

Lester Electrical

TROUBLESHOOTING, REPAIR, AND REPLACEMENT GUIDE FOR MODEL #19300 BATTERY CHARGER

PLEASE SAVE THESE IMPORTANT SAFETY 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.

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INTRODUCTION

This battery charger is designed to recharge deep-cycle, wet lead-acid batteries. A ferroresonant transformer is used to provide a highly reliable, AC line voltage-compensating unit with a minimum of moving parts, designed for long, trouble-free service. An electronic charge controller turns the charger on and off automatically. This controller determines full charge of the batteries by measuring the rate at which the battery voltage increases. When the battery is fully charged, 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 hook up the batteries improperly 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. 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.
3. Limit the use of new batteries for the first 20 cycles until they have been broken in. Heavily discharging (over 60%) new batteries before they have been broken in can cause permanent cell damage, resulting in reduced energy capacity and shortened life.
4. DO NOT EXCESSIVELY DISCHARGE THE BATTERIES. Excessive discharge can cause polarity reversal of individual cells resulting in complete failure shortly thereafter.
5. Maintain the proper electrolyte level by adding water when necessary. Distilled or de-ionized water is free of contaminants and preferred for this use. Never allow the electrolyte level to fall below the top of the battery plates. Electrolyte levels lower 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.
6. Hard crystalline sulfates form 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 will self-discharge, sulfate to various degrees and lose capacity. Repeated charging without using the batteries between charges can recover some of the lost power, range, and life, but some permanent loss should be expected.
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. Electrolyte spilled on the batteries never dries or evaporates.
9. All connections to batteries that are bolted must be maintained clean and tight. Due to heating and vibration, bolted connections may loosen over time. Re-tighten the connections twice yearly to the manufacturer's specified torque.
10. Follow all operating instructions, cautions, and warnings as specified in this manual, on the charger, and in your vehicle owner's 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.

⚠ DANGER: HIGH VOLTAGE! WITH THE CHARGER ON, THE INTERNAL CHARGER CAPACITOR VOLTAGE IS APPROXIMATELY 660 VOLTS.

⚠ CAUTION: ALWAYS UNPLUG THE AC AND DC CORDS 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.

This 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
1A	Relay does not close, no transformer hum, and ammeter does not register.
1B	Relay closes but no transformer hum and ammeter does not register.
1C	Relay closes and transformer hums but ammeter does not register.
2	CHARGER FUSE BLOWS
2A	Single fuse link blows.
2B	Both fuse links blow.
3	AMMETER READS 25 AMPS FOR MORE THAN 30 MINUTES
4	CHARGER OUTPUT IS LOW
5	CHARGER TURN-OFF MALFUNCTIONS
5A	Charger turns off too soon.
5B	Charger does not turn off.
5C	Charger runs too long but <u>does</u> turn off.
6	AC LINE FUSE OR CIRCUIT BREAKER BLOWS

1. CHARGER DOES NOT TURN ON

In normal operation, the charger DC output plug must be connected to the batteries and the AC input cord must be connected to a live power source in order to turn the charger on. A time delay of three to five (3-5) 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 SECTION 1A, 1B, or 1C.

1A. Relay does not close, no transformer hum, and ammeter does not register

Start by checking to be sure the charger's AC input cord is connected to a live outlet. Disconnect the AC input cord from the outlet and either plug another device into the power outlet to verify its operation or measure the voltage at the outlet. If there is no voltage, check the circuit breaker or fuse for that outlet.

Also check the DC output plug and inspect the battery receptacle 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.

Disconnect the AC input cord from its outlet and the DC output plug from its receptacle. Measure the DC voltage at the battery and at the battery receptacle using a suitable multi-meter. The voltage reading should be the same and must be a minimum of 5 volts for the charger to turn on. If there is no voltage reading at the receptacle, then a problem exists in the wiring harness between the battery and the receptacle. Other things that could possibly prevent the charger from starting:

- Defective AC input or DC output cord on the charger
- Loose wiring connection in the charging circuit
- Defective electronic charge controller
- Transformer problem

Refer to the Component Test Procedures in the next section to check each of these potential issues.

1B. Relay closes, but no transformer hum, and ammeter does not register

If the relay is closing, then the electronic charge controller is sensing both AC and DC voltages indicating that the AC input and DC output cords are wired properly. Things that could possibly prevent the charger from starting:

- Loose wiring connection in the charger
- Transformer problem

Refer to the Component Test Procedures in the next section to check each of these potential issues.

1C. Relay closes, and transformer hums, but ammeter does not register

If the relay closes and the transformer hums, the charger AC circuit and electronic charge controller are functioning properly. If the ammeter does not register, a problem could exist with the following components:

- Loose wiring connection in the charger
- Ammeter failure
- Capacitor problem
- Open diode
- Blown fuse
- Transformer problem

Refer to the Component Test Procedures in the next section to check each of these potential issues.

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 SECTION 2A or 2B. **Locate and correct cause of trouble before replacing blown fuse.** Do NOT attempt to repair the fuse link, as inadequate protection will result.

2A. 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 plug is connected to the battery receptacle, regardless of whether the AC input cord is connected to an outlet. To check the diodes, refer to “Diode Assembly Testing” SECTION 9.

2B. Both fuse links blow

This is normally caused by a reverse polarity connection between the charger DC output plug and the battery receptacle. Check the battery pack and battery receptacle to be sure they are wired in the correct polarity. If possible, check the voltage and polarity at the battery posts with a DC voltmeter. Also, check the battery receptacle for the correct polarity. The WHITE 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 AC input cord is connected to an outlet. Reverse polarity connection may also stress and damage the diodes and affect the ammeter accuracy due to the large amount of current flow that occurs in this situation.

3. AMMETER READS 25 AMPS FOR MORE THAN 30 MINUTES

This high output condition is caused by misuse, connecting the charger to an incorrect battery system that 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 the battery pack are correctly wired, and also test the battery pack voltage at the battery receptacle. After charging for 30 minutes at this excessive rate, the measured on-charge voltage should rise to 34 volts DC or higher for a 36-volt system. While charging, voltage measurements lower than this indicates 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.

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 Item 2, "Charger Fuse Blows", for troubleshooting procedures. Other possible problems which might cause the output to be low are the following:

- Short circuit failure of a transformer coil
- Loose wiring connection in the charging circuit
- Capacitor problem
- Open diode

Refer to Component Test Procedure section to check each of these potential issues.

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

5. CHARGER TURN-OFF MALFUNCTIONS

The electronic charge controller 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 ammeter, 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 charge controller terminates charging.

THE FOLLOWING CONTROLLER MALFUNCTIONS ARE OCCASIONALLY DUE TO FACTORS OTHER THAN THE CHARGER'S PERFORMANCE, REFER TO SECTION 5A, 5B OR 5C. 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.

5A. Charger turns off too soon

Check to be sure the AC input cord is securely connected to a live outlet. To determine if the charger did shut off too soon, disconnect and reconnect the charger DC output plug. This will restart the charger. Observe charger output on the ammeter.

