
TROUBLESHOOTING GUIDE

LESTRONIC II BATTERY CHARGER

FOR MOTIVE POWER BATTERIES

PLEASE SAVE THESE IMPORTANT SAFETY AND OPERATING INSTRUCTIONS

For correct operation of the equipment, it is important to read and be familiar with this entire manual before installing and operating the charger.
DO NOT DISCARD THIS MANUAL AFTER READING.



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.

INTRODUCTION

The Lestronic II battery charger is designed to recharge deep-cycle, lead-acid batteries. A ferroresonant transformer is used to provide a highly reliable, line compensating unit with a minimum of moving parts, designed for long, trouble-free service. A patented electronic timer turns the charger on and off automatically. This electronic timer determines full charge of the batteries by measuring the rate at which the battery voltage increases during charge. When the voltage stops rising, the battery is fully charged and the charger turns off.

PROPER CARE OF MOTIVE POWER BATTERIES

Motive power batteries are subjected to severe deep cycle duty on a daily basis. Although these batteries are designed to withstand such duty, the following precautions must be observed to obtain good performance and maximum cycle life.

⚠ CAUTION: ALWAYS WEAR PROTECTIVE EYE SHIELDS AND CLOTHING WHEN WORKING WITH BATTERIES. BATTERIES CONTAIN ACIDS WHICH CAN CAUSE BODILY HARM. DO NOT PUT WRENCHES OR OTHER METAL OBJECTS ACROSS THE BATTERY TERMINAL OR BATTERY TOP. ARCING OR EXPLOSION OF THE BATTERY CAN RESULT.

1. When installing new batteries, be sure the polarity of each battery and overall battery pack is correct. Due to the electrical characteristics of this charger, it is possible to improperly hook up the batteries and not blow the fuse when charging. Battery and/or charger damage can result.
2. New batteries should be given a full charge before their first use because it is difficult to know how long the batteries have been stored.
3. Limit the use of new batteries for the first 20 cycles. New batteries and older batteries that have been in storage are not capable of their rated output until they have been discharged and charged a number of times.
4. Sulfation results when batteries in storage are not maintained in a charged, active state. Internal self-discharge can bring about the start of this condition in as little as three days in warm temperatures. Batteries allowed to sit unmaintained in storage self-discharge, sulfate to various degrees, and lose capacity. Repeated charging will generally result in the recovery of most of the battery's capacity, though some permanent loss can be expected.
5. **DO NOT EXCESSIVELY DISCHARGE THE BATTERIES.** Excessive discharge can cause polarity reversal of individual cells, resulting in

complete failure shortly thereafter. Heavily discharging (over 60%) new batteries before they have been broken in (approximately 20 cycles) can cause permanent cell damage, resulting in reduced energy capacity and shortened life.

6. Maintain the proper electrolyte level by adding water when necessary. Never allow the electrolyte level to fall below the top of the battery plates. Electrolyte levels fall during discharge and rise during charge. Therefore, to prevent the overflow of electrolyte when charging, it is mandatory that water be added to cells AFTER they have been fully charged; do not overfill. Old batteries require more frequent additions of water than do new batteries.
7. When the temperature falls below 65°F, the batteries should be placed on charge as soon after use as possible. Cold batteries require more time to fully recharge.
8. The tops of the batteries and battery hold-downs must be kept clean and dry at all times to prevent excessive self-discharge and flow of current between the battery posts and frame.
9. Follow all operating instructions, cautions, and warnings as specified in this manual, on the charger, and in your vehicle owner manual.

TROUBLESHOOTING GUIDE

To be able to use the troubleshooting guide safely and effectively, it is important to read this guide completely before beginning any tests.

⚠ 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 WARRANTY AND LESTER LIABILITY.

⚠ CAUTION: DO NOT DISASSEMBLE THE CHARGER. TAKE IT TO A QUALIFIED SERVICE AGENT WHEN SERVICE OR REPAIR IS REQUIRED. INCORRECT REASSEMBLY MAY RESULT IN RISK OF ELECTRIC SHOCK OR FIRE.

⚠ DANGER: HIGH VOLTAGE! WITH THE CHARGER ON, THE INTERNAL CHARGER CAPACITOR VOLTAGE IS APPROXIMATELY 650 VOLTS.

⚠ CAUTION: ALWAYS UNPLUG THE ELECTRICAL PLUGS FROM THE AC OUTLET

AND THE BATTERIES BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER.

