

Figure 1

FEATURES

- Control handles 1/30 to 1/4 HP. 90 Volt armature DC motors.
- Operates: DC Permanent magnet and shunt wound motors.
- Full wave rectification.
- Speed range 0 to base speed (20:1 constant torque)
- Speed regulation: 3% of base speed.
- Transient and surge protection.
- Adjustable IR compensation potentiometer.
- Fixed acceleration control (1 to 3 seconds) soft start.
- Adjustable current limit.
- Adjustable minimum and maximum speed.
- Line fuse – Motor fuse.
- Power ON/OFF switch.
- Power ON indicator light.
- NEMA 1 enclosure.
- Circuitry: All solid state full wave SCR control with feedback regulation. IR compensation current limit (torque control) designed for use with DC permanent magnet and DC shunt wound motors.

WARRANTY

ELECTROL controls are warranted by ELECTROL CO., INC. to the original user against defects in workmanship or materials under normal use (rental excluded) for one (1) year after purchase.

Any part which is determined to be defective in material or workmanship must be returned to ELECTROL headquarters, or an authorized service center, as ELECTROL designates, shipping costs prepaid. The control will be repaired or replaced at ELECTROL's option. Expenses incurred by buyer in repairing or replacing any defective product will not be allowed except where authorized in writing and signed by an officer of the company.

SPECIFICATIONS

Motor Rating 1/30 to 1/4 HP Permanent Magnet DC or Shunt Wound DC motors.

Input 115 ($\pm 10\%$) Volts AC 60/50 Hz. single phase only. 5 Amps (max.)

Output 0 to 90 Volt DC. 5 Amp (max.) armature 100 Volt DC. 2 Amp (max.) field.

Ambient 40° C Maximum.

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APPLICATION INFORMATION

1. If you replace an AC induction motor with a DC motor and adjustable speed drive, consideration must be given to the full load torque rating of the AC induction motor that is being replaced. The full load torque rating of the DC motor must be equal to or greater than the full load torque rating of the AC motor it is going to replace.
2. When replacing an AC induction motor with a DC motor and adjustable speed control the DC motors starting torque must be limited to 200% of full load torque (150% of full torque for gearmotors). The reason for these limits is to protect the motor or gearmotor from damaging overloads. Cyclic type loads should be avoided.
3. Soft Start – The DC motor accelerates from 0 to full load RPM smoothly and takes 1 to 3 seconds to reach full load RPM. Acceleration rate varies with respect to speed setting and amount of inertia in the system.
4. The motor controller has circuitry to protect it from normal line surges, and transients. If, however, the control will be used in an environment where these are present constantly, such as high frequency welding equipment, an isolation transformer or other line filtering device should be used.
5. The Electrol adjustable speed DC motor control is designed for use on constant (or diminishing) torque applications such as conveyors, fans, blowers, etc.

WARNING: NOT INTENDED FOR USE WITH SAWS, DRILL PRESSES, OR OTHER CONSTANT HP APPLICATIONS. NOT TO BE USED IN AN EXPLOSIVE ATMOSPHERE!

If your control is equipped with DYNAMIC BRAKING, the following applies:

Dynamic Braking functions in the control when the FWD/BRAKE/REV switch is moved to the BRAKE position while the motor is running. This allows the motor to come to a quick smooth stop.

NOTE: Dynamic braking resistors are sized to function on the basis of no appreciable external inertia. The following is the maximum allowable motor starts and stops:

1/6 - 1/30 HP DC motors – 5 per minute max.

1/6 - 1/30 HP DC gearmotor – 10 per minute max.

INSTALLATION

MOUNTING

1. Select a flat, rigid surface for mounting the controller.

CAUTION: Avoid locating the controller where vibration, temperature, moisture, oil, and dust will affect controller operation or damage controller components.

2. Refer to Figure 2 for mounting dimensions and layout mounting pattern on location selected.

NOTE: #8 bolts are recommended for mounting the controller; these are not provided.

