SECTION 14–ACCU-POWER BATTERY CHARGER

⚠ DANGER

- **BATTERY - EXPLOSIVE GASES! DO NOT SMOKE. KEEP SPARKS AND FLAMES AWAY. VENTILATE WHEN CHARGING OR USING IN AN ENCLOSED SPACE. ALWAYS WEAR FULL FACE SHIELD AND RUBBER GLOVES WHEN WORKING ON BATTERIES.**
- **USE EXTREME CAUTION WHEN USING TOOLS, WIRES, OR METAL OBJECTS NEAR BATTERIES! A SHORT CIRCUIT AND (OR) SPARK COULD CAUSE AN EXPLOSION.**
- **BATTERY - POISON! CONTAINS ACID! CAUSES SEVERE BURNS. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ANTIDOTES:**
  - **EXTERNAL: FLUSH WITH WATER. CALL A PHYSICIAN IMMEDIATELY.**
  - **INTERNAL: DRINK LARGE QUANTITIES OF MILK OR WATER. FOLLOW WITH MILK OF MAGNESIA OR VEGETABLE OIL. CALL A PHYSICIAN IMMEDIATELY.**
  - **EYES: FLUSH WITH WATER FOR FIFTEEN MINUTES. CALL PHYSICIAN IMMEDIATELY.**

⚠ WARNING

- ONLY TRAINED TECHNICIANS SHOULD REPAIR OR SERVICE THIS VEHICLE. ANYONE DOING EVEN SIMPLE REPAIRS OR SERVICE SHOULD HAVE KNOWLEDGE AND EXPERIENCE IN GENERAL ELECTRICAL REPAIRS. FOLLOW ALL PROCEDURES EXACTLY AND HEED ALL WARNING STATEMENTS IN THIS MANUAL.
- ALWAYS WEAR APPROVED EYE PROTECTION WHILE SERVICING VEHICLE. WEAR A FULL FACE SHIELD AND RUBBER GLOVES WHEN WORKING WITH BATTERIES.
- TURN KEY SWITCH **OFF,** PLACE FORWARD/REVERSE HANDLE IN THE **NEUTRAL** POSITION, AND REMOVE KEY PRIOR TO SERVICING.
- DO NOT WEAR LOOSE CLOTHING. REMOVE JEWELRY SUCH AS RINGS, WATCHES, CHAINS, ETC. BEFORE SERVICING VEHICLE.
- ALWAYS USE INSULATED TOOLS WHEN WORKING NEAR BATTERIES OR ELECTRICAL CONNECTIONS.
- TO AVOID UNINTENTIONALLY STARTING THE VEHICLE, DISCONNECT BATTERIES, NEGATIVE CABLE FIRST, AS SHOWN IN **FIGURE 14-4, PAGE 14-3**.

GENERAL INFORMATION

Each Club Car V-Glide 36-volt electric vehicle is equipped with a fully automatic Accu-Power battery charger. There are no knobs to turn or buttons to push. The charger will turn ON two to five seconds after it is plugged in, and it will automatically turn OFF when the batteries are fully charged. The charger automatically compensates for a variable AC voltage supply between 105 to 128 volts and then tapers the charge rate for longer battery life. Charging time depends on the age of the batteries and on the amount of use they have experienced. The charger compensates for these factors by measuring the voltage increase versus time, and turns OFF when the batteries are fully charged. As long as the charger is allowed to turn OFF by itself, overcharging and undercharging should be prevented **(Figure 14-1)**. **See following WARNING and CAUTION.**

⚠ WARNING

- BECOME FAMILIAR WITH WIRING AND TERMINOLOGY OF CHARGER BEFORE ATTEMPTING ANY REPAIR TO THE CHARGER **(FIGURE 14-2, PAGE 14-2 AND FIGURE 14-3, PAGE 14-3)**.

General Information, Continued:

⚠ CAUTION

- DO NOT LEAVE THE DC CORD PLUGGED INTO A VEHICLE RECEPTACLE WHILE UNATTENDED FOR MORE THAN TWO DAYS IN A ROW. SEVERE OVERHEATING AND DAMAGE TO THE BATTERIES MAY RESULT IF THE CHARGER DOES NOT TURN OFF.

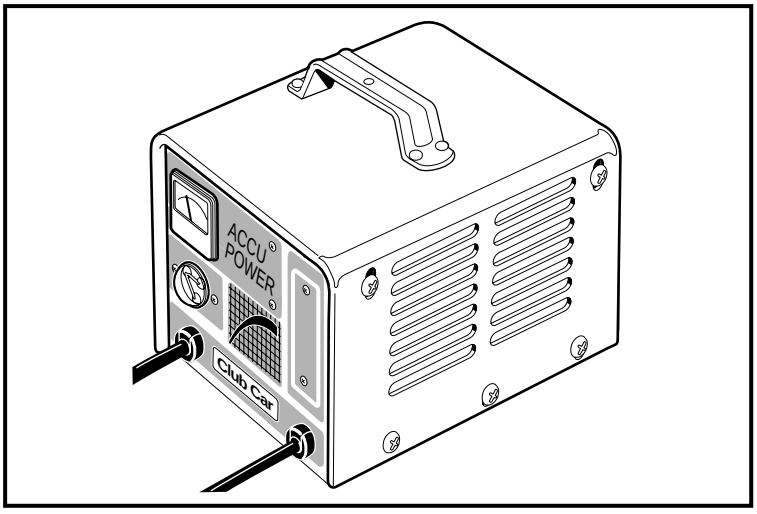

Figure 14-1 Accu-Power Battery Charger

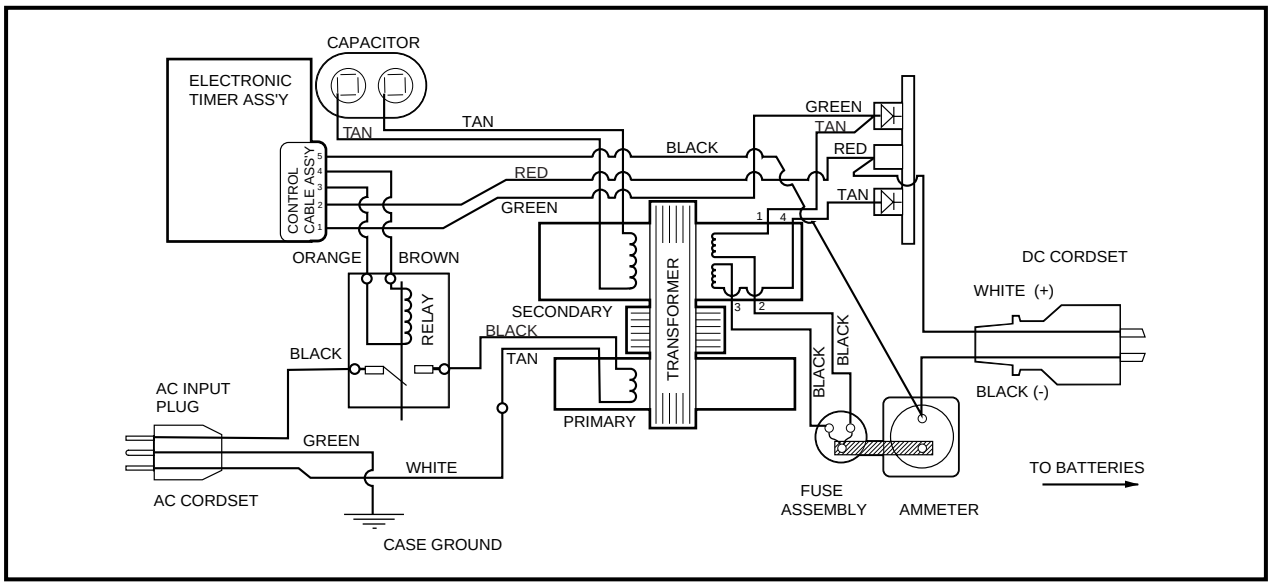

Figure 14-2 Charger Wiring Diagram

CHARGE CIRCUIT

The charge circuit consists of the charger receptacle, receptacle fuse link, and the batteries. The negative terminal of the receptacle is connected to the No. 6 battery by a 10 gauge white wire, and the positive terminal of the receptacle is connected to the fuse link. A 10 gauge red wire from the receptacle fuse link connects to the positive post of battery No. 1. If the charger operates properly with one vehicle, but will not operate properly with another, check this path to be sure the receptacle fuse link has not failed and all connections, including battery connections, are clean and tight **(Figure 14-4, Page 14-3)**.

