Alternators & Regulators

LUCAS ALTERNATORS

Jaguar XJ6, XJS

NOTE: Some Jaguar models may be equipped with Motorola alternators. See appropriate article in this section.

DESCRIPTION

Lucas ACR model alternators have an integral, non-adjustable voltage regulator, mounted in the slip ring end bracket. Individual connectors are used to connect external wiring to the alternator.

The rotor, which turns inside the stator, has its field windings connected to 2 face-type slip rings. It is supported in the drive-end bracket by ball bearings and in the end cover by needle roller bearings.

One positive and 1 negative carbon brush ride against concentric brass slip rings. The heat sink, rectifier, and terminal block assembly incorporates 6 silicon diodes, forming a full-wave rectifier bridge circuit, and 3 diodes which supply current to the rotor windings.

Individual diodes cannot be removed from the heat sink assemblies. A surge protection diode, in the outer face of the slip ring end bracket, protects the diode pack from high transient voltages resulting from faulty cable connections.

NOTE: Precautions should be taken while attaching and detaching cables, as surge protection is limited. Observe polarity and never connect or disconnect wires while engine is running.

APPLICATION

Model	Type No.
XJ6	
With Air Conditioning	25 ACR
Without Air Conditioning	18 ACR
XJS	25 ACR

SPECIFICATIONS

Alternator	Nominal Output Amps@6000 RPM	Voltage
18 ACR	45	14
25 ACR	66	14

TESTING

ON-VEHICLE TESTING

Preliminary Checks

1) Alternator drive belt must be properly adjusted, the battery and connections must be in good condition, and the charge warning bulb and circuit continuous in order to properly test charging system.

2) Polarity of alternator and battery terminals MUST be observed to prevent system damage. Warm engine 3-4 minutes before testing. (Output may be slightly higher when alternator is cold.) Battery ground cable should be disconnected when attaching jumper wires to alternator and regulator.

Alternator Tests

1) Remove individual connectors from alternator. Turn ignition switch "ON". Connect negative voltmeter lead to ground. Attach positive lead, in turn, to each disconnected lead. *See Fig. 2.* Voltmeter should indicate battery voltage at each.

2) If reading is zero (0) at main output lead, check wiring to starter solenoid and battery. If zero (0) when connected to "IND" lead, check for ground or open circuit between warning light and alternator connector.

3) If reading is zero (0) when connected to "S" lead, check wiring back to starter solenoid and battery. A break in the sensing lead will result in alternator not charging and warning light not working.

4) Attach connectors to alternator. Turn ignition switch "ON". With negative lead of voltmeter still attached to ground, connect positive lead to "IND"

