

Battery Chargers



SERVICE MANUAL / PARTS LIST

AUTOMATIC Advance MODELS 56206980, 56206981, 56372947, 56388109, 56395101, 56388502, 56388120, 56409494, 56411058, 56411643, 56409788, 56205983, 56412272, 56206973, 56372203, 56372190, 56388119

Lester MODELS 56031407, 56632342, 56638431, 56638436, 56638439, 56638440, 56632293, 56031403, 56031405, 56031408

MANUAL MODELS (obsolete) 56206975, 56372945, 56372955



**Nilfisk
Advance**

setting standards

Revised 8/00 Form Number 56041170

BATTERY CHARGER SERVICE MANUAL / PARTS LIST

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BATTERY CHARGER SERVICE MANUAL

SYMBOLS

Nilfisk-Advance uses the symbols below to signal potentially dangerous conditions. Always read this information carefully and take the necessary steps to protect personnel and property.

DANGER!

Is used to warn of immediate hazards that will cause severe personal injury or death.

WARNING!

Is used to call attention to a situation that could cause severe personal injury.

CAUTION!

Is used to call attention to a situation that could cause minor personal injury or damage to the machine or other property.

GENERAL SAFETY INSTRUCTIONS

DANGER!

HIGH VOLTAGE! With the charger on, the internal charger capacitor voltage is approximately 650 volts.

WARNING!

Do not operate the charger if it is malfunctioning. Personal injury or property damage could result.

Remove all jewelry when working near electrical components.

CAUTION!

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

Incorrect assembly may result in a risk of electric shock or fire.

Always unplug the electrical cords, first from the AC outlet and then from the charger receptacle before attempting any repairs or service to the charger.

REPAIRS BY QUALIFIED PERSONNEL ONLY. NOTE: Modifying this charger for use other than that for which it was intended, repairs by persons not qualified, or not using original equipment replacement parts will void the manufacturer's warranty and liability.

BATTERY CHARGER SERVICE MANUAL

GENERAL INFORMATION

The Nilfisk-Advance Battery Chargers are designed to recharge deep-cycling lead acid batteries. A ferroresonant transformer is used to provide a highly reliable, line compensating unit with a minimum of moving parts, designed for long trouble-free service. The chargers are constructed so that all parts can be tested and replaced with basic hand tools. In addition, an analog multimeter of 10,000 ohms per volt sensitivity or better is required.

The Nilfisk-Advance battery charger is comprised of two basic sections; the transformer/rectifier or power section, and the on/off control section.

TRANSFORMER / RECTIFIER OR POWER SECTION

The power or charging section consists of a transformer with its specified part number and rating capacitor and rectifying diodes attached to a heat sink. The ammeter displays charging current and the fusing provides electrical protection.

The transformer consists of primary coil or coils separated from the capacitor and secondary coils by a stack of transformer grade steel pieces called a shunt pack. The transformer coils are wound with high temperature double insulated magnet wire. The leads are covered with tan or black sleeving and all termination connectors are crimped and soldered. The transformer must be properly connected in accordance with the correct wiring diagram for each specific part number charger.

The capacitor functions in combination with the specific transformer to provide the correct charger output with variation in AC line voltage. The correct part number and rating capacitor as listed on the parts list must be used with the correct part number transformer and charger.

CAUTION!

Use only the correct part number and rating capacitor. Use of a different capacitor may result in improper charging, capacitor failure, transformer burnout and / or battery damage.

The rectifier diodes are attached to a heatsink plate or bracket that is fastened to, but electrically isolated from, the charger chassis. Connection points are provided on the heatsink assembly with diodes. One connection point is to the heatsink plate itself or a tab attached to it, the remaining connections are to individual diode tabs or leads. More than one lead can be attached to each connection point and the heatsink assembly with diodes must be the right part number and connected in accordance with the correct wiring diagram for the specific part number charger.

The ammeter needle deflects in response to current flow indicating charge current. Connections to the ammeter terminals are either push on or with jam nuts. When tightening the jam nuts, insure the threaded stud does not turn, or damage to the ammeter can occur. Use only the correct ammeter as specified in the appropriate wiring diagram and parts list.

BATTERY CHARGER SERVICE MANUAL

TRANSFORMER / RECTIFIER OR POWER SECTION (continued)

The fusing consists of a fuse link in series with each diode and provides overcurrent protection should one or both diodes fail in the shorted mode. When both fuses or fuse links blow, this is usually due to a reverse polarity connection to the batteries. Either two individual fuseholders with fuses or a single dual element fuse assembly provides this protection. The fuse assembly consists of a double ended fuse wire visible through a transparent bubble mounted on the front panel. Each half of the fuse wire serves as an individual fuse element. After correcting the reason for the fuse blowing, replace the fuse or fuse assembly only with the correct rating and part number in accordance with the correct wiring diagram and parts list for the specific part number charger.

ON/OFF CONTROL SECTION

The ON/OFF control is provided by either a manually set hours of charge timer or the fully automatic battery condition sensing electronic timer kit.

The fully automatic timer section has three main components.

The, "Electronic Timer Kit", consist of state of the art electronic circuitry on a printed circuit board contained in a protective sheet metal housing.

The "Control Cable Assembly", has a polarized edge connector that mates with the circuit board pads on the rear of the electronic timer kit. The wires attached to the edge connector are the correct length, position and color to be connected in accordance with the proper wiring diagram for each specific part number charger.

The "On/Off Control Relay", responds to signals from the electronic timer kit to either turn the AC power on or off to the transformer of the power section. The relay terminal nomenclature is printed on each relay case and should be connected according to the correct wiring diagram for each specific part number charger.

The manually set hours of charge timer is a simple electric clock motor operated on/off switch that turns off after the preset number of hours has elapsed. The push on connections are numbered and must be connected according to the correct wiring diagram for each specific part number charger.

BATTERY CHARGER SERVICE MANUAL

AUTOMATIC TIMER BATTERY CHARGER TROUBLESHOOTING

Proper functioning of the Automatic Battery Charger is indicated by the following sequence of events. Three to five seconds after the DC plug is connected to the charger receptacle the control relay “clicks” on, the transformer hums and the ammeter registers proper charge.

Proper diagnosing and repair requires identifying the malfunction from the following list, performing the indicated tests and repairing or replacing the malfunctioning items.

Malfunction Description	Test Procedures / Section Number
Relay does not “click” on when DC plug is connected to the charger receptacle.	Test for complete electrical connection to batteries / 1 . Test for proper functioning of automatic timer components / 2 .
Relay “clicks” on, but transformer does not hum.	Test AC power circuit / 3 .
Transformer hums but no ammeter indication.	Test Charger DC Circuit / 7 . Test Fuses and Diodes / 6 . Test Capacitor / 4 . Test Transformer / 5 .
Transformer hums but charger output is low.	Test Fuses and Diodes / 6 . Test Transformer / 5 .
Fuse blows as soon as DC plug is connected to the charger receptacle.	Test Charger DC Circuit / 7 . Test Fuses and Diodes / 6 .
Ammeter remains pegged at maximum charge for more than 30 minutes.	Check Battery System Voltage / 8 .
Charger does not turn off.	Test Automatic Timer Section for “Does Not Turn Off” / 9 .

WARNING!

Do not touch the battery terminals or contacts on the charging plug. An electrical shock could result.

BATTERY CHARGER SERVICE MANUAL

MANUAL TIMER BATTERY CHARGER TROUBLESHOOTING

Proper functioning of the charger is indicated by the following sequence of events. When the timer knob is turned to "ON", the transformer hums and the ammeter registers proper charge.

Proper diagnosing and repair requires identifying the malfunction from the following list, performing the indicated tests and repairing or replacing the malfunctioning items.

Malfunction Description	Test Procedures / Section Number
Transformer does not hum when the timer is turned to "ON".	Test AC Power Circuit / 3 .
Transformer hums but no ammeter indication.	Test for complete electrical connection to battery system / 1 . Test Charger DC Circuit / 7 . Test Fuses and Diodes / 6 . Test Capacitor / 4 . Test Transformer / 5 .
Transformer hums but charger output is low.	Test Fuses and Diodes / 6 . Test Transformer / 5 .
Fuse blows as soon as the charger is connected to the batteries.	Test Fuses and Diodes / 6 .
Ammeter remains pegged at maximum charge for more than 30 minutes.	Check Battery System Voltage / 8 .
Charger does not turn off.	Replace Manual Timer.

WARNING!

Do not touch the battery terminals or contacts on the charging plug. An electrical shock could result.

BATTERY CHARGER SERVICE MANUAL

1-CHECKING FOR COMPLETE ELECTRICAL CONNECTION TO THE BATTERIES

- A** Measure and record battery system voltage at the battery posts of the machine. Connect the positive (+) voltmeter lead to the positive (+) battery system post and the negative (-) voltmeter lead to the negative (-) battery system post.
- B** Measure and record battery voltage at the charger receptacle. If no voltage is measured or the voltage measured is lower than the voltage measured in step A, repair or replace connections to batteries in machine.
- C** See Figure 1. With both the AC cord and the charging plug disconnected, remove the cover from the charger. Connect the positive voltmeter lead to the same point inside the charger where the white (+) DC cord lead connects. Connect the negative voltmeter lead to the same point inside the charger where the black (-) DC cord lead connects.

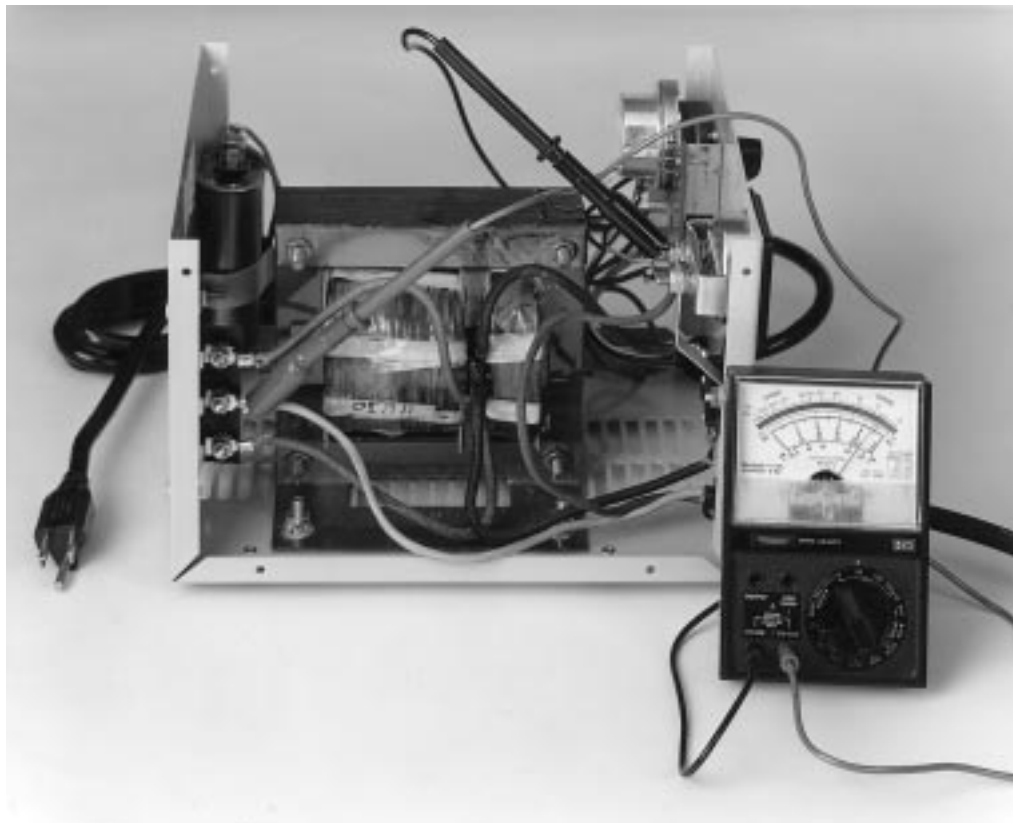


FIGURE 1. Testing for complete electrical connection to the battery system.

- D** Connect the DC Output cord to the charger receptacle and record the voltage measured. It should be the same voltage as measured in step A.
- E** If no voltage is measured or the voltage measured is lower than the voltage measured in step A, repair or replace the receptacle, charger plug and / or the cordset and re-test.

BATTERY CHARGER SERVICE MANUAL

2-TEST FOR PROPER FUNCTIONING OF AUTOMATIC TIMER COMPONENTS

- A** With both the AC cord and the charging plug disconnected, remove the cover from the charger. Verify that the charger is wired correctly according to appropriate wiring diagram for the specific part number charger.
- B** Remove the retaining screws and slide the automatic timer kit out the front of the charger. Disconnect the edge connector from the automatic timer kit and insert the test kit (Fig. 2). Connect the DC plug to the charging receptacle and listen for the relay to “click” on. If the relay now “clicks” on, install a new automatic timer kit and re-test. If the relay does not “click” on, continue with the next test.



FIGURE 2. Insert the test kit.

- C** Measure DC voltage across the pads on the test kit that the red (Positive) and black (Negative) wires contact (Fig. 3). The meter should read the same battery voltage as recorded in 1-C. If no voltage is measured or the voltage measured is lower, repair or replace the control cable assembly and retest.
- D** Measure DC voltage across the pads on the test kit that the black (Negative) and brown (Positive) wires contact. It should read the same battery voltage as recorded in 2-C. If no voltage is measured install a new control relay and retest.



FIGURE 3. Measure battery system voltage at the test kit pads.

3-TEST AC POWER CIRCUIT

- A** Measure AC line voltage at the outlet to be sure the correct AC voltage for the specific part number charger is present (115 VAC, or 230 VAC). If the correct AC power is present, disconnect the AC plug and the charging plug.
- B** Adjust the multimeter to the low resistance scale (R X 1) or use a low voltage continuity tester. Connect the tester leads to the flat prongs on the AC plug.
- **MANUAL TIMER CHARGER**
Turn the timer knob to “ON” and note the response. The circuit should be complete when the timer knob is turned to “ON”, (Fig. 4) and open when the timer knob is turned to “OFF”.



FIGURE 4. Test AC circuit for continuity.

- **AUTOMATIC TIMER CHARGER**
Connect the charging plug to the charging receptacle and listen for the control relay to “click” on, 2 to 5 seconds after connection.
- The circuit should be open before the relay “clicks” on and the circuit should be complete after the relay “clicks” on.
- C** If the circuit does not test as described, individually check the AC cord, manual timer contacts, control relay contacts, primary transformer coil(s) and all connections.

⚠ DANGER!

HIGH VOLTAGE! With the charger on, the charger capacitor voltage is approximately 650 volts AC. Use extreme caution when working near the capacitor terminals.

BATTERY CHARGER SERVICE MANUAL

4-TEST THE CAPACITOR

WARNING!

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

A Using the analog ohmmeter adjust the scale to R X 10,000 (1 Ok) Ohms. Loosen the capacitor clamp and carefully remove both transformer leads from the capacitor terminals so the wires do not break. Touch the ohmmeter leads to the capacitor terminals and note the results. Reverse the test leads, repeat the test and compare to the following:

- **GOOD CAPACITOR:** When the ohmmeter leads are connected to the capacitor terminals the meter needle bumps up to mid scale and quickly coasts back to high resistance (∞).
- **OPEN CAPACITOR:** When the ohmmeter leads are connected to the capacitor the meter needle does not move and stays at high resistance (∞). A bulge in the top of the capacitor may be visible if the capacitor has failed "OPEN".
- **SHORTED CAPACITOR:** When the ohmmeter leads are connected to the capacitor terminals, the meter needle jumps to full scale, zero ohms and remains there.

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

CAUTION!

Use only the correct part number and rating capacitor as specified on the correct parts list for the specific part number charger. The use of a different part number or rating capacitor may result in improper charging, capacitor failure, transformer burnout, and / or battery damage.

5-TRANSFORMER TESTING

Testing the transformer consists of measuring the AC voltage across the transformer secondary leads that connect to the diodes. This voltage is measured first with the capacitor disconnected and compared to the voltage measured with a capacitor connected that has been tested and found good.

DANGER!

HIGH VOLTAGE! With the charger operating, the charger capacitor voltage is approximately 650 volts AC. Use extreme caution when working near capacitor terminals.

- A** Disconnect the transformer secondary coil leads #1 and #4 (TAN SLEEVING) from the diode terminals. Loosen the capacitor strap and carefully disconnect the transformer capacitor coil leads from the capacitor terminals.
- B** Refer to the transformer test voltages diagram on the wiring diagram and parts list page for the specific part number charger and adjust the voltmeter to an appropriate AC voltage range. Attach the meter test leads to the identified transformer coil leads.
- C** Checking to be sure for personal safety, and that no leads have been accidentally allowed to short, follow the instructions below to energize the transformer primary.
 - **MANUAL TIMER CHARGER**
Turn the timer knob to “ON” and connect the power supply cord to an outlet while recording the voltage reading and unplug as soon as the reading is noted.
 - **AUTOMATIC TIMER CHARGER**
Connect the DC plug to the charger receptacle and listen for the relay to “click” on 2 to 5 seconds after the connection. Connect the AC power supply cord to an outlet while recording the voltage reading and unplug as soon as the reading is noted.

