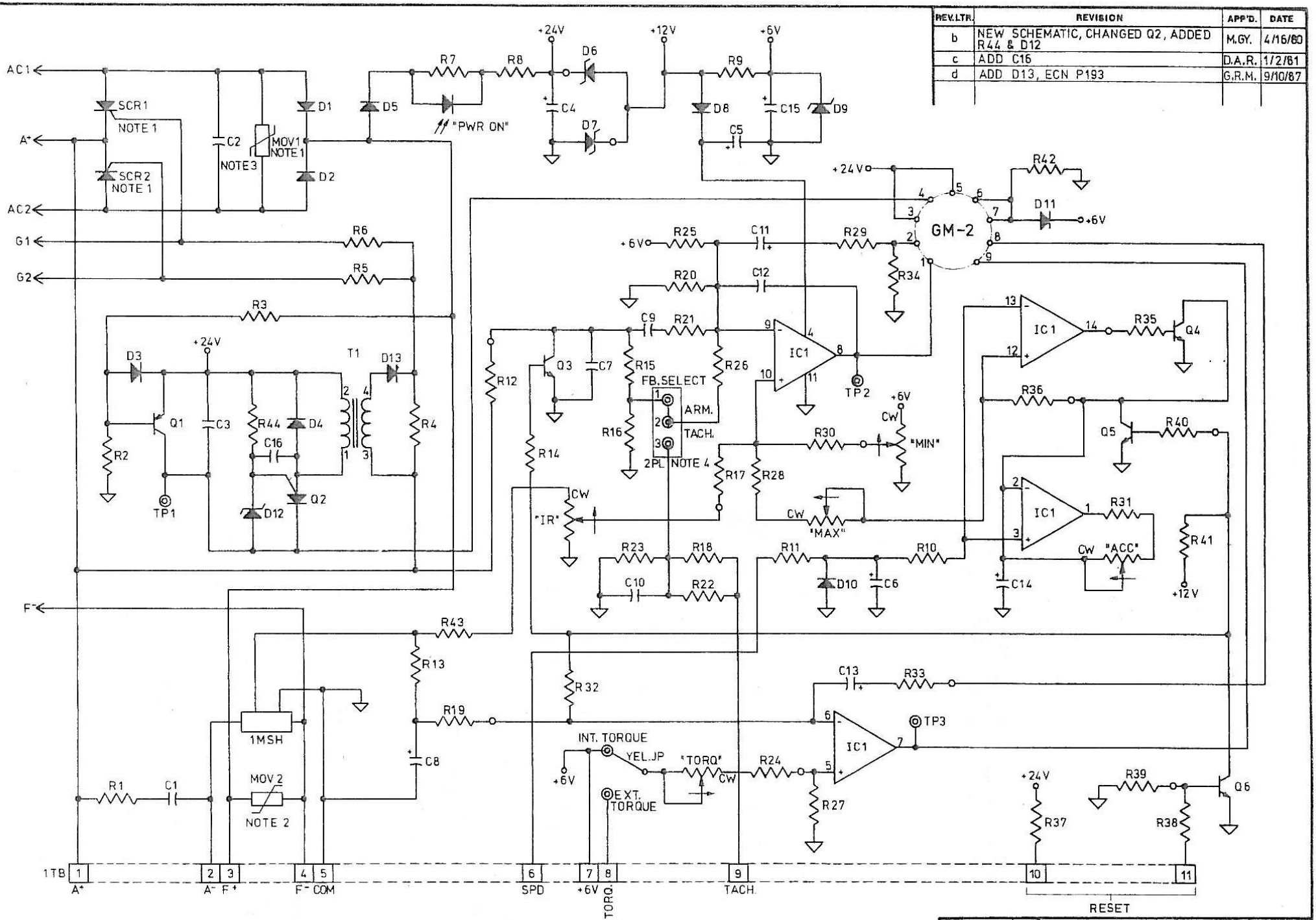


FIG. 6.3 EXTERNAL TORQUE LIMIT
(USING AN EXTERNAL POTENTIOMETER)

EXTERNAL SIGNAL PROGRAMMING
FIGURE 6



REV.LTR.	REVISION	APP'D.	DATE
b	NEW SCHEMATIC, CHANGED Q2, ADDED R44 & D12	M.GY.	4/16/80
c	ADD C16	D.A.R.	1/2/81
d	ADD D13, ECN P193	G.R.M.	9/10/87

NOTES:

1. MOV1, SCR1 & SCR2 ONLY SUPPLIED ON THE -01 ASSEMBLY. THEY ARE NOT SUPPLIED ON OTHER ASSEMBLIES.
2. MOV2 ONLY SUPPLIED ON THE -03 & -05 ASSEMBLIES.
3. CAPACITOR C2 NOT SUPPLIED ON -05 AND -06 ASSEMBLIES.
4. FOR ARMATURE VOLTAGE FEEDBACK PINS 1 AND 2 ON 2PL ARE JUMPERED TOGETHER. FOR TACHOMETER FEEDBACK PINS 2 AND 3 ON 2PL ARE JUMPERED TOGETHER.

DRAWING SIZE	C	POLYSPEDE ELECTRONICS CORP. 6770 TWIN HILLS AVE. DALLAS, TEXAS	
DRAFTSMAN	DATE		
	4/16/80	BOARD, PC. 0C2 CONTROL CIRCUIT SCHEMATIC 115 OR 230 VAC	
APP'D.	DATE		
SCALE		SHEET NO.	DWG. NO. E1507-000-ES,d
		SHEETS NO.	

FIGURE 7