1. The ammeter needle jumps smartly to between 18 and 22 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 charge controller is performing properly.
2. The ammeter needle jumps smartly to between 18 and 22 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 charge controller must be replaced. Refer to Replacement Procedures section of this manual

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 no longer perform as required, they should be replaced.

5B. 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 6 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 6 amperes, and less time will be required for the batteries to reach full charge. Regardless of the finish charge rate, the electronic charge controller should turn the charger off at a maximum of 16 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 three to five (3-5) second delay. If the charger turns on instantly without the 3-5 second delay, the electronic charge controller has probably failed. This type of malfunction generally results in the charger not turning off. Refer to Component Test Procedures section to check the electronic charge controller for proper operation.

5C. 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, which has a maximum run time of 16 hours. To check for AC power interruptions, plug an electric clock into the same outlet to which the AC input cord is connected. Charge normally and note any time difference between the test clock time and the actual time.

Charge time on new batteries will generally run longer as the internal chemistry of the battery continues to change during its break-in period of about 20 cycles. During this period heavy gassing from the battery is normal.

6 AC LINE FUSE OR CIRCUIT BREAKER BLOWS

If this occurs when the charger AC input cord is connected to an outlet, without the DC output plug connected to the battery receptacle, the charger's AC input cord may be shorted. If this occurs just as the electronic charge controller's relay closes, a shorted transformer primary coil could cause this to occur. Refer to the Component Test Procedures section to check each of these potential issues.

COMPONENT TEST PROCEDURES

To be able to use these component test procedures 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.

⚠DANGER: HIGH VOLTAGE! WITH THE CHARGER ON, THE INTERNAL CHARGER CAPACITOR VOLTAGE IS APPROXIMATELY 660 VOLTS.

⚠CAUTION: ALWAYS UNPLUG THE AC AND DC CORDS 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.

This battery charger is a reliable, automatic charger designed for long, trouble-free service. If a component requires testing, identify the symptom and follow the associated test procedures.

SECTION	COMPONENT TESTING PROCEDURES
7	ELECTRONIC CHARGE CONTROLLER TESTING
7A	Relay Not Closing.
7B	Not Turning Off.
8	TRANSFORMER TESTING
9	DIODE ASSEMBLY TESTING
10	CAPACITOR TESTING
11	AC INPUT CIRCUIT TESTING
12	DC OUTPUT CIRCUIT TESTING

7. ELECTRONIC CHARGE CONTROLLER TESTING

The electronic charge controller is used to start and stop each charge cycle. It is designed to sense both the AC input and DC battery pack voltages. When each of these is present, the controller will connect the AC input to the transformer primary by closing the relay contacts. When the controller senses that the battery pack is fully charged, it will open the relay contacts thus terminating the charge cycle.

If the electronic charge controller is suspect of being bad after going through the Troubleshooting Guide in the previous section, there are several tests in SECTION 7A and 7B which can be performed to verify its operation. Remove the cover on the charger to conduct each of these tests.

⚠DANGER: HAZARD OF ELECTRICAL SHOCK. ONLY QUALIFIED PERSONNEL WHO ARE KNOWLEDGABLE IN ELECTRICAL SAFETY PRECAUTIONS ARE TO TEST EQUIPMENT WHILE ENERGIZED!

7A. Relay Not Closing

Connect the AC input cord to a live outlet and DC output plug to the battery receptacle. Using an appropriate multi-meter, set it to measure AC volts on a scale large enough to measure 120 VAC. Place the two meter probes across point A (screw head) and B (dual QD terminal) as shown in Figure. 7A. If normal AC voltage is present, the AC input circuit is connected properly.



Figure 7A



Figure 7B

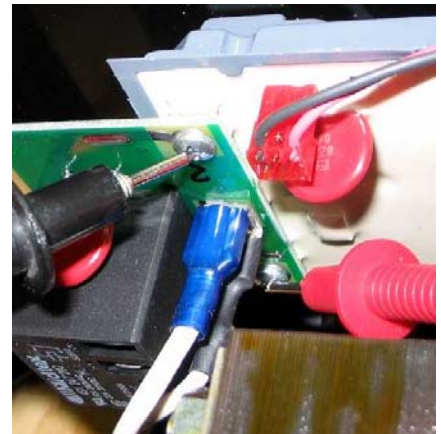


Figure 7C

Adjust the multi-meter to measure DC voltage and place the test probes at the wire harness connector on the electronic charge controller as shown in Figure 7B. The voltage measured should be the same as the battery voltage pack. If the correct DC voltage is present, the DC output circuit is connected properly. If not, check the connections at the battery receptacle, the plug sense contact and sense wire, the controller wire harness, the diode assembly, and at the ammeter.

If both the AC and DC voltages are present on the electronic controller and the charger still will not start then check to make sure the screws holding the relay board assembly to the potted electronic board are tight. A loose connection on these screws will prevent the charger from starting. With the multi-meter adjusted to measure 120 volts AC, place the test probes across points A (top screw head) and C (bottom screw head) as shown in Figure 7C. If input line voltage is not present after the five-second delay time, the electronics have malfunctioned and the electronic charger controller will have to be replaced. If input line voltage is present, then the relay board assembly has failed and will have to be replaced.

Bypassing the electronic charge controller

The electronic charge controller may be bypassed in order to verify that a malfunction exists with the controller. Disconnect the charger's AC input cord from its outlet and the DC output plug from the battery receptacle. Find the white wire from the transformer which attaches to the NO terminal and the black AC input cord wire which attaches to the COM terminal on the relay. Remove these two wires from the relay and connect them directly to each other as shown in Figure 7D and 7E. We suggest that you fabricate a 14-gauge wire, three inches long, that has 1/4 inch quick disconnect male terminals crimped and soldered onto both ends.

⚠ CAUTION: NEVER 'ROCK' OR 'WALK' THESE TERMINALS TO GET THEM ON OR OFF OF THE RELAYS. USE A 'DIRECT' IN/OUT MOTION WHEN INSTALLING AND REMOVING THESE TERMINALS.

The goal is to minimize widening or spreading of the 'curl' of the female terminal that reduces the clamping strength and area of surface contact with the blade in the relay. Use large needle-nose pliers or similar tool that you feel comfortably in control of to remove and install these quick disconnect terminals from the relay blades.