BATTERY CHARGER SERVICE MANUAL

5-TRANSFORMER TESTING (continued)

- ALTERNATELY

The relay contacts can be bypassed to enable transformer testing when the battery system is not present. Make up jumper leads (1 for 115 VAC, 2 for 230 VAC) with 3/16" (4.56 mm) wide flat blade push in connectors on both ends of a piece of 14 gauge flexible wire (Fig. 5). Carefully disconnect the AC cord lead and transformer primary lead (1 each 115 VAC, 2 each 230 VAC) from the relay terminals. Connect the jumper lead (1 for 115 VAC, 2 for 230 VAC) according to the transformer test diagram on the wiring diagram and parts list for the specific part number charger. Connect the AC power supply cord to an outlet while recording the voltage reading and unplug as soon as the reading is noted (Fig. 5).

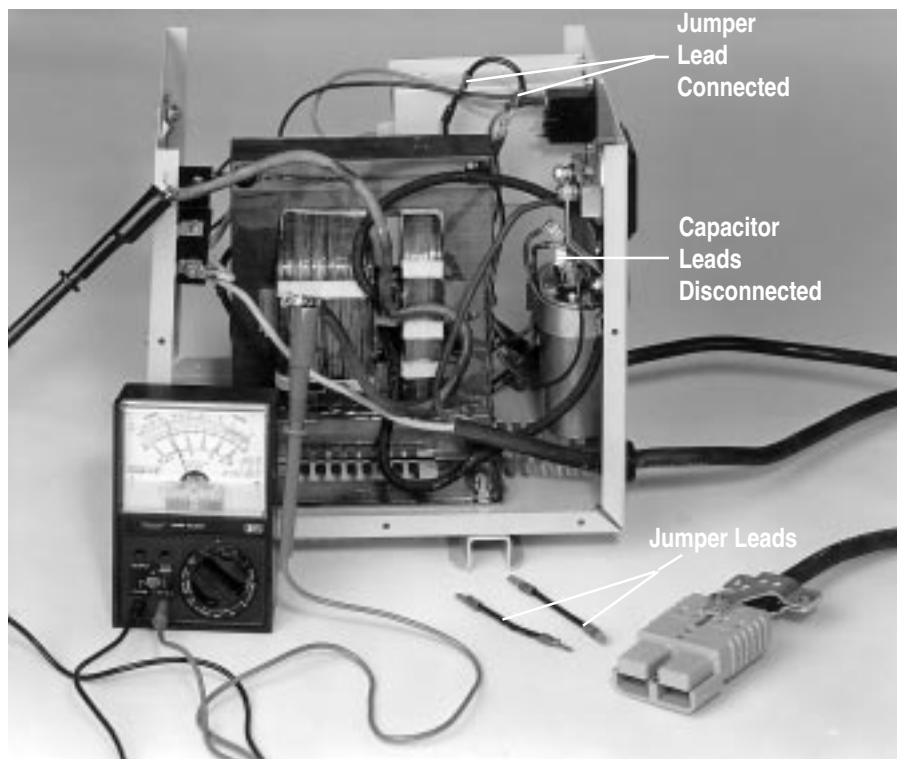


FIGURE 5. Transformer test.

- D** If the AC line fuse or circuit breaker blows, the transformer is shorted internally and must be replaced.
- E** Check the transformer secondary coil and capacitor coil voltage and compare to voltages on the transformer test diagram for the specific part number charger. If the voltages are substantially lower than those shown, the transformer is shorted internally and must be replaced.
- F** If the secondary coil voltage and capacitor coil voltage check good, re-test the secondary coil voltage with the correct capacitor connected. If the secondary coil voltage is the same measured with the capacitor disconnected, the capacitor may be open, or the capacitor coil terminals may not be making proper contact.

6-TEST FUSES AND DIODES

Disconnect the AC power cord and the charging cord.

- A** Set the multimeter to the low resistance scale (R X 1) or use a low voltage continuity test light.
- B** Excessive heat due to a loose, corroded or distressed connection can cause one or both fuse assembly links to melt and open. Fuseholders that are worn, corroded, bent or broken can result in an open circuit even when a good fuse is installed. Isolate the fuseholder assembly electrically and test for continuity with a good fuse installed.
- C** Electrically test and visually check the fuses and fuse assembly for continuity. A single blown fuse or fuse link is normally caused by a short circuit failure of a single diode. When both fuses or fuse links are blown, this is usually due to a reverse polarity connection to the batteries. Test the diodes and correct the problem before replacing the fuse.

⚠ DANGER!

Replace the fuse or fuse assembly only with the correct fuse or fuse assembly. FIRE, PROPERTY DAMAGE AND PERSONAL INJURY CAN RESULT IF THE CHARGER IS USED WITH AN INCORRECT FUSE INSTALLED.

- D** To test the diodes, disconnect one transformer secondary coil lead (TAN SLEEVING) from the diode terminal. Using the multimeter or a low voltage continuity tester, connect one lead to the diode heatsink plate or terminal, and the other lead to a diode terminal (Fig. 6). Note the response and then reverse the tester leads and check each diode again.
- **GOOD DIODE:** When the diode shows continuity in one direction but not the other.
 - **SHORTED DIODE:** When the diode shows continuity in both directions.
 - **OPEN DIODE:** When the diode does not show continuity in either direction.
- E** If the diode(s) is **OPEN** or **SHORTED** the complete heatsink assembly with diode(s) must be replaced.

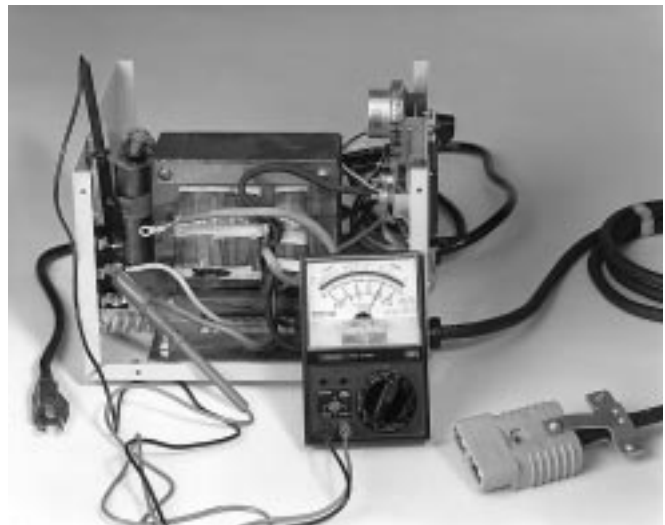


FIGURE 6. Test diodes.

BATTERY CHARGER SERVICE MANUAL

7-CHARGER DC CIRCUIT TEST

Disconnect the AC power cord and the DC charger plug.

- A** Set multimeter to low resistance scale (R X 1) or use a low voltage continuity tester.
- B** Connect one lead of the ohmmeter or continuity tester to one of the DC charging plug contacts, and the other to the remaining DC plug contacts and note the response. Reverse the test leads and note the response again. The circuit should be complete in one direction only (Fig. 7 & 8).



FIGURE 7. Test charger DC circuit. The circuit conducts in one direction.



FIGURE 8. Test charger DC circuit. The circuit does not conduct in reverse direction.

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

- C** If the circuit does not conduct in either direction and the fuses or fuse assembly test good, individually check the continuity of the DC output cord, ammeter, diodes and all connections.
- D** If the circuit conducts in both directions, a “short” exists in the charger DC circuit. First check the DC output cord for a “short” between the two wires. Second, check if one or more of the diodes has failed in the shorted mode.

BATTERY CHARGER SERVICE MANUAL

8-AMMETER REMAINS AT MAXIMUM CHARGE FOR MORE THAN 30 MINUTES

This condition normally results if the charger is connected to a battery pack which is of lower system voltage than specified in the operators manual and / or the charger case.

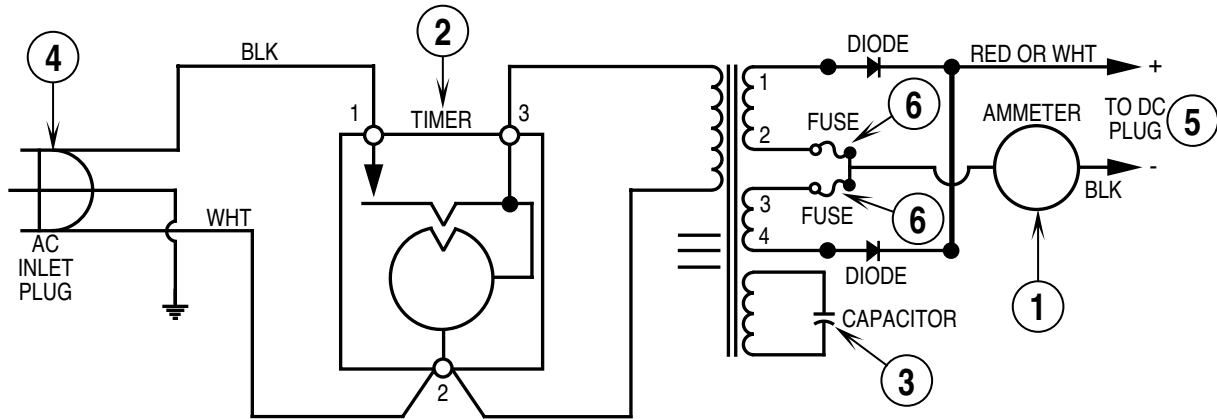
CAUTION!

Do not connect the charger to, or attempt to use the charger on battery packs of different DC voltage than specified on the front of the charger. Overheating and transformer burn-out will result.

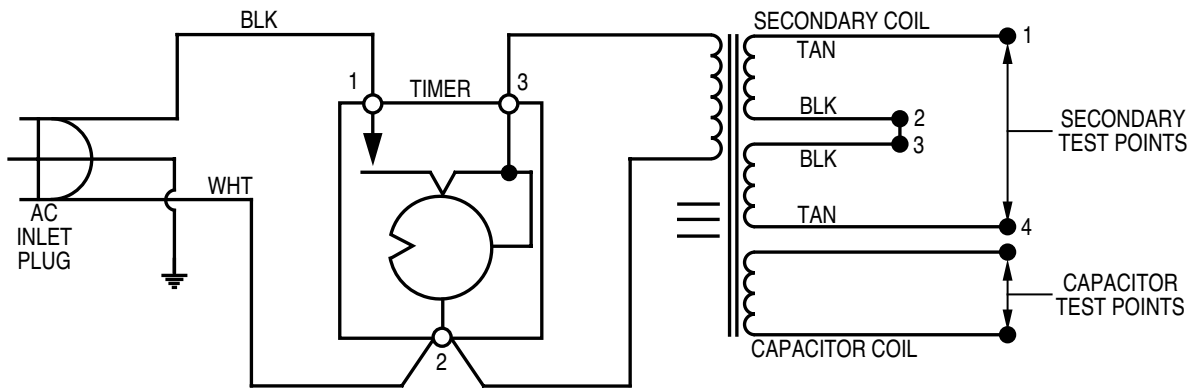
9-TEST AUTOMATIC TIMER SECTION FOR “DOES NOT TURN OFF”

- A** Disconnect the AC power supply cord and the DC charging plug. Remove the cover and verify that the control cable assembly leads are securely connected in accordance with the correct wiring diagram for the specific part number charger.
- B** Using the test kit, check continuity of the green sense lead between the pad on the test kit in line with the green wire and where the sense lead connects to the diode terminal. If the circuit is “open”, replace the control cable assembly.
- C** Connect the charger DC plug to the charging receptacle and then the AC power cord to turn the charger on. Remove the automatic timer kit retaining screws and carefully slide the kit out the front of the charger. Disconnect the edge connector from the circuit board and note if the transformer hum ceases and the ammeter drops to zero. Does the charger now turn off?
 - CHARGER DOES NOT TURN OFF: The control relay has frozen “ON”. Replace the relay with the correct part number as specified on the correct parts list for the specific part number charger.
 - CHARGER TURNS OFF: The automatic timer kit is malfunctioning. Replace the automatic timer kit with the correct part number as specified on the correct parts list for the specific part number charger.

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



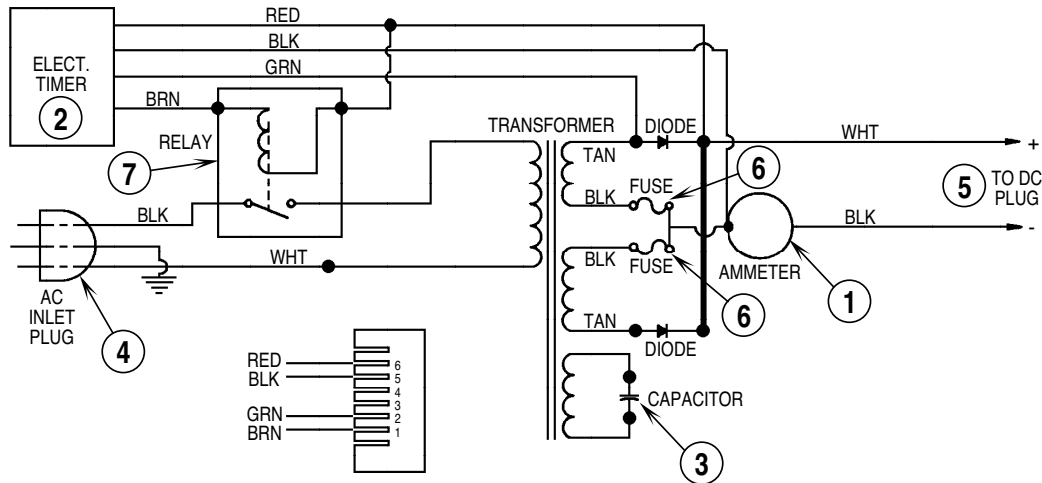
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56206975 24 VOLT 10 AMP MANUAL 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56206904	1	Heatsink Assembly, With Diodes
1	56206905	1	Ammeter
2	56206906	1	Timer, 12 Hour
*	56206914	1	Knob, Timer
3	56206907	1	Capacitor, 2.0 MFD, 660 VAC
*	56206908	2	Bushing, 6N3-4, Insulator For Cordsets
5	56206910	1	Cordset, DC, 14/2, 108", Lester Plug
6	56206912	2	Fuse, 15 AMP, AGC-15
*	56206913	2	Fuseholder, HKP-HH, With 1/4 qd Tabs

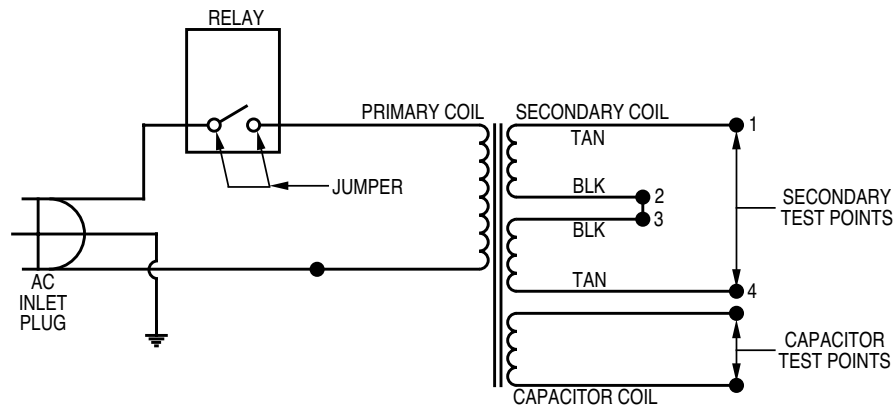
* = Not Shown

Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 36 to 44 VAC	Approx. 54 to 66 VAC
Capacitor Coil	Approx. 395 VAC	X
A.C. Input - 120 VAC / 60HZ		

