marathon®

Understanding the Lima® MAC 4 Lead Single Phase Alternator

The Lima MAC, single phase, four load lead alternator, Frame 250, features the patented, "Compound DC Exciter," and consists of a standard, externally-regulated exciter rotor and 4-pole main rotor, a standard, concentric wound, single-phase alternator stator, and a special patented exciter stator with shunt and series windings. The rotating rectifier assembly consists of two separate, "Full Wave Molded Bridge Rectifiers," secured (bolted) on the exciter rotor core ***(see Figure 1).*** Mounted in the alternator's conduit box is a stationary diode and terminal strip assembly consisting of a four double terminal, barrier type terminal board, three stud type diodes mounted on a common grounded heat sink, a slide wire, "No Load" voltage adjust resistor, a surge suppressor, and a small lead mounted diode ***(see Figure 2).***

The exciter stator consists of 6 poles alternately wound with shunt and series windings. The three shunt poles are connected in series, thus making what amounts to a single shunt winding. The series circuit consists of two separate windings. Each of these windings is series connected and is wound on all three series poles – each series pole then has two separate and electrically isolated coils.

Shunt Circuit

The shunt circuit provides excitation for no load voltage. A supply voltage for the shunt of approximately 60 volts is obtained from a tap on the alternator main stator winding.

With current flowing in the alternator stator in the direction shown in drawing "A" (dotted line), current flow is through the voltage adjust resistor, the shunt winding and then through CR-4 back to neutral.

During the other half cycle (see drawing "B") current flow from the alternator is blocked by CR-4. However, the magnetic field stored in the shunt winding is now discharged through the "Free Wheeling Diode" – CR-5 – allowing some shunt current flow during this half cycle (see dotted lines drawing "B") thus providing more shunt output than could be obtained from strictly half wave operation.

The voltage tapped from the alternator stator provides more excitation than is required to obtain rated output voltage, and thus the voltage adjust resistor can be used to set the no load voltage at the desired level. The voltage adjust resistor as little, if any effect upon full load output voltage.

Series Circuit – 120/240 Volt Three Wire Connection

With a load applied to L1 and L4, the load current flows through the series winding and the stationary diode assembly.

During the half cycle shown in drawing “A,” current from the bottom alternator stator coil flows through CR-2 then through the upper series winding, the upper alternator stator winding, and then out L to the load. During the other half cycle (drawing “B”), the current flows through CR-1, the bottom series winding, the bottom alternator winding, and then out to the load.

For the half cycle that a series winding is not conducting, the bypass diodes (CR-1 and CR-2) are also acting as “Free Wheeling Diodes” providing some additional exciter output.

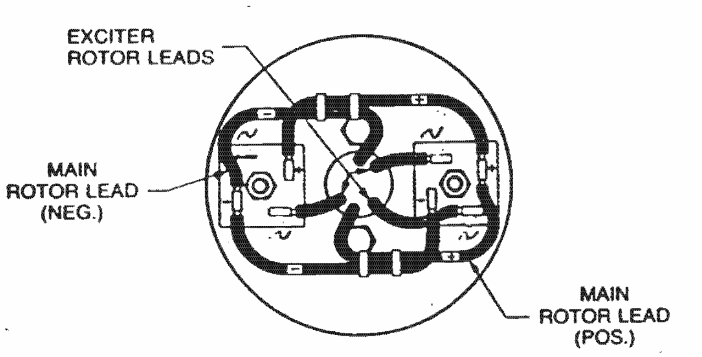
The two series winding conduct alternately each half cycle, and being wound on a common pole, have the effect of full water excitation.

When loading either 120 volt side separately, the alternator performs as above except that only one series operates giving half wave excitation in the series winding. This provides the proper amount of excitation since the unit is only half loaded.

Series Circuit – 120 Volt Two Wire Connection

Operation of the series circuit in the parallel (120 volt) connection is identical to the above except that during the “A” half cycle current flows through **both** series windings, and by-passes both series windings during the “B” half cycle.

