Lester Electrical

LESTRONIC II WITH SLIDE-IN TIMER
TECHNICIAN SERVICE GUIDE

PLEASE SAVE THESE IMPORTANT SAFETY AND OPERATING INSTRUCTIONS

To be able to troubleshoot safely and effectively, it is important to read this guide COMPLETELY before beginning any tests.

LOOK FOR THIS SYMBOL TO POINT OUT SAFETY PRECAUTIONS. IT MEANS: *BECOME ALERT—YOUR SAFETY IS INVOLVED.* IF YOU DO NOT FOLLOW THESE SAFETY INSTRUCTIONS, INJURY OR PROPERTY DAMAGE CAN OCCUR.

CAUTION: REPAIRS BY QUALIFIED PERSONNEL ONLY. NOTE: MODIFYING THIS CHARGER FOR USE OTHER THAN THAT FOR WHICH IT WAS INTENDED, REPAIRS BY PERSONS NOT QUALIFIED, OR NOT USING ORIGINAL EQUIPMENT REPLACEMENT PARTS WILL VOID THE MANUFACTURER'S WARRANTY AND LIABILITY. INCORRECT REASSEMBLY MAY RESULT IN A RISK OF ELECTRIC SHOCK OR FIRE.

DANGER: HAZARD OF ELECTRIC SHOCK! ALWAYS UNPLUG THE ELECTRICAL CORDS, FIRST FROM THE AC OUTLET, AND THEN FROM THE CHARGER RECEPTACLE, BEFORE ATTEMPTING ANY REPAIRS OR SERVICE TO THE CHARGER. TURNING THE CHARGER OFF DOES NOT REDUCE THIS RISK.

WARNING: DO NOT OPERATE THE CHARGER IF IT IS MALFUNCTIONING. PERSONAL INJURY OR PROPERTY DAMAGE COULD RESULT.

WARNING: DO NOT TOUCH THE BATTERY TERMINALS OR CONTACTS ON THE CHARGING PLUG. AN ELECTRIC SHOCK COULD RESULT.

The battery charger is, at most, one third (1/3) of the complete system, which includes the equipment, the batteries, and the wiring to/from and between the batteries. To locate and correct a problem with certainty, initial diagnosis and testing must include all elements of the system. The charger is constructed so all parts can be tested and replaced with basic hand tools. An analog *multimeter* of 5,000 ohms per volt sensitivity or better and some jumper and test leads **are essential** for electrical testing.

Proper functioning of the charger is described in the operation section. Troubleshooting begins with observing how the performance varies from the described steps. Use the following list as a guide to perform tests based on observations of variances from the described performance.

TROUBLESHOOTING GUIDE

Performance Problem	Section No.	Test Procedure
The control relay inside the charger does not pull in with a "click" three to five (3-5) seconds after the charger DC output plug is connected to the equipment battery charging connector.	1 2 9	Test for correct battery voltage Test relay and timer Test for complete DC circuit
The transformer does not "hum" after the control relay inside the charger is heard to pull in with a "click".	3	Test AC voltage and relay

Performance Problem	Section No.	Test Procedure
The ammeter needle deflection indicates TOO HIGH AN INITIAL CHARGE RATE and does not decrease to the specified maximum initial charge rate after 30 continuous minutes of charging.	4	Test battery system
The ammeter needle deflection indicates TOO LOW OR NO INITIAL CHARGE RATE.	5 6 7 8	Test battery voltage Test fuses and diodes Test capacitor Test transformer
DC fuse blows as soon as the DC output charging plug is connected to the charging receptacle or AC fuse blows or breaker trips.	6 11	Test fuses or diodes Test building AC circuits
CHARGER RUNS TOO LONG OR DOES NOT TURN OFF. Charger continues to charge after specific gravity measurements of several battery cells does not increase in three consecutive readings taken one hour apart.	10	Test for charged battery

1. The electronic timer kit is powered by the battery and will not operate unless powered by the proper battery voltage.

A. Measure and record battery system DC voltage at battery posts of machine.

Connect the positive (+) voltmeter lead to the positive (+) battery system post and the negative (-) voltmeter lead to the negative (-) battery system post. Reread the charger nameplate information for the specified DC VOLTS and verify the battery system has the proper DC voltage for the charger.