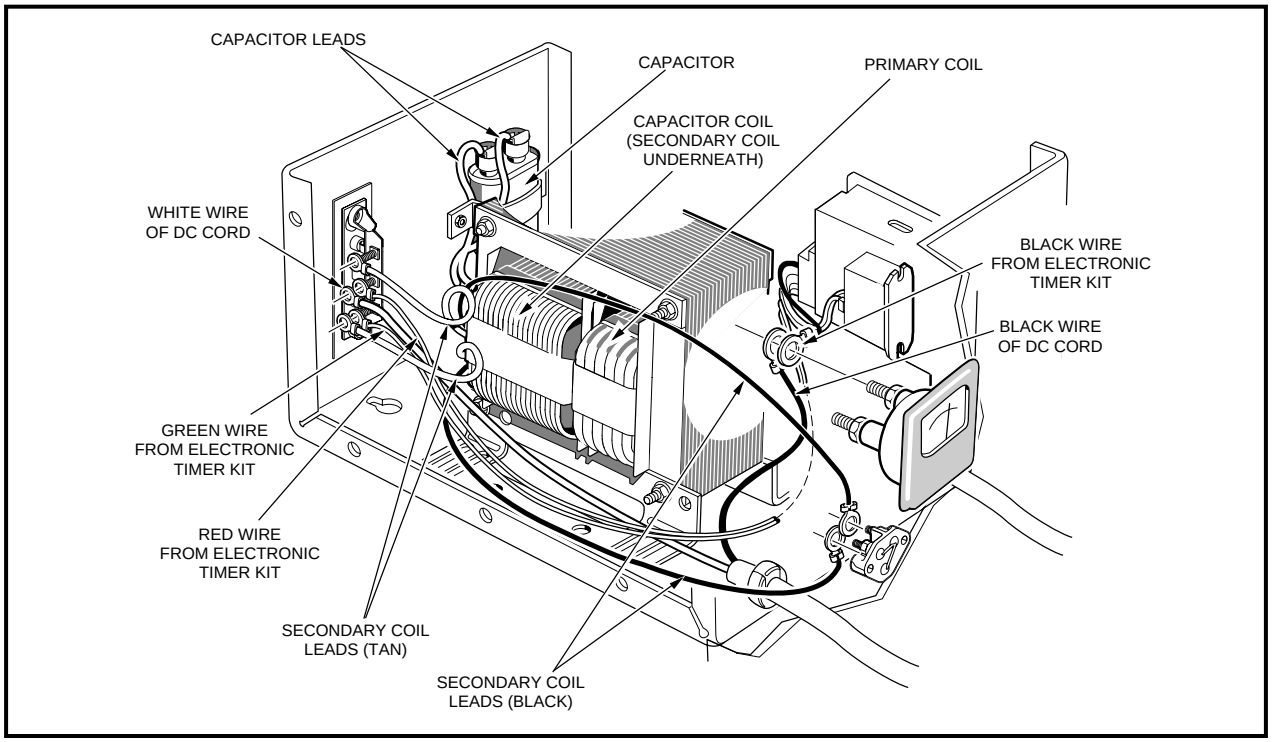

Figure 14-3 Charger Wiring

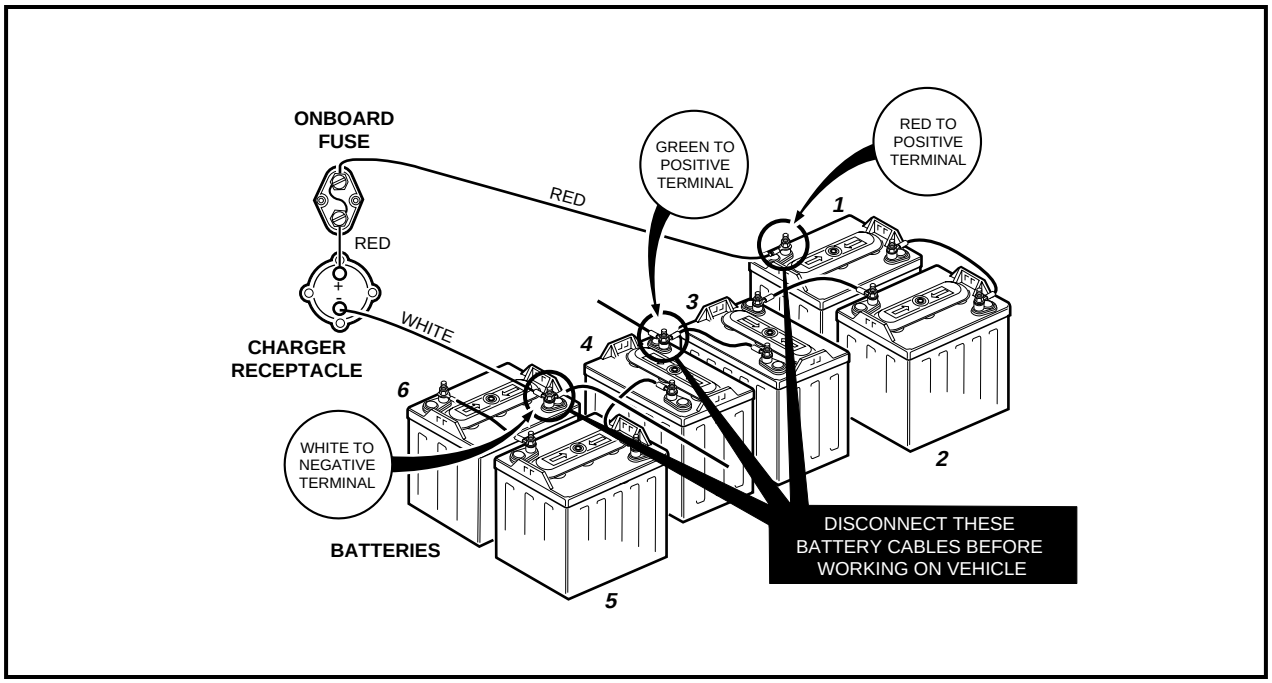

Figure 14-4 Charge Circuit

CHARGER INSTALLATION AND USE

Read DANGER and WARNING on page 14-1.

The AC line to which the charger is to be connected must be capable of supplying at least 15 amperes to each charger.

Charger Installation and Use, Continued:

To reduce the risk of electric shock, the battery charger must be grounded. The charger is equipped with an AC electric cord with an equipment-grounding conductor and a grounding type plug. It is for use on a nominal 120 volt, 60 hertz circuit. The AC plug must be connected to an appropriate receptacle that is properly installed and grounded in accordance with the National Electric Code and all local codes and ordinances.

The use of an extension cord with the charger is not recommended. If an extension cord must be used, use a three conductor No. 12 AWG cord with ground, properly wired and in good electrical condition. Keep it as short as possible (no more than twelve feet). Place all cords so they will not be stepped on, tripped over, or otherwise subject to damage or stress. **See following WARNING.**

⚠ WARNING

- EACH CHARGER SHOULD HAVE ITS OWN 15 OR 20 AMPERE BRANCH CIRCUIT PROTECTION (CIRCUIT BREAKER OR FUSE), IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE ANSI/NFPA 70, AND LOCAL CODES AND ORDINANCES. IMPROPER AC SUPPLY CIRCUIT PROTECTION MAY RESULT IN A FIRE.
- DO NOT USE AN ADAPTER TO PLUG A CHARGER WITH A THREE-PRONG PLUG INTO A TWO-PRONG OUTLET. IMPROPER CONNECTION OF THE EQUIPMENT-GROUNDING CONDUCTOR CAN RESULT IN A FIRE OR AN ELECTRICAL SHOCK.
- AN EXTENSION CORD OR ELECTRICAL OUTLET MUST ACCEPT A THREE-PRONG PLUG. THE USE OF AN IMPROPER EXTENSION CORD COULD RESULT IN FIRE OR AN ELECTRICAL SHOCK.
- DO NOT OPERATE THE CHARGER IF IT HAS RECEIVED A SHARP BLOW, WAS DROPPED, OR OTHERWISE DAMAGED IN ANY WAY. CHECK IT TO BE SURE IT IS OPERATING PROPERLY BEFORE PUTTING IT BACK IN USE.

Provide adequate ventilation for the charger. Keep all charger ventilation openings at least 2 in. away from walls and other objects.

NORMAL CHARGER OPERATION

⚠ WARNING

- DO NOT USE THIS CHARGER IF:
  - THE PLUG IS TOO LOOSE OR DOES NOT MAKE A GOOD CONNECTION.
  - THE PLUG AND/OR RECEPTACLE BECOME HOTTER THAN NORMAL DURING CHARGE.
  - THE PLUG BLADES OR RECEPTACLE CONTACTS ARE BENT OR CORRODED.
  - THE PLUG, RECEPTACLE, OR CORDS ARE CUT, WORN, HAVE EXPOSED WIRES, OR ARE DAMAGED IN ANY WAY.
- USING THE CHARGER WITH ANY OF THE ABOVE CONDITIONS COULD RESULT IN A FIRE, PROPERTY DAMAGE, PERSONAL INJURY, OR DEATH. REPAIR OR REPLACE WORN OR DAMAGED PARTS BEFORE USING THE CHARGER.
- DO NOT ROCK OR BEND THE PLUG. TO CONNECT THE CHARGER PLUG TO THE VEHICLE RECEPTACLE, GRASP THE PLUG (NOT THE CORD) AND PUSH IT STRAIGHT INTO THE RECEPTACLE.
- TO DISCONNECT THE CHARGER PLUG FROM THE VEHICLE, GRASP THE PLUG (NOT THE CORD) AND PULL IT STRAIGHT OUT OF THE RECEPTACLE. DO NOT PULL ON THE CORD. DO NOT TWIST, ROCK, OR BEND THE PLUG SIDEWAYS.

1. With the charger DC output cord disconnected from the batteries, connect the power supply cord to a 120 volt, 60 hertz outlet.
2. Connect the charger DC plug to the charger receptacle located on the seat support panel **(Figure 14-5, Page 14-5)**. The charger will turn ON automatically within 2 to 5 seconds after the DC plug is connected.