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

The Lestronic II battery charger is a reliable, automatic charger designed for long, trouble-free service. If a malfunction should develop, identify the symptom and follow the associated test procedures.

SECTION	MALFUNCTION SYMPTOM
1	CHARGER DOES NOT TURN ON
	A. Relay does not close, no transformer hum, and ammeter does not register.
	B. Relay closes but no transformer hum and ammeter does not register.
	C. Relay closes and transformer hums but ammeter does not register.
	D. Electronic timer kit replacement instructions
2	CHARGER FUSE BLOWS
	A. Single fuse link blows.
	B. Both fuse links blow.
3	AMMETER READS 30 AMPS FOR MORE THAN 30 MINUTES
4	CHARGER OUTPUT IS LOW
5	CHARGER TURN OFF MALFUNCTIONS
	A. Charger turns off too soon.
	B. Charger does not turn off.
	C. Charger runs too long but <u>does</u> turn off.
6	AC LINE FUSE OR CIRCUIT BREAKER BLOWS
7	TRANSFORMER SHORT OR BURN-OUT

SECTION 1 – CHARGER DOES NOT TURN ON

In normal operation, the charger DC output connector must be connected to the batteries in order to turn the charger on. A time delay of two to five (2-5) seconds is provided to allow adequate time to make a secure connection before the charger turns on. After this time delay, the power relay closes and an audible "click" should be heard. When the relay closes, AC power is supplied to the transformer primary coil. If operating properly, the transformer should hum and the ammeter should indicate the charge rate. If the charger does not turn on properly, refer to Part A, B or C for specific test procedures.

Part A Relay does not close, no transformer hum, and ammeter does not register

Check to be sure the power supply cord is securely connected to a live outlet. Check the DC output connector and the battery connector for damage, dirt or corrosion that would prevent a good electrical connection.

⚠ WARNING: IF THE PLUG OR RECEPTACLE IS BROKEN, TWISTED, BENT OR LOOSE AND DOES NOT MAKE GOOD ELECTRICAL CONTACT, HAVE IT REPLACED BY A QUALIFIED SERVICE AGENT IMMEDIATELY. DO NOT USE THE CHARGER IN THIS CONDITION AS FIRE OR PERSONAL INJURY CAN RESULT.

Then disconnect the power supply cord from its outlet. With the DC output connector still connected to the battery connector, measure the voltage at the battery connector using a suitable DC voltmeter.

The voltage reading should be the same as the battery terminal voltage and must be 70% of the nominal rating of the battery pack. Example: 24VDC batteries need at least 16.8 VDC. If the DC voltage is within the above limits, remove the charger cover and verify that the charger is properly wired and you read the same voltage (24 to 50 VDC) inside the charger where the WHITE and BLACK wires of the DC cord attach. If the battery DC voltage measured inside the charger is now below the above limits or not present, the DC plug or cordset has an internal break and must be replaced. If the charger is wired correctly and a satisfactory battery DC voltage is measured inside the charger, a malfunction in the Electronic Timer Kit has probably occurred. Due to its complexity, do not attempt to make field repairs to any part of the Electronic Timer Kit. If a malfunction exists, simply remove the entire Electronic Timer Kit and replace it with a new one. Refer to Part D, "Electronic Timer Kit Replacement", for correct procedure.

The Electronic Timer Kit may be bypassed in order to verify that a malfunction exists. First disconnect the charger power supply cord from its outlet and the DC output connector from the battery connector. Place a jumper wire between terminals #1 and #3 to bypass the Electronic Timer Kit as shown in Figures 1 and 2.

The power supply cord is now connected directly to the primary transformer coil and the transformer should hum when the power supply cord is connected to a live outlet. The charger operation may be checked by first connecting the DC output connector to the battery connector, and then connecting the power supply cord to an outlet. If normal charging current is indicated on the ammeter, the Electronic Timer Kit is defective and must be replaced.

⚠ CAUTION: DO NOT CHARGE BATTERIES WITH THE ELECTRONIC TIMER KIT BYPASSED. THE CHARGER WILL REMAIN ON AS LONG AS THE POWER SUPPLY CORD IS CONNECTED TO AN OUTLET. SEVERE OVERCHARGING AND EVENTUAL DAMAGE TO BATTERIES WILL RESULT.