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



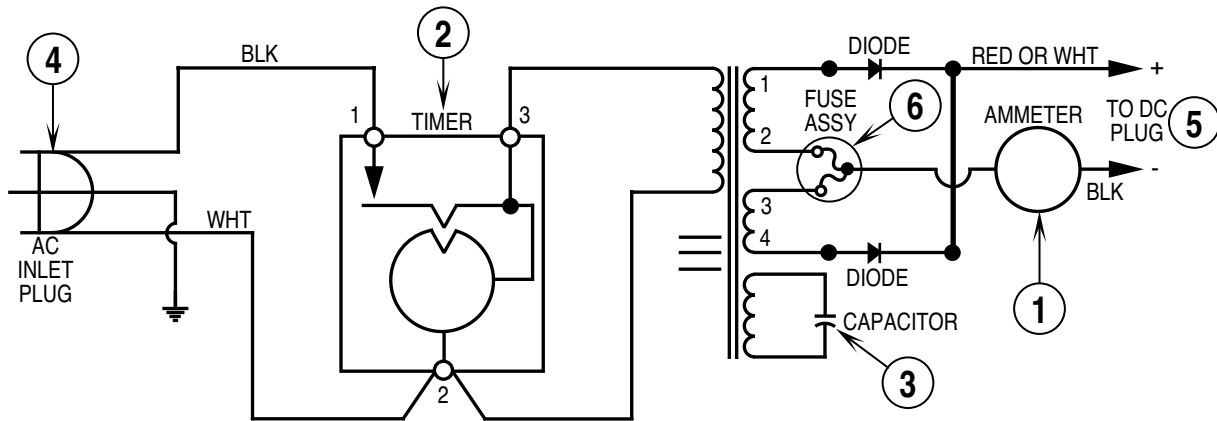
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56206980 24 VOLT 10 AMP AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56206904	1	Heatsink Assembly, With Diodes
1	56206905	1	Ammeter
2	56206917	1	Electronic Timer Assembly
3	56206907	1	Capacitor, 2.0 MFD, 660 VAC
*	56206908	2	Bushing, 6N3-4, Insulator For Cordsets
*	56206982	1	AC Cord Strain Relief
5	56206910	1	Cordset, DC, 14/2, 108", Yellow Lester Plug (used on 206980)
*	56324306	2	DC Charger Plug Contact (used with SB 50 small red plug)
6	56206912	2	Fuse, 15 AMP, AGC-15
*	56206913	2	Fuseholder
7	56206919	1	Relay, 24VDC, SP, 15 AMP
*	56206921	1	Test Kit, E.T. Bypass

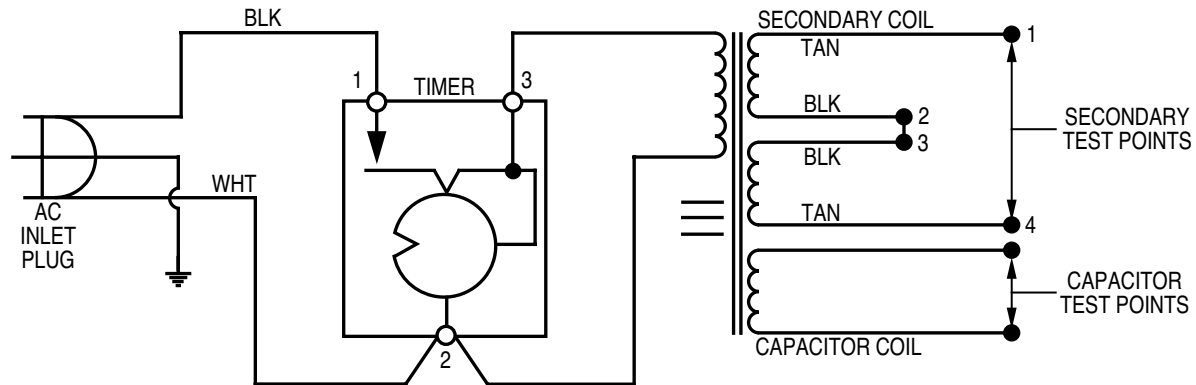
Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 36 to 44 VAC	Approx. 54 to 66 VAC
Capacitor Coil	Approx. 370 VAC	X
A.C. Input - 120 VAC / 60HZ		

* = Not Shown

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



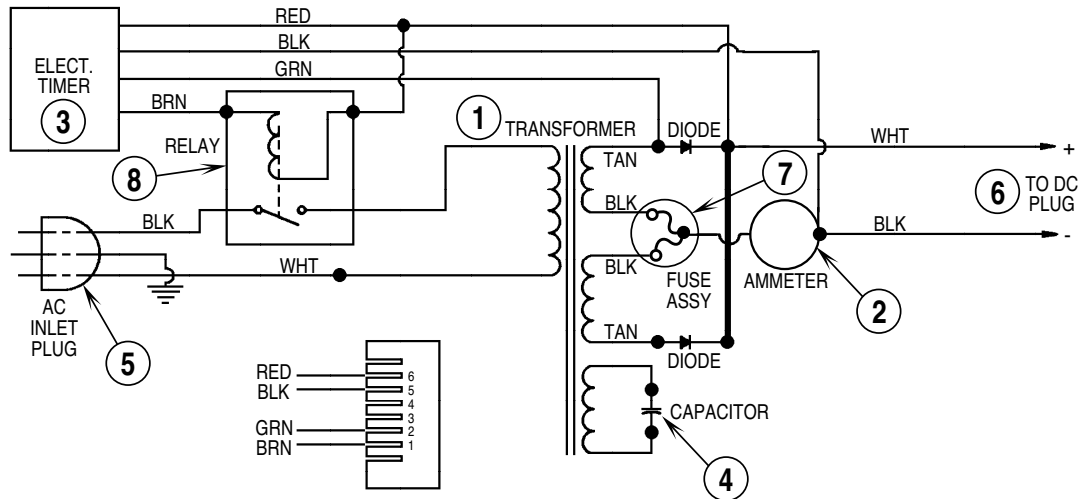
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56372945 24 VOLT 20 AMP MANUAL 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56373047	1	Heatsink Assembly, With Diodes
1	56373048	1	Ammeter
2	56206906	1	Timer, 12 Hour
*	56206914	1	Knob, Timer
3	56373049	1	Capacitor, 4.0 MFD, 660 VAC
*	56373050	2	Bushing, 7W-2, Insulator For Cordsets
4	56373051	1	Cordset, AC, 14/3, 78", Molded Plug
5	56373053	1	Cordset, DC, 12/2, 108", SB175 Red Plug
6	56373054	1	Fuse Assembly
*	56372045	1	Case Assembly
*	56373046	1	Transformer Assembly

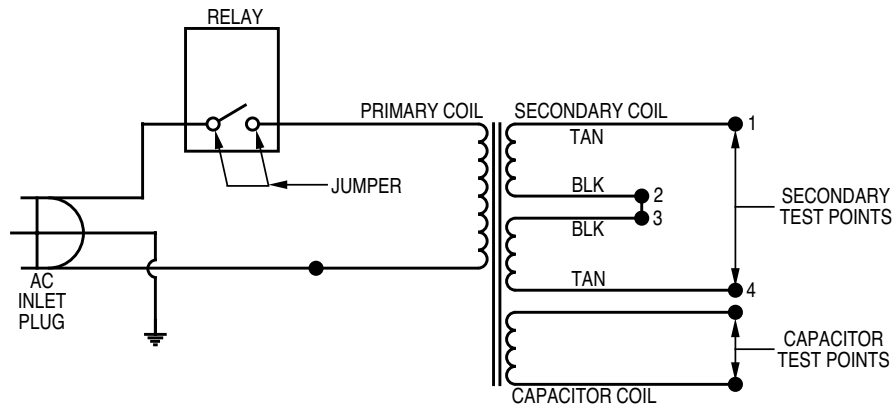
* = Not Shown

Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 36 to 44 VAC	Approx. 54 to 66 VAC
Capacitor Coil	Approx. 435 VAC	X
A.C. Input - 120 VAC / 60HZ		

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



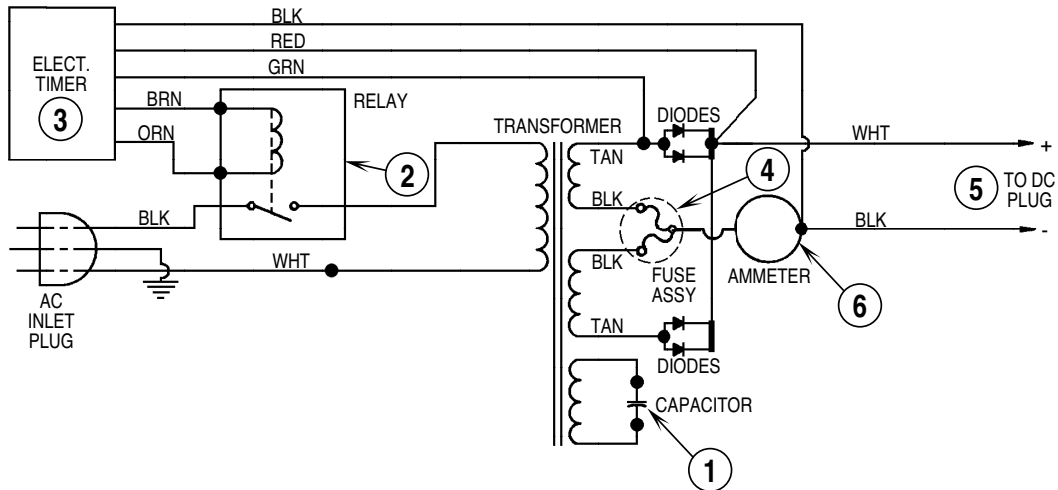
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56372947 24 VOLT 20 AMP AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
1	56373056	1	Transformer Assembly
*	56373047	1	Heatsink Assembly, With Diodes
2	56373048	1	Ammeter
3	56373057	1	Electronic Timer Assembly
4	56373049	1	Capacitor, 4.0 MFD, 660 VAC
*	56373050	2	Bushing, 7W-2, Insulator For Cordsets
5	56373058	1	Cordset, AC, 14/3, 78", Molded Plug
6	56373053	1	Cordset, DC, 12/2, 108", SB175 Red Plug
7	56373054	1	Fuse Assembly
8	56206919	1	Relay, 24VDC, SP, 15 AMP
*	56373059	1	Control Cable Assembly
*	56206921	1	Test Kit, E.T. Bypass
*	56373055	1	Case Assembly

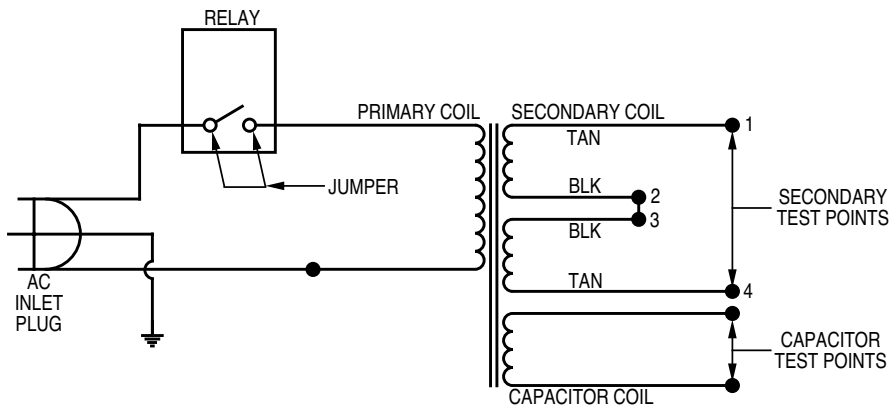
Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 36 to 44 VAC	Approx. 54 to 66 VAC
Capacitor Coil	Approx. 430 VAC	X
A.C. Input - 120 VAC / 60HZ		

* = Not Shown

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



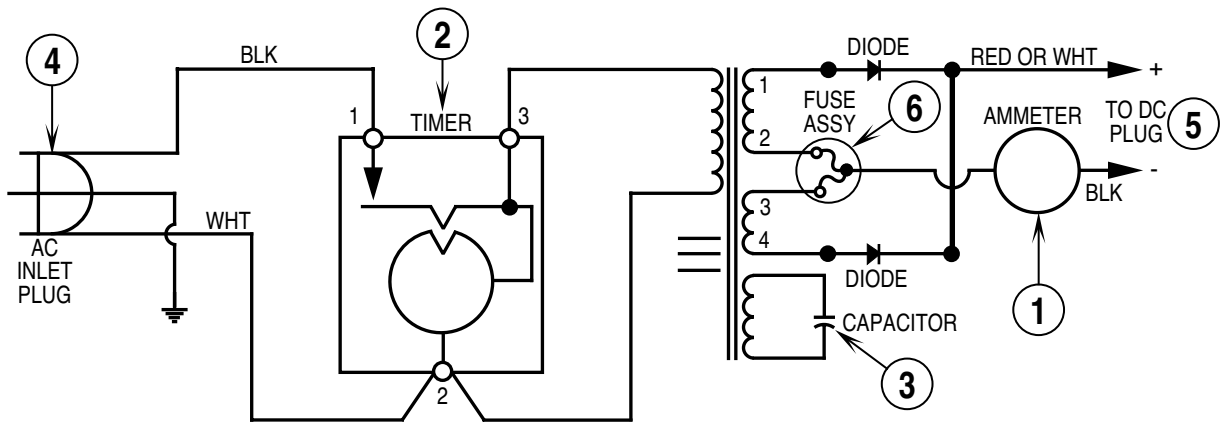
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56388109 24 VOLT 25 AMP AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
1	56388557	1	Capacitor
2	56206919	1	Relay, 24VDC, 15 AMP
4	56373054	1	Fuse Assembly
5	56373053	1	DC Cordset, SB-175 Red Plug
*	56373055	1	Control Cable
*	56373050	2	Bushing, 7W-2
*	56373072	1	Heatsink Assembly, With Diodes
6	56373069	1	Ammeter
*	56206921	1	Test Kit, E.T. Bypass
*	56373057	1	Electronic Timer Kit

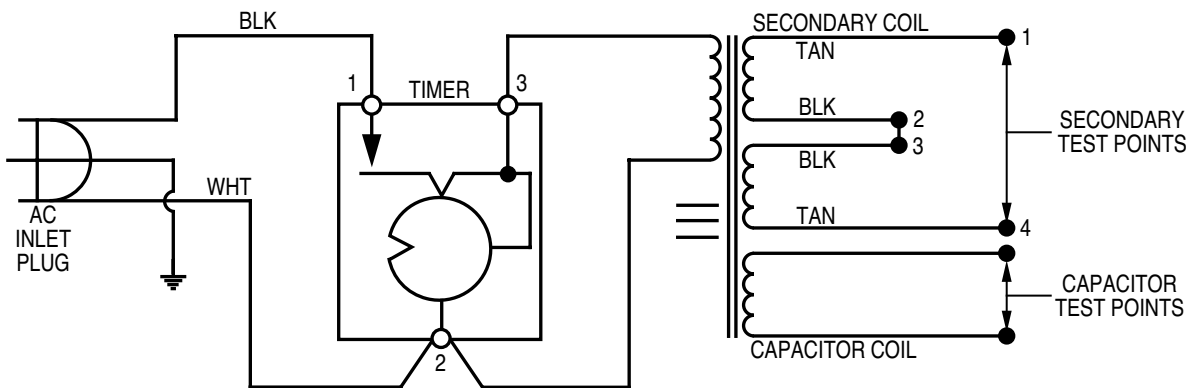
* = Not Shown

Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 36 to 44 VAC	Approx. 54 to 66 VAC
A.C. Input - 120 VAC / 60HZ		

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



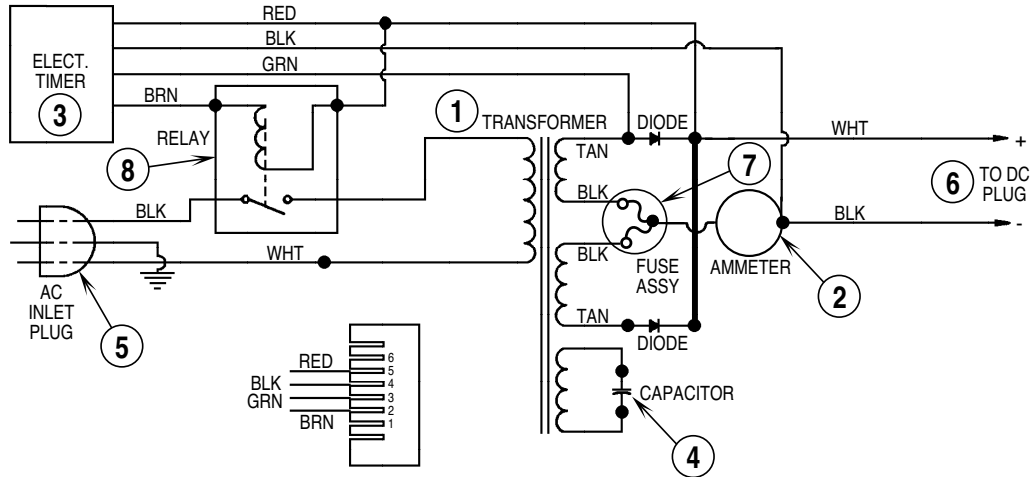
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56372955 36 VOLT 20 AMP MANUAL 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56373047	1	Heatsink Assembly, With Diodes
1	56373048	1	Ammeter
2	56206906	1	Timer, 12 Hour
*	56206914	1	Knob, Timer
3	56373049	1	Capacitor, 4.0 MFD, 660 VAC
*	56373050	2	Bushing, 7W-2, Insulator For Cordsets
4	56373051	1	Cordset, AC, 14/3, 78", Molded Plug
5	56373063	1	Cordset, DC, 12/2, 108", SB175 Red Plug
6	56373054	1	Fuse Assembly
*	56373061	1	Case Assembly
*	56373062	1	Transformer Assembly