Figure 1 (Rotating Rectifier Bridge Assembly)



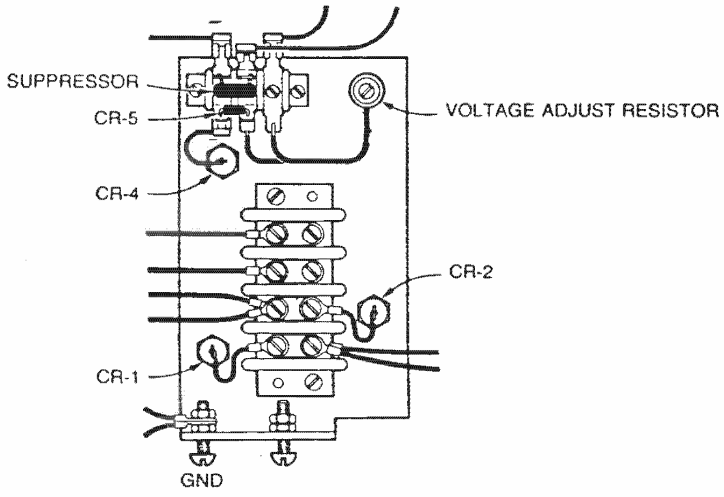
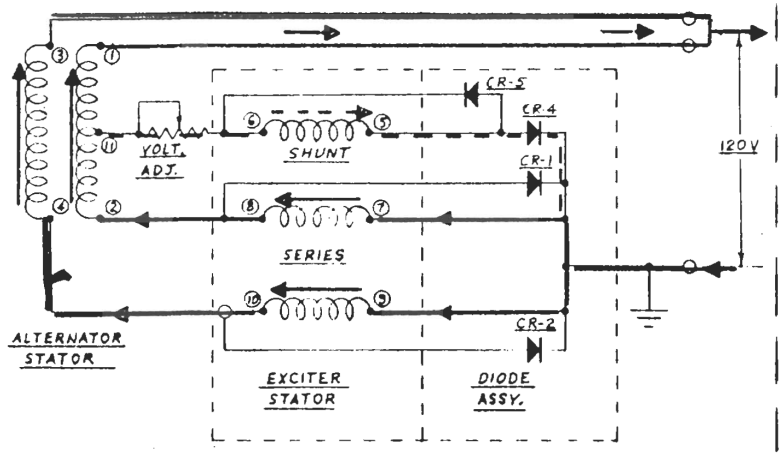
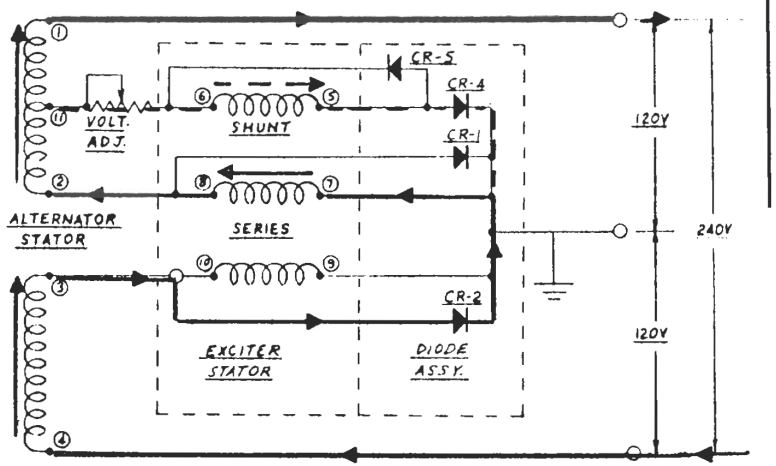


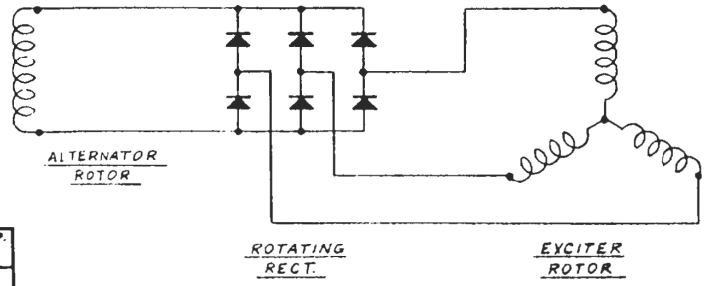
Figure 2 (Stationary Rectifier Assembly)

A 120V CONN.