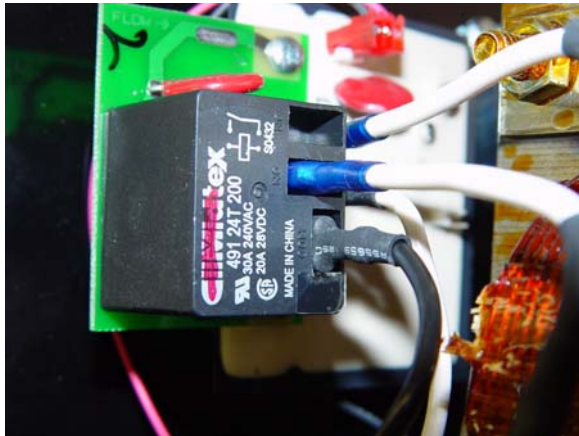


Figure 7D

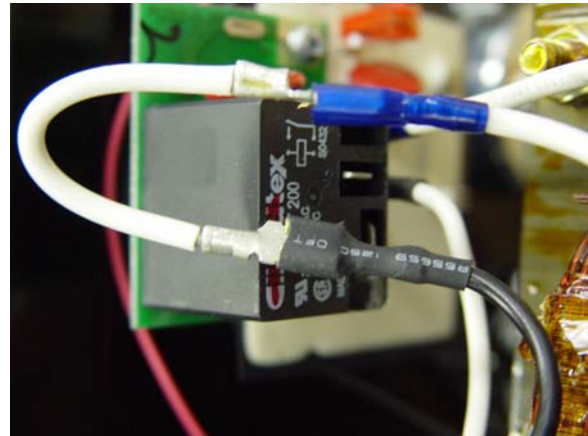


Figure 7E

The charger operation may be checked by first connecting the DC output plug to the battery receptacle, and then connecting the AC input cord to a live outlet. If the transformer hums and normal charging current is indicated on the ammeter, the electronic charge controller is defective and must be replaced.

⚠ CAUTION: DO NOT CHARGE BATTERIES WITH THE ELECTRONIC CHARGE CONTROLLER BYPASSED. THE CHARGER WILL REMAIN ON AS LONG AS THE AC INPUT CORD IS CONNECTED TO A LIVE OUTLET. SEVERE OVERCHARGING AND EVENTUAL DAMAGE TO BATTERIES WILL RESULT.

7B. Not Turning Off

The electronic charge controller has a built in maximum timer, which will turn the charger off if it has run for 16 hours. The actual time may be longer than this if the AC input voltage has been off during part of a charge cycle. Connect the AC input cord to a live outlet, then check to see if the charger turns on immediately without the normal three to five (3-5) second delay when the DC output cord is connected. If the charger turns on instantly, the electronic charge controller relay contacts have probably failed closed. This type of malfunction results in the charger not turning off.

⚠ CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES BEFORE YOU PERFORM THIS TEST.

Remove the Phillips screws that retain the cover, and then remove the cover. Remove the two screws that hold the controller to the enclosure. Stuck relay contacts may open if jarred, so gently move the controller to access the points as shown in Figures 7F and 7G. With a multi-meter set to measure resistance, measure across the relay contacts as shown in Figure 7F. If there is continuity, the contacts have welded closed and the relay board assembly will need to be replaced. If the meter shows an open circuit, measure the resistance of the relay coil as shown in Figure 7G. Normal resistance reading will be between 2,000 and 3,500 ohms. If the measured resistance displays an open, low reading, or short circuit, the relay coil has failed and the controller will need to be replaced.

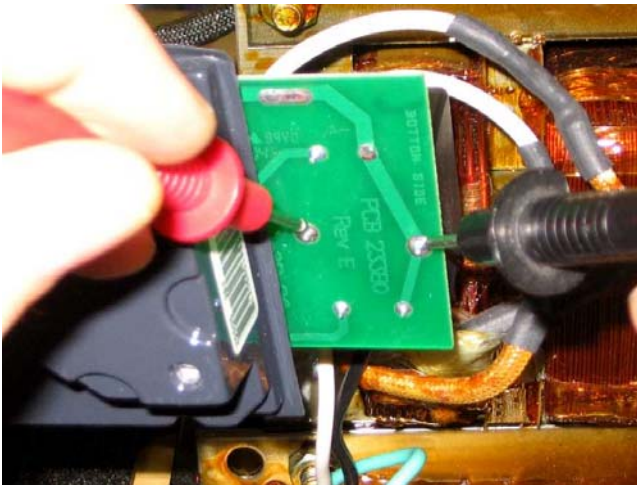


Figure 7F

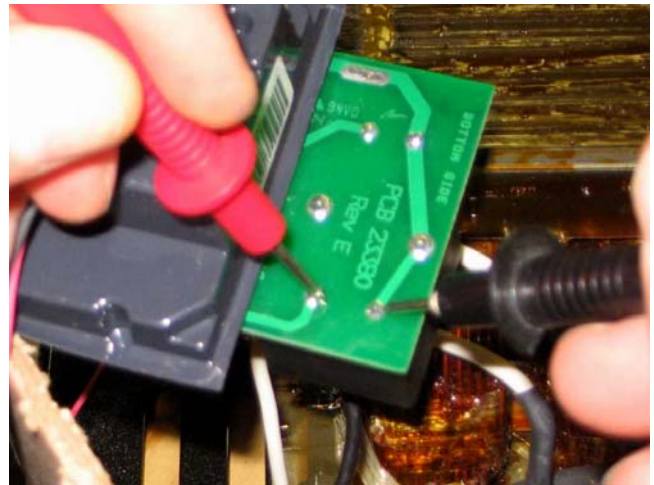


Figure 7G

If the relay contacts and relay coil both test OK, a test to verify if the electronic charge controller has malfunctioned can be made if a precision digital type DC voltmeter is available. Connect the charger to the battery pack and allow it to charge normally. After the charge output amperage 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 .072 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 charge controller has malfunctioned and must be replaced.

8. TRANSFORMER TESTING

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 burnout is the result of misuse, connecting the charger to a battery system of lower voltage than specified on the charger. 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.

The purpose of this test is to confirm the AC output voltage of the transformer. Please read, review, and understand this entire testing procedure before you perform this test.

⚠ CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES BEFORE YOU PERFORM THIS TEST.

Remove the Phillips screws that retain the cover, and then remove the cover. Locate the transformer output leads that attach to the rectifier/diode assembly at the rear of the case as shown in Figure 8, then remove the 11/32 nuts that retain these leads. Carefully reposition these leads so that they are at least 1/4 inch away from any objects near them as shown in Figure 8.



Figure 8

⚠ DANGER: HAZARD OF ELECTRICAL SHOCK. ONLY QUALIFIED PERSONNEL WHO ARE KNOWLEDGABLE IN ELECTRICAL SAFETY PRECAUTIONS ARE TO TEST EQUIPMENT WHILE ENERGIZED!

A successful test will require that you apply AC power to the transformer to measure its output. Bypass the electronic charge controller as described in SECTION 7A, Figure 7E, verifying that the terminals are making electrically sound connections. Attach the clips of the meter to the transformer output leads as shown in Figure 8. Adjust your meter to measure the maximum AC voltage anticipated from the transformer – 97 volts. For your personal safety insure that the meter clips touch only the transformer leads, and that the relay jumper wire is not near any electrically conductive components. Connect the AC input cord to a live 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 voltage and record the reading you obtain. Compare this reading to the output voltage listed in the table. If the measured voltages are substantially lower than those shown, the transformer is either shorted internally or open and must be replaced.

Example: the meter reading displayed in Figure 8 indicates this transformer has an output of 90.9 volts AC. This is within the range of 83 to 97 volts anticipated, thus this transformer is good.

Charger DC voltage rating	AC volt output with a good capacitor	AC volt output with capacitor disconnected
36	83 to 97	55 to 65

If the transformer secondary coil voltage measures between 55-65, either the capacitor coil on the transformer may be open, the capacitor coil terminals are not making proper contact or the capacitor may be open. The influence of the capacitor on transformer AC output is significant - consider the loss of more than 30 volts when it is not connected as in this example. You would find the effect on DC output to be even greater. Typically if a capacitor is disconnected or has failed, the actual current output while charging is near zero. Please refer to “Capacitor Testing” Item 10, for further details.