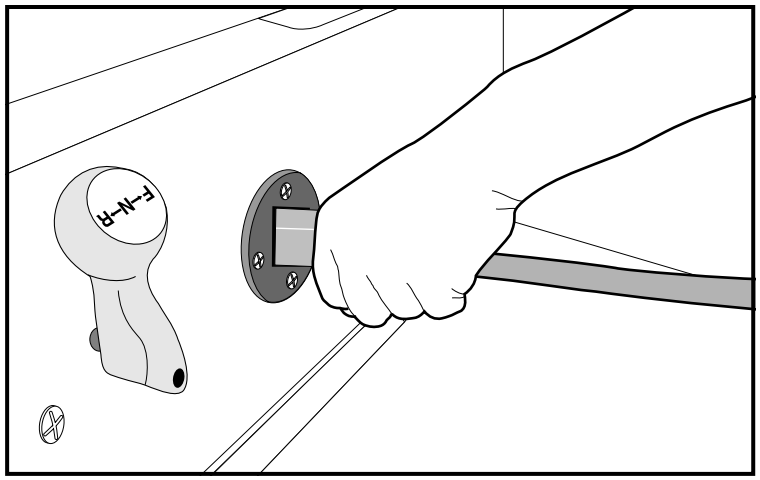

Figure 14-5 Charger Receptacle

3. Monitor the ammeter for the correct charge rate. The initial charge rate will vary from 16 to 25 amps, depending upon the condition and depth of discharge of the batteries. Slight variations in the initial charge rate may also result from AC line input voltages which are higher or lower than 120 volts. Higher line voltages increase the initial charge rate and lower line voltages reduce the initial charge rate.

NOTE

- WHEN AIR TEMPERATURES FALL BELOW 65°F (18.3°C), BATTERIES CHARGED IN UNHEATED AREAS SHOULD BE PLACED ON CHARGE AS SOON AS POSSIBLE AFTER USE. BATTERIES ARE WARMEST IMMEDIATELY AFTER USE, AND COLD BATTERIES REQUIRE MORE TIME TO FULLY CHARGE.

TROUBLESHOOTING

Read DANGER and WARNING on page 14-1.

⚠ DANGER

- **HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.**

⚠ WARNING

- BEFORE ATTEMPTING ANY REPAIRS TO THE CHARGER, ALWAYS UNPLUG THE ELECTRICAL CORDS, FIRST FROM THE AC OUTLET AND THEN FROM THE VEHICLE RECEPTACLE.

ACCU-POWER BATTERY CHARGER TROUBLESHOOTING GUIDE		
SYMPTOM	**POSSIBLE CAUSES**	**REFER TO**
1. Relay does not close, no transformer hum and ammeter does not move.	1) Batteries disconnected.	Figure 14-4, Page 14-3.
	2) Battery voltage is too low.	Test Procedure 1, Page 14-7
	3) Poor connection between plug and receptacle.	Test Procedure 1,Page 14-7
	4) DC plug and cord.	Test Procedures 1 and 9, Pages 14-7 & 14-12
	5) Electronic Timer Kit malfunction.	Test Procedure 2, Page 14-7
	6) Onboard receptacle fuse link is blown.	Page 14-16
2. Relay closes with an audible click but no transformer hum and ammeter does not move.	1) Improper AC outlet voltage.	Test Procedure 3, Page 14-8
	2) Failed AC plug and cord.	Test Procedure 3, Page 14-8
	3) Improper wiring of Electronic Timer Kit.	Figure 14-2, Page 14-2
	4) Transformer primary coil.	Test Procedure 7, Page 14-11
	5) Relay.	Test Procedure 9, Page 14-12
3. Relay closes and transformer hums but ammeter does not move.	1) Blown charger fuse.	Test Procedure 4-B, Page 14-9
	2) Both diodes failed.	Test Procedure 4-B, Page 14-9
	3) Failed capacitor.	Test Procedure 6, Page 14-10
	4) Failed transformer.	Test Procedure 7, Page 14-11
	5) Defective charger relay.	Test Procedure 9, Page 14-12
	6) Failed ammeter.	Test Procedure 9, Page 14-12
4. Single charger fuse link blows.	1) Diode failed.	Test Procedure 4-A, Page 14-8
	2) Loose internal fuse connection.	Test Procedure 4-A, Page 14-8
5. Both charger fuse links blow or receptacle fuse link blows.	1) Battery is wired in reverse polarity.	Test Procedure 4-B, Page 14-9
	2) DC cord is wired in reverse polarity.	Test Procedure 4-B, Page 14-9
	3) Both diodes failed.	Test Procedure 4-B, Page 14-9
6. Charger output is low.	1) One diode failed.	Test Procedure 4-A, Page 14-8
	2) Transformer coil short-circuit failure.	Test Procedure 7, Page 14-11
7. Charger turns OFF too soon.	1) AC power supply was turned off.	Test Procedure 3, Page 14-8
	2) Batteries may be fully charged.	Test Procedure 8, Page 14-12
8. Charger does not turn OFF.	1) Electronic Timer Kit has failed.	Test Procedure 2, Page 14-7
	2) Electronic Timer Kit is improperly wired.	Test Procedure 2, Page 14-7
	3) Bad battery.	Section 13–Batteries
9. AC line fuse or circuit breaker blows.	1) Electronic Timer relay.	Test Procedure 2 or 9, Pages 14-7 & 14-12
	2) AC plug or cord is shorted.	Test Procedure 9, Page 14-12
	3) Failed transformer.	Test Procedure 7, Page 14-11

TEST PROCEDURES

Read DANGER and WARNING on page 14-1.

The charger uses DC battery voltage to close an internal relay which in turn closes the AC circuit. When the charger is operating properly, there is a 2 to 5 second delay after the DC cord is plugged into the vehicle before the relay closes. This delay allows time for the DC plug to make a secure connection with the receptacle before the AC circuit is activated and AC power is supplied to the primary coil of the transformer. When the relay closes an audible “click” can be heard, and then as power is supplied, the transformer should hum and the ammeter should indicate the charge rate.

Test Procedure 1 - Battery Voltage is Too Low or Faulty DC Plug Connection

1. Check the DC plug and the receptacle for damage, dirt, corrosion, etc., that might prevent a sound electrical connection.
2. Measure the voltage at the receptacle using a multimeter set to 200 volts DC **(Figure 14-6, Page 14-7)**.
3. Measure battery terminal voltage between the positive post on battery No. 1 and the negative post on battery No. 6 **(Figure 14-7, Page 14-7)**. The voltage reading should be the same as at the receptacle.

NOTE

- TO CLOSE THE CHARGER RELAY, BATTERY VOLTAGE MUST BE BETWEEN 24 AND 50 VOLTS.

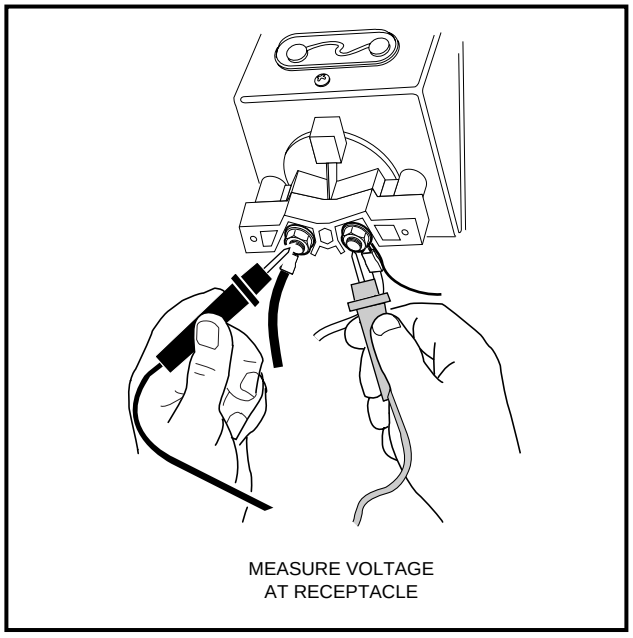

Figure 14-6 Voltage at Receptacle

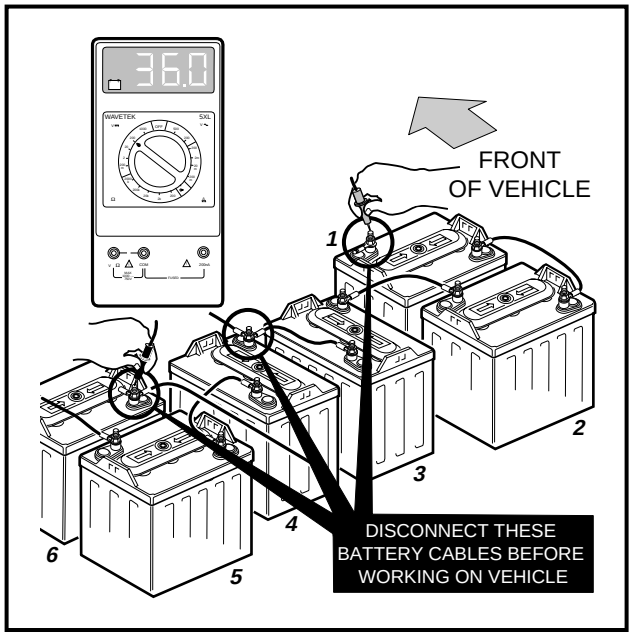

Figure 14-7 Battery Terminal Voltage

4. If the voltage readings obtained at the receptacle and at the batteries are not the same, check the wire connections at the receptacle and at the batteries. If the DC voltages are the same and within limits, remove the charger cover and verify that the charger is properly wired. With the AC cord disconnected, insert the DC plug into the charger receptacle. With a multimeter set to 200 volts DC, measure battery voltage at the white and black wires from the DC cord inside the charger **(Figures 14-2 and 14-3, Pages 14-2 and 14-3)**. The voltage reading should be the same as at the receptacle. **See Test Procedure 9**. **See DANGER and WARNING on page 14-5**.