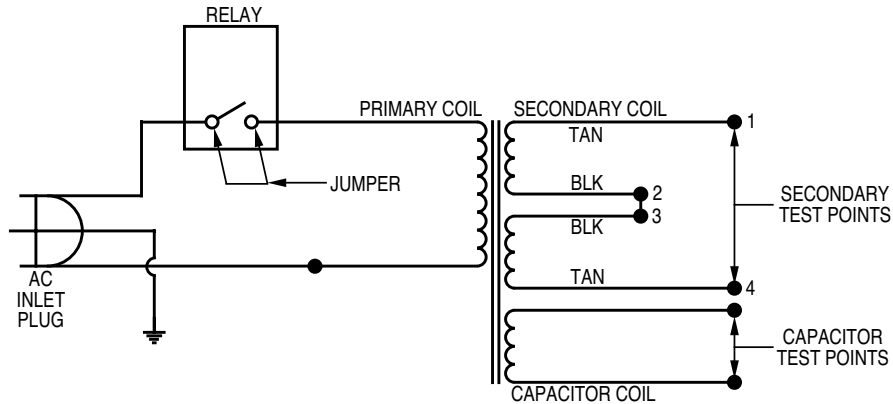
* = Not Shown

Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 55 to 65 VAC	Approx. 83 to 97 VAC
Capacitor Coil	Approx. 460 VAC	X
A.C. Input - 120 VAC / 60HZ		

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



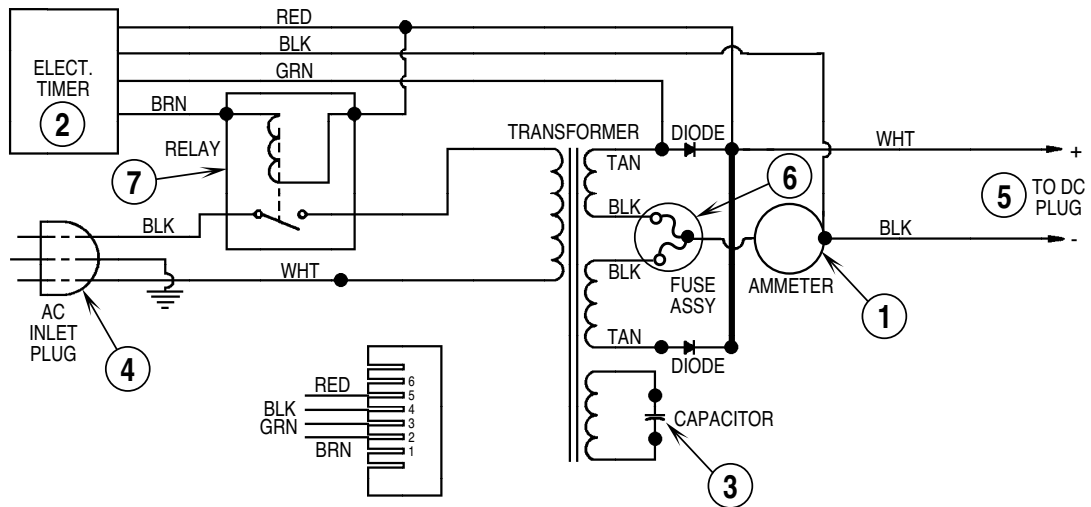
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56395101 (replaces part numbers 56372947 & 56395347) 36 VOLT, 20 AMP, AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56373064	1	Case Assembly
1	56373065	1	Transformer Assembly
*	56373047	1	Heatsink Assembly, With Diodes
2	56373048	1	Ammeter
3	56373066	1	Electronic Timer Assembly
4	56373049	1	Capacitor, 4.0 MFD, 660 VAC
*	56373050	2	Bushing, 7W-2, Insulator For Cordsets
5	56373058	1	Cordset, AC, 14/3, 78", Molded Plug
6	56373063	1	Cordset, DC, 12/2, 108", SB175 Red Plug
7	56373054	1	Fuse Assembly
8	56206919	1	Relay, 24VDC, SP, 15 AMP
*	56206921	1	Test Kit, E.T. Bypass

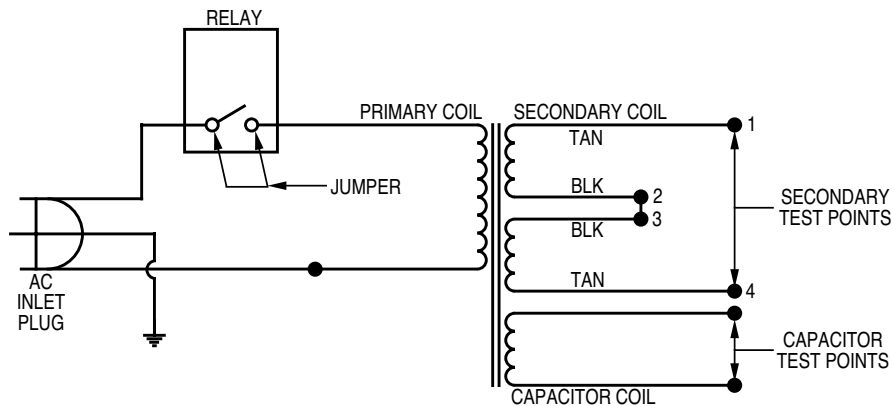
Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 55 to 65 VAC	Approx. 83 to 97 VAC
Capacitor Coil	Approx. 445 VAC	X
A.C. Input - 120 VAC / 60HZ		

* = Not Shown

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



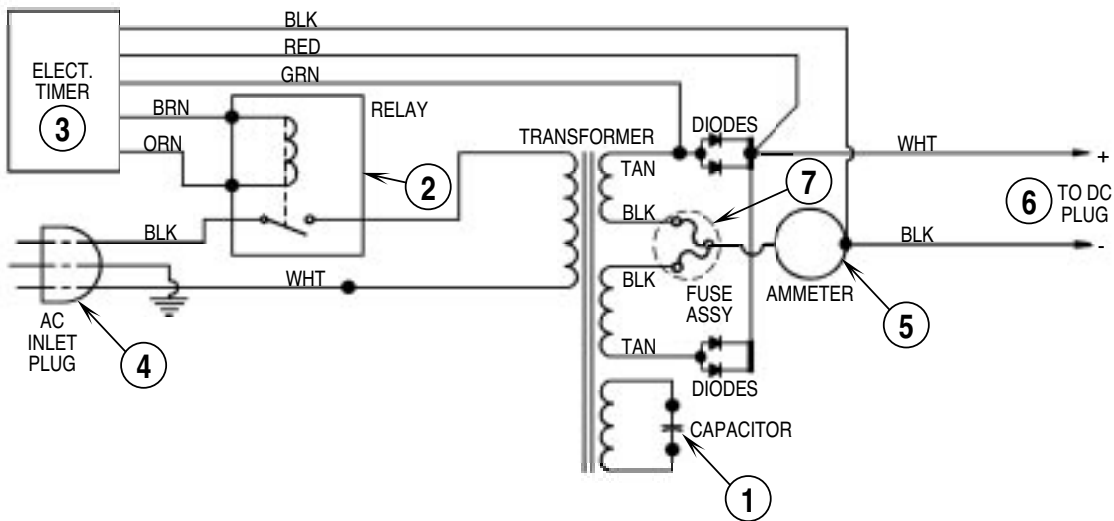
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56388502 36 VOLT 25 AMP AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56388555	1	Heatsink Assembly, With Diodes
1	56388556	1	Ammeter
2	56373066	1	Electronic Timer Assembly
3	56388557	1	Capacitor, 4.0 MFD, 660 VAC
*	56373050	2	Bushing, 7W-2, Insulator For Cordsets
4	56373058	1	Cordset, AC, 14/3, 78", Molded Plug
5	56373063	1	Cordset, DC, 12/2, 108", SB175 Plug
6	56373054	1	Fuse Assembly
7	56206919	1	Relay, 24VDC, SP, 15 AMP
*	56206921	1	Test Kit, E.T. Bypass

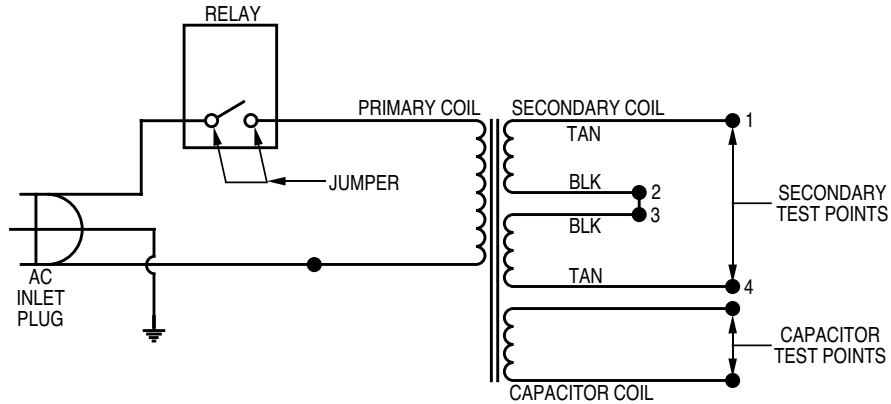
* = Not Shown

Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 55 to 65 VAC	Approx. 83 to 97 VAC
Capacitor Coil	Approx. 420 VAC	X
A.C. Input - 120 VAC / 60HZ		

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



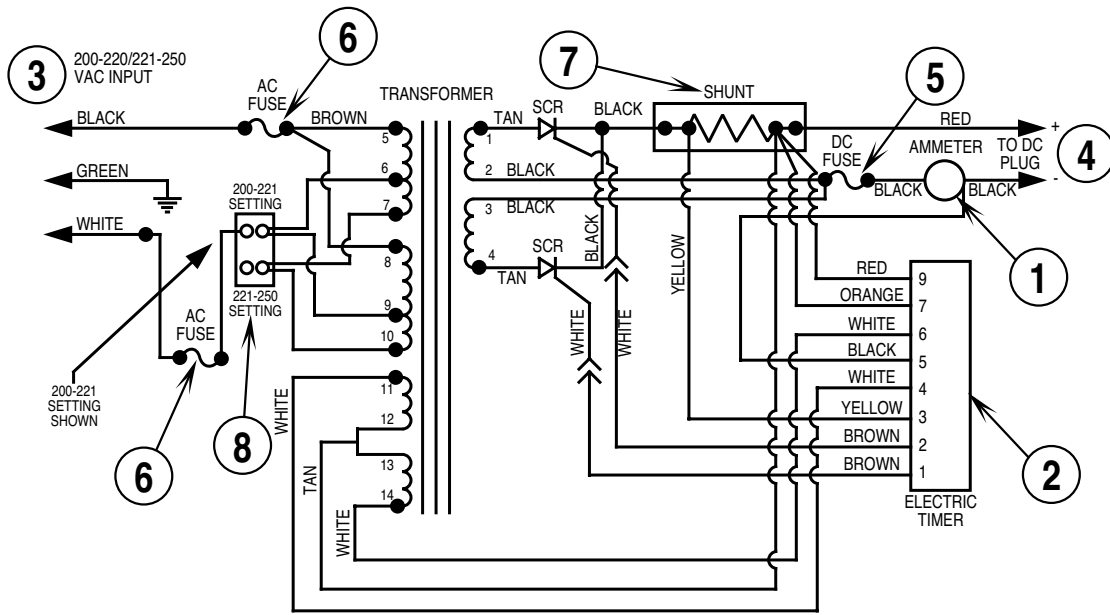
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56388120 36 VOLT 35 AMP AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
1	56388557	1	Capacitor
2	56206919	1	Relay, 24VDC, 15 AMP
3	56373066	1	Electronic Timer Kit
4	56373058	1	AC Cordset 14/3, 78", Molded Plug
*	56373050	2	Bushing, 7W-2
*	56373073	1	Heatsink Assembly, With Diodes
5	56373070	1	Ammeter
6	56373074	1	Cordset, DC
7	56373071	1	Fuse Assembly
*	56206921	1	Test Kit, E.T. Bypass

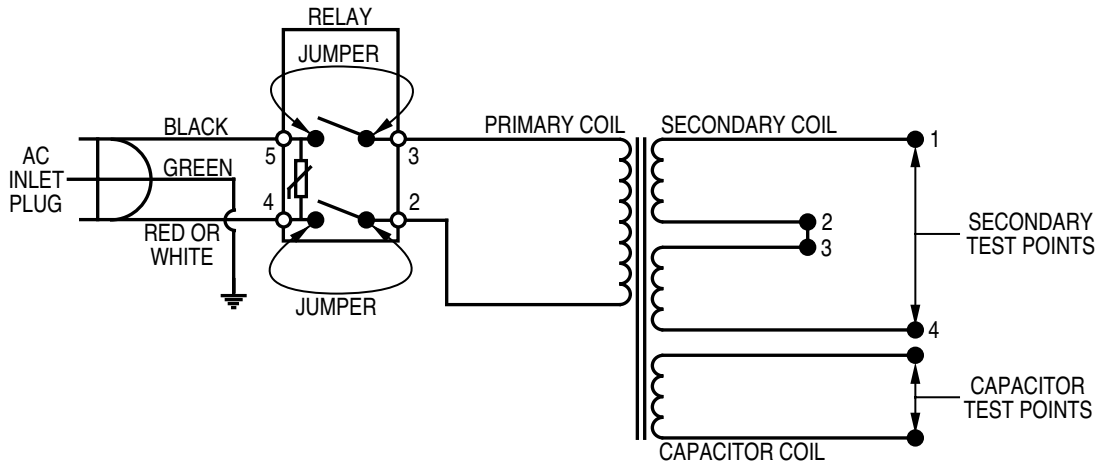
* = Not Shown

Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 55 to 65 VAC	Approx. 83 to 97 VAC
A.C. Input - 120 VAC / 60HZ		

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



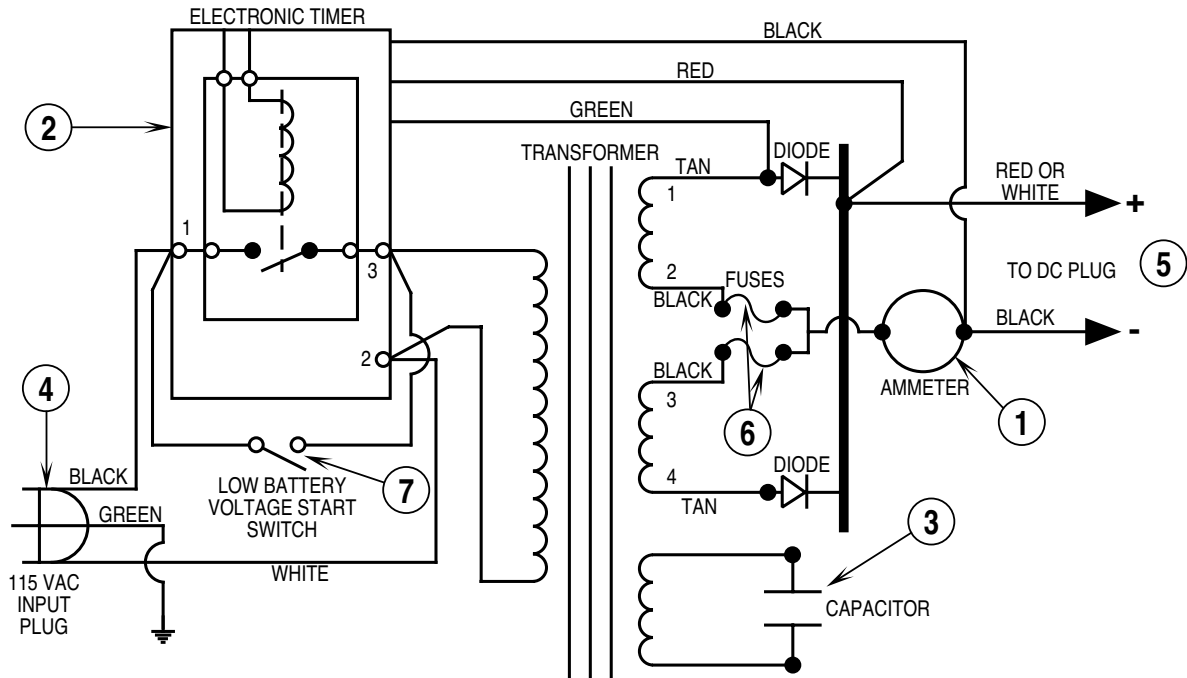
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56409494 36 VOLT 45 AMP AUTOMATIC 221-250 VAC 50-60 HZ