⚠ DANGER: RISK OF ELECTRIC SHOCK! HIGH VOLTAGE! THE VOLTAGE AT THE CAPACITOR TERMINALS CAN BE AS HIGH AS 660 VOLTS WHILE THE CHARGER OPERATES. USE EXTREME CAUTION WHEN YOU ARE NEAR THE CAPACITOR TERMINALS.

To test the transformer capacitor coil to check if it is open, remove the AC input cord from its outlet and the DC output plug from the battery receptacle. Discharge the capacitor by adjusting your test meter to its highest DC voltage scale and then touch and hold the test leads to the capacitor terminals for three seconds. Follow this by ‘shorting’ across the terminals with an insulated metal tool. A capacitor discharged in this manner will be safe to touch.

Carefully remove one of the quick disconnect female terminals from the capacitor. Use a large needle nose-pliers or similar clamping tool that you feel comfortably in control of and grasp the body of the quick disconnect terminal to remove it. Do NOT pull directly on the copper wire or a broken connection can occur. With a multi-meter set to measure resistance on the lowest scale, measure across the transformer coil wires. The value should be less than 0.02 ohms. If the meter measures open, the transformer capacitor coil is open or is making a bad contact to the terminal. If it should become necessary to replace a terminal on one of the transformer leads, the new terminal must be crimped and soldered.

9. DIODE ASSEMBLY TESTING

The purpose of this test is to confirm if a diode is good or bad. A diode is a semi-conductor device that behaves as an electrical ‘one-way’ check valve that allows electrical current to flow in only one direction. A good diode will have ‘continuity’ and measurable resistance in one direction of polarity and no ‘continuity’ or measurable resistance when the polarity is reversed. A failed diode will measure ‘shorted’ (continuity), or ‘open’ (no continuity), in both directions of polarity.

⚠ CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES. POWER IS NOT NEEDED FOR THIS TEST.

Remove the Phillips screws that retain the cover and then remove the cover. Locate the diode assembly at the rear of the case as shown highlighted in Figure 9A. Remove the 11/32" nuts that retain the transformer output leads to the heatsink assembly and then position these leads so that they are at least 1/4 inch away from any objects near them. The diodes must be disconnected for the test to be valid.

Connect your meter clips as shown in Figure 9A. For this direction of polarity attach the red positive (+) lead to the upper diode and attach the black negative (-) lead to the center DC output terminal. Set your meter to the 'diode check' position as shown in Figure 9B.



Figure 9A



Figure 9B

The value you see should vary between .450 and .600 volts DC due to the variations in diodes and test meters. If this diode had failed shorted the meter would display “.000” or sound an audible beep to indicate ‘continuity’ exactly as it does when you touch the test probes of your meter together. If this diode had failed open, this meter would display a *flashing* “3.000”, other meters would display “OL”. An open diode will measure ‘open’ exactly as it does when you do not touch the test probes of your meter together.

For the next test we will reverse the polarity of the meter clips as shown in Figure 9C. The red positive (+) lead now attaches to the center DC output terminal and the black negative (-) lead attaches to the upper diode. Do not change your meter settings; they remain the same for both tests as shown in Figures 9B and 9D.



Figure 9C



Figure 9D

This diode as tested in this direction of polarity is good. This meter displays a value of “3.000” *flashing* indicating that the diode is blocking all current flow as a serviceable diode should. Other meters may display “OL”.

Next, test the lower diode in the same manner as you tested the upper diode. The center DC output terminal is common to both tests and the meter settings remain the same. The same conditions for shorted and open diodes described in the first test still apply.

Service tips:

A continuity light is a very good alternative test device to test a diode. It has a light bulb, a battery, a needle-like probe on the body, and a short wire lead with an alligator clip on it. If you do not feel confident when using a digital meter, a continuity light is the preferred device to test diodes due to its simplicity.

If your meter does not have a diode check setting, the resistance (ohms) setting may be used. Do so **ONLY** if you are familiar with the meter -- false readings are common by inexperienced users. The meter shown will indicate a good diode to have failed ‘open’ if the range is set incorrectly (too low). Always confirm that you have good connections at the checkpoints, and always repeat your tests.

10. CAPACITOR TESTING

The purpose of this test is to prove if the capacitor is good, or has failed 'open' or 'shorted'. The capacitor in this charger is a tuning device that maximizes the current output of the transformer. Failure of the capacitor will decrease the DC current output of the transformer from 20+ amperes maximum to zero amperes.

⚠ CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES. POWER IS NOT NEEDED FOR THIS TEST.

Remove the Phillips screws that retain the cover, then remove the cover and locate the capacitor at the rear of the case assembly as shown in Figure 10A.

⚠ DANGER: RISK OF ELECTRIC SHOCK! HIGH VOLTAGE! THE VOLTAGE AT THE CAPACITOR TERMINALS CAN BE AS HIGH AS 660 VOLTS WHILE THE CHARGER OPERATES. USE EXTREME CAUTION WHEN NEAR THE CAPACITOR TERMINALS.

⚠ WARNING: THE CAPACITOR STORES AN ELECTRICAL CHARGE AND MAY NOT BE FULLY DISCHARGED! TO AVOID AN ELECTRICAL SHOCK FROM THE CAPACITOR YOU MUST DISCHARGE IT COMPLETELY.



Figure 10A

Discharge the capacitor by adjusting your test meter to its highest DC voltage scale and then touch and hold the test leads to the capacitor terminals for three seconds. Follow this by 'shorting' across the terminals with an insulated metal tool. A capacitor discharged in this manner will be safe to touch.

Carefully remove both of the quick disconnect female terminals. Use a large needle nose pliers or similar clamping tool that you feel comfortably in control of and grasp the body of the quick disconnect terminal to remove it. Do NOT pull directly on the copper wire or a broken connection could occur.

⚠ CAUTION: NEVER 'ROCK' OR 'WALK' THESE TERMINALS TO GET THEM ON OR OFF OF RELAYS. USE AS 'DIRECT' IN/OUT MOTION WHEN INSTALLING AND REMOVING THESE TERMINALS.

Your goal is to minimize widening or spreading of the 'curl' of the female terminal that reduces the clamping strength and area of surface contact with the blade in the capacitor. Position the terminals of the transformer wire leads so that they are distant from any electrically conductive objects near them as shown in Figure 10A. Do not attach your meter test leads at this time.

A failed capacitor will measure either shorted or open when tested for resistance. To test the capacitor adjust your meter to measure resistance at the highest scale (3000) available as shown in Figure 10A. Attach the test leads to the fully discharged capacitor, allow 5 seconds for the meter to stabilize, then note the value displayed on the meter.

A capacitor that has failed shorted will display "000", "000.1" or a similar very low resistance value. This is exactly what you would see if you were to touch and hold the test leads of your meter together. A capacitor that has failed open will display a *flashing* "3.000", "OL" or a similar very high resistance value. This is exactly what you would see if you were to keep the test leads of your meter separated.