Test Procedure 2 - Electronic Timer Kit

1. Connect the charger AC plug to an outlet, then connect the DC plug to the vehicle. After a 2 to 5 second delay, the charger should start. If the charger starts immediately (without a 2 to 5 second delay), the electronic timer relay has failed.
2. If the charger does not turn off automatically when batteries are fully charged, check the connections of the green wire on the heat sink and check the relay **(see Test Procedure 9)**. If the wire connections are secure and the relay has not failed, the electronic timer kit must be replaced. To verify the timer is malfunctioning:
   2.1. Unplug AC and DC cords and remove the cover from the charger. **See DANGER on page 14-5.**
   2.2. Locate and carefully remove the two black wires connected to the contact terminals of the relay.

Test Procedure 2, Continued:

2.3. Place a relay bypass wire (14 AWG minimum) between the two black wires **(Figure 14-13, Page 14-12)**.

2.4. The power supply cord is now connected directly to the primary transformer coil and the transformer should hum when the AC cord is plugged into a live outlet.

2.5. Charger operation may now be checked by connecting the DC plug into the receptacle, and then connecting the AC cord into an outlet. If normal charging current is indicated on the ammeter, the electronic timer and/or the relay is defective and must be replaced. **See Test Procedure 9 for relay testing**. **See following CAUTION.**

⚠ CAUTION

- **DO NOT** CHARGE BATTERIES WITH THE ELECTRONIC TIMER KIT BYPASSED. IF THE TIMER KIT IS BYPASSED, THE CHARGER WILL REMAIN OPERATING AS LONG AS THE AC CORD IS PLUGGED INTO AN OUTLET. SEVERE OVERCHARGING AND EVENTUAL DAMAGE TO THE BATTERIES WILL RESULT.

2.6. If the transformer does not hum and the ammeter still does not register with the relay bypassed, it will be necessary to check the continuity of the charger AC circuit. **See Test Procedure 3**.

Test Procedure 3 - AC Power and Continuity Check of AC Circuit

1. Unplug AC and DC cords.
2. Check the AC line fuse or circuit breaker in the storage facility.
3. Insert the probes of a multimeter, set to 500 volts AC, into the AC outlet to check incoming AC voltage. A reading of 105 to 128 volts should be obtained.
4. If AC power is not present, have a licensed electrical contractor check the building wiring and service panel.
5. Check continuity of the AC circuit: **See DANGER on page 14-5.**
   5.1. Carefully disconnect the two black wires attached to the contact terminals of the relay.
   5.2. Connect a jumper wire between the two black wires.
   5.3. With relay bypassed, check the circuit across the AC cord plug blades **(Figure 14-8, Page 14-9)**.
   5.4. If the reading is no continuity, check the wiring of the AC cord, the transformer primary coil leads, and the jumper wire. If the charger is wired correctly, check, individually, the continuity of the AC cord, the transformer primary coil, and the jumper wire.

Test Procedure 4 - Diodes

Use Test Procedure 4-A for single diode failures and diode testing. If both diodes have failed, use Test Procedure 4-B.

Test Procedure 4A - Single Diode Failure

A single diode failure is indicated by the failure of one fuse link (short circuited diode) or by low charger output (open circuit diode). If a diode has failed, the entire heat sink assembly must be replaced. To check the diodes:

1. Unplug the AC cord from its outlet and unplug the DC cord from the vehicle receptacle.
2. Disconnect one transformer secondary coil lead from the diode terminal **(Figure 14-2, Page 14-2)**.
3. Using a low voltage continuity tester or multimeter set to diode, place one tester probe on the diode mounting plate and the other probe on a diode terminal and note the reading **(Figure 14-9, Page 14-10)**.

4. Reverse the tester probes and check each diode again **(Figure 14-10, Page 14-10)**. A diode is designed to conduct current in only one direction. If a diode shows continuity in both directions, the entire heat sink assembly with diodes must be replaced. If a diode shows no continuity in either direction, the entire heat sink assembly must be replaced.
5. Check all three fuse connections inside the charger to be sure they are clean and tight. It is possible that a loose internal fuse connection could create enough heat to cause a single fuse link to melt. The proper torque on all fuse link connections is 20 in.lb. (2.3 N-m).
6. Be sure the charger is wired properly and all connections are clean and tight.

⚠ CAUTION

- IF CONNECTIONS ARE NOT CLEAN AND TIGHT, EXCESSIVE HEAT WILL BE CREATED AND THE CHARGER MAY BE DAMAGED.

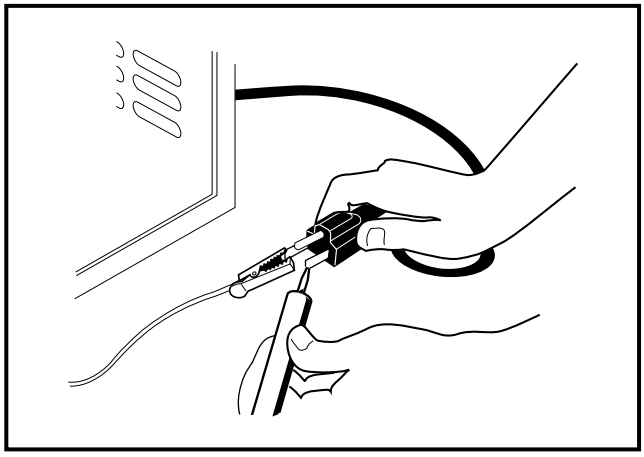

Figure 14-8 Test AC Plug Blades

Test Procedure 4B - Both Diodes Failed

Use Test Procedure 4A to test diodes. If both diodes have failed closed (shorted), both charger fuse links will be blown. If both diodes have failed open, the relay will close and the transformer will hum, but the ammeter will indicate *no* output. If both diodes have failed open or have shorted, the entire heat sink assembly must be replaced. To determine why both diodes failed:

1. Check the batteries and the receptacle to be sure they are wired in the correct polarity. Use a multimeter to check the voltage and polarity at the receptacle.
2. Make sure the charger DC plug is wired correctly. The white wire should be connected to the center terminal of the heat sink assembly and the black wire should be connected to the left side of the ammeter when viewed from inside the charger. Whether or not the AC cord is plugged into an outlet, both fuse links will blow if a reversed polarity connection is made between the charger and the batteries.
3. Although it is a rare occurrence, both diodes may fail due to a lightning strike at the charging location.
4. Excessive heat due to a loose connection could also cause both fuse links to melt. Be sure fuse connections are tightened to 20 in.lb (2.3 N-m).
5. Make sure the charger is wired properly and all connections are clean and tight.

Test Procedure 5 - Continuity Test of Charger DC Circuit

1. Connect the probes of a continuity tester (Club Car Part No. 1011273) to the blades of the charger DC plug and note the reading **(Figure 14-11, Page 14-10)**.

Test Procedure 5, Continued:

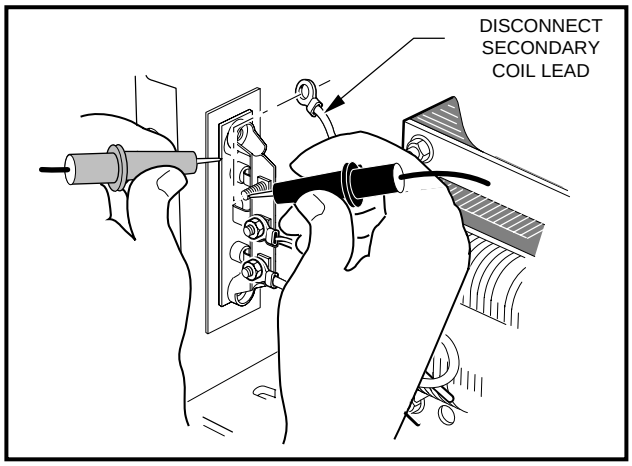

Figure 14-9 Single Diode Test

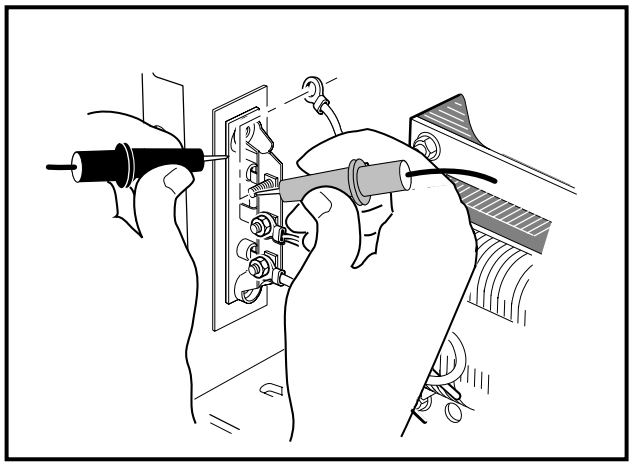

Figure 14-10 Reverse Tester Leads

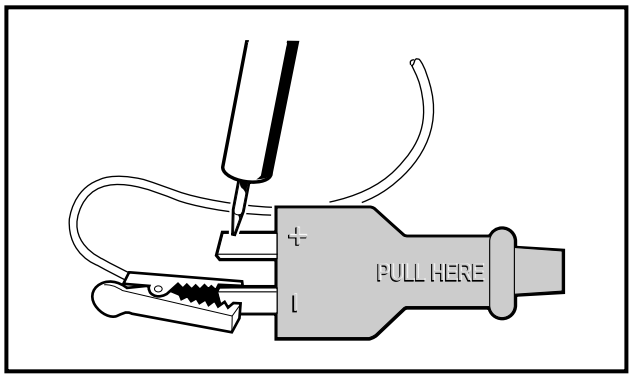

Figure 14-11 Charger DC Plug

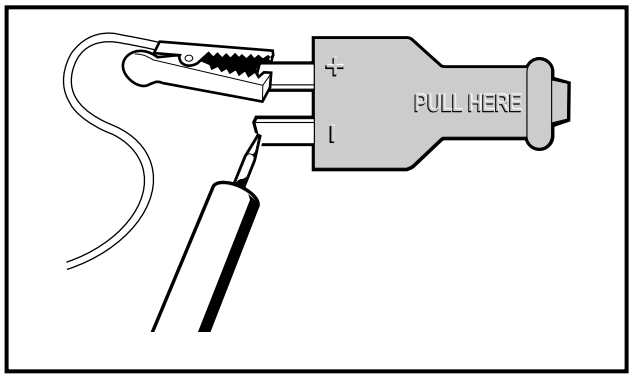

Figure 14-12 Charger DC Plug, Reverse Probes

2. Reverse the probes **(Figure 14-12, Page 14-10)** and note the reading.
3. Continuity should be observed in only one direction. If the circuit shows no continuity in either direction and the fuse is functional, check the continuity of the DC plug and cord **(Test Procedure 9)**, the ammeter **(Test Procedure 9)**, the diodes **(Test Procedure 4A)**, and all connections.
4. If the circuit indicates continuity in both directions, a short circuit exists in the charger DC circuit, probably caused by failed diodes **(see Test Procedure 4)**. If the diodes have not failed, check the DC output cord for a short circuit between the two wires **(Test Procedure 9)**.
5. If the test shows the charger DC circuit is functional, check the capacitor **(Test Procedure 6)**.

Test Procedure 6 - Capacitor

⚠ DANGER

- **HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.**

⚠ CAUTION

- TO AVOID BREAKING WIRES, DISCONNECT CAPACITOR LEADS CAREFULLY.

1. Disconnect both transformer coil leads from the capacitor terminals.
2. Using insulated pliers, place uninsulated tips onto capacitor terminal ends to discharge controller.
3. Place probes of a multimeter, set to 2000k ohms (Ω), on the capacitor terminals and note the reading.
4. Reverse the probes and note the reading.
5. Interpret the readings as follows:
   - **Functional Capacitor** - When the multimeter probes are connected to the capacitor terminals, initially meter indicates low resistance then rapidly moves to high resistance and eventually to open circuit.
   - **Open Capacitor** - When the multimeter leads are connected to the capacitor terminals, and the meter does not indicate any initial resistance and only open circuit, the capacitor has failed open. A bulge in the top of the capacitor may be visible if the capacitor has failed open.
   - **Shorted Capacitor** - When the multimeter probes are connected to the capacitor terminals, and the meter indicates a closed circuit and does not change, the capacitor has failed closed.
6. If the capacitor is open or shorted, it must be replaced.

⚠ WARNING

- USE A CLUB CAR CAPACITOR (PART NO. 1015910) ONLY. THE USE OF A DIFFERENT VALUE CAPACITOR MAY RESULT IN IMPROPER CHARGING, CAPACITOR FAILURE, TRANSFORMER BURNOUT, AND/OR BATTERY DAMAGE.

Test Procedure 7 - Transformer

Failure of the transformer could be caused by natural aging or premature shorting of adjacent coil turns. If the transformer has failed, ammeter would indicate no output or low output even though the transformer might hum. A failed transformer could cause an AC line fuse to blow or a circuit breaker to trip in the storage facility. To check the transformer:

1. Disconnect the transformer secondary coil leads (1) and (4) from the diode terminals **(Figure 14-13, Page 14-12)**. Remount nuts on diode assembly. **See following DANGER.**
2. Disconnect the transformer capacitor coil leads (5) and (6) from the capacitor terminals **(Figure 14-13, Page 14-12)**. **See following DANGER.**

⚠ DANGER

- **DO NOT ALLOW THE SECONDARY COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 61 VOLTS AC PRESENT.**
- **DO NOT ALLOW THE CAPACITOR COIL LEADS TO TOUCH EACH OTHER. THERE ARE APPROXIMATELY 650 VOLTS AC PRESENT.**
- **HIGH VOLTAGE! WITH THE CHARGER ON, THE VOLTAGE OF THE CAPACITOR INSIDE THE CHARGER IS APPROXIMATELY 650 VOLTS. USE EXTREME CAUTION WHEN WORKING NEAR CAPACITOR TERMINALS.**

3. In order to supply AC power directly to transformer coil, relay must be bypassed. **Refer to Test Procedure 2.**
4. Make sure the capacitor coil leads and the secondary coil leads are not touching one another. Then, with the relay by-passed, plug the AC cord into an outlet. If the AC line fuse blows or the circuit breaker trips, the transformer has failed internally and must be replaced.
5. If this does not occur, use a multimeter, set to 500 volts AC, to check transformer secondary voltage across lead Nos. 1 and 4, and capacitor coil voltage across lead Nos. 5 and 6 **(Figure 14-13, Page 14-12).** If measured voltages are approximately 48 volts or lower for secondary coil, or less than approximately 385 volts for capacitor, the transformer is shorted internally and must be replaced. **See previous DANGER**.
6. If the transformer output voltages are correct, disconnect the AC cord from the outlet and proceed as follows:

Test Procedure 7, Continued:

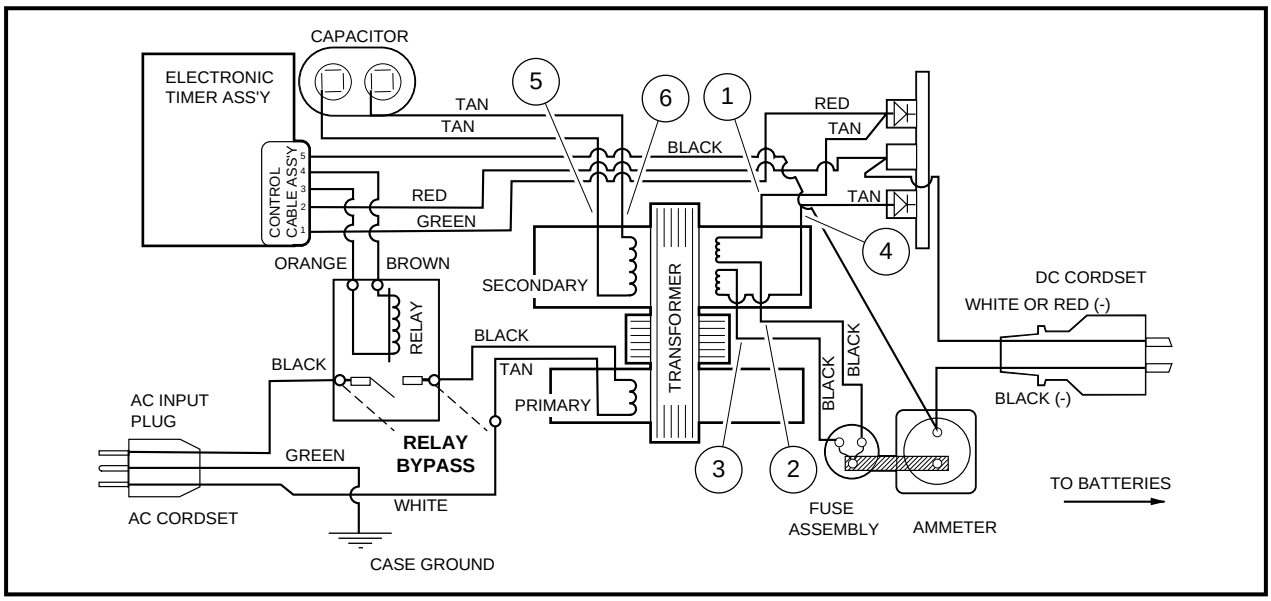

Figure 14-13 Relay Bypass Wire Placement

6.1. Check the capacitor to be sure its rating is 3 microfarads (capacitor should be marked), 660 volts AC, and then carefully reconnect the capacitor coil lead Nos. 5 and 6 to the capacitor terminals.

6.2. After making sure the secondary coil leads are not touching one another, connect the AC cord to an outlet and measure the transformer secondary voltage across lead Nos. 1 and 4.

6.3. If the voltage reading is the same as the voltage reading in step 5 (which eliminates the capacitor from the circuit), the capacitor may be defective or the coil leads may not be making proper electrical contact **(see Test Procedure 6)**. If the voltage readings are correct, both the transformer and the capacitor are functional; refer to Test Procedure 5 for further tests of the DC circuit.

Test Procedure 8 - Battery State of Charge Test

1. When the charger has turned off after a charge cycle, disconnect and then reconnect the charger AC plug. The ammeter should jump to 18-22 amps and taper to below 12 amps within 15 minutes. If it tapers to below 12 amps within 15 minutes, the batteries are fully charged and the charger is functioning properly.
2. If the charger does not taper to below 12 amps within 15 minutes, the batteries may not be receiving a full charge and the Electronic Timer Kit should be checked. **See Test Procedure 2**.

NOTE

- OLD BATTERIES NEAR THE END OF THEIR USEFUL LIVES MAY NOT TAPER TO BELOW 12 AMPS. **SEE SECTION 13–BATTERIES**.