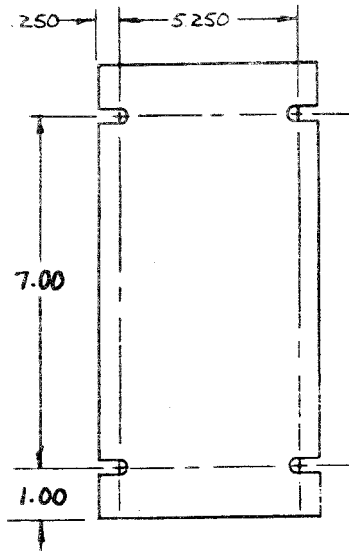


Figure 2 – Controller Mounting Dimensions

CONNECTION

CAUTION: Disconnect power source before connecting controller or motor. Use No. 16 AWG (minimum size) wire for controller input lines, and for interconnection lines between controller and motor.

Make connections to the controller and the motor in accordance with the Connection Chart. The controller terminal strip (Figure 3) is located inside the controller enclosure, on the PC board assembly. (See Figure 5 Ref. No. 11) To reach the terminal strip, loosen the captive screw in the top center of the controller front panel, then swing the panel open. To feed wiring to the terminal strip, remove the two button plugs from the bottom of the controller enclosure.

INSTALLATION (Continued)

CONNECTION CHART

Motor Type	Controller Term No. (Figure 4)	Connect To
Permanent Magnet Motor	L1, L2 (Controller power input)	115 VAC \pm 10% 60/50 Hz (single phase) lines
	A1, A2 (Controller armature output)	Motor armature (A1, A2 leads)
	F1, F2 (Controller field output)	Not Connected
Shunt Wound Motor	L1, L2	115VAC \pm 10% 60/50 Hz (single phase) lines
	A1, A2	Motor Armature (A1, A2 leads)
	F1, F2	Motor Field

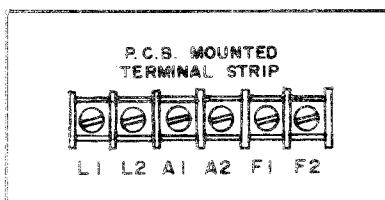


Figure 3

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).
2. Motor and controller must be securely and adequately grounded. This can be accomplished by wiring with a grounded, metal-clad raceway system, by using a separate ground wire connected to the bare metal of the motor frame or other suitable means. Refer to NEC article 250 (grounding) for additional information.
3. Always disconnected power source before working on or near a motor and controller or its connected load. If the power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power.

INSTALLATION (Continued)

4. All moving parts should be guarded.
5. Be careful when touching the exterior of an operation motor — it may be hot enough to be painful or cause injury. With modern motors this condition is normal if operated at rated load and voltage — modern motors are built to operate at higher temperatures.
6. Protect the power cable from coming in contact with sharp objects.
7. Do not kink power cable and never allow the cable to come in contact with oil, grease, hot surfaces, or chemicals.
8. Make certain that the power source conforms to the requirements of your equipment.
9. Wiping or cleaning rags and other flammable waste materials must be placed in a tightly closed metal container and disposed of later in the proper fashion.
10. When cleaning electrical or electronic equipment, always use an approved cleaning agent such as dry cleaning solvent.
11. Remove the motor output shaft key before running the motor without a connected load. (Caution: Shaft key-way edges are sharp.)

CONTROLLER SET UP PROCEDURE

1. Safety Precautions:

- a. One should observe the normal safety precautions for the voltages involved.

CAUTION: Only a qualified electrician should perform any electrical function (installation, maintenance, etc.)!

- b. When controller is opened to make running adjustments, electrically "live components" are exposed, both on the front cover and back panel. **EXERCISE CAUTION!**
- c. Be sure power is disconnected or shut off at fuse box or circuit breaker when installing controller and making adjustments except running adjustments.
- d. **WHEN MAKING RUNNING ADJUSTMENTS, BE VERY CAREFUL NOT TO TOUCH ANY COMPONENT EXCEPT ADJUSTING SCREWS.**
- e. Check all control terminal strip connections.
- f. Remove key from gearmotor's or motor's shaft before running.