If the transformer does not hum and the ammeter still does not register with the Electronic Timer Kit bypassed, a continuity check of the charger AC circuit is necessary. Disconnect the power supply cord from its outlet and the DC output connector from the battery connector and, with a suitable continuity tester, check the circuit across the power supply cord prongs. With the Electronic Timer Kit bypassed, the CIRCUIT SHOULD BE COMPLETE. If the circuit is not complete, individually check the continuity of the power supply cord, primary transformer coil and all connections.

Part B Relay closes, but no transformer hum, and ammeter does not register

Check to be sure the power supply cord is securely connected to a live AC outlet. When three-prong to two-prong adapters are used, they tend to work loose, resulting in a poor connection. Check the AC line fuse or circuit breaker and, if possible, measure the AC line voltage at the outlet to be sure AC power is present. If necessary, connect a functioning charger, utility light, or other electrical appliance to the outlet to verify the presence of AC power.

If AC power is present, disconnect the power supply cord from its outlet and the DC output connector from the battery connector. Bypass the Electronic Timer Kit as described in Section 1, Part A, and with a suitable continuity tester, check the circuit across the power supply cord prongs. With the Electronic Timer Kit bypassed, the CIRCUIT SHOULD BE COMPLETE. If the circuit is complete, refer to the Wiring Diagram and check the relay wiring and all connections. If the circuit is not complete, check the wiring of the power supply cord, transformer primary coil leads, and the Electronic Timer Kit. If the charger is wired correctly, individually check the continuity of the power supply cord, transformer primary and relay.

Part C Relay closes, and transformer hums, but ammeter does not register

If the relay closes and the transformer hums, the charger AC circuit and Electronic Timer Kit are functioning properly. If the ammeter does not register, a fault in the charger DC circuit exists and a continuity check must be performed. Disconnect the power supply cord from its outlet and the DC output connector from the battery connector, and check the charger fuse. If a fuse link is blown, refer to Section 2, "Charger Fuse Blows", for further tests. If the fuse checks good, use a low voltage continuity tester to perform the following tests:

1. Connect the tester leads to the charger DC output connector and note the readings. Reverse the tester leads and check the output connector again. The circuit should be complete in only one direction. If the circuit does not conduct in either direction and the fuse is good,

individually check the continuity of the DC output cord, ammeter, diodes, and all connections. If the circuit conducts in both directions, a "short" exists in the charger DC circuit. First check the DC output cord for a "short" between the two wires. It is more likely that one or both diodes have "shorted". Refer to Section 2, "Charger Fuse Blows", for continuity test of diodes.

2. If the charger DC circuit test is good, a check of the capacitor is necessary. Disconnect the power supply cord from its outlet and the DC output connector from the battery connector. Then disconnect both transformer coil leads from the capacitor terminals. Use care when disconnecting the capacitor leads so the wires do not break. Using an ohmmeter, set the scale to $R \times 10K$ ohms and test the capacitor as follows:

GOOD CAPACITOR When the ohmmeter leads are connected to the capacitor terminals, the meter needle jumps to mid-scale and rapidly moves to higher resistance (:)

OPEN CAPACITOR When the ohmmeter leads are connected to the capacitor terminals, 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".

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

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

⚠ CAUTION: USE ONLY THE PROPERLY RATED CAPACITOR FOR REPLACEMENT. THE USE OF A DIFFERENT VALUE CAPACITOR MAY RESULT IN IMPROPER CHARGING, CAPACITOR FAILURE, TRANSFORMER BURN-OUT, AND/OR BATTERY DAMAGE.

3. If the charger DC circuit and capacitor check good, a test of the transformer is necessary. Refer to Section 7, "Transformer Short or Burn-out" for test procedures.

Part D Electronic Timer Kit replacement

The Electronic Timer Kit should always be replaced as a complete assembly. The tools required are a Phillips head screwdriver, 3/8" and 11/32" wrenches, and pliers. No soldering is required. To replace the kit, follow the step-by-step procedures listed below.

1. Disconnect the charger power supply cord from its outlet and the DC output connector from the

battery connector, and remove the charger cover.

