

OPEN CIRCUIT VOLTAGE, TRANSFORMER TEST PROCEDURE

Transformer failure can be the result of natural aging, premature shorting of adjacent coil wires, or overheating damage. The most common cause of transformer overheating and burnout is the result of misuse, connecting the charger to a battery system of lower voltage than specified for the charger. This is usually caused when service is performed on a battery system consisting of several 6-volt batteries connected in series to produce a higher system voltage. During service, one or more batteries is installed reverse polarity decreasing the system voltage, forcing the charge current to stay high without tapering.

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

⚠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. THE CAPACITOR CAN BE DISCHARGED BY HOLDING THE VOLTMETER LEADS ON THE CAPACITOR TERMINALS UNTIL THE VOLTAGE READING DROPS TO ZERO.

TESTING THE TRANSFORMER requires energizing the transformer primary with the specified voltage and frequency AC power and recording the AC voltage measured at the transformer secondary leads that connect to the diodes. This voltage is (1) measured with a good capacitor connected and (2) measured with the capacitor disconnected. Always test and verify the capacitor is good before performing transformer tests. All fuse links of the fuse assembly must test good and/or connect a jumper lead across the transformer leads connected to the fuse assembly.

- A. To electrically isolate the transformer output for these tests, disconnect the transformer secondary coil leads (TAN sleeving) from the diode terminals. Attach the meter leads to these transformer leads and adjust the meter initially to an AC range of three (3) times the DC voltage rating specified by the charger nameplate.
- B. Inspect to be sure for personal safety that no leads have been accidentally allowed to short before applying input power to the transformer primary for test.
- C. With the resonant capacitor connected, the AC voltage measured across the transformer secondary leads disconnected from the diodes should read approximately two and one half (2.5) times the DC voltage rating of the charger. With the resonant capacitor disconnected, the measured voltage should decrease to two thirds (2/3) of that measured with the capacitor connected.

Charger Nameplate DC Voltage V_N	Number of Lead-Acid Battery Cells in Series	No Load Open Circuit Transformer	
		Secondary Coil Test Voltages	
		Resonant Capacitor Connected $V_1 = V_N \times 2.5$	Resonant Capacitor Disconnected $V_2 = V_1 \times 2/3$
12	6	27 to 33	17 to 23
24	12	54 to 66	36 to 44
36	18	83 to 97	55 to 65
48	24	110 to 130	73 to 97

(Example: For a 36 VDC charger, 36 times 2.5 is 90 VAC with the capacitor connected, and 90 VAC times 2/3 is 60 VAC with the capacitor disconnected.)

The voltage readings are approximate and transformer failure is indicated when the measured AC voltages are significantly LOWER than the calculated values. Voltage measurements less than 10 volts with the capacitor disconnected generally confirm a failed transformer that must be replaced.

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