Item	Part No.	Qty	Description
1	56409699	1	Ammeter
*	56409700	2	Heatsink Assembly
2	56409701	1	Electronic Timer Assembly
*	56409702	3	Bushing, Insulator
*	56409703	1	Control Cable Assembly
3	56409704	1	Cordset, AC
4	56409706	1	Cordset, DC, SB-175 Plug
*	56409707	1	Fuseholder, 30 Amp, 600 Volt, 2 Pole
5	56409708	1	Fuse, DC, 125 Amp, JJN-125
6	56409709	2	Fuse, AC, 25 Amp, FLM-25
7	56409710	1	Shunt, Electronic
8	56409711	1	Terminal Strip, 2 Pole

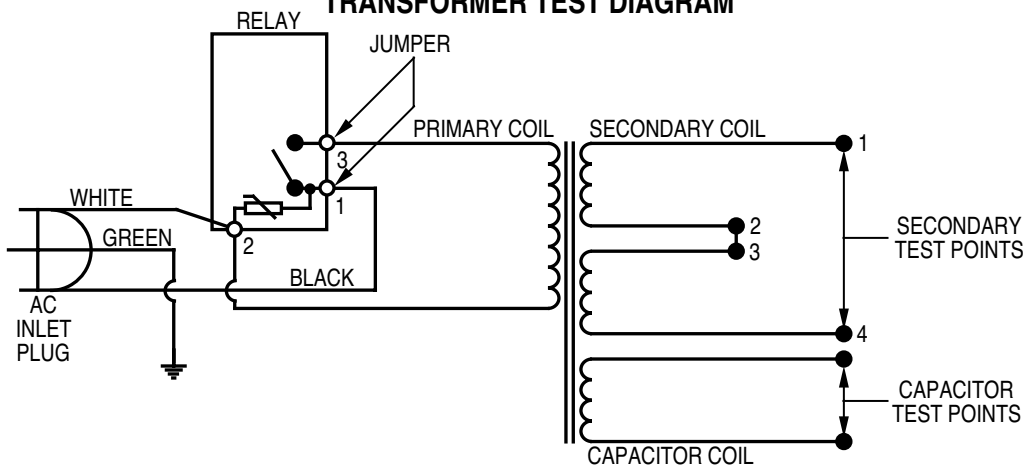
Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 55 to 65 VAC	Approx. 83 to 97 VAC
Capacitor Coil	Approx. 410-470 VAC	X
A.C. Input - 230 VAC / 50HZ		

* = Not Shown

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



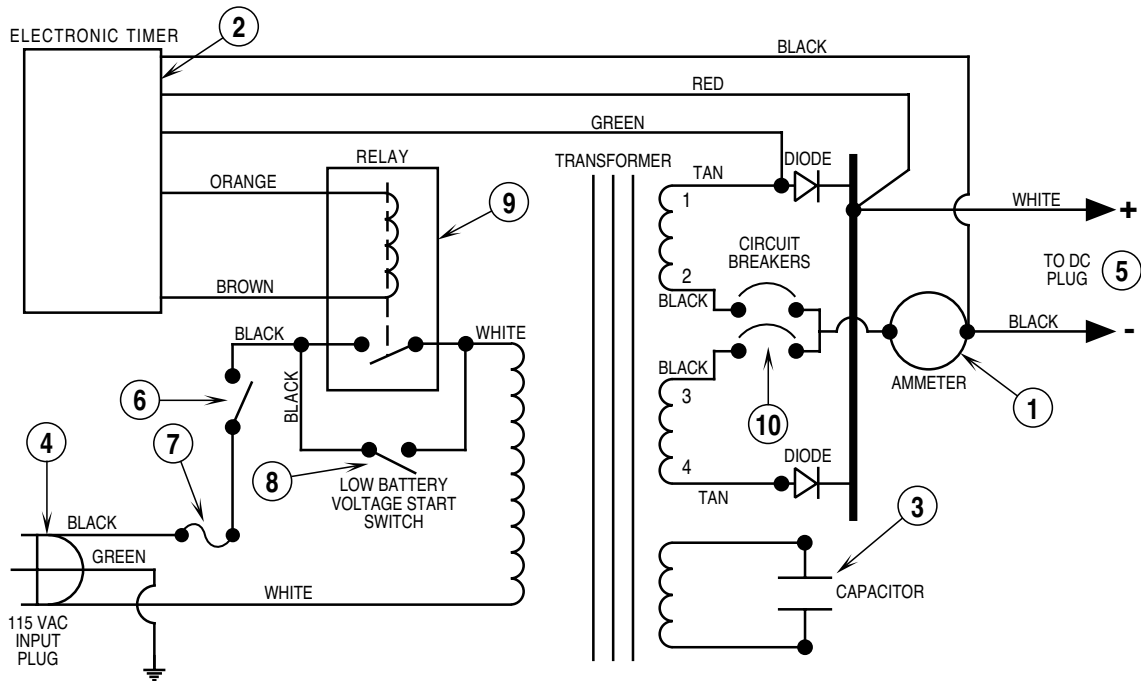
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56411058 12 VOLT 10 AMP AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56411083	1	Heatsink Assembly, W/Diodes
1	56411084	1	Ammeter
2	56411085	1	Electronic Timer Assembly
3	56411086	1	Capacitor, 2.0 MFD, 660 VAC
*	56411087	2	Bushing, 6N3-4, Insulator for Cordset
4	56411088	1	Cordset, AC
5	56411089	1	Cordset, DC W/SB-50 Amp Grey Plug
*	56411090	2	Fuseholder Assembly
6	56478271	2	Fuse, 15 Amps
7	56411091	1	Switch, Rocker
*	56411082	1	Transformer Assembly

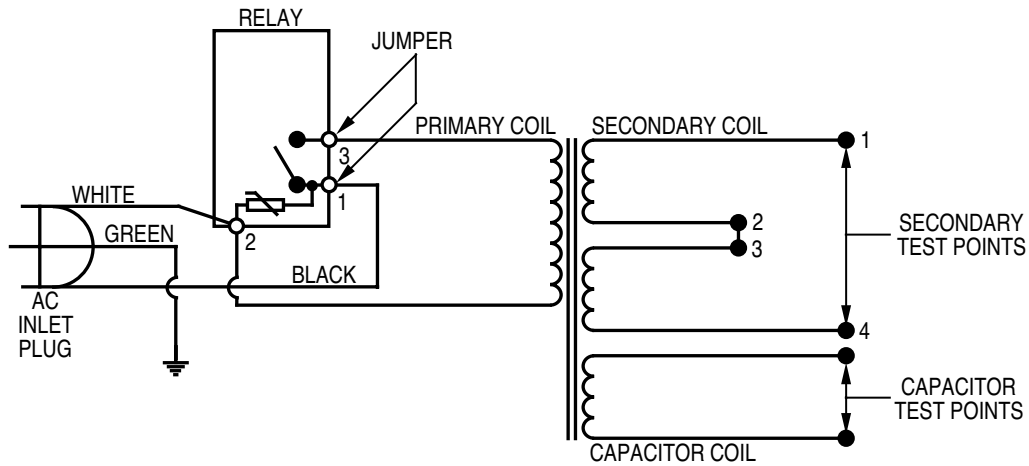
Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 17 to 23 VAC	Approx. 27 to 33 VAC
Capacitor Coil	Approx. 410-470 VAC	X
A.C. Input - 120 VAC / 60HZ		

* = Not Shown

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM



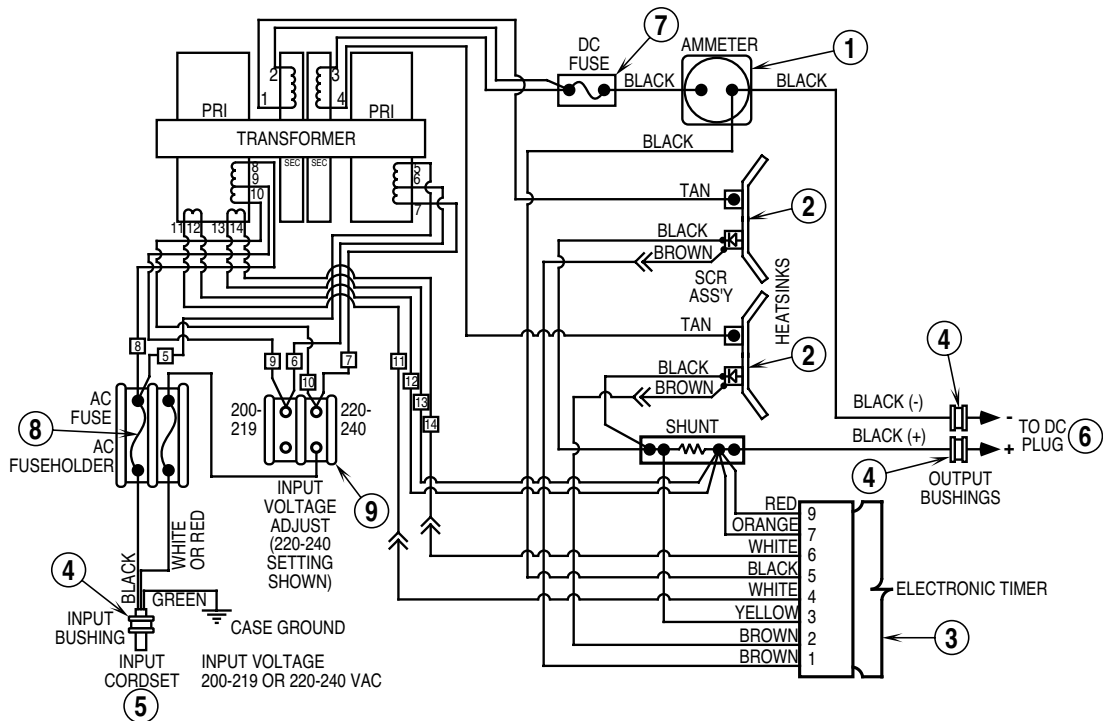
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56411643 12 VOLT 20 AMP AUTOMATIC 120 VAC 60 HZ

Item	Part No.	Qty	Description
*	56411647	1	Heatsink Assembly, W/Diodes
1	56411648	1	Ammeter
2	56411649	1	Electronic Timer Assembly
3	56411650	1	Capacitor, 3.0 MFD, 660 VAC
*	56411651	2	Bushing, SR-5KN-4, Insulator for DC Cordset
4	56411653	1	Cordset, AC
5	56411654	1	Cordset, DC W/SB-50 Amp Red Plug
6	56478655	1	Switch Assembly
7	56411657	1	Fuse, 5 Amps, MDA-5
9	56411659	1	Relay, 12V / 10A, SPST
*	56411087	1	Bushing 6N3-4 Insulator Cordset
*	56411645	1	Case Assembly
*	56411679	1	Control Cable Assembly
*	56411646	1	Transformer Assembly

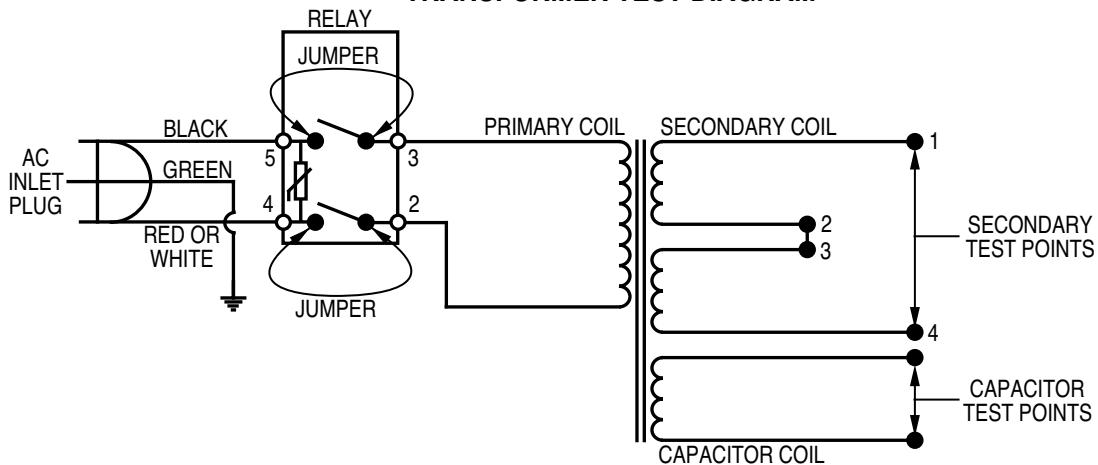
Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 17 to 23 VAC	Approx. 27 to 33 VAC
Capacitor Coil	Approx. 410-470 VAC	X
A.C. Input - 120 VAC / 60HZ		

* = Not Shown

BATTERY CHARGER PARTS LIST



TRANSFORMER TEST DIAGRAM

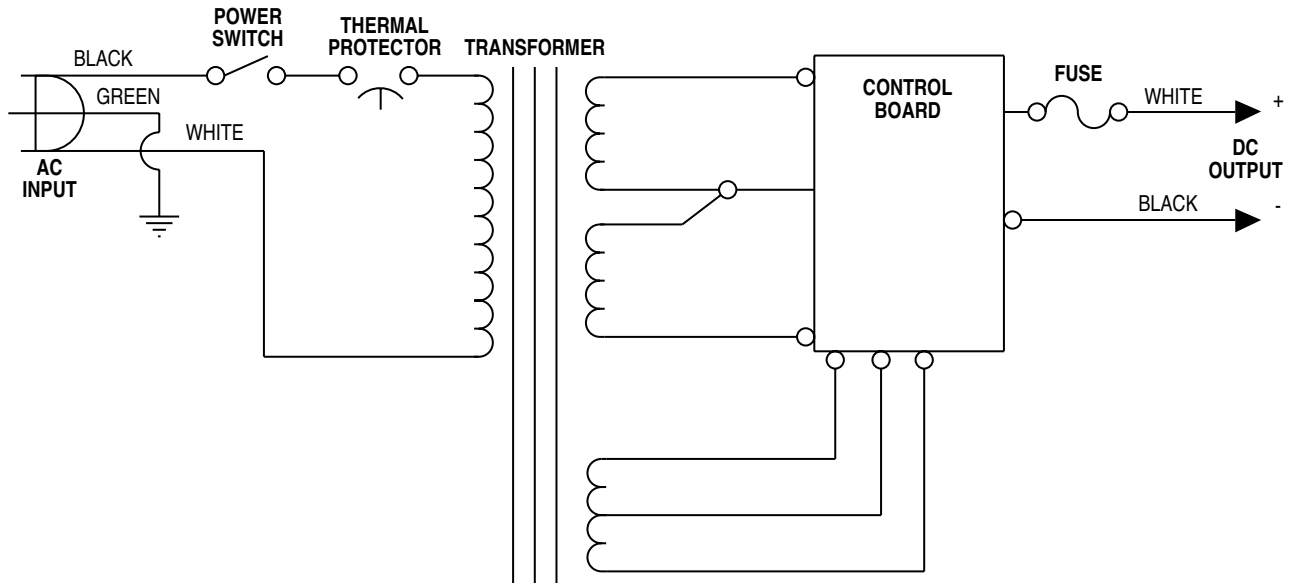


PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56409788 36 VOLT 38 AMP AUTOMATIC 221-250 VAC 50-60 HZ

Item	Part No.	Qty	Description
1	56409795	1	Ammeter
2	56409700	2	Heatsink Assembly
3	56409796	1	Electronic Timer Assembly
4	56409702	3	Bushing, Insulator
*	56409797	1	Control Cable Assembly
5	56409704	1	Cordset, AC
6	56409706	1	Cordset, DC, SB-175 Plug
*	56409707	1	Fuseholder, 30 Amp, 600 Volt, 2 Pole
7	56409708	1	Fuse, DC, 125 Amp, JJN-125
8	56409709	2	Fuse, AC, 25 Amp, FLM-25
*	56409798	2	Scr Assy, 55A/400V, with wires
*	56409799	1	Electronic Control/Timer Assy 36V, 38/14 Amps
9	56409800	1	Input Voltage Adjust Terminal Block, 30A/300V, 2 Pole
*	56409793	1	Case Assembly
*	56409794	1	Transformer Assembly

Test Position	Capacitor Disconnected	Capacitor Connected
Secondary Coils	Approx. 55 to 65 VAC	Approx. 83 to 97 VAC
Capacitor Coil	Approx. 410-470 VAC	X
A.C. Input - 230 VAC / 50HZ		