B. Measure and record battery DC voltage at charging receptacle.

If no DC voltage is measured or the DC voltage measured is lower than the DC voltage measured in A, repair or replace charging wires, attachments, and circuitry in equipment.

C. With both AC cord and charging plug disconnected, remove the cover from the charger and refer to the wiring diagram for that model of charger. Connect positive voltmeter lead to the same point inside the charger where the WHITE (+) DC cord lead connects. Connect the negative voltmeter lead to the same point inside the charger where the BLACK (-) DC cord lead connects. Connect the DC output cord to the charger receptacle and record the DC voltage measured.

D. The DC voltage measured at these test points must be the same battery system voltage as measured in A, before the charger can operate. If the voltage measured is zero, or lower than the results of A, then replace the DC charging cordset and/or the equipment charging receptacle and retest.

E. If the DC voltage measured in C is correct and as in A, then remove the timer kit retaining screws, slide the timer kit out of the charger and carefully remove the connector from the electronic timer.

F. Carefully examine the control cable assembly, electronic timer assembly connector and compare to the wiring diagram for this charger model. The same DC voltage measured in E must be present at the connector contacts that the RED (+) positive and BLACK (-) negative control cable assembly sense wires attach. If no DC voltage is measured or the DC voltage measured is lower than the DC voltage measured in D, repair or replace the control cable assembly.

2. The control relay is powered by the battery and will not operate unless supplied with proper DC voltage by the electronic timer assembly. The electronic timer assembly supplies the operating DC voltage to the charger control relay to turn the charger on, and stops supplying the DC voltage to turn the charger off.

A. Reconnect the electronic timer assembly and the control cable assembly connector. Refer to the wiring diagram for that specific model of charger and verify that you have the correct wiring diagram. Compare the model number of the charger to the model number listed on the wiring diagram page and verify they are identical. Verify the charger is wired correctly according to appropriate wiring diagram for the specific model charger. Locate where the BROWN and ORANGE control cable assembly leads connect to the relay actuating coil terminals on the relay. Connect the DC voltmeter leads to these connections.

B. Plug the DC charging plug into the equipment charging receptacle. Wait three to five (3-5) seconds for the electronic timer assembly to apply battery voltage to the relay coil connections.

If battery DC voltage as measured in 1.A. is measured at the control relay coil

connections and the relay does not pull in with a click, then replace the control relay with the exact replacement service part specified in the parts list for this model of charger and retest.

If battery DC voltage as measured in 1.F. is not measured at the control relay coil connections, then replace the electronic timer assembly and retest.

3. The transformer primary coil must be energized by AC power of the voltage and frequency specified by the charger nameplate for the charger to operate and the transformer to hum.

A. Read the charger nameplate for the required nominal AC voltage. Unplug the charger AC power plug from its outlet and measure AC line voltage at the outlet with a suitable meter. If no voltage is measured, test additional outlets until the specified voltage is measured. Locate the charger nameplate model number and verify it and the model number listed on the wiring diagram page are identical. Remove the cover and verify the charger is wired correctly according to the appropriate wiring diagram for that specific model of charger. Locate the WHITE AC power cord lead connection to one transformer primary lead and the BLACK AC power cord lead connection to one side of the control relay switch connections. Attach the leads from a suitable AC voltmeter to these AC cordset connections. Plug the AC power plug into a live AC outlet and verify the presence of proper AC voltage. If no voltage is measured, replace the AC cordset with the replacement service part specified on the parts list for this specific model charger and retest.