Test Procedure 9 - Continuity Tests

AC Cord and Plug

1. Disconnect black wire (1) of AC cord from the contact terminal of the relay **(Figure 14-14, Page 14-13)**.
2. Disconnect the green wire (2) from the charger case **(Figure 14-14, Page 14-13)**.
3. Connect the alligator clip of a continuity tester (Club Car Part No. 1011273) to the end of the black wire (1) and check for continuity on both flat blades and on the ground blade of the AC plug **(Figure 14-14, Page 14-13)**. Continuity should be shown on only one flat blade. If continuity is indicated on more than one blade or on no blade, the AC cord and plug must be replaced.

4. Disconnect white wire terminal connector (4) at the transformer lead. Insert red probe into the white wire terminal end (4). Place black probe on each flat blade and then on the ground pin and check for continuity. Continuity should be shown on only one flat blade. If tester indicates continuity on more than one blade or on no blade, the AC cord and plug must be replaced **(Figure 14-14, Page 14-13)**.
5. Attach alligator clip to end of green wire (2) and check for continuity on both flat blades and ground pin of AC plug **(Figure 14-14, Page 14-13)**. Continuity should be shown on only ground pin. If continuity is indicated on flat blades or is not indicated on ground pin, AC cord and plug must be replaced.

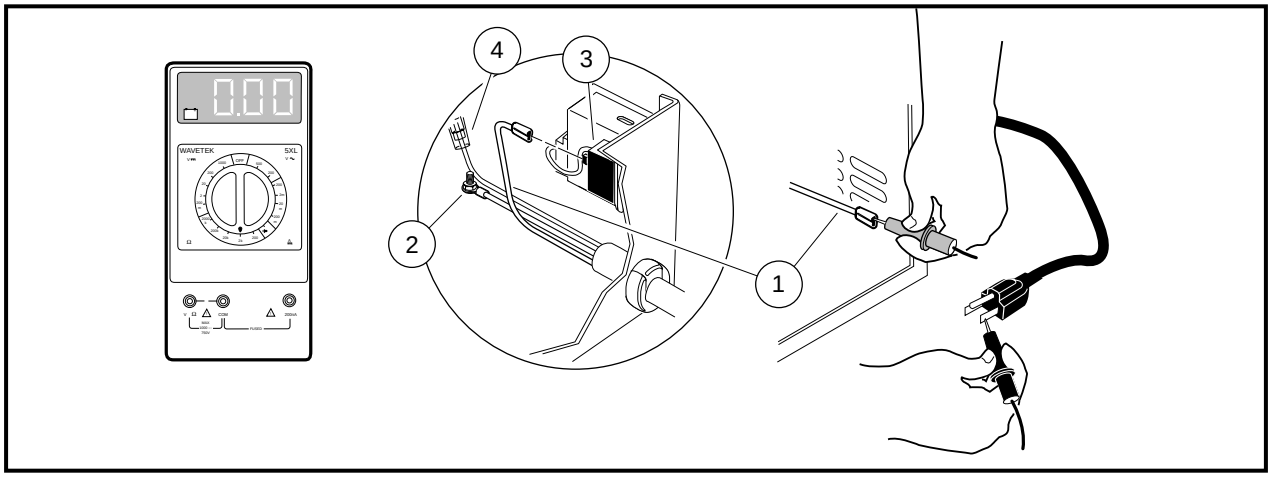

Figure 14-14 AC Plug

DC Cord and Plug

1. Disconnect the black wire (5) of the DC cord from the ammeter, and disconnect the white wire of the DC cord from the heat sink assembly **(Figure 14-15, Page 14-15)**.
2. Attach alligator clip of continuity tester to the white wire (6) of the DC cord **(Figure 14-15, Page 14-15)**.
3. Place the probe of the continuity tester on the positive (+) blade of the DC plug (the positive and negative blades are identified on the plug). The tester should indicate continuity. If the tester does not indicate continuity, the DC cord and plug must be replaced.
4. Place the probe of the tester on the negative (-) blade of the DC plug. The tester should indicate no continuity. If the tester indicates continuity, the cord and plug must be replaced.
5. Attach alligator clip to the black wire (5) of the DC cord and then place the probe on the negative (-) blade of the DC plug **(Figure 14-15, Page 14-15)**. The tester should indicate continuity. Place the probe on the positive (+) side. The reading should be no continuity. If the readings are not correct, the cord and plug must be replaced.

Transformer

The transformer has three coils that must be tested **(Figure 14-3, Page 14-3)**.

1. Test the Primary Coil:
   1.1. Disconnect the transformer primary coil leads from the terminals.
   1.2. Place the continuity tester probes on the primary coil leads. The tester should indicate continuity. If the tester indicates no continuity, replace the transformer.
2. Test the Secondary Coil:
   2.1. Disconnect the transformer secondary coil lead from the upper terminal of the heat sink assembly.
   2.2. Disconnect the other transformer secondary coil lead from the upper terminal of the heat sink assembly, then place the tester probes on the secondary coil leads (tan wires). The reading should be continuity. If the reading is no continuity, replace the transformer. Be sure the fuse is intact and has not failed. **See DANGER on page 14-11**.

Transformer, Continued:

3. Test the Capacitor Coil:
   3.1. Disconnect the transformer capacitor coil leads from the capacitor terminals.
   3.2. Place the tester probes on the capacitor coil leads. The reading should be continuity. If the reading is no continuity, replace the transformer.

Relay

⚠ WARNING

- BEFORE PERFORMING THIS TEST, MAKE SURE THE AC PLUG IS **NOT** PLUGGED IN.

1. Disconnect the two black wires from the contact terminals of the relay.
2. Place the continuity tester probes on the contact terminals of the relay. The reading should be ***no*** continuity. If the tester shows continuity, the relay contacts are welded shut and the relay must be replaced.
3. Plug the DC cord into a vehicle receptacle (make sure the vehicle batteries are connected), then place the tester probes on the contact terminals of the relay. The reading should be continuity; if the tester shows ***no*** continuity, the relay must be replaced.

Ammeter

1. Disconnect both black wires from the left (when viewed from inside the charger) ammeter post.
2. Attach the alligator clip of the tester to one of the ammeter posts.
3. Place the tester probe on the other ammeter post. The reading should be continuity. If the tester indicates ***no*** continuity, the ammeter must be replaced.

PLUG AND RECEPTACLE REPLACEMENT

Read DANGER and WARNING on page 14-1.

The charger DC cord and plug, and the charger receptacle on the vehicle are wear items that should be inspected daily. They ***must*** be replaced when worn or damaged. If the charger plug and receptacle show signs of corrosion or are becoming difficult to insert and remove, the receptacle contacts and plug blades can be cleaned with a good electrical contact cleaner or lightly sprayed with WD-40® brand spray lubricant.

TESTING THE RECEPTACLE

1. Inspect the receptacle for cracks, loose connections and frayed wiring.
2. Insert the tapered end of a test blade (Club Car Part No. 1013930) approximately 1-1/2 in. (38 mm) into one side of the receptacle, then withdraw the blade from the contact, pulling straight out from the receptacle.
3. Repeat for the other contact. Both contacts must grip the test blade well enough to create sufficient pressure (or drag) for an adequate electrical connection. If little or no drag is felt, the receptacle must be replaced.

CHARGER DC CORD REPLACEMENT

DC Cord Removal

1. Unplug the AC and DC cords and remove the charger cover. **See DANGER and WARNING on page 14-5.**
2. Disconnect the black lead of the DC cord from the ammeter by loosening the nut (1). Support the terminal as the nut is loosened to prevent rotation of the connection. Leave the black wire from the electronic timer (4) on the terminal post **(Figure 14-15, Page 14-15)**.
3. Remove the nut that retains the white lead of the DC cord on the heat sink assembly. Leave the red wire from the electronic timer on the screw at the heat sink assembly.
4. Using pliers, squeeze the strain relief bushing and remove the cord set.

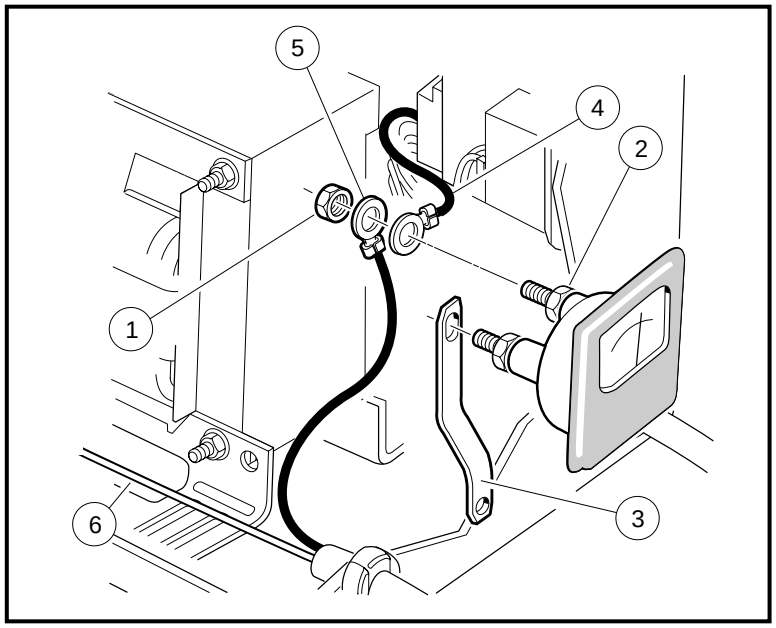

Figure 14-15 DC Cord

DC Cord Installation

1. Insert the leads of the new cord through the hole in the charger base.
2. Make sure the red wire of the electronic timer is on the middle terminal of the heat sink assembly, then place the white lead of the new cord on the terminal and tighten the nut to 14 in.lb (1.5 N-m).
3. Make sure the black wire (4) of the electronic timer is on the ammeter post. Attach the black lead (5) of the new cord and tighten nut (1) on the post until finger tight **(Figure 14-15, Page 14-15). See following CAUTION.**

⚠ CAUTION

- DO NOT ALLOW AMMETER POST TO ROTATE AS NUT IS TIGHTENED. IF IT ROTATES, THE AMMETER COULD BE DAMAGED.