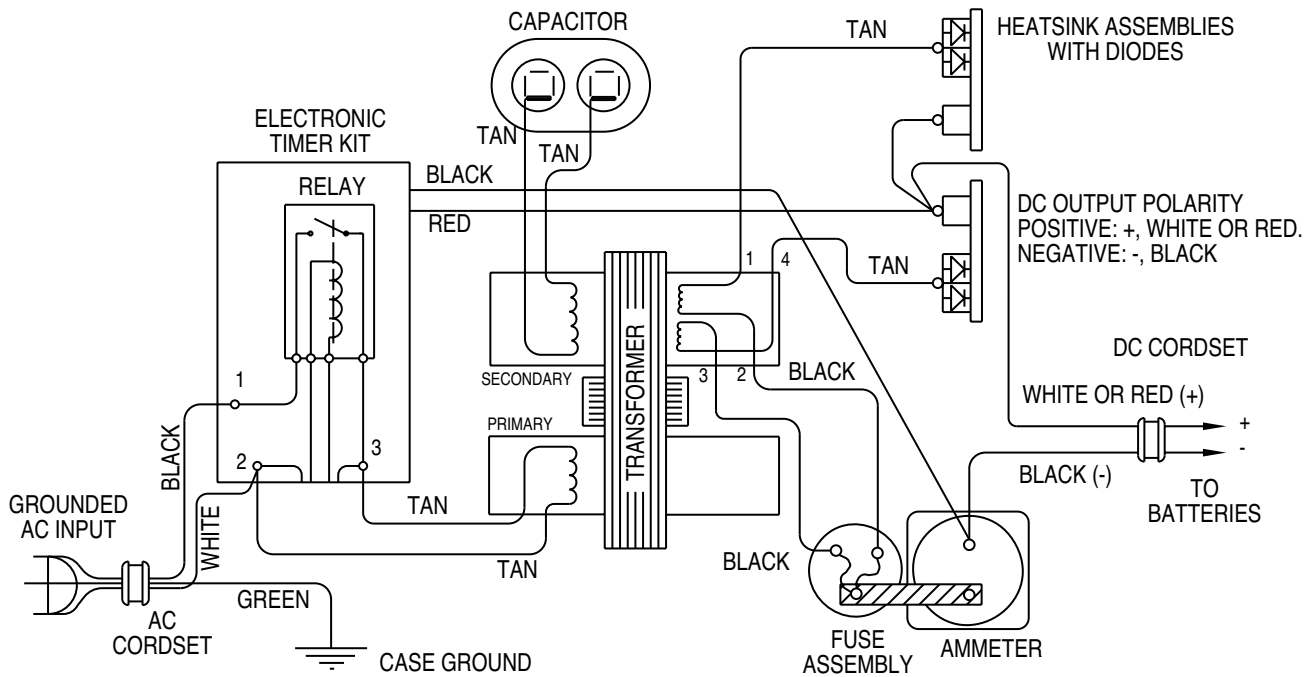
BATTERY CHARGER PARTS LIST



PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56205983 (replaces part number 56206981) 24 VOLT 12 AMP AUTOMATIC 120 VAC 60 HZ

Part No.	Qty	Description
56411087	1	Bushing 6N3-4 Insulator Cordset
56205148	2	Case Assembly
56205153	1	Control Board Assembly
56205150	3	Cordset AC 18/3 102" w/Plug
56205152	1	Cordset DC 14/2 108" w/SB50 Red Plug
56205154	1	Power Switch
56205149	1	Transformer

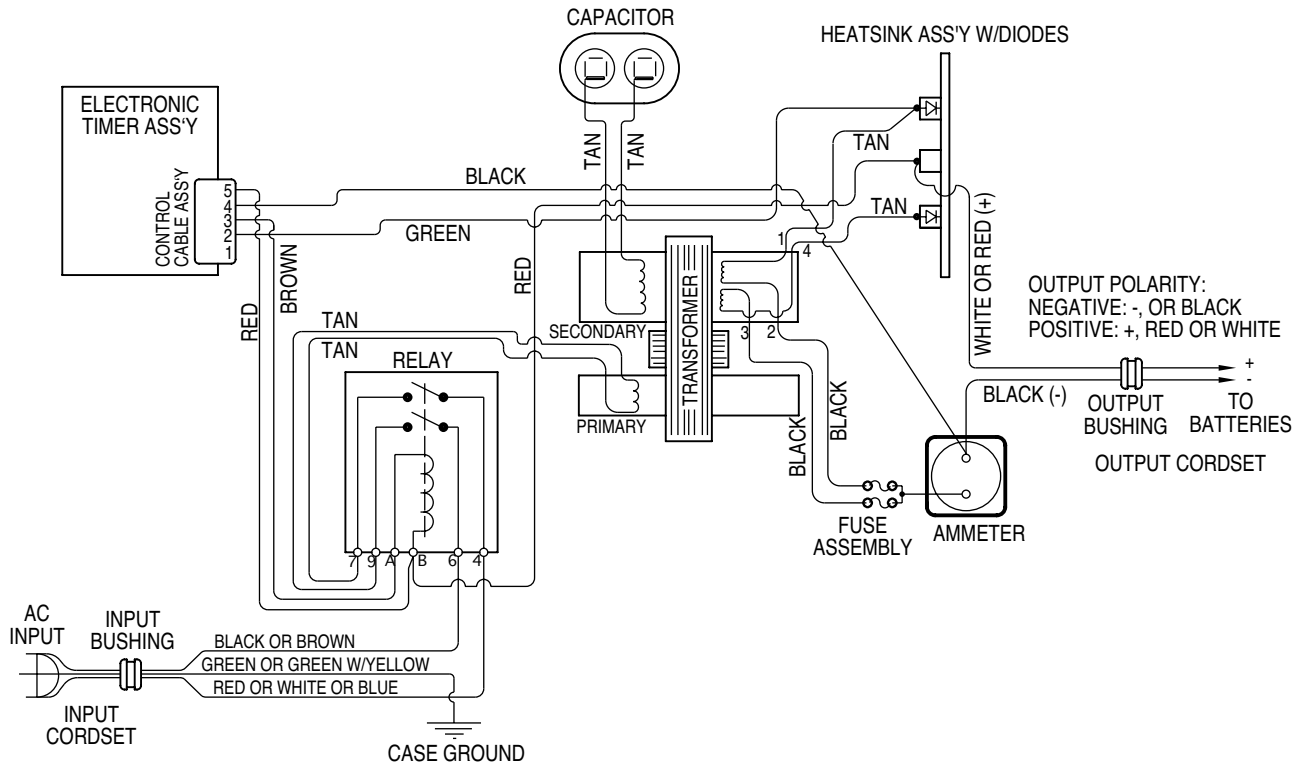
BATTERY CHARGER PARTS LIST



PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56412272 24 VOLT, 36 to 8 AMP AUTOMATIC 120 VAC 60 HZ

Part No.	Qty	Description
56373070	1	Ammeter 50 Amp w/Mounting Studs
56373073	2	Heatsink Assy w/2 Diodes in Parallel
56388557	1	Capacitor 6MFD 660 VAC
56409702	3	Bushing, Insulator
56412451	1	Case Assembly
56412457	1	Cordset, AC 14/3 86" w/125V/15a Plug
56412456	1	Cordset Bushing 8P-2
56412458	1	Cordset DC 10/2 108" w/SB175 Red Plug
56373071	1	Fuse Assembly
56412454	2	Timer Kit 24 VDC 120 VAC
56412455	2	Timer Kit Relay 24 VDC 120 VAC
56412452	1	Transformer Assembly

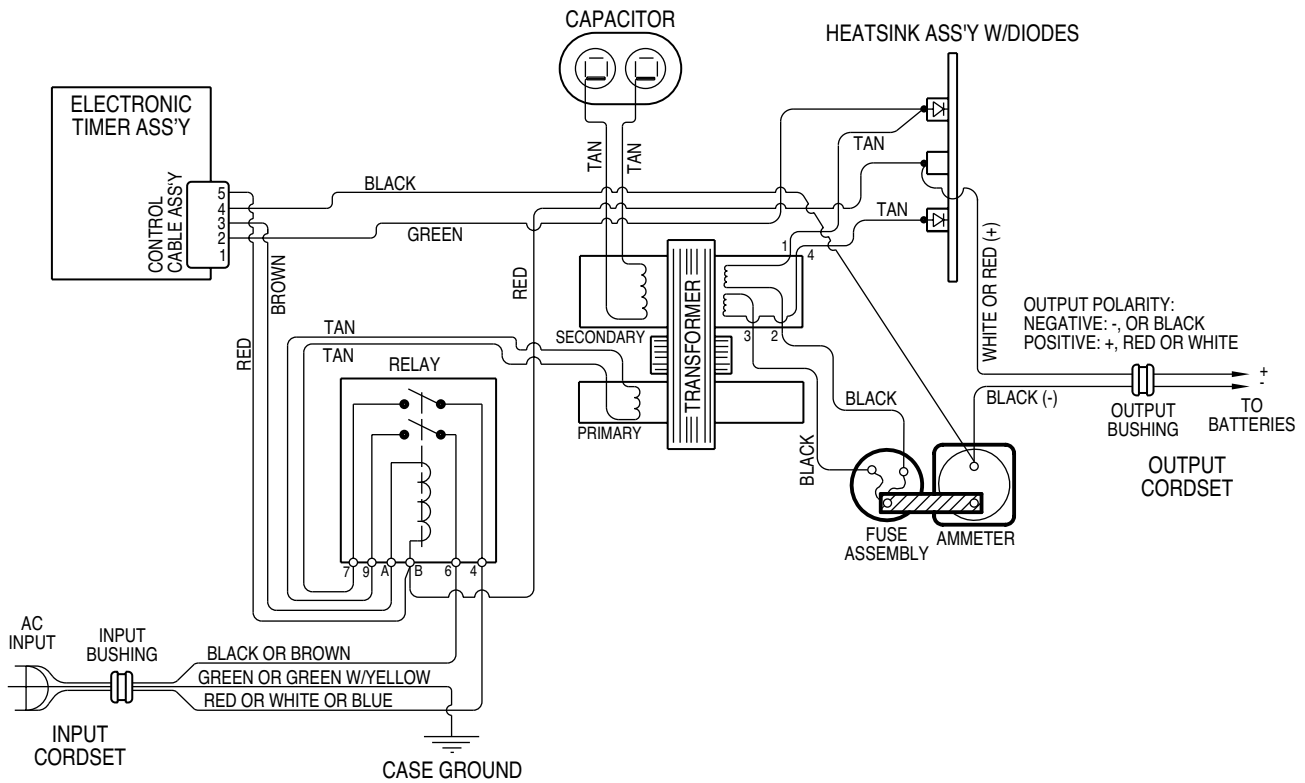
BATTERY CHARGER PARTS LIST



PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56206973 24 VOLT 10 AMP AUTOMATIC 230 VAC 50 HZ

Part No.	Qty	Description
56373066	1	Timer Kit
56373070	1	Ammeter
56373073	1	Heatsink Assembly w/ Diodes
56373071	1	Fuse Assembly
56388557	1	Capacitor, 6 MFD, 660 VAC
56373074	1	Cordset, DC, 10/2, 108", SB175 Plug

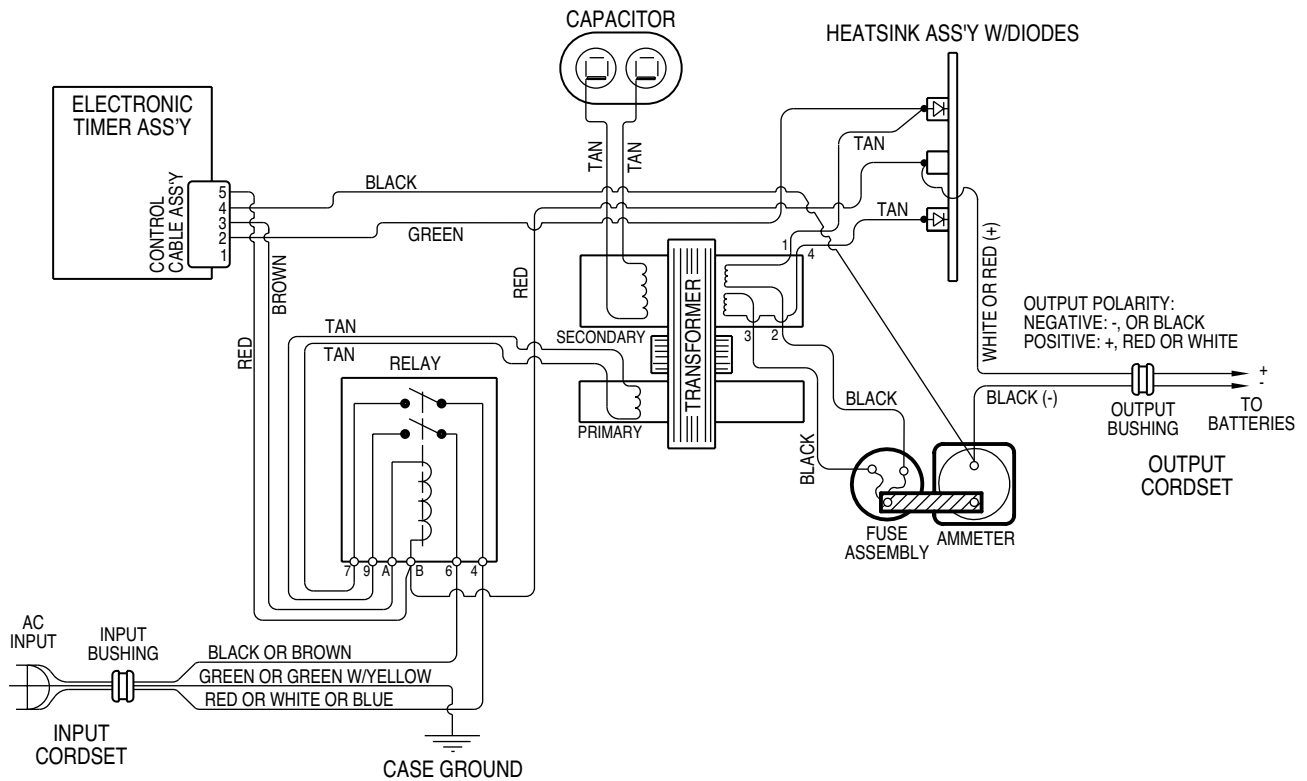
BATTERY CHARGER PARTS LIST



PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56372203 24 VOLT 20 AMP AUTOMATIC 230 VAC 50 HZ

Part No.	Qty	Description
56388557	1	Capacitor, 6 MFD, 660 VAC/70C, 600 VAC/90C
56373047	1	Heatsink Assembly, w/ Diodes
56373054	1	Fuse Assembly
56409702	1	Insulator Bushing, for 12/2 DC Cordset

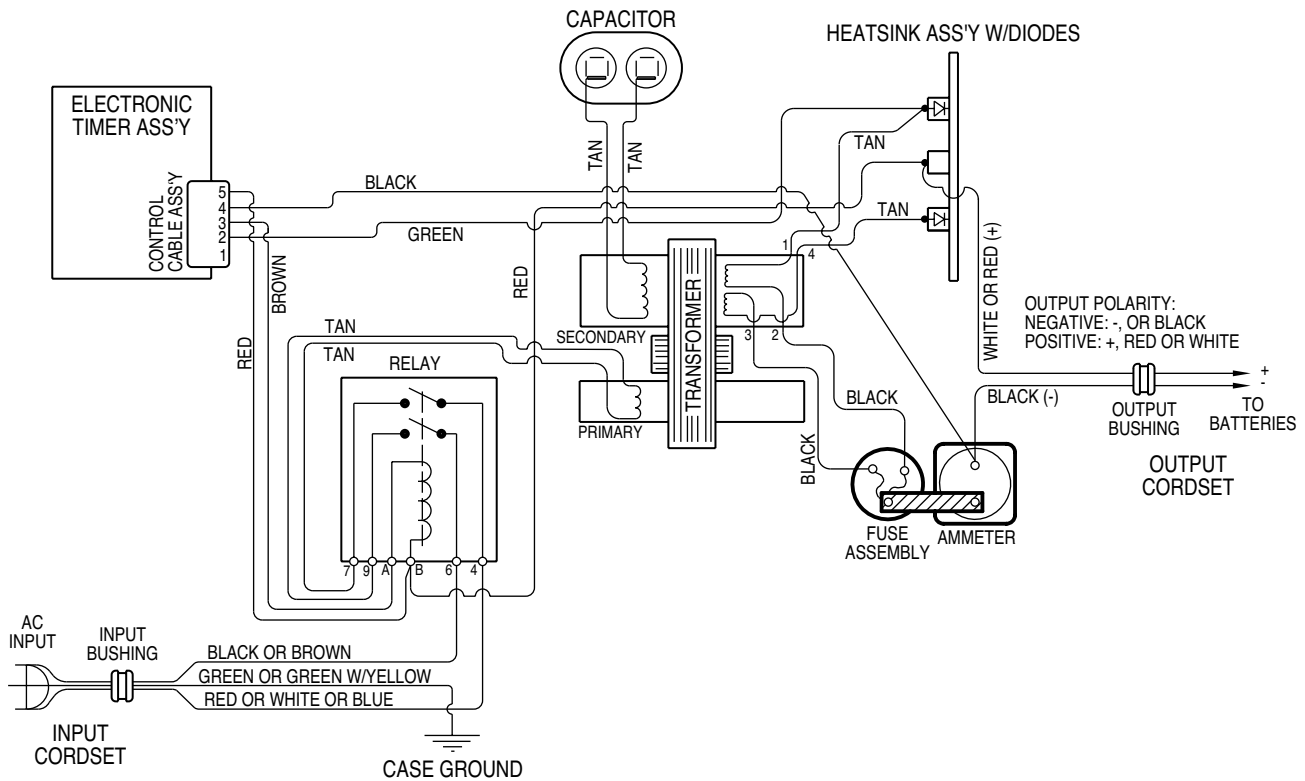
BATTERY CHARGER PARTS LIST



PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56372190 36 VOLT 20 AMP AUTOMATIC 230 VAC 50 HZ