B. If the presence of AC voltage on the cordset is verified, per part A, unplug the AC power plug from the outlet. Move the meter test lead connected to the Black AC cordset lead connection on the control relay to the relay connection where the transformer primary coil lead is connected.

Connect the AC power plug to a live outlet and the DC charging plug to the equipment charging receptacle. After the relay pulls in with a "click", verify the presence of AC voltage. If no voltage is measured, replace the control relay with the service part specified in the parts list for that model of charger and retest.

C. If the required AC voltage is present at the transformer primary and the transformer does not hum the transformer primary is open. Replace the transformer assembly with the service part number specified on the parts list for this model of charger and retest.

4. The ammeter indicates too high a charge for more than 30 minutes.

This high charge rate is caused by misuse. The charger is connected to a battery pack with a system voltage lower or amp-hour capacity greater than specified on the charger. If battery maintenance has recently been performed, test with a suitable meter to determine if an individual battery in the battery pack has been installed reverse polarity. A common error is to install one or more 6-volt batteries in a battery pack in reverse polarity. Use a suitable DC voltmeter and test to be certain all batteries in a battery pack are correctly installed, and also test by measuring the battery system voltage at the equipment charging receptacle and compare to the system battery voltage specified on the charger nameplate. After charging for 30 continuous minutes at this excessive rate with the charger operating, the measured ON charge voltage should rise to at least the nominal voltage specified on the charger nameplate.

⚠CAUTION: DO NOT CONNECT THE CHARGER TO, OR ATTEMPT TO USE THE CHARGER ON, BATTERY PACKS OF DIFFERENT DC VOLTAGE THAN SPECIFIED ON THE FRONT OF THE CHARGER. OVER-HEATING AND TRANSFORMER BURNOUT WILL RESULT.

5. Too low an initial charge rate or no initial charge rate.

This too low a charge rate at the instant of turn-on can be due to charger malfunction resulting from electrical overload damage, or the battery pack system voltage is higher than specified on the charger. Test for the correct battery system voltage with a suitable voltmeter at the equipment battery connector and compare with the system voltage specified on the charger nameplate. Visually inspect the fuse assembly through the clear bubble. A single blown fuse link indicates an electrical overload caused short circuit failure of the heatsink assembly with diodes. Two blown links usually indicate reverse polarity connection of the batteries to the charger, but may also indicate that both diodes have been damaged and caused to fail in the shorted mode.

LOCATE AND CORRECT THE CAUSE OF TROUBLE BEFORE REPLACING THE BLOWN FUSE.

⚠CAUTION: DO NOT USE THE CHARGER IF THE OUTPUT IS LOW. BATTERIES WILL NOT REACH FULL CHARGE, THEREBY INCREASING THE POSSIBILITY OF A HARMFUL DEEP DISCHARGE DURING THEIR NEXT USE.

6. Test fuses and diodes.

Disconnect the AC power cord and DC charging cord before proceeding with any tests.

A. Adjust the analog meter to the low resistance scale (R x 1).

B. Excessive heat due to a loose, corroded, or distressed connection can cause one or both fuse assembly links to melt and open.

C. Electrically test and visually inspect the fuse assembly for continuity. A single blown DC fuse link is normally caused by a short circuit failure of a single diode. When both fuse links are blown, this is usually due to a reverse polarity connection to the batteries. Test the diodes and correct the problem **before** replacing the fuse.

LOCATE AND CORRECT THE PROBLEM BEFORE REPLACING A BLOWN FUSE.

⚠DANGER: REPLACE THE FUSE OR FUSE ASSEMBLY ONLY WITH THE CORRECT FUSE OR FUSE ASSEMBLY. FIRE, PROPERTY DAMAGE, AND PERSONAL INJURY CAN RESULT IF THE CHARGER IS USED WITH AN INCORRECT FUSE.