Fig. 1: Exploded View of Lucas 25 ACR Alternator with Integral Regulator

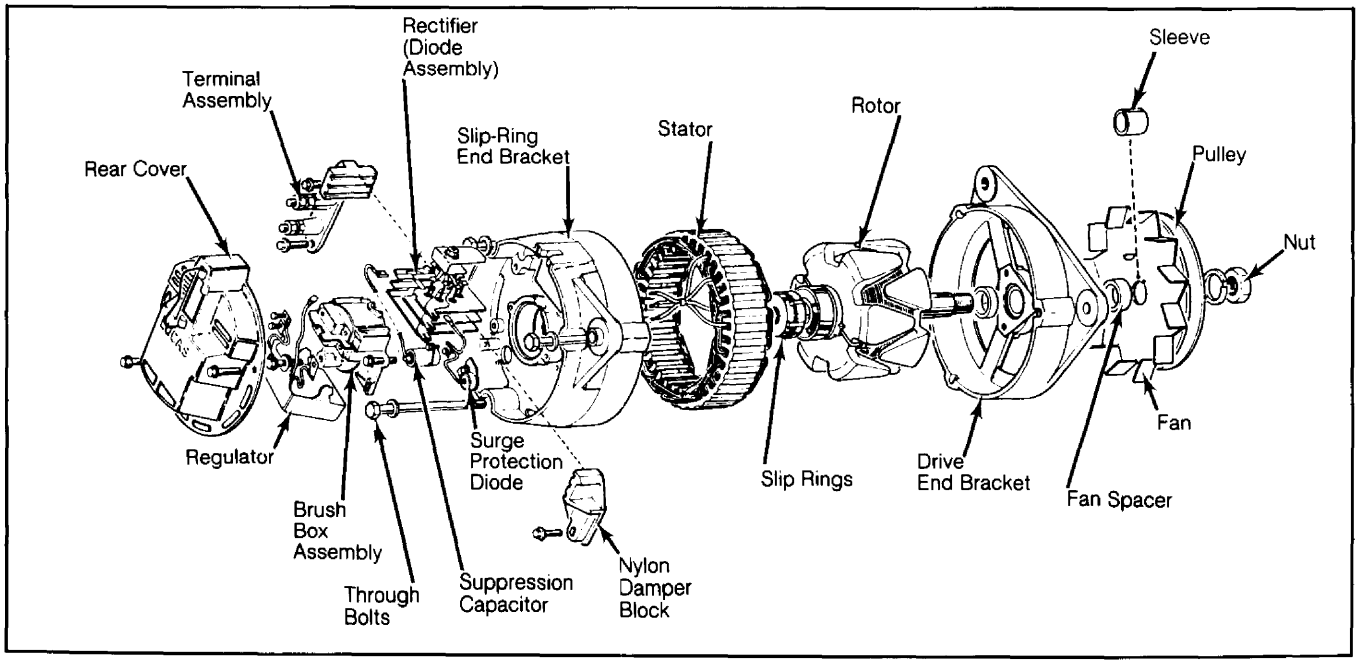

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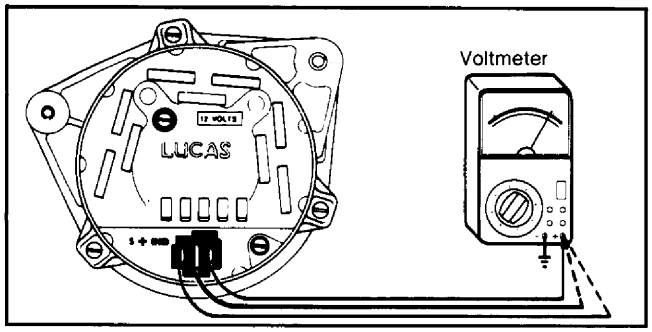
Fig. 2: Voltage Test with Alternator Connectors Removed

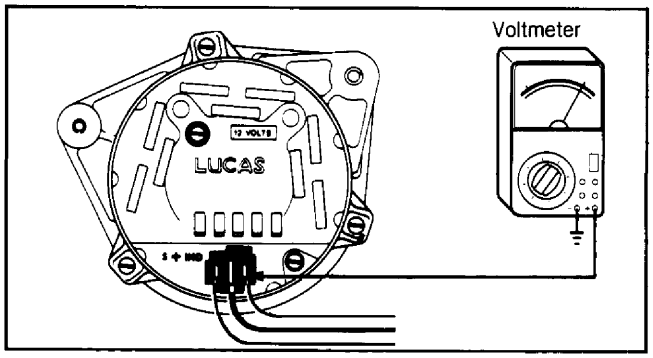


Connect voltmeter positive lead, in turn, to each wire.

terminal. *See Fig. 3.* Voltmeter should indicate approximately 2 volts.

5) If reading is zero (0), suspect surge protection diode. If voltmeter indicates battery voltage, suspect brushes, rotor or regulator.

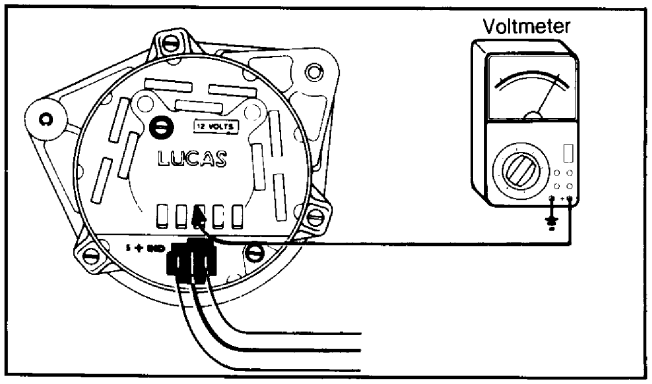
Fig. 3: Voltage Test at "IND" Terminal



Alternator connectors should be in place.

6) With voltmeter negative lead attached to ground, attach positive lead to metal link on regulator. *See Fig. 4.* Turn ignition switch "ON". Voltmeter should indicate approximately 0.5 volt. If 12 volts is indicated, regulator is faulty.

Fig. 4: Voltage Test at Regulator Metal Link