4. While holding the outside of the nut (1), turn the inside nut (2) counterclockwise 1/4 turn **(Figure 14-15, Page 14-15). See previous CAUTION and following NOTE.**

NOTE

- CHECK THE POSITIONS OF THE TERMINALS TO MAKE SURE THEY ARE NOT TOUCHING THE AMMETER BUS BAR (3) OR THE AMMETER POST **(FIGURE 14-15, PAGE 14-15)**.

5. Place the strain relief bushing on the cord and use pliers to insert bushing into the charger base.
6. Place the charger cover in position and install the mounting screws, starting with the bottom holes. Tighten the screws to 11 in.lb (1.2 N-m).

RECEPTACLE REPLACEMENT

⚠ WARNING

- REMOVE KEY AND PLACE FORWARD/REVERSE HANDLE IN THE **NEUTRAL** POSITION.
- DISCONNECT THE BATTERIES AS SHOWN IN **FIGURE 14-4, PAGE 14-3.**

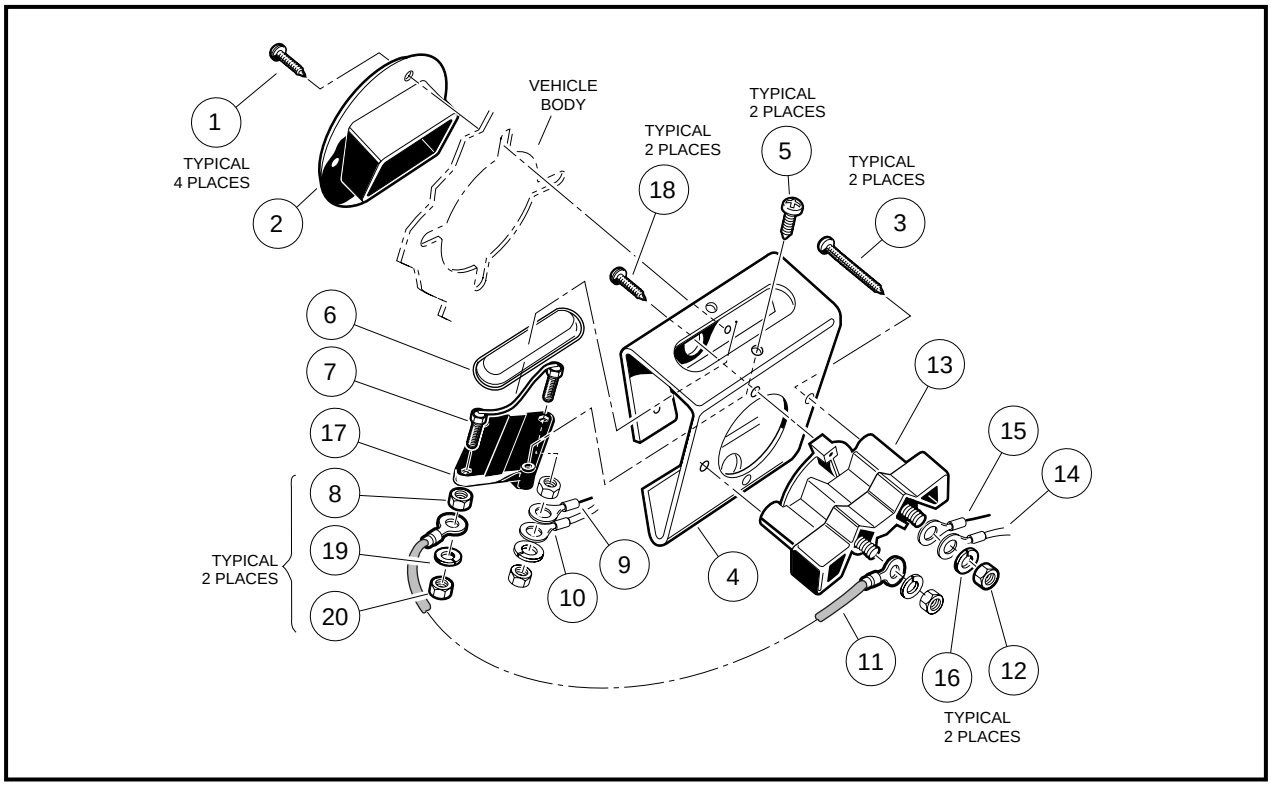

Figure 14-16 Receptacle

Receptacle Removal

1. Disconnect the small black wire (15) and the white wire (14) (to the negative battery post) from the negative terminal of the receptacle **(Figure 14-16, Page 14-16).**
2. Disconnect the red wire (11) (to the fuse link) from the positive terminal of the receptacle and remove the four screws (1) from the bezel (2) **(Figure 14-16, Page 14-16). See following WARNING**.

⚠ WARNING

- MAKE SURE THE BLACK AND WHITE WIRES DO NOT TOUCH.

3. Remove screws (3 and 18) attaching receptacle to the fuse link bracket (4) **(Figure 14-16, Page 14-16)**.

Receptacle Installation

1. Install the screws (3 and 18) which attach the receptacle (13) to the fuse link bracket (4) **(Figure 14-16, Page 14-16)**. Tighten the screws to 20 in.lb (2.2 N-m).
2. Install red wire of fuse link to positive (+) terminal of receptacle (the positive (+) and negative (-) terminals are labeled on face of receptacle) **(Figure 14-16, Page 14-16)**. Tighten nut to 23 in.lb (2.6 N-m).
3. Install the small black wire (from wiper switch) and the white wire (from negative battery post) on the negative (-) terminal of the receptacle **(Figure 14-16, Page 14-16)**. Tighten nut to 23 in.lb (2.6 N-m).
4. Position bezel (2) and fuse link bracket (4) and install the four mounting screws (1) through the bezel and into the fuse link bracket **(Figure 14-16, Page 14-16)**. Tighten the screws to 20 in.lb (2.2 N-m).

ONBOARD RECEPTACLE FUSE LINK

If the receptacle fuse link has failed, the vehicle cannot be charged until the fuse has been replaced. The fuse link (7) is located on the fuse link bracket (4) in the battery compartment (rear portion of the charger receptacle) **(Figure 14-16, Page 14-16)**. **See also Figure 14-4, Page 14-3**.

⚠ WARNING

- UNDER NORMAL OPERATING CONDITIONS, THE RECEPTACLE FUSE LINK SHOULD NEVER FAIL UNLESS THERE IS AN ELECTRICAL PROBLEM. IF THE FUSE BLOWS, DETERMINE THE CAUSE OF THE PROBLEM AND CORRECT IT BEFORE REPLACING THE FUSE.

Receptacle Fuse Link Removal

1. Remove the two screws (5) and then the lens (6) **(Figure 14-16, Page 14-16)**.
2. Remove the outer nuts (20), lockwashers (19), and wires (9, 10, and 11) **(Figure 14-16, Page 14-16)**.
3. Remove the remaining nuts (8) **(Figure 14-16, Page 14-16)**.
4. Remove the fuse link (7) from the base (17) **(Figure 14-16, Page 14-16).**

Receptacle Fuse Link Installation

1. Install a new fuse link (7) (Club Car Part No. 1014516) into the base (17) **(Figure 14-16, Page 14-16).**
2. Install nuts (8) which attach fuse link to base and tighten to 18 in.lb (2.0 N-m) **(Figure 14-16, Page 14-16).**
3. Connect the red wire (9) (from the forward and reverse switch) and the orange wire (10) (from the reverse buzzer) to the passenger side of the fuse assembly and install the lock washer (19) and outer nut (20). Tighten the nut to 23 in.lb. (2.5 N-m) **(Figure 14-16, Page 14-16). See also Figure 14-4, Page 14-3.**
4. Connect the red wire (11) (from the charger receptacle) to the driver's side of the fuse assembly and install the lock washer (19) and nut (20). Tighten the nut to 23 in.lb (2.5 N-m).
5. Install fuse link assembly and cover (6). Tighten screws (5) to 20 in.lb (2.2 N-m) **(Figure 14-16, Page 14-16)**.

CHARGER REPAIRS

Read DANGER and WARNING on page 14-1.

ELECTRONIC TIMER KIT

Electronic Timer Kit Removal

1. Remove the two screws attaching the electronic timer assembly to the face of the charger.
2. Slide the electronic timer assembly from the charger and carefully remove the control cable connector from the timer.

Electronic Timer Kit Installation

1. Carefully connect the control cable connector to the new timer and slide the timer assembly into the charger.
2. Install the two timer assembly retaining screws in the face of the charger.

Electronic Timer Relay Wiring

If the wires from the relay were disconnected, connect them to the numbered relay terminals as follows:

1. Attach the orange wire to terminal No. 6.
2. Attach the brown wire to terminal No. 1.
3. Attach the black wire from the AC cord to terminal No. 3.
4. Attach the black extension wire from the transformer primary coil to terminal No. 5.