D. To test the diodes, disconnect one transformer secondary coil lead (TAN SLEEVING) from the diode terminal. Using the multimeter, connect one lead to the diode heatsink plate or terminal and the other lead to a diode terminal. Note the response and then reverse the test leads and repeat the procedure.

E. GOOD DIODE: When the diode shows continuity in one direction but not the other.

F. SHORTED DIODE: When the diode shows continuity in both directions.

G. OPEN DIODE: When the diode does not show continuity in either direction.

H. If a diode is open or shorted, the ENTIRE heatsink assembly with diodes must be replaced.

7. Test the Capacitor and replace if it is shorted or open.

⚠DANGER: HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE AT THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR THE CAPACITOR TERMINALS.

⚠WARNING: IT IS POSSIBLE FOR THE CAPACITOR NOT TO BE FULLY DISCHARGED.

To test for this, adjust your meter to the highest DC voltage and touch the leads to the capacitor terminals and note the reading. If the meter needle deflects in the wrong direction, reverse the test leads and repeat. If the capacitor was not fully discharged, a voltmeter reading will indicate this. Continue holding the voltmeter leads on the capacitor terminals until the voltage reading drops to zero.

A. Using the analog ohmmeter, adjust the scale to R x 10,000 (10k) ohms. Loosen the capacitor clamp and carefully remove both transformer leads from the capacitor terminals so the wires do not break. Touch the ohmmeter leads to the capacitor terminals and note the results. Reverse the test leads and repeat; reverse the test leads and repeat, and compare the response to the following:

B. GOOD CAPACITOR: When the ohmmeter leads are connected to the capacitor terminals, the meter needle bumps up scale and coasts back to high resistance.

C. OPEN CAPACITOR: When the ohmmeter leads are connected to the capacitor, the meter needle does not move and stays at high resistance. A bulge in the top of the capacitor may be visible if the capacitor has failed open.

D. SHORTED CAPACITOR: When the ohmmeter leads are connected to the capacitor terminals, the meter needle jumps to full scale, zero ohms, and remains there.

E. If the capacitor is Open or Shorted, it must be replaced.

⚠CAUTION: USE ONLY THE CORRECT PART NUMBER AND RATED CAPACITOR AS SPECIFIED ON THE PARTS LIST FOR THE SPECIFIED PART NUMBER CHARGER. THE USE OF A DIFFERENT PART NUMBER OR RATED CPACITOR MAY RESULT IN IMPROPER CHARGING, CAPACITOR FAILURE, TRANSFORMER BURNOUT, AND/OR BATTERY DAMAGE.

8. TESTING THE TRANSFORMER requires energizing the transformer primary with the

specified voltage and frequency AC power, and recording the AC voltage measured at the transformer secondary leads that connect to the diodes. This voltage is first measured with a good capacitor connected, and second, measured with the capacitor disconnected. Always test and verify the capacitor is good before performing transformer tests. All fuse links of the fuse assembly must test good and/or connect a jumper lead across the transformer leads connected to the fuse assembly.

⚠DANGER: HIGH VOLTAGE! WITH THE CHARGER OPERATING, THE CHARGER CAPACITOR IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.

A. Disconnect the transformer secondary coil leads (TAN SLEEVING) from the diode terminals. Attach the meter leads to these transformer leads and adjust the meter initially to an AC range of three (3) times the nominal DC voltage rating specified by the charger nameplate.

B. For personal safety, inspect and ensure that neither transformer lead has been accidentally allowed to short to any other component. Follow the instructions below to energize the transformer primary.

   Connect the DC plug to the charging receptacle and wait for the control relay to pull in with a click, three to five (3-5) seconds after connection. The transformer may now be energized by connecting the AC power supply cord to a live outlet while recording the voltage reading. Unplug after the reading is noted.