A good capacitor will cause the value in the display to increase incrementally. The display in this meter flashes on and off about three times a second. The value increased with each cycle as follows; "079", "175", "264", and so on until the meter reached its limit. This is why this capacitor measured "3.000". If you thought it had failed open you would have guessed wrong, because the meter exceeded its limit just before the picture for Figure 10A was taken.

The reason why the resistance value increases is that the battery of the test meter charges the capacitor, and the meter indicates this increased charge. Unlike an instrument quality meter this consumer grade meter did not indicate polarity.

If we allowed this meter to charge the capacitor until it reached its limit and then reversed the polarity of the leads, it would take as long as six seconds before the display value began to increase from "000". Do not make the mistake of assuming the *flashing* reading you just measured is accurate. Unlike the transformer and diode tests where a *flashing* reading may be valid, if not excusable, a capacitor test is unforgiving if you are unfamiliar with your meter or how a capacitor behaves in response to it.

An old-fashioned analog meter (sweep-needle) works very well for capacitor tests. A good capacitor will cause the needle to move smoothly clockwise from zero to about 2/3 to the right on the scale, at which point it will stop and bump back clockwise. This indicates the capacitor has accepted a charge from the battery in the meter.

To accurately measure the actual capacitance of a capacitor requires a meter closer to instrument quality as shown in Figure 10B. The practical need for this investment will be rewarded when you find that someone has replaced the 4 micro-farad capacitor required with a generic, unmarked 3 micro-farad capacitor that is identical to the one required. Could this be why the charger outputs 5 amperes instead of 20? Access to a quality test instrument may be your only option.



Figure 10B

11. AC INPUT CIRCUIT TESTING

⚠CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, CONNECT ONLY TO A PROPERLY GROUNDED OUTLET!

Check to be sure that the AC input 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.

⚠CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES. POWER IS NOT NEEDED FOR THIS TEST.

If AC power is present at the outlet, disconnect the AC input cord from its outlet and the DC output plug from the battery receptacle. Bypass the electronic charge controller as described in Component Test Procedures SECTION 7A, Figure 7E, and with a continuity tester or multi-meter set to measure resistance, check the circuit across the AC input cord prongs. With the electronic charge controller bypassed, the resistance should measure less than two ohms indicating the circuit is 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 AC input cord, transformer primary coil wires, and the electronic charge controller. If the charger is wired correctly, individually check the continuity of the AC input cord, transformer primary and relay to see if any of these have failed open.

If the AC wall breaker blows, there may be a short in the AC circuit. Disconnect the AC input cord from its outlet and the DC output plug from the battery receptacle. With a suitable continuity tester or multi-meter, check the circuit across the AC input cord prongs and from each prong to the enclosure ground terminal. The reading should display an open circuit, indicating the circuit is not complete. If the circuit is complete, check to be sure the electronic charge controller is NOT bypassed. If it is bypassed, remove the jumper and recheck the AC input cord prongs for continuity. If still shorted, check the relay contacts as described in SECTION 7B, to be sure they are open and have not welded closed. If the relay contacts are closed, either the relay board assembly or the whole electronic charge controller will need to be replaced. Further testing of the electronic charge controller should be done as indicated in SECTION 7. If the relay contacts are open, either the AC input cord or the transformer may be shorted. Disconnect the transformer wire from the relay NO terminal. If the short circuit goes away, the transformer is shorted and must be replaced.

⚠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.

12. DC OUTPUT CIRCUIT TESTING

First verify that the battery pack voltage is present at the battery receptacle. If it is not, a fault has occurred in the vehicle's wiring. Remove the Phillips screws that retain the cover, then remove the cover. Connect the DC output plug to the battery receptacle and with a multi-meter measure the voltage inside the charger where the WHITE and BLACK wires of the DC output cord attach. If the battery DC voltage measured inside the charger is not present, the DC output plug or cord has an internal break and must be replaced. If the battery pack voltage is measured inside the charger, remove the DC output plug from the battery receptacle. Check the charger fuse and if blown, refer to Troubleshooting Guide SECTION 2.

Set the multi-meter to measure resistance and connect the test leads to the charger DC output plug terminals and note the readings. Reverse the tester leads and check the DC output plug again. The circuit should be complete in only one direction. If the circuit does not conduct in either direction and the DC output 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 9 "Diode Assembly Testing" for further diode testing procedures.

If the charger DC circuit test is good, a check of the capacitor is necessary. Refer to SECTION 10 "Capacitor Testing" for further test procedures. 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.

If the charger DC output circuit and capacitor check good, a test of the transformer is necessary. Refer to SECTION 8, "Transformer Testing" for test procedures.

⚠ 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.

COMPONENT REPLACEMENT PROCEDURES

To be able to use the component replacement procedures 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.

⚠DANGER: HIGH VOLTAGE! WITH THE CHARGER ON, THE INTERNAL CHARGER CAPACITOR VOLTAGE IS APPROXIMATELY 660 VOLTS.

⚠CAUTION: ALWAYS UNPLUG THE AC AND DC CORDS 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.

This battery charger is a reliable, automatic charger designed for long, trouble-free service. To install a replacement, identify the item and follow its replacement procedures.

SECTION	COMPONENT REPLACEMENT PROCEDURES
13	ELECTRONIC CHARGE CONTROLLER REPLACEMENT
14	DIODE ASSEMBLY REPLACEMENT
15	CAPACITOR REPLACEMENT
16	AC INPUT AND DC OUTPUT CORD REPLACEMENT
17	FUSE ASSEMBLY REPLACEMENT

13. ELECTRONIC CHARGE CONTROLLER REPLACEMENT

No soldering and only a Phillips screwdriver is required. To replace the kit, follow the step-by-step procedures listed below.

⚠DANGER: HAZARD OF ELECTRICAL SHOCK. DO NOT ATTEMPT TO SERVICE YOUR CHARGER WHILE IT IS CONNECTED TO AN AC INPUT OUTLET OR TO THE BATTERY RECEPTACLE. TURNING OFF THE CHARGER DOES NOT REDUCE THIS RISK!

1. Disconnect the charger's AC input cord from its outlet and the DC output plug from the battery receptacle.
2. Remove the Phillips screws that retain the cover and then remove the cover.
3. Disconnect the BLACK and RED wire connector from the existing electronic charge controller. Remove the BLACK and WHITE leads of the AC input cord and both primary transformer coil leads from the terminal tabs on the existing electronic charge controller. The old controller can now be removed by removing the two mounting screws on the charger front panel.
4. Align the two dimpled mounting guide locations on the bottom of the new charge controller (as shown in Figure 13A) with the two hole-mounting pattern on the charger enclosure. Drive

the 3/8-inch self-threading screws into the mounting locations. The screws will thread into a metal bracket located inside the plastic tray. Tighten until screws are flush and snug against the enclosure. Do not over tighten. Using longer screws will damage the electronics.