2. Disconnect the GREEN (if included), BLACK and RED wires of the Electronic Timer Kit. Then remove the BLACK and WHITE leads of the power supply cord and both primary transformer coil leads from the Electronic Timer Kit terminal tabs. The Kit can be removed by removing the three mounting screws on the charger front panel. Save all hardware for reassembly.
3. Install the replacement Electronic Timer Kit by reversing the disassembly procedures described in Step 2. When reconnecting the wires to the Electronic Timer Kit terminal tabs, support the terminal board to prevent damage to the electronic circuit board. Connect either transformer primary lead to terminal #2, and the remaining primary lead to terminal #3.

Connect the BLACK lead of the power supply cord to terminal #1 on the Electronic Timer Kit and the WHITE lead of the power supply cord to terminal #2.

Connect the RED wire of the Electronic Timer Kit along with the WHITE or RED lead of the DC cord to the Heatsink Assembly. Connect the BLACK wire of the Electronic Timer Kit along with the BLACK lead of the DC cord to the ammeter post. Do not allow the ammeter post to turn when tightening the nut. Reconnect the GREEN wire of the Electronic Timer Kit along with the transformer secondary lead to the diode lead terminal (if included).

⚠ CAUTION: BE SURE ALL CONNECTIONS ARE CLEAN AND TIGHT. ALSO CHECK TO BE SURE ALL WIRES AND TERMINALS ARE POSITIONED SO THEY DO NOT SHORT TOGETHER OR TO THE CHARGER CASE.

4. Replace the charger cover and check the Electronic Timer Kit for proper operation as follows:
 - a. With the DC output connector disconnected from the battery connector, insert the power supply cord into an outlet. The relay on the Electronic Timer Kit should not close. A DC voltmeter connected across the DC output connector should indicate zero volts.
 - b. Disconnect the power supply cord from its outlet and connect the DC output connector to the battery connector. The relay on the Electronic Timer Kit should close with an audible "click" after a two to five (2-5) second delay.
 - c. If the Electronic Timer Kit does not operate as (a) and (b) above, refer to the wiring diagram and check to be sure the charger is

wired correctly. If the Electronic Timer Kit operates properly, the charger is ready for use. Always monitor the first charge cycle to verify that the charger is turning off properly.

SECTION 2 – CHARGER FUSE BLOWS

The charger fuse assembly consists of a dual element fuse link under a transparent cover mounted on the charger front panel. Each fuse element is electrically connected in series with a rectifier diode to provide protection for the transformer in the event of a diode failure. Visually inspect and electrically test the fuse to determine if one or both fuse links are blown and refer to Part A or Part B for test procedures. **Locate and correct cause of trouble before replacing blown fuse.** DO NOT attempt to repair the fuse link as inadequate protection will result.

Part A Single fuse link blows

This condition is normally caused by a short circuit failure of one diode. The fuse link will blow when the charger DC output connector is connected to the battery connector, regardless of whether the power supply cord is connected to an outlet. To check the diodes, disconnect the power supply cord from its outlet and the DC output connector from the battery connector, and then disconnect one transformer secondary coil lead from the diode terminal. Using a low voltage continuity tester, connect one tester lead to the diode mounting plate and the other tester lead to a diode terminal.

Note the reading, then reverse the tester leads, and check each diode again. If a diode conducts current in both directions, it is "shorted" and the complete Heatsink Assembly with Diodes must be replaced.

Part B Both fuse links blow

This is normally caused by a reverse polarity connection between the charger DC output connector and the battery connector. Check the battery pack and battery connector to be sure they are wired in the correct polarity. If possible, check the voltage and polarity at the battery connector with a DC voltmeter. Also, check the charger DC output connector for the correct polarity. The WHITE or RED wire should be connected to the positive (+) contact, and the BLACK wire to the negative (-) contact. If a reverse polarity connection is made between the charger and batteries, both fuse links will blow regardless of whether the power supply cord is connected to an outlet.

SECTION 3 – AMMETER READS 30 AMPS FOR MORE THAN 30 MINUTES

This high output condition is caused by misuse, connecting the charger to an incorrect battery system which is lower than what is rated for the charger. A common error is to install one or more of the batteries in a battery pack reverse polarity.

Using a suitable DC voltmeter, test to be sure all batteries in a battery pack are correctly wired, and also test the battery pack voltage at the charging connector. After charging for 30 minutes at this excessive rate, the measured on-charge voltage should rise to 34 to 38 volts DC for a 36-volt system. While charging, voltage measurements lower than this indicate an incorrect or failed battery pack that must be corrected before using the charger.