2. Proceed as follows:
 - a. Check and install correct line and motor fuse.
Do not oversize fuse.

Fuse Selection Table

Motor H.P.	Motor Line & Armature
1/6 - 1/4	5
1/8	3
1/10 - 1/20	2
1/25 - 1/30	2

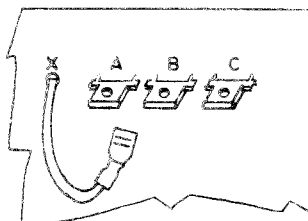
Use only Buss fast blow or standard ¼" dia. x 1¼" long MBO/ABC [250V.] fuses or equivalent. Do not use type MDL slow blow fuses.

- b. Open control and set I.R. compensation tab for the proper motor horsepower. Refer to I.R. Compensation Adjustment Table.

I.R. COMPENSATION ADJUSTMENT TABLE

Settings:

- X — Fast-On
- A — 1/25 thru 1/30 HP
- B — 1/15 thru 1/20 HP
- C — 1/4 thru 1/12 HP



- c. Connect line and motor leads as shown in connection chart.
 - d. Close controller cover and turn Power switch off.
 - e. Restore power to the control from the breaker panel or fuse box.
 - f. Set Master speed dial to zero.
 - g. Turn on/off switch to On position.
 - h. If your control has Fwd/Brake/Rev., Switch it to Fwd.
 - i. Turn Master speed dial (CW) and note rotation of shaft.
 - j. If the shaft rotates in the opposite direction of that desired, reverse the motor connections. (A1, A2)
 - k. Adjust Master speed dial until desired speed is reached.
 - l. If a different maximum speed is desired, adjust Max. RPM trim pot (on circuit board) to the desired maximum motor speed. If available, use a tachometer to check motor speed. If a different minimum speed is desired, adjust as follows:

INSTALLATION (Continued)

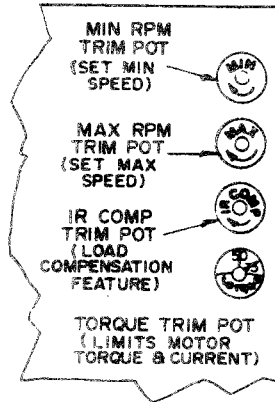


Figure 4

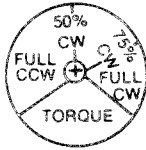
- (1) Set Master Speed Dial to zero (Max. CCW).
- (2) Adjust Min. RPM trim pot (on circuit board) to desired minimum motor speed. Rotate trip pot CW to increase speed, CCW to decrease speed. If available, use a tachometer to check motor speed. Do not allow motor to run any slower than necessary.

NOTE: Settings of the Max. and Min. RPM Trim Pots override the Master Speed Dial.

NOTE: Should the motor fail to operate, see Trouble Shooting Chart.

3. If there is a big difference between no load RPM and Full load RPM, or if the control will not reach full speed by adjusting the Master speed dial and the Max RPM trim pot (control in Current Limit) follow the procedure described below:
 - a. Open front cover of the control. **EXERCISE EXTREME CAUTION AS ELECTRICALLY LIVE 115 VOLT TERMINALS ARE EXPOSED.**
 - b. Place a DC Current Meter capable of at least 5 amps in series with the motor armature.
 - c. Using an insulated handle 3/16" blade screw driver, set torque limit trim pot as follows:

- (1) Rotate the torque trim pot to maximum CW.
- (2) Set master speed dial to maximum CW, apply full load to motor.
- (3) Current Limit Adjustment (Torque)



Rotation towards full CCW reduces current limit. Rotation toward full CW increases full limit.

Adjust current limit of the control to limit output amps of a motor to a maximum of 200% of motor full load amp rating and a maximum of 150% of full load amp ratings for gear-motors.