5. Attach the wire connector to the new electronic charge controller as shown in Figure 13B. If a new BLACK and RED wire harness needs to be installed, connect the RED wire from the electronic charge controller to the same point as the WHITE positive (+) DC lead on the diode assembly. The BLACK wire connects to the RED sense lead on the DC output cord or to the same point as the BLACK negative (-) DC lead on the ammeter assembly. See Charger Wiring Diagram Section.

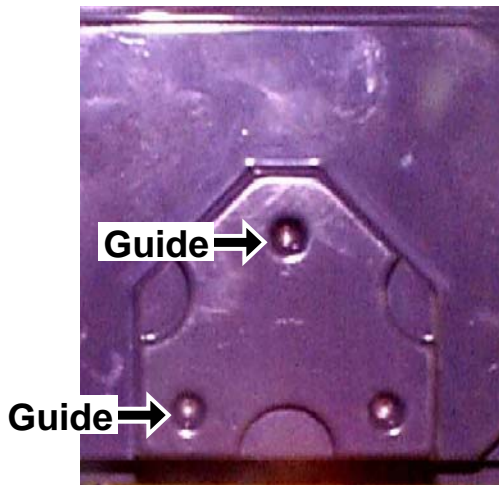


Figure 13A



Figure 13B

6. Connect the BLACK lead of the AC input cord to the common (COM) terminal of the relay on the electronic charge controller and the WHITE lead to the dual QD terminal (B) on the controller as shown in Figures 13C and 13D. Connect either transformer primary lead to the dual QD terminal (B), and the remaining primary lead to normally open (NO) terminal on the relay. Support the terminal board on the controller when connecting these wires to prevent damage to the circuit board.



Figure 13C

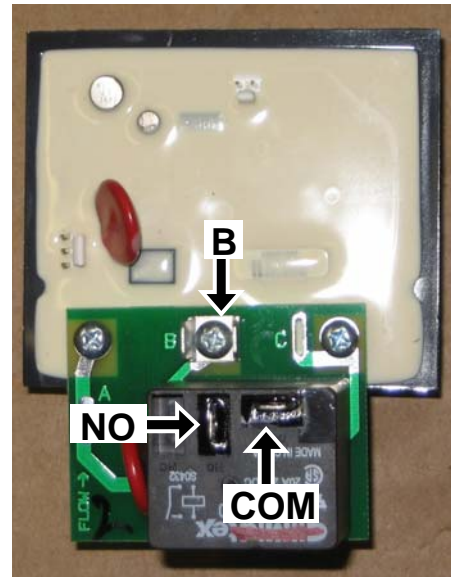


Figure 13D

⚠ CAUTION: BE SURE ALL CONNECTIONS ARE POSITIONED SO THEY DO NOT SHORT TOGETHER OR TO GROUND.

7. Replace the charger cover and check the charger for proper operation as follows:
 - a. This unit only functions when both the AC input cord is connected to a live outlet and the DC output plug is connected to the battery receptacle.
 - b. When the last of the two connections are made (either AC or DC), after a short delay (3-5 seconds), the control relay will click, the transformer will hum, and the ammeter will indicate charge current.
 - c. If your charger performs as above, it is ready for use, if not, refer to the wiring diagram and check to be sure the charger is wired correctly. Always monitor the first charge cycle to verify proper turn off.

14. DIODE ASSEMBLY REPLACEMENT

The diode assembly should always be replaced as a complete assembly. A 3/8 inch, 5/16 inch, and 11/32 inch socket or nutdriver and a Phillips headed screwdriver are the tools required for this replacement procedure. To replace the assembly, follow the step-by-step procedures listed below.

⚠ DANGER: HAZARD OF ELECTRICAL SHOCK. DO NOT ATTEMPT TO SERVICE YOUR CHARGER WHILE IT IS CONNECTED TO AN AC INPUT OUTLET OR TO THE BATTERY RECEPTACLE. TURNING OFF THE CHARGER DOES NOT REDUCE THIS RISK!

1. Disconnect the charger's AC input cord from its outlet and the DC output plug from the battery receptacle.
2. Remove the Phillips screws that retain the cover and then remove the cover.
3. Disconnect all wires from the existing heatsink.
4. Remove the old heatsink, insulator and all hardware.

Refer to Figure 14 when installing new heatsink.

5. Using the hardware furnished with the replacement kit, install the insulator with the heatsink compound side toward the enclosure and fasten the heatsink to the base through the holes where the old heatsink was mounted. Insert the mounting screws from the outside of the enclosure through the plastic body of the assembly, then install the two flat washers on the mounting screw and torque the nylon lock nuts to a maximum of 22 inch-pounds.
6. Attach the RED wire from the electronic charge controller and the WHITE (+) DC output wire to the center stud. Connect the two transformer leads to the top and bottom studs. Torque the connection nuts to 18 inch-pounds maximum.

⚠ CAUTION: BE SURE ALL CONNECTIONS ARE POSITIONED SO THEY ARE NOT SHORTING TO ONE ANOTHER.

7. Replace the charger cover and tighten the cover screws.



Figure 14

15. CAPACITOR REPLACEMENT

To replace the capacitor, follow the step-by-step procedures listed below.

⚠ CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES. POWER IS NOT NEEDED FOR THIS REPLACEMENT.

1. Disconnect the charger's AC input cord from its outlet and the DC output plug from the battery receptacle.
2. Remove the Phillips screws that retain the cover and then remove the cover and locate the capacitor at the rear of the case assembly as shown in Figure 15.

⚠ DANGER: RISK OF ELECTRIC SHOCK! HIGH VOLTAGE! THE VOLTAGE AT THE CAPACITOR TERMINALS CAN BE AS HIGH AS 660 VOLTS WHILE THE CHARGER OPERATES. USE EXTREME CAUTION WHEN NEAR THE CAPACITOR TERMINALS.

⚠ WARNING: THE CAPACITOR STORES AN ELECTRICAL CHARGE AND MAY NOT BE FULLY DISCHARGED! TO AVOID AN ELECTRICAL SHOCK FROM THE CAPACITOR YOU MUST DISCHARGE IT COMPLETELY.

3. Discharge the capacitor by adjusting your multi-meter to its highest DC voltage scale and then touch and hold the test leads to the capacitor terminals for three seconds. Follow this by shorting across the terminals with an insulated metal tool. A capacitor discharged in this manner will be safe to touch.
4. Carefully remove both of the quick disconnect female terminals. Use a large needle nose pliers or similar clamping tool that you feel comfortably in control of and grasp the body of the quick disconnect terminal to remove it. Do NOT pull directly on the copper wire or a broken connection could occur.
5. Loosen the screw on the back of the enclosure that retains the capacitor strap. When the capacitor strap is loose, the capacitor will slide out the top of the strap. Install the new capacitor into the capacitor strap and retighten the screw to hold the capacitor in securely.
6. Carefully reconnect the female quick disconnect female terminals to the new capacitor, inspecting them for proper connection.
7. Replace the cover and tighten the cover screws.



Figure 15

16. AC INPUT AND DC OUTPUT CORD REPLACEMENT

To replace either the AC input or DC output cord, follow the step-by-step procedures listed below.

⚠ CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES. POWER IS NOT NEEDED FOR THIS REPLACEMENT.