⚠ CAUTION: DO NOT CONNECT THE CHARGER TO BATTERY PACKS WHICH ARE NOT RATED FOR THE CHARGER. THIS MISUSE WILL CAUSE OVERHEATING AND TRANSFORMER BURN-OUT WILL RESULT.

SECTION 4 – CHARGER OUTPUT IS LOW

The most probable cause of low output is a single fuse link blowing as a result of a short circuit failure of one diode. Refer to Section 2, "Charger Fuse Blows", for troubleshooting procedures. On rare occasions, a short circuit failure of the transformer coils may cause the output to be low. Refer to Section 7, "Transformer Short or Burn-out", for test procedures.

Another failure that could cause low output is an open diode on the heatsink assembly. To check for an open diode, follow the procedures in "Section 2 – CHARGER FUSE BLOWS, Part A Single fuse link blows" and test the continuity of both diodes. An open diode will not have continuity in either direction.

⚠ 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.

SECTION 5 – CHARGER TURN-OFF MALFUNCTIONS

The Electronic Timer Kit turns the charger off as well as on. Proper charge time is determined by many factors, but the main elements are: (1) battery size, (2) depth of battery discharge, and (3) finish charge rate. Large, severely discharged batteries require more time to reach full charge than do smaller, lightly discharged batteries.

The charge rate, as indicated by current flow in amperes on the panel meter, is controlled by the batteries' rising voltage during charge. The higher the on-charge voltage will rise, the lower the finish charge will be before the Electronic Timer terminates charging.

THE FOLLOWING TIMER MALFUNCTIONS ARE OCCASIONALLY DUE TO FACTORS OTHER THAN THE CHARGER'S PERFORMANCE. TO HELP ISOLATE THE PROBLEM, IT IS OFTEN

NECESSARY TO USE THE CHARGER ON A DIFFERENT SET OF BATTERIES AND THE ORIGINAL SET OF BATTERIES ON ANOTHER CHARGER.

Part A Charger turns off too soon

Check to be sure the power supply cord is securely connected to a live outlet. If the power supply outlet is live, proceed with the next step.

To determine if the charger did shut off too soon, disconnect and reconnect the charger DC output connector. This will restart the charger. Observe charger output on the ammeter.

1. The ammeter needle jumps smartly to between 20 and 25 amps and then tapers below 14 amps within 15 minutes. This indicates that the batteries were truly charged. The apparent short charging time is in response to the batteries' ability to accept charge and the electronic timer is performing properly.
2. The ammeter needle jumps smartly to between 20 and 25 amps, but does not taper below 14 amps within 15 minutes. If the batteries have been properly maintained and charged regularly, this generally indicates that the batteries were not fully charged. If possible, use a hydrometer to check the specific gravity of several battery cells. If the specific gravity readings are more than 30 points (.030) lower than normal full charge readings, the electronic timer has malfunctioned and the complete Electronic Timer Kit must be replaced. Refer to Section 1, Part D, "Electronic Timer Replacement", for correct procedure.

If the batteries have not been used or charged regularly, they may be sulfated and will not produce their full capacity. Repeated cycles (at least 5) of a light discharge, followed by a full charge, will generally result in the recovery of most of the battery's capacity. Do not interpret this reduced battery capacity as being caused by the charger's turning off too soon. The charger is working properly if, after several charge cycles, the battery capacity increases to near normal. Sulfation occurs most often when the batteries have been stored without weekly charging. New batteries may also be sulfated due to extended shipment or storage time prior to sale.

As batteries age, individual cells may weaken, causing a reduction in battery capacity. This condition normally results in a finish charge rate higher than 10 amps and less time is required to fully charge the batteries. Do not interpret this shorter charging time and reduced battery capacity as being caused by the charger's turning off too soon. The battery is aging naturally and the charger is working properly.

When the batteries will not longer perform as required, they should be replaced.

Part B Charger does not turn off

New batteries with all good cells should rise to at least 2.5 volts per cell. This will allow the finish charge rate to taper below 8 amperes. As batteries age, individual cells may weaken and these cells may not reach 2.5 volts. This will result in finish charge rates greater than 8 amperes, and less time will be required for the batteries to reach full charge. At a finish charge rate of 8 amperes or less, the charge time should not exceed 18 hours. At a finish charge rate greater than 8 amperes, the charge time should not exceed 14 hours.