A 120/240V CONN.





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THE LIMA ELECTRIC COMPANY, INC.

TITLE: WIRING DIA.

UNLESS OTHERWISE SPECIFIED, TOLERANCES TO BE ± 1/64 ON FRACTIONS, ± .010 ON DECIMALS, AND ± 1° ON ANGLES.

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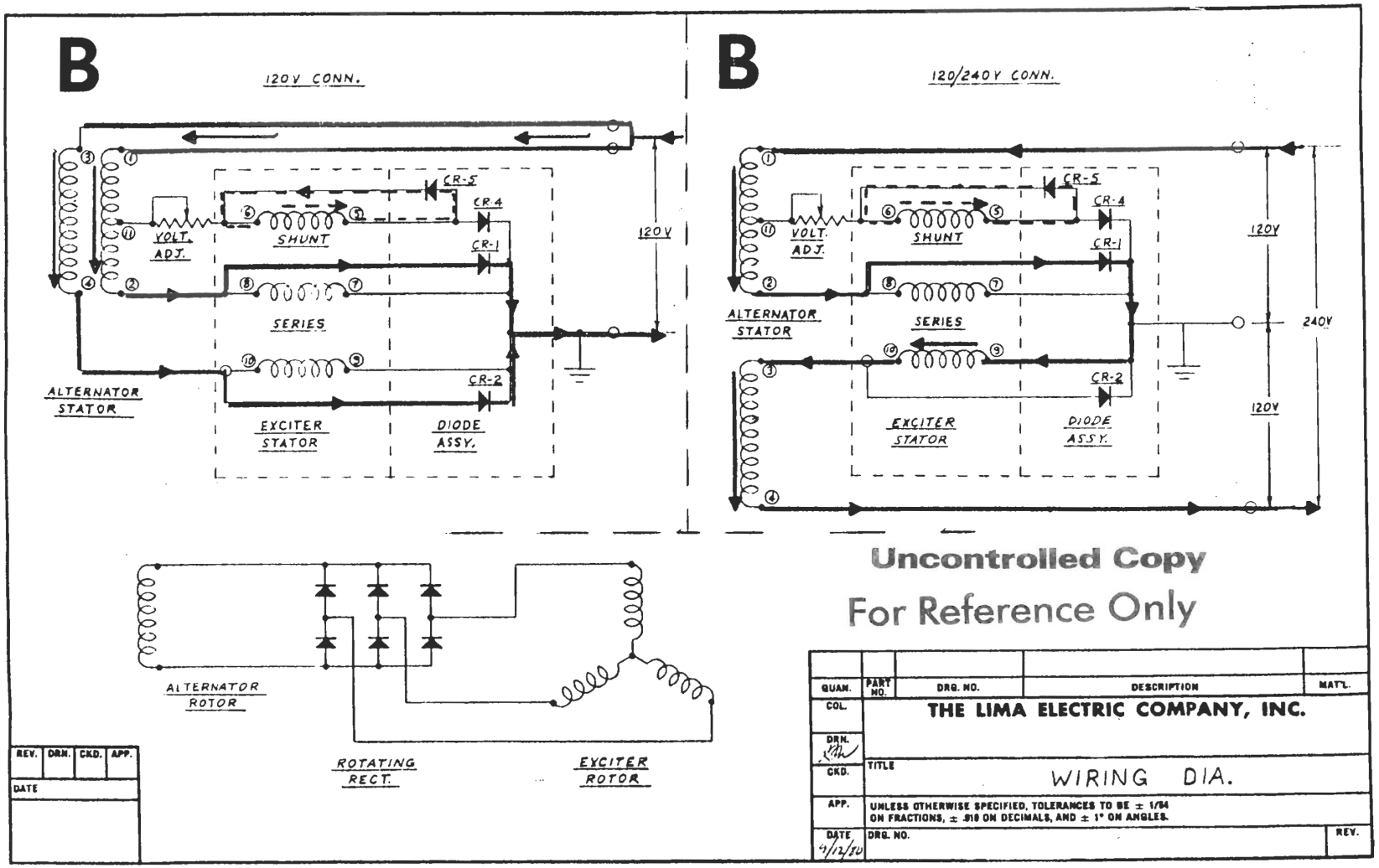

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