1. Disconnect the charger's AC input cord from its outlet and the DC output plug from the battery receptacle.
2. Remove the Phillips screws that retain the cover and then remove the cover.
3. Disconnect the cords (three wire or two wire) from where they are attached on the inside of the charger.

The cord strain relief is crimped onto the cord and then snapped into the enclosure. This type of strain relief is very difficult to remove having three mounting ears which hold it to the enclosure, thus ensuring that the pullout strength will meet safety requirements.

4. Use a flat bladed screwdriver to pry two of the strain relief mounting ears up. Pry up the top one and the one closest to the enclosure side as shown in Figure 16A
5. Using a cutting tooling as shown in Figure 16B, cut off the two mounting ears pried up in the previous step.
6. Pull and wiggle the cord to remove the strain relief from the enclosure and remove the cord from the charger.
7. Install the new cordset by pushing on the strain relief until it snaps into the enclosure.
8. Reattach the cord wires to the charger: (See wiring diagram)
 - AC cord: BLACK wire to the relay COM terminal.
WHITE wire to the dual QD terminal on the electronic charge controller.
GREEN wire to the ground connection, which is attached to the enclosure.
 - DC cord: BLACK wire to the ammeter.
WHITE wire to the center lug on the diode assembly.
RED wire to the quick disconnect terminal on the controller wire harness (see wiring diagram).
9. Replace the cover and tighten the cover screws.



Figure 16A



Figure 16B

17. FUSE ASSEMBLY REPLACEMENT

⚠ CAUTION: A BLOWN FUSE INDICATES A FAILURE IN THE CHARGING CIRCUIT. LOCATE AND CORRECT THE CAUSE OF FAILURE BEFORE REPLACING THE FUSE ASSEMBLY AND OPERATING THE CHARGER.

A blown fuse is normally caused by a short in the DC output cord, a shorted diode, or a reverse polarity connection to the batteries. Refer to the Component Test Procedures to check each of these potential failure sources.

To replace the fuse assembly, follow the step-by-step procedures listed below. A 3/8 inch socket and a Phillips screwdriver are the tools required for this replacement procedure.

⚠ CAUTION: DISCONNECT BOTH AC INPUT AND DC OUTPUT CORDS FROM ALL POWER SOURCES. POWER IS NOT NEEDED FOR THIS REPLACEMENT.

1. Disconnect the charger's AC input cord from its outlet and the DC output plug from the battery receptacle.
2. Remove the Phillips screws that retain the charger cover and then remove the cover.
3. Remove the three nuts on the back of the fuse assembly which secure the two transformer secondary wires and the buss bar as shown in Figure 17.
4. Loosen the nut that holds the buss bar to the ammeter, and then remove the buss bar and the two wires from the fuse assembly.
5. Remove the two Phillips screws from the front of the charger which are used to attach the fuse assembly to the enclosure.
6. Install the new fuse assembly into the base attaching it to the front of the enclosure. Safety standards require the clear plastic fuse cover to be installed between the enclosure and the fuse assembly, thus protecting the end user.
7. Connect the wires and buss bar to the new fuse assembly where they were originally located. Torque to 22 inch-pounds.
8. Torque the nut on the ammeter which has the buss bar connection to 22 inch-pounds.
9. Replace the charger cover and tighten the cover screws.