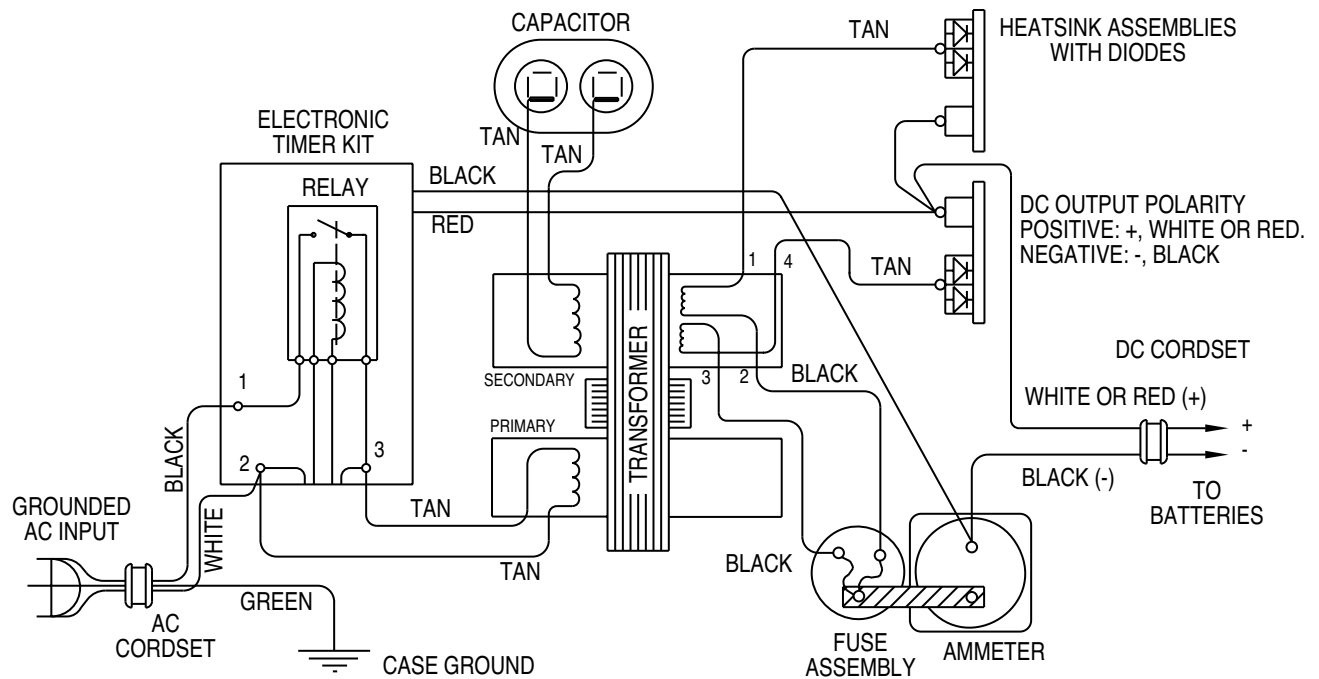
Part No.	Qty	Description
56373066	1	Timer Kit
56373070	1	Ammeter
56373073	1	Heatsink Assembly w/ Diodes
56373071	1	Fuse Assembly
56388557	1	Capacitor, 6 MFD, 660 VAC
56373074	1	Cordset, DC, 10/2, 108", SB175 Plug

BATTERY CHARGER PARTS LIST



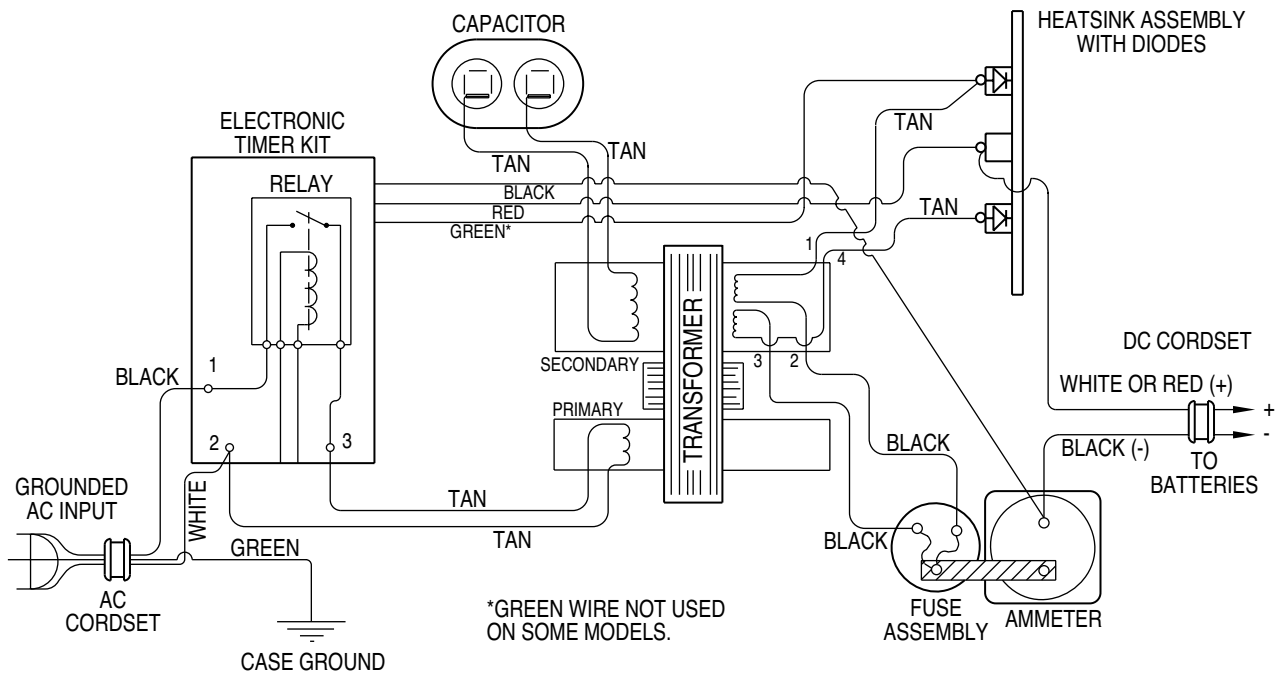
PARTS LIST FOR APA BATTERY CHARGER PART NUMBER 56388119 36 VOLT 36 AMP AUTOMATIC 230 VAC 50 HZ

Part No.	Qty	Description
56373066	1	Timer Kit
56373070	1	Ammeter
56373073	1	Heatsink Assembly w/ Diodes
56373071	1	Fuse Assembly
56388557	1	Capacitor, 6 MFD, 660 VAC
56373074	1	Cordset, DC, 10/2, 108", SB175 Plug



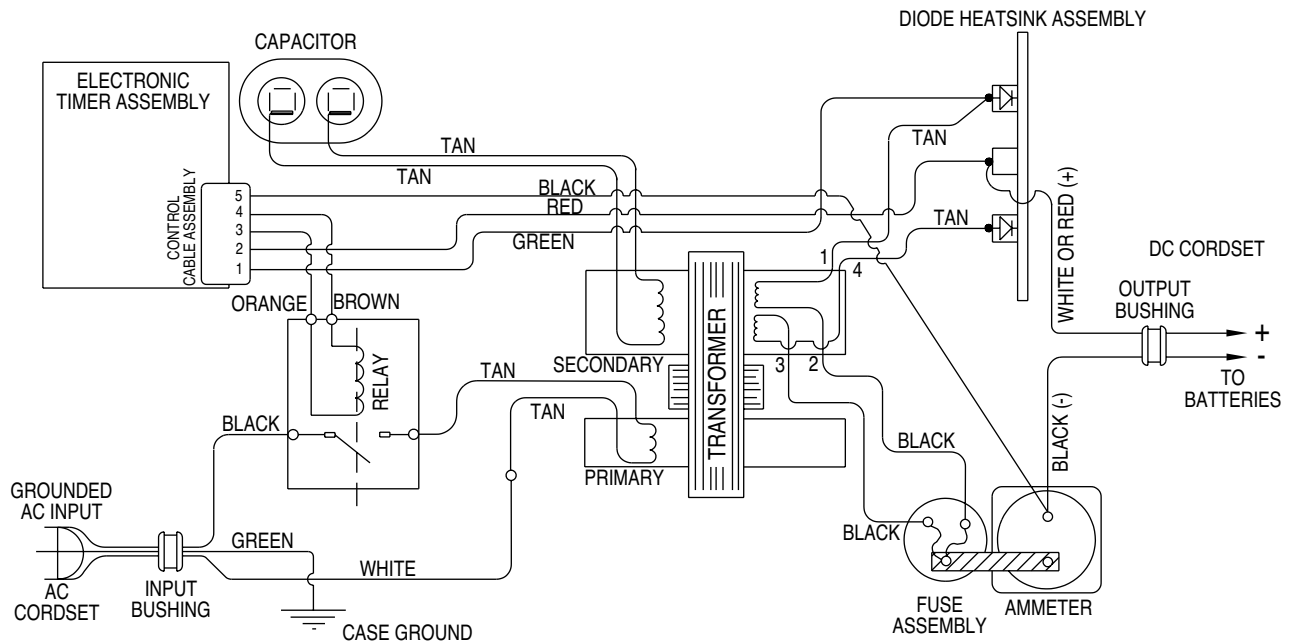
**PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56031407 12 VOLT 38 AMP AUTOMATIC
120 VAC 60 HZ**

Part No.	Qty	Description
56388557	1	Capacitor, 6 MFD, 660 VAC
56373073	2	Heatsink Assembly w/ 2 Diodes in Parallel
56373071	1	Fuse Assembly
56373070	1	Ammeter, 50 Amp, w/ Corner Mounting Studs
56409702	1	Cordset Bushing, 7W-2, for Input Cordset
56412456	1	Cordset Bushing, 8P-2, for Output Cordset
56412457	1	AC Cordset, 14/3, 86", w/ 125V/15A Plug



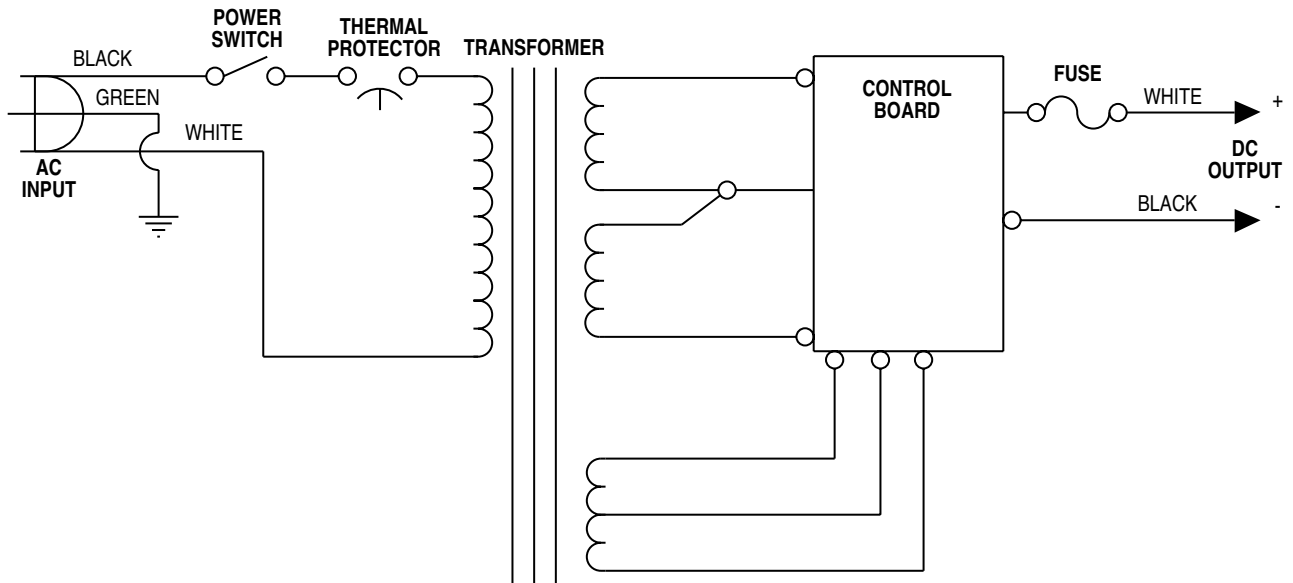
**PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56632342 24 VOLT, 25 to 8 AMP AUTOMATIC
115 VAC 60 HZ**

Part No.	Qty	Description
56373047	1	Heatsink Assembly, w/Diodes
56373054	1	Fuse Assembly
56412454	1	Relay, Timer Kit, 24 VDC
56409702	1	Bushing, 7W-2, Insulator for Cordsets
56373063	1	Cordset, DC, w/175 Amp Plug, Gray, 101"
56373053	1	Cordset, DC, w/175 Amp Plug, Red, 101"



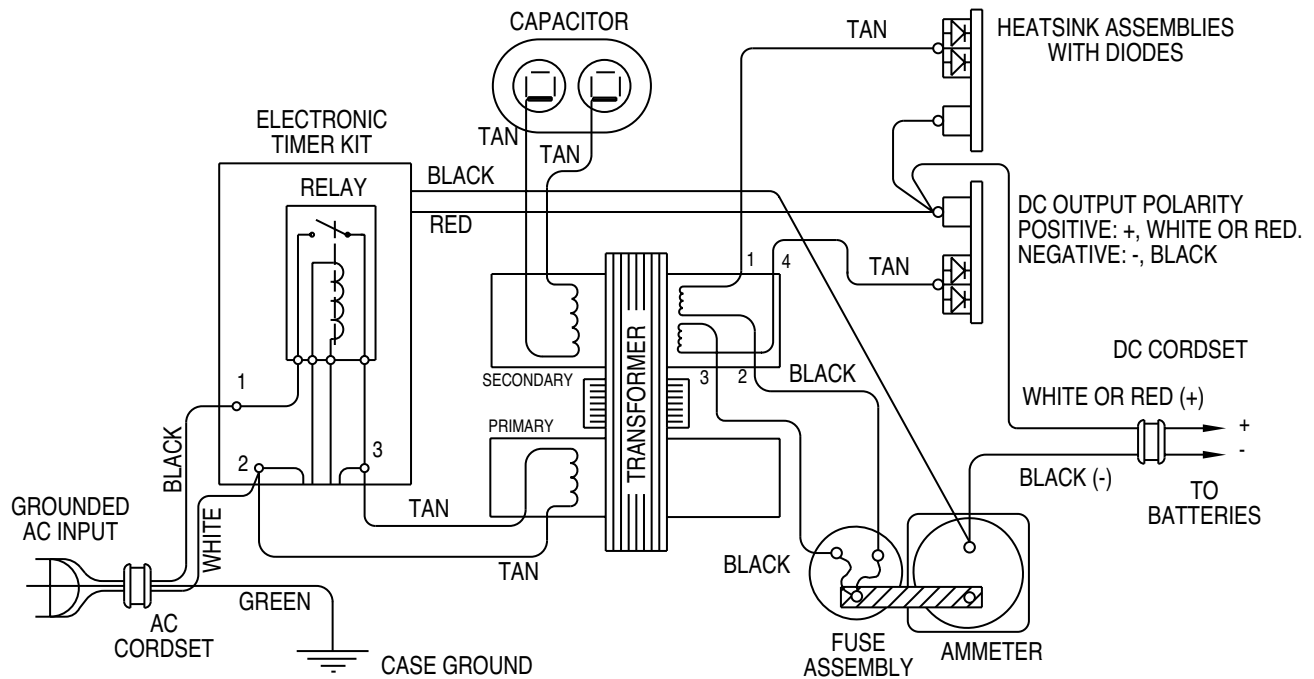
PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56638431 24 VOLT, 18 to 4 AMP AUTOMATIC
120 VAC 60 HZ

Part No.	Qty	Description
56373054	1	Fuse Assembly
56373047	1	Heatsink Assembly w/Diodes
56409702	1	Bushing, 7W-2, Insulator for DC Cord
56206919	1	Relay, 24 VDC, SPST, 15 Amp
56373049	1	Capacitor, 4.0 MFD, 660 VAC