NOTE: The 150% and 200% Torque Limit is not for continuous duty operation but handles only temporary overload conditions. Continuous overload conditions must be guided by the service factor rating of the motor or gearmotor or by derating the full load horsepower to compensate. (1.0 service factor)

- (4) If during normal operation, when the load on the motor is increased and an abrupt motor speed drop is noticed, check to see if the motor is overloaded, reduce the load or increase motor horsepower. If the motor was not overloaded, turn the torque trim pot CW. This could correct the problem.
 - d. If the load on the motor is increased, and the speed drop off is greater than desired, adjust the I.R. Comp. Trim Pot to minimize speed drop.

NOTE: To adjust, turn I.R. Comp. Trim Pot CW to increase speed, and CCW to decrease speed.

CAUTION: If IR Comp. Trim Pot is over adjusted, motor RPM at low speed settings may rise excessively under full load conditions.

NOTE: Motor speed variations amounting to $\pm 5\%$ of motor base speed, or less, are normal during operation at any set speed; you may not be able to eliminate them (Base speed is the speed at which the motor, or motor portion of a gear-motor, runs when driven at rated armature voltage with rated load.)

CAUTION: Make sure fast-on is on the correct post because this gives you correct I.R. Compensation and automatically adjusts current limit setting of 150% of full load without changing Torque trim pot.

OPERATION

WARNING: This adjustable speed DC motor controller is designed for operation on 115VAC ($\pm 10\%$) 60/50 Hz single phase power only. Connection to any other source of power will permanently damage the controller and void the warranty. If a source of 115 VAC, 50/60 Hertz power is not available at the point of installation, a suitable dry type isolation transformer should be installed. The primary voltage should match the available voltage and the secondary voltage should be 115 volts.

The adjustable speed D.C. motor controller is designed for use on constant (or diminishing) torque applications such as conveyors, fans, blowers, etc.

WARNING: Not intended for use with saws, drill presses or other constant HP applications. Not to be used in an explosive atmosphere.

The controller is NOT sealed to dust or moisture and operation in a dusty or wet environment is NOT recommended.

If your control has FWD/BRAKE/REV., the direction of rotation can be reversed by means of the FWD/BRAKE/REV switch on the controller.

To reverse the rotation, move switch to brake position, allow time for motor to come to complete stop, then move the switch to the reverse position. The motor will now run in the opposite direction.

The motor or gearmotor load for continuous operation, at various speeds, should not exceed the full load torque rating specified on the units nameplate.

TROUBLE SHOOTING

Check all terminal board connections.

WARNING: MAKE CERTAIN THAT THE POWER SUPPLY IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR REMOVE ANY COMPONENTS! If the power disconnect point is out-of-sight, lock it in the open position and tag to prevent unexpected application of power. ONLY A QUALIFIED ELECTRICIAN OR SERVICE PERSON SHOULD PERFORM ANY ELECTRICAL TROUBLE SHOOTING OR MAINTENANCE.

SAFETY PRECAUTIONS:

When controller is opened to make running adjustments, electrically "live" components are exposed, both on the front cover and back panel. Be sure power is disconnected or shut off at fuse box or circuit breaker when installing controller and making adjustments except running adjustments. WHEN MAKING RUNNING ADJUSTMENTS, BE VERY CAREFUL NOT TO TOUCH ANY COMPONENT EXCEPT ADJUSTING SCREWS.