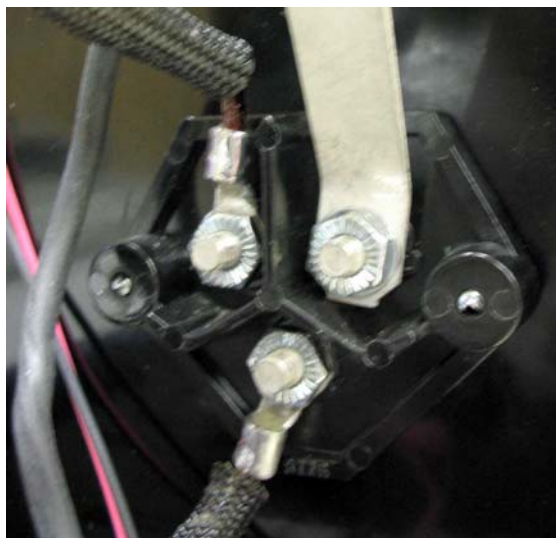
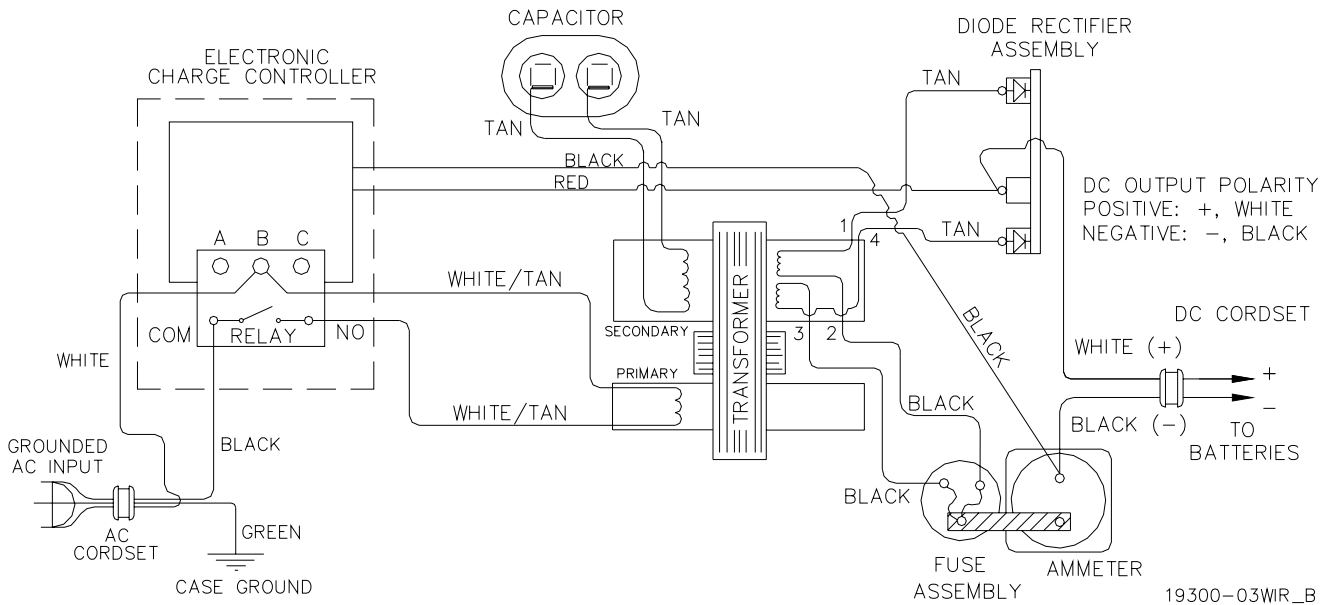
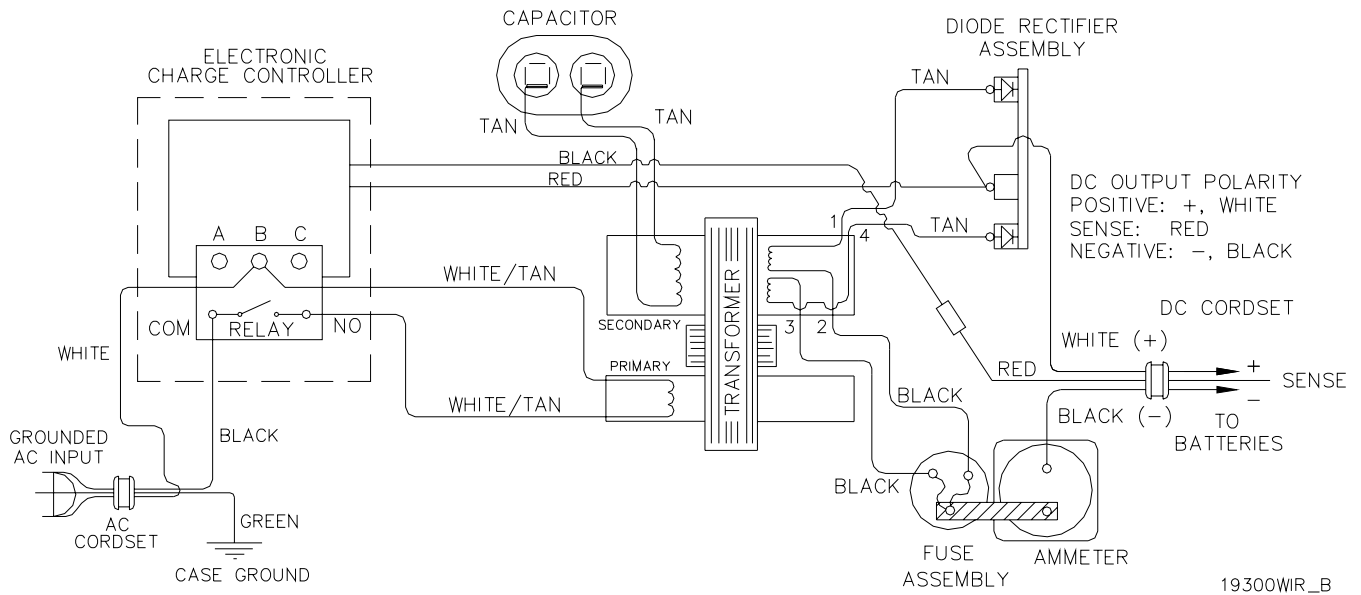
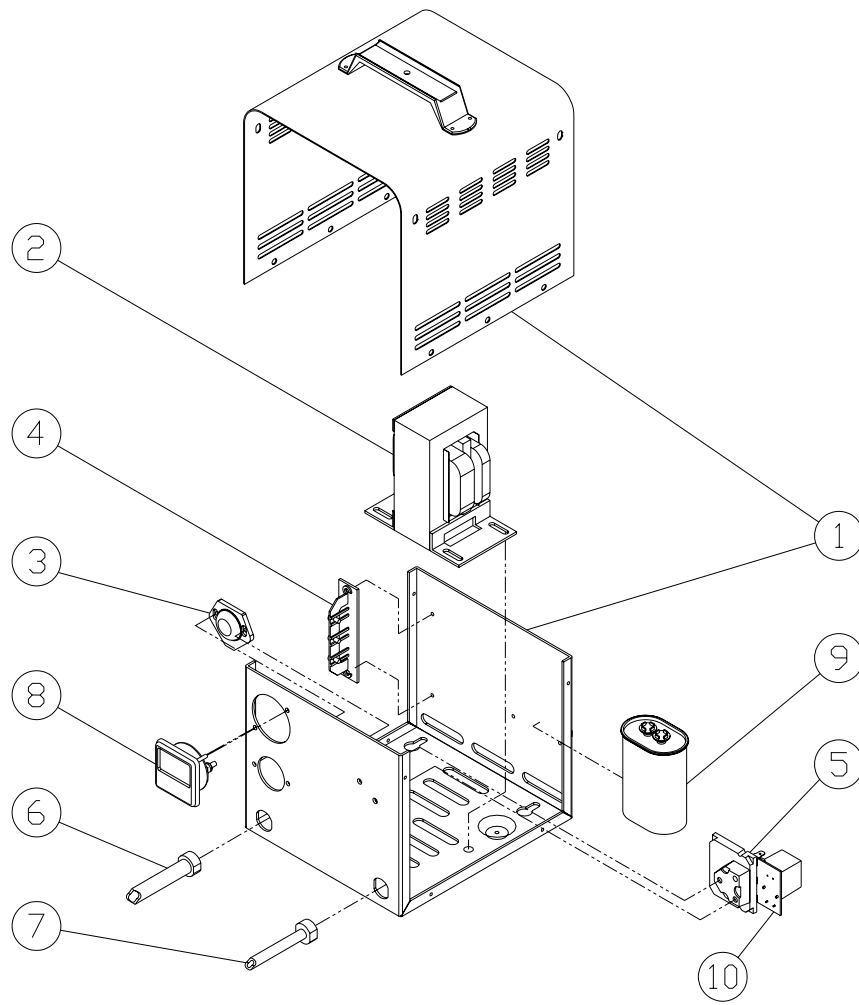


Figure 17

CHARGER WIRING DIAGRAM





35827FIG001_A1

PARTS LIST FOR CHARGER Model 19300

REF. No.	PART NO.	QTY.	DESCRIPTION
1	36186S	1	CASE ASSEMBLY
2	26145S	1	TRANSFORMER ASSEMBLY W/ 4 MFD CAPACITOR
3	08776S	1	FUSE ASSEMBLY
4	16354S	1	DIODE RECTIFIER ASSEMBLY
5	25505S	1	ELECTRONIC CHARGE CONTROLLER (INCLUDES RELAY BOARD #10)
6	35003-13S	1	DC CORDSET, 12/2 & 16/1, 120" POWER WISE PLUG, OPTION -88
6	35252-13S	1	DC CORDSET, 12/2 & 16/1, 216" POWER WISE PLUG, OPTION -78
6	07755-15S	1	DC CORDSET, 12/2, 108" SB50 GRAY, OPTION -03
6	36174-13S	1	DC CORDSET, 12/2, 108" SILICONE RUBBER PLUG, OPTION -01
6	36182-13S	1	DC CORDSET, 12/2, 108" LESTER PLUG, OPTION -02
6	07785-14S	1	DC CORDSET, 12/2, 108" SB 175 GRAY, OPTION -04
7	35446-08S	1	AC CORDSET, 16/3, 97" W/BUSHING & NEMA 5-15P
8	16369S	1	AMMETER, 30 AMP
9	04142S	1	CAPACITOR, 3 MFD, 660 VAC, OPTION -88 S/N 030605059 AND OLDER, OPTION -78 S/N 470500808 AND OLDER
9	04401S	1	CAPACITOR, 4 MFD, 660 VAC, OPTIONS -01, -02, -03, -04 ALL MODELS, OPTION -88 S/N 040601941 & NEWER, OPTION -78 S/N 050604890 & NEWER
10	24480S	1	RELAY BOARD ASSEMBLY