If the charger remains on longer than the specified maximum time, check to see if the charger turns on immediately when the DC output cord is connected without the normal two to five (2-5) second delay. If the charger turns on instantly without the 2-5 second delay, the Electronic Timer Kit has probably failed. This type of malfunction generally results in the charger not turning off and the complete Electronic Timer Kit must be replaced. Refer to Section 1, Part D, "Electronic Timer Kit Replacement", for correct procedures.

If the charger remains on longer than the maximum time specified and the two to five (2-5) second delay is present, verify that the GREEN wire from the Electronic Timer Kit and the secondary transformer coil lead are securely connected to the diode lead. (Not all Electronic Timer Kits will have a GREEN wire.) The charger will NOT turn off if the GREEN wire is loose or disconnected. If the GREEN wire is securely connected, the Electronic Timer Kit has malfunctioned and the complete Electronic Timer Kit must be replaced.

If a precision digital type DC voltmeter is available, a test to verify that the Electronic Timer has malfunctioned can be made. Connect the charger to the batteries and allow to charge normally. After the charge rate has tapered to its lowest point, measure the battery terminal voltage using a DC voltmeter capable of reading in increments of .001 volts. Continue charging and check the battery voltage reading every hour. If the battery voltage increases less than .012 volts, or if the battery voltage decreases between successive hourly readings, the charger should turn off. If the charger does not turn off, the Electronic Timer has malfunctioned and the complete Electronic Timer Kit must be replaced.

Part C Charger runs too long but does turn off

In the event of AC power interruption when the charger is on, the charger will automatically restart when AC power is restored. This power outage can make the apparent charge time seem longer than the actual charge time. To check for AC power

interruptions, plug an electric clock into the same outlet to which the AC cord is connected. Charge normally and note any time difference between the test clock time and the actual time.

SECTION 6 – AC LINE FUSE OR CIRCUIT BREAKER BLOWS

If this occurs when the charger power supply cord is connected to an outlet, without the DC output connector connected to the battery connector, the charger power supply cord may be shorted. Disconnect the power supply cord from its outlet and the DC output connector from the battery connector, then check to be sure the Electronic Timer Kit is NOT bypassed. With a suitable continuity tester, check the circuit across the power supply cord prongs. **THE CIRCUIT SHOULD NOT BE COMPLETE.** If the circuit is complete, check the relay contacts to be sure they are open and have not welded closed. If the relay contacts are open, the power supply cord is shorted and must be replaced.

If the power supply cord checks good, the transformer coils may be shorted. Refer to Section 7, "Transformer Short or Burn-out", for test procedures.

SECTION 7 – TRANSFORMER SHORT OR BURN-OUT

Failure of the transformer can be the result of natural aging, premature shorting of adjacent coil turns or overheating damage. The most common cause of transformer overheating and premature burn-out is the result of misuse, connecting the charger to a battery system of lower voltage than specified on the charger (see Section 3). Darkening of all the transformer secondary coil windings is an indication of possible overheating damage. A low or complete lack of output would be observed on the ammeter; however, the transformer may hum or the AC line fuse or circuit breaker may blow when the charger is turned on. To test the transformer, disconnect the power supply cord from its outlet and the DC output connector from the battery connector. Then disconnect the transformer secondary coil leads #1 and #4 from the diode terminals and disconnect the transformer capacitor coil leads from the capacitor terminals. Use care when disconnecting the capacitor lead so the wires do not break.

 DANGER: HIGH VOLTAGE! WITH THE CHARGER OPERATING, THE CHARGER CAPACITOR VOLTAGE IS APPROXIMATELY 650

VOLTS AC. USE EXTREME CAUTION WHEN WORKING NEAR THE CAPACITOR TERMINALS.