TROUBLE SHOOTING CHART

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
Motor does not run, indicator light out.	<ol style="list-style-type: none"> 1. Power switch in the OFF position. 2. Blown fuse or open circuit breaker. 3. Incorrect power source. 4. Power switch is inoperative. 5. Defective PC Board. 	<ol style="list-style-type: none"> 1. Move to ON position. 2. Replace fuse or reset circuit breaker (See Fuse Selection Table for proper fuse size & type). 3. See input under Specifications. 4. Replace power switch. 5. Replace PC Board.
Motor does not run indicator light on.	<ol style="list-style-type: none"> 1. Master speed knob set to zero. 2. Worn brushes. 3. Loose motor connections. 4. Blown motor fuse. 5. FWD Brake Rev. switch is in brake position. 	<ol style="list-style-type: none"> 1. Turn knob CW to start motor shaft rotating. 2. Replace brushes. 3. Check that all connections are secure at controller & motor. 4. Replace fuse (See Fuse Selection Table for proper fuse size & type). 5. Place switch in FWD or Rev. position.
Motor stalls or runs at very low speed with potentiometer turned full CW	<ol style="list-style-type: none"> 1. Low voltage 2. Overload condition. 3. Worn brushes. 4. Loose Connections 5. Incorrect HP hook-up. 	<ol style="list-style-type: none"> 1. Check input; voltage should not be below 104VAC; increase voltage to 115VAC 2. Reduce load. 3. Replace brushes. 4. Check that all connections are secure. 5. Improper HP selection on PC Board.
Repeated fuse blowing	<ol style="list-style-type: none"> 1. Low voltage. 2. Overload condition. 3. Loose connections. 4. Worn brushes. 5. Defective motor bearings. 6. Defective PC Board. 	<ol style="list-style-type: none"> 1. Check input; voltage should not be below 104VAC; increase voltage to 115VAC. 2. Reduce load. 3. Check all connections. 4. Replace brushes. 5. Replace bearings. 6. Replace PC Board.
Motor runs full speed no matter where master speed knob is set.	<ol style="list-style-type: none"> 1. Defective master speed pot. 2. Defective PC Board. 	<ol style="list-style-type: none"> 1. Replace master speed pot. 2. Replace PC Board.
FWD Brake Rev switch inoperative in one or more of its functions.	Defective switch.	Replace switch.

TROUBLE SHOOTING CHART (Continued)

SYMPTOM	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
PC board problems 1. No adjustment from one or more of the four adjustment trim pots. 2. Obvious damage to board component.	1. Defective PC Board. 2. Defective PC Board.	1. Replace PC Board. 2. Replace PC Board.
Motor RPM decreases 25% or more under full load condition or motor fails to regulate or nuisance blowing of the armature fuse.	1. Controller not properly set up for HP of motor being used. 2. IR compensation pot not adjusted properly. 3. Overload condition.	1. Refer to Motor HP Selection Guide and Controller Set Up Procedure, set controller for proper horsepower rating. 2. Adjust IR compensation pot to correct the speed variation under full load. Refer to Controller Set Up Procedure Section B. 3. Reduce load.

MAINTENANCE

WARNING: MAKE CERTAIN THAT THE POWER SUPPLY IS DISCONNECTED BEFORE ATTEMPTING TO SERVICE OR REMOVE ANY COMPONENTS! IF THE POWER DISCONNECT POINT IS OUT-OF-SIGHT, LOCK IT IN THE OPEN POSITION AND TAG TO PREVENT UNEXPECTED APPLICATION OF POWER. ONLY A QUALIFIED ELECTRICIAN OR SERVICE MAN SHOULD PERFORM ANY ELECTRICAL TROUBLE SHOOTING OR MAINTENANCE.

CONTROLLER

The exterior of the controller enclosure should be periodically inspected to prevent an accumulation of materials which might block the flow of cooling air.

CAUTION: Incorrect wiring and accidental grounding will seriously damage the controller and void the warranty.

ORDER REPLACEMENT PARTS THROUGH DEALER FROM WHOM PRODUCT WAS PURCHASED

Please provide following information;

- Model Number
- Serial Number (if any)
- Part Description and Number as shown in parts list.