   ALTERNATELY, the relay contacts can be bypassed to enable transformer testing when the battery system is not present. Make up the necessary jumper leads (1 for 115 VAC; 2 for 230 VAC) with 3/16" (.187 in) wide flatblade, push in connectors on both ends of a 10 to 14-inch long piece of 14 gauge flexible wire. Carefully disconnect the AC cord lead and transformer primary lead from the control relay and connect the jumper lead to bypass the control relay. Connect the AC power supply cord to a live outlet while recording the voltage reading and unplug as soon as the reading is noted.

⚠CAUTION: DO NOT CHARGE BATTERIES WITH THE ELECTRONIC TIMER ASSEMBLY CONTROL RELAY BYPASSED. THE CHARGER WILL CONTINUE TO CHARGE AS LONG AS THE POWER SUPPLY CORD IS CONNECTED TO A LIVE OUTLET. SEVERE OVERCHARGING AND EVENTUAL DAMAGE TO BATTERIES WILL RESULT.

C. With the resonant capacitor connected, the AC voltage measured across the transformer secondary leads, while disconnected from the diodes, should read approximately two and one half (2.5) times the nominal DC voltage rating of the charger. With the resonant capacitor disconnected, the measured voltage should decrease to two thirds (2/3) of that measured with the capacitor connected. (Example: For a 36 VDC charger, 36 times 2.5 is 90 VAC with the capacitor connected, and 90 VAC times 2/3 is 60 VAC with the capacitor disconnected.) The voltage readings are approximate and transformer failure is indicated when the measured AC voltages are significantly LOWER than the calculated values.

   Due to no-load transformer instabilities and peculiar wave shapes, transformer secondary voltage readings made with the resonant capacitor connected can produce noticeably higher measurements. This is particularly true when using digital meters. Transformer failure is confirmed when the measured voltages are significantly lower than calculated.

9. CHARGER DC CIRCUIT TEST: Disconnect AC power cord and DC charger plug.

A. Set multimeter to low resistance scale R x 1.

B. Connect one lead of the ohmmeter or continuity tester to one of the DC charging plug contacts and the other to the remaining DC plug contacts and note the response. Reverse the test leads and note the response again. The circuit should be completed in one direction only.

NOTE: When using a very sensitive ohmmeter, disconnect the control cable assembly edge connector from the electronic timer kit.

C. If the circuit does not conduct in either direction and the fuses or fuse assembly test good, individually check the continuity of the DC output cord, ammeter, diodes, and all connections.

D. If the circuit conducts in both directions, a short exists in the charger's DC circuit. First, test the DC output cord for a short between the two wires. Second, test if one or more of the diodes has failed in the shorted mode.

10. Charger runs too long or does not turn off.

As a lead acid battery recharges, the depleted plate material converts to active material and the measured specific gravity of the electrolyte gradually increases. When no further depleted material converts to active material, the measured specific gravity ceases rising as the battery reaches its maximum state of charge. IF THE SPECIFIC GRAVITY READINGS OF SEVERAL CELLS DO NOT INCREASE IN THREE CONSECUTIVE READINGS TAKEN ONE HOUR APART WHILE THE CHARGER CONTINUES TO OPERATE, THE CHARGER IS OPERATING TOO LONG. TURN THE CHARGER OFF BY FIRST DISCONNECTING THE AC PLUG FROM ITS RECEPTACLE. The electronic timer and control relay are powered by the battery. With the AC plug disconnected from the AC outlet, disconnect the DC charging plug from the DC charging receptacle. With the DC charging plug disconnected, plug the AC power supply cord to the outlet and listen for the sound of transformer hum. If the transformer is heard to hum, then the control relay has failed to open and must be replaced.

Failure to turn off when no further increase in specific gravity is measured over three hours of continuous charging can be due to a failure of the electronic timer assembly, the control relay having stuck closed, or the GREEN sense lead of the control cable assembly having opened.

A. Disconnect the AC power supply cord and DC charging plug. Remove the cover and verify that the control cable assembly leads are securely connected in accordance with the correct wiring diagram for the specific model of charger.