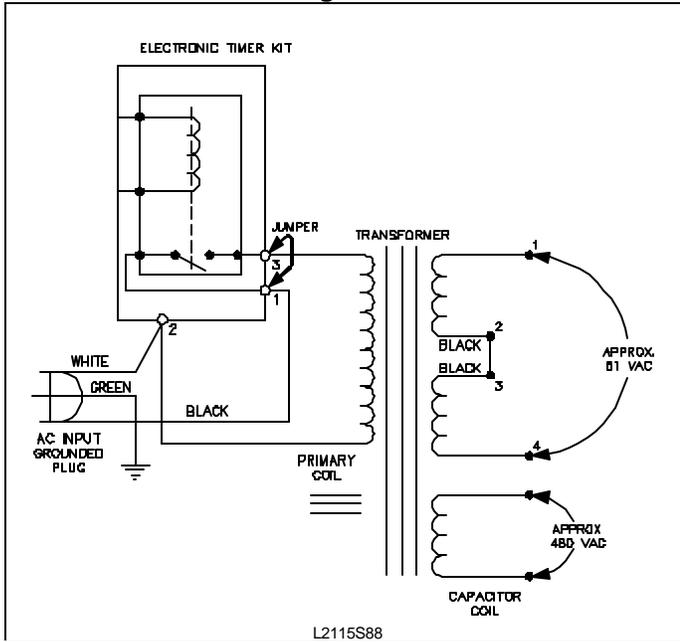
In order to apply AC power directly to the transformer primary coil, the Electronic Timer Kit must be bypassed. Refer to Section 1, Part A, for bypass procedures. With the Electronic Timer Kit bypassed and taking care of personal safety, connect the power supply cord to an outlet. If the AC line fuse or circuit breaker blows, the transformer is shorted internally and must be replaced. If this does not occur, check the transformer secondary and capacitor coil voltages (Figure 1), using a suitable AC voltmeter. If the measured voltages are substantially lower than those shown, the transformer is shorted internally and must be replaced.

If the transformer secondary coil voltage and capacitor coil voltage check good, disconnect the power supply cord from its outlet. Check the capacitor for correct rating, and then carefully reconnect the capacitor coil leads to the capacitor terminals. Then, taking care for personal safety, reconnect the power supply cord to an outlet and measure the transformer secondary voltage again. The correct voltage reading for a 36 VDC charger is shown in Figure 2. If the transformer secondary voltage is the same as measured with the capacitor disconnected, the capacitor may be opened, the capacitor coil may be open, or the capacitor coil terminals may not be making proper electrical contact. Refer to Section 1, Part C, Item 2, for capacitor test procedures. If the voltage readings are correct, both the transformer and capacitor are good, refer to Section 1, Part C, Item 1, for further tests of the DC circuit.

If it should become necessary to replace a terminal on one of the transformer leads, the new terminal must be crimped AND soldered. NOTE: Some transformer leads may be aluminum wire and a solder must be used on these wires that is intended for use on aluminum, such as Alcoa #807 solder with Alcoa #69 flux. If these materials are not available locally, contact the Lester factory.

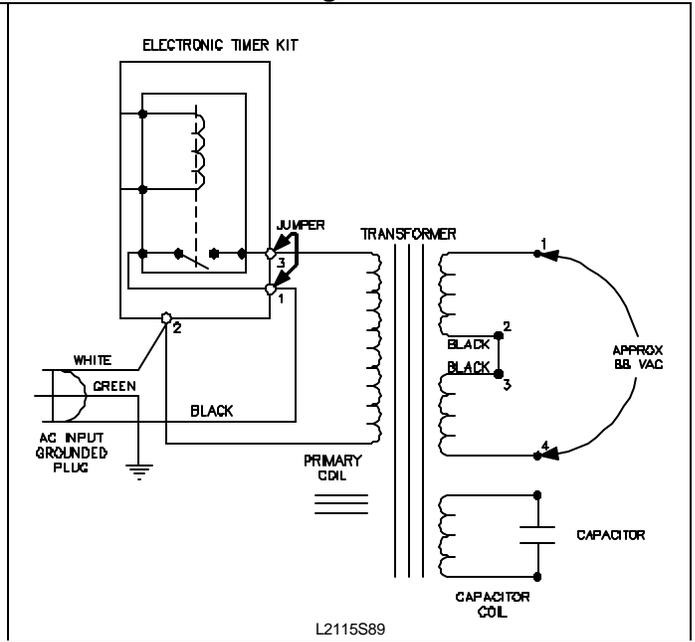
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Figure 1



Transformer Coil Voltage Test
36 Volt Charger (Without Capacitor)

Figure 2



Transformer Coil Voltage Test
36 Volt Charger (With Capacitor)

TEST RESULTS FOR OTHER BATTERY VOLTAGE RANGES

- 12 VDC: 27 – 33 VAC
- 24 VDC: 54 – 66 VAC
- 48 VDC: 110 – 130 VAC

WIRING DIAGRAM