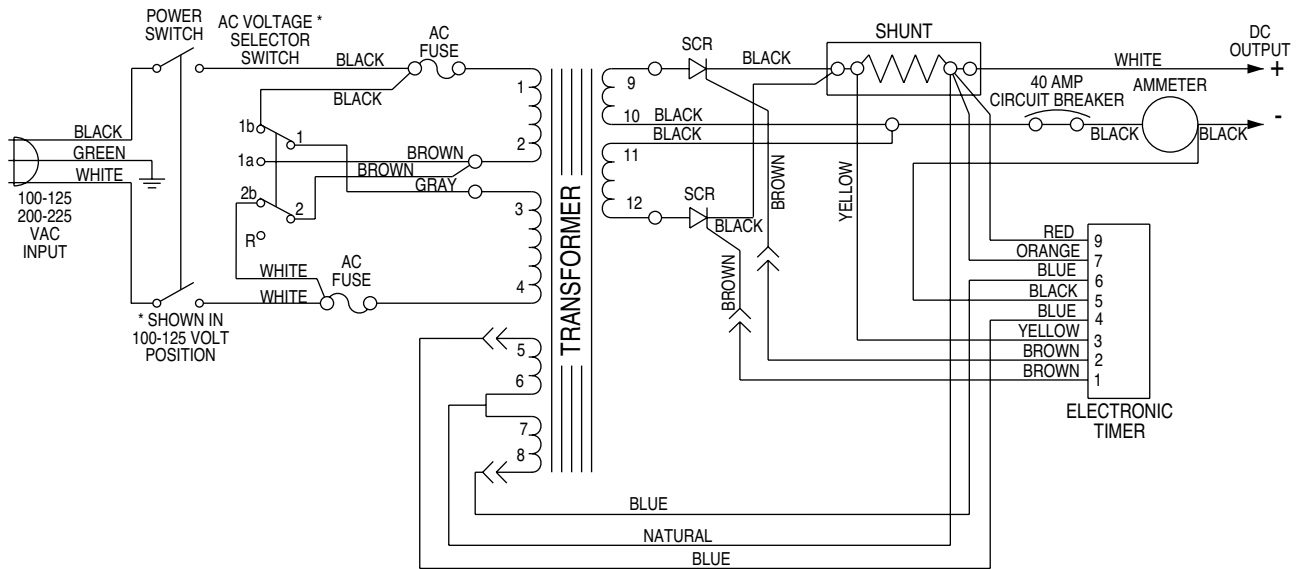
**PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56638436 24 VOLT, 12 to 3 AMP AUTOMATIC
120 VAC 60 HZ**

Part No.	Qty	Description
56205149	1	Transformer
56205154	1	Power Switch
56411087	2	Bushing, Strain Relief, For Cords
56205150	1	Cordset, AC, 18/3, 102", w/ Molded Plug
56205152	1	Cordset, DC, 14/2, 108", w/ SB50 Red Plug



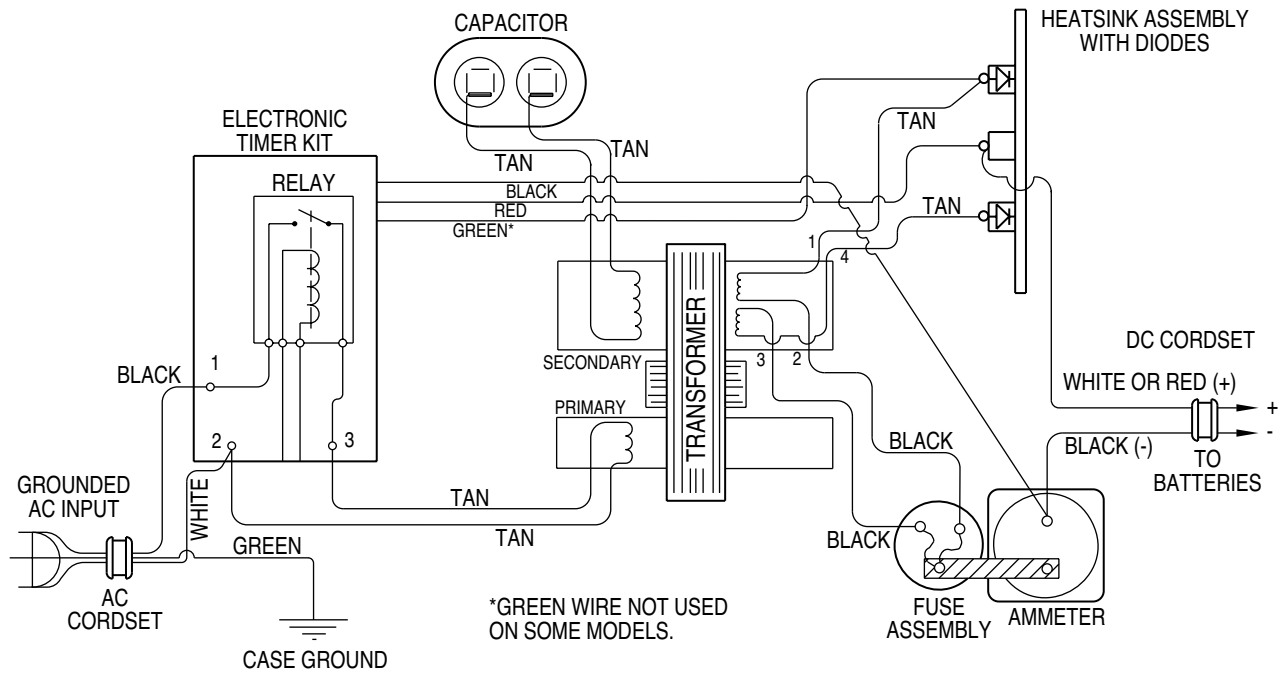
**PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56638439 24 VOLT, 36 to 8 AMP AUTOMATIC
120 VAC 60 HZ**

Part No.	Qty	Description
56412452	1	Transformer Assembly
56388557	1	Capacitor, 6 MFD, 660 VAC
56373073	2	Heatsink Assembly w/ 2 Diodes in Parallel
56373071	1	Fuse Assembly
56373070	1	Ammeter, 50 Amp, w/ Corner Mounting Studs
56412454	1	Timer Kit, 24 VDC, 120 VAC
56412455	1	Timer Kit, Relay 24 VDC, SPSTNO, 120 VAC
56409702	1	Cordset Bushing, 7W-2, for Input Cordset
56412456	1	Cordset Bushing, 8P-2, for Output Cordset
56412457	1	AC Cordset, 14/3, 86" w/ 125V/15A Plug
56412458	1	DC Cordset, 10/2, 108", w/ SB175 Red Plug
56373074	1	DC Cordset, 10/2, 108", w/SB175 Gray Plug



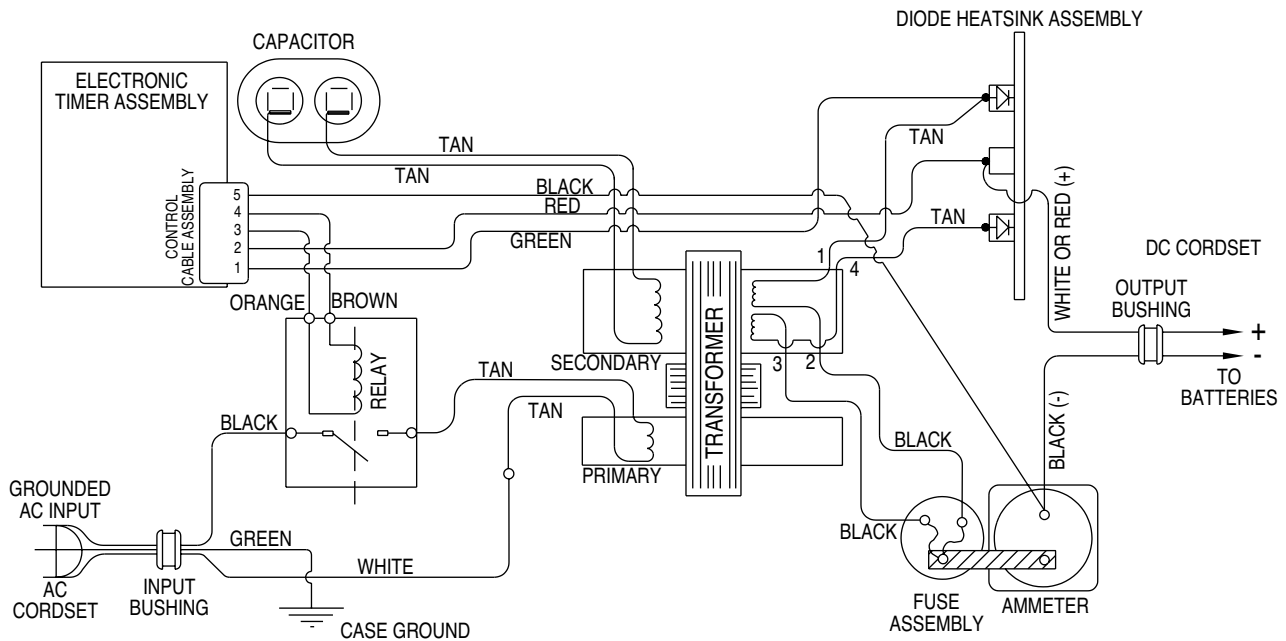
PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56638440 24 VOLT, 20 to 8 AMP AUTOMATIC
100, 125 or 200-250 VAC / 50 or 60 HZ

Part No.	Qty	Description
56373069	1	Ammeter
56409702	1	Bushing, Insulator, 7W-2, for DC Cordset
56206913	2	Fuseholder



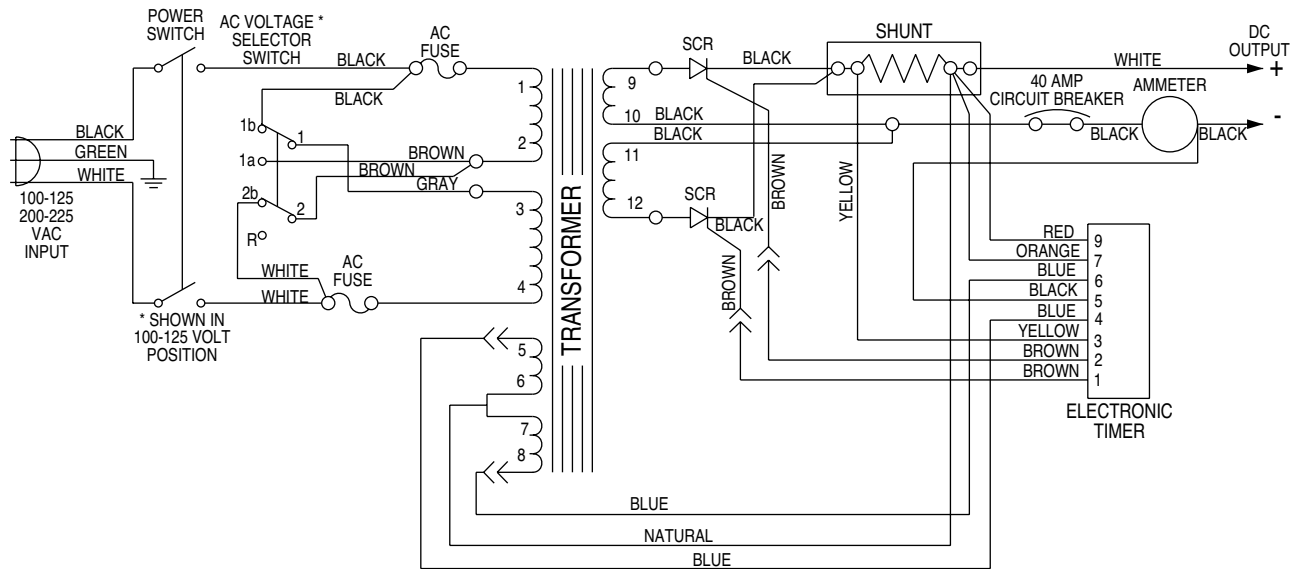
PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56632293 36 VOLT, 25 to 8 AMP AUTOMATIC
115 VAC 60 HZ

Part No.	Qty	Description
56373047	1	Heatsink Assembly, W/Diodes
56373054	1	Fuse Assembly
56373069	1	Ammeter, 0-30 Amp
56409702	1	Bushing, 7W-2, Insulator for DC Cord
56373051	1	Cordset, AC, 14/3, 80", Molded Plug
56373063	1	Cordset, DC, 12/2, 108", SB175Gray Plug



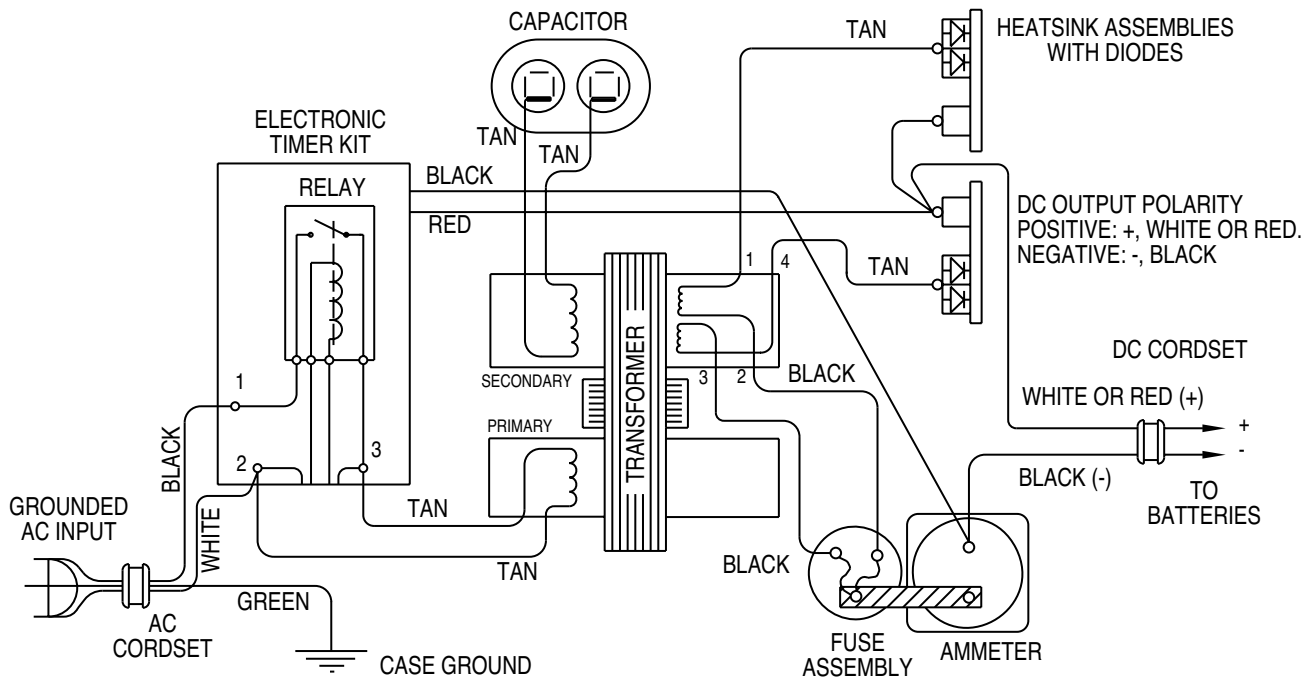
**PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56031403 36 VOLT, 21 to 6 AMP AUTOMATIC
120 VAC 60 HZ**

Part No.	Qty	Description
56373054	1	Fuse Assembly
56373047	1	Heatsink Assembly w/Diodes
56373069	1	Ammeter, 30 Amp, Corner Mount
56409702	1	Bushing, 7W-2, Insulator for DC Cord
56411650	1	Capacitor, 3.0 MFD, 660 VAC



**PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56031405 36 VOLT, 20 to 8 AMP AUTOMATIC
115 or 230 VAC / 50 or 60 HZ**

Part No.	Qty	Description
56373069	1	Ammeter
56409702	1	Bushing, Insulator, 7W-2, for DC Cordset
56206913	1	Fuseholder



**PARTS LIST FOR LESTER BATTERY CHARGER
PART NUMBER 56031408 36 VOLT, 36 to 8 AMP AUTOMATIC
120 VAC 60 HZ**

Part No.	Qty	Description
56388557	1	Capacitor, 6MFD, 660 VAC
56373073	2	Heatsink Assembly w/ 2 Diodes in Parallel
56373071	1	Fuse Assembly
56373070	1	Ammeter, 50 Amp, w/ Corner Mounting Studs
56409702	1	Cordset Bushing, 7W-2, for 14/3 Input Cordset
56412456	1	Cordset Bushing, 8P-2, for 10/2 Output Cordset
56373074	1	DC Cordset, 10/2, 108", w/ SB175 Gray Plug



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