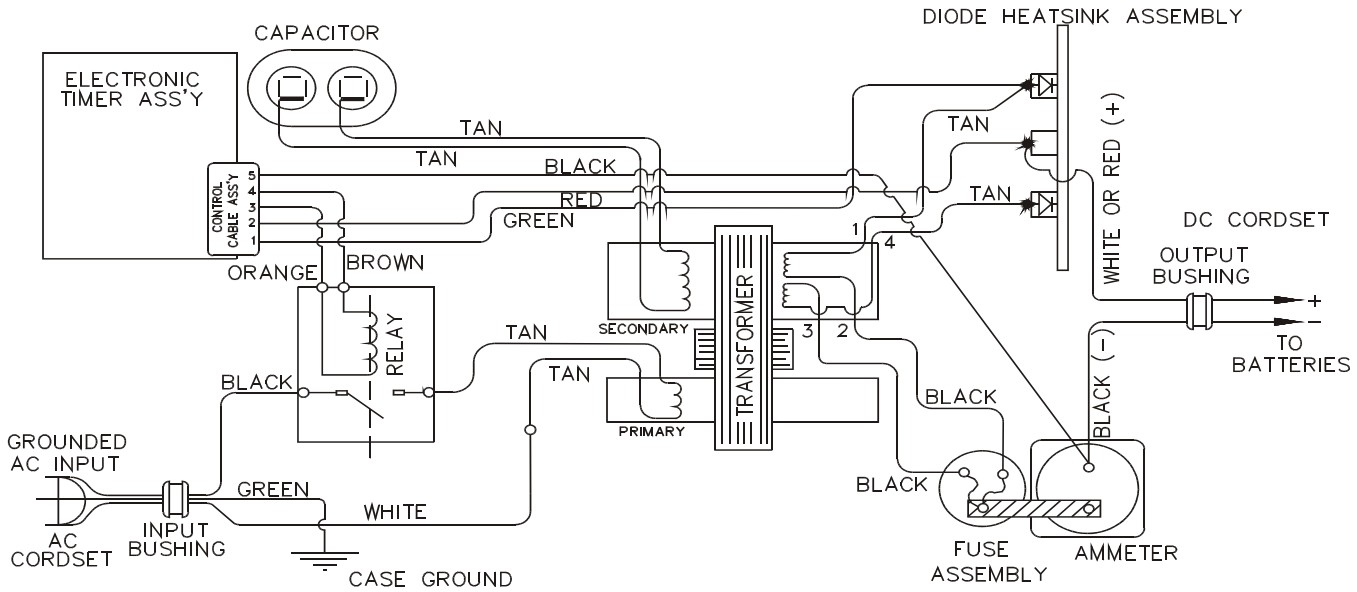
B. Test the continuity of the control cable assembly's GREEN sense lead. Measure between the electronic timer assembly connector contact and to where the GREEN sense lead connects to the diode terminal. If the circuit is open, replace the control cable assembly and retest. Replace the electronic timer assembly and retest if the GREEN sense lead demonstrates continuity.

11. The building AC line circuit breaker or fuse blows.

This condition can be caused by a charger problem, a "weak" fuse or circuit breaker protecting the circuit, or an overloaded circuit. If the building AC power fuse or circuit breaker blows, connect the charger to other outlets (on different circuits) in the building. If the charger operates properly on other circuits, have a qualified electrician check the original circuit. If the charger causes other fuses or circuit breakers (in the building) to blow, the charger should be checked for a problem.

If the charger causes AC fuses or circuit breakers to blow without the DC charging plug connected to the charging receptacle, replace the AC cordset and retest. If the AC fuses and circuit breakers blow only after the control relay inside the charger pulls in with a "click", then replace the transformer and retest.

WIRING DIAGRAM



PLEASE REFER TO THE SPECIFIC DIAGRAM IN THE OWNERS MANUAL.