⚠ WARNING

- MAKE SURE ALL CONNECTIONS ARE CLEAN AND TIGHT. MAKE SURE ALL WIRES AND TERMINALS ARE POSITIONED SO THEY DO NOT SHORT TOGETHER OR TO CHARGER BASE.

Checking Proper Operation of Electronic Timer Kit

1. With the DC plug disconnected from the receptacle, plug the AC cord into an outlet. The relay on the electronic timer kit should not close. A multimeter set to 200 volts DC and connected across the DC plug should indicate zero volts. The transformer should not hum.
2. Unplug the AC cord from its outlet and connect the DC plug to the receptacle. The relay, located next to the electronic timer kit, should close with an audible “click” after a two to five second delay.
3. If the electronic timer kit does not operate as in step one or two above, refer to the wiring diagram **(Figure 14-2, Page 14-2)** and make 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 the charger is turning OFF properly.

CAPACITOR

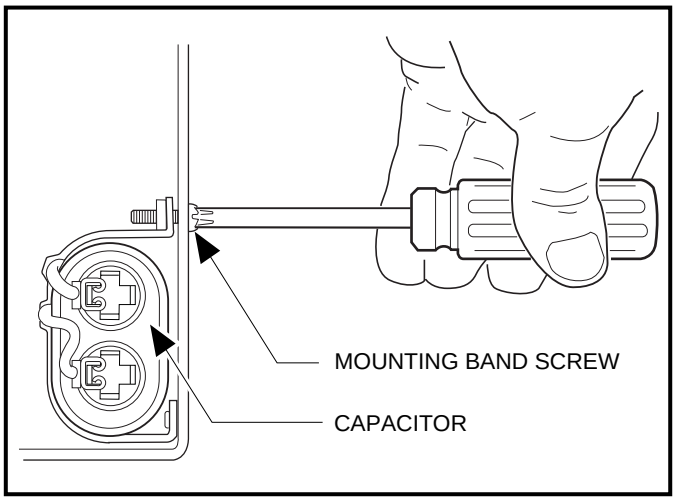

Figure 14-17 Capacitor

Capacitor Removal

1. Remove the charger cover. **See DANGER on page 14-5.**
2. Loosen the mounting band screw **(Figure 14-17, Page 14-18)**. **See CAUTION on page 14-10.**
3. Remove the connectors from the capacitor terminals.
4. Pull the capacitor out of the band.

Capacitor Installation

1. Route the capacitor wires through the band and then slide the capacitor into the band.
2. Tighten the mounting band screw.
3. Connect the terminal connectors to the capacitor terminals.
4. Install the charger cover and check the charger for proper operation.

HEAT SINK ASSEMBLY

Heat Sink Assembly Removal

1. Remove the charger cover. **See DANGER on page 14-5.**
2. Disconnect both secondary transformer leads (tan) from the heat sink assembly.
3. Disconnect the red, green, and white wires from the heat sink assembly.
4. Remove the nuts and bolts which secure the heat sink assembly to the case.

Heat Sink Assembly Installation

1. Mount the heat sink assembly to the charger case. Make sure the clear plastic strip, which is coated with a white di-electric grease, is against the charger case and install the nuts and bolts that secure the assembly to the charger case. Tighten the bolts to 13 in.lb (1.4 N-m).
2. Connect the white wire from the DC cord and the red wire of the control cable to the center connector of the heat sink assembly. Tighten the nut to 13 in.lb (1.4 N-m).
3. Connect the green wire of the control cable and one of the secondary transformer leads (tan) to the bottom connector of the heat sink assembly. Tighten the nut to 13 in.lb (1.4 N-m).
4. Connect the other secondary transformer lead (tan) to the top connector of the heat sink assembly.
5. Install the charger cover and check the charger for proper operation.

TRANSFORMER

Transformer Removal

1. Remove the charger cover **(Figure 14-3, Page 14-3)**. **See DANGER on page 14-5.**
2. Disconnect the black extension wire and the transformer primary coil lead, then disconnect the white wire in the AC cord and the transformer coil lead.
3. Disconnect the secondary transformer leads from the heat sink assembly.
4. Disconnect the secondary transformer leads from the fuse assembly.
5. Disconnect the capacitor coil leads from the capacitor. **See DANGER on page 14-11.**
6. Remove the plastic wire tie holding the red and green wires of the control cable and one secondary transformer lead (from the heat sink assembly) together.
7. Remove the four bolts and nuts from the transformer and remove the transformer.

Transformer Installation

1. Position the transformer in the charger, oriented with the secondary coil lead to the rear. Install the four mounting bolts and nuts and tighten them to 28 in.lb (3.0 N-m).
2. Connect one secondary transformer lead (tan) to the top of the heat sink assembly. Tighten the nut to 13 in.lb (1.4 N-m).
3. Connect the green wire of the control cable and the other secondary transformer lead (tan) to the bottom terminal of the heat sink assembly. Tighten the nut to 23 in.lb (2.5 N-m).
4. Connect one secondary transformer lead (black) to one terminal of the fuse assembly. Tighten the nut to 23 in.lb (2.5 N-m).
5. Connect the other secondary transformer lead (black) to the remaining terminal of the fuse assembly. Tighten the nut to 23 in.lb (2.5 N-m).
6. Connect the capacitor coil leads to the capacitor.
7. Tie the wires together as they were before the wire tie was removed.
8. Install the charger cover and check the charger for proper operation. **See following WARNING**.

⚠ WARNING

- MAKE SURE WIRING OR WIRING HARNESS IS PROPERLY SECURED TO THE VEHICLE FRAME. FAILURE TO PROPERLY SECURE WIRING COULD RESULT IN VEHICLE MALFUNCTION, PROPERTY DAMAGE OR SEVERE PERSONAL INJURY.

AMMETER

Ammeter Removal

1. Remove the charger cover. **See DANGER on page 14-5.**
2. Disconnect all wires (4 and 5) and the bus bar (3) from the ammeter posts **(Figure 14-18, Page 14-20)**.
3. Remove nuts (2) attaching ammeter to charger face, and remove the ammeter **(Figure 14-18, Page 14-20)**.

Ammeter Installation

1. Position the ammeter in the charger face and install the mounting nuts. **See DANGER on page 14-5.**
2. Install the ammeter bracket on the back of the ammeter.
3. Connect the black wire (4) of the electronic timer kit and the black wire (5) of the DC cord to the left post of the ammeter (when viewed from the rear of the charger) **(Figure 14-18, Page 14-20)**.

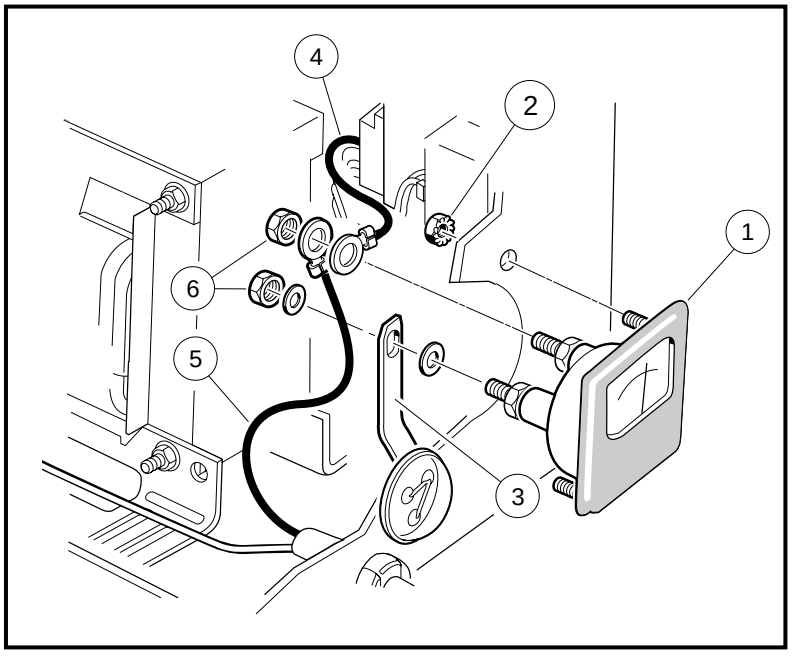

Figure 14-18 Ammeter

4. Connect the bus bar (3) from the fuse link to the right post of the ammeter. Make sure there is a washer on each side of the bus bar.
5. Install the nuts on both posts of the ammeter and tighten slightly more than finger tight. Then while holding the outside nut, turn the inside nut counterclockwise 1/4 turn. **See CAUTION on page 14-15.**
6. Install the charger cover.
7. Plug the charger into a vehicle and make sure the ammeter is operating properly.

CHARGER FUSE LINK

Fuse Link Assembly Removal

1. Remove the charger cover. **See DANGER on page 14-5.**
2. Remove both secondary transformer leads and the bus bar from the back of the fuse link assembly.
3. Remove the fuse link retaining screws from the face of the charger and remove the fuse link assembly.

Fuse Link Assembly Installation

1. Place the plastic cover over the fuse assembly and position the assembly on the charger face, then install the mounting screws from the front of the charger face.
2. Install the bus bar over center branch of fuse assembly and ammeter post. Tighten to 23 in.lb (2.6 N-m).
3. Connect one of the secondary transformer leads (black) to one of the remaining terminals on the back of the fuse assembly. Connect the remaining secondary transformer lead (black) to the remaining terminal. Tighten to 23 in.lb (2.6 N-m).
4. Install the charger cover.