Contact
ELECTROL CO., INC.
321 Dewey St.
York, PA 17404
(717) 848-1722

Replacement Parts Illustration

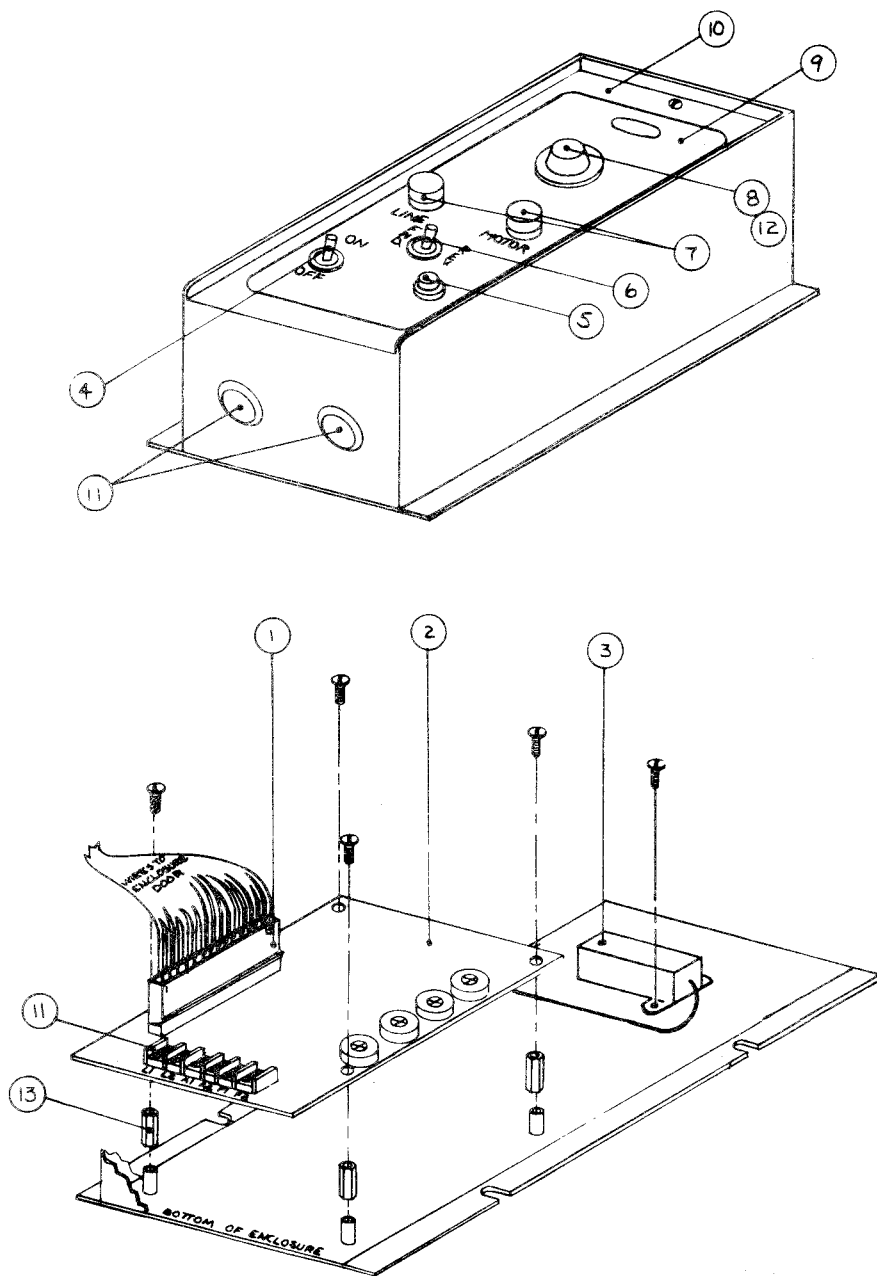


Figure 5

Replacement Parts List

Ref. No.	Part No.	Qty.	Description
1	2436	1	09-50-3151 Housing
2	9010	1	PCB #1060 Assy.
3	1308	1	1 Ω 50 Watt Resistor
4	2109	1	On/Off Switch
5	2201	1	Indicator Light
6	2108	1	Reversing Switch
7	2530	2	Fuseholders
8	2502	1	Knob
9	3216	1	Decal
10	3005	1	Enclosure
11	2519	2	Holeplugs
12	1408	1	Potentiometer 5K ohm, 2 watt
13	2529	4	Standoffs 1/2"

To Request Schematic
Please call or write:

Electrol Co. Inc.
321 Dewey St.
York, PA 17404

Phone (717) 848-1722
Fax (717) 848-4514
E-mail electrol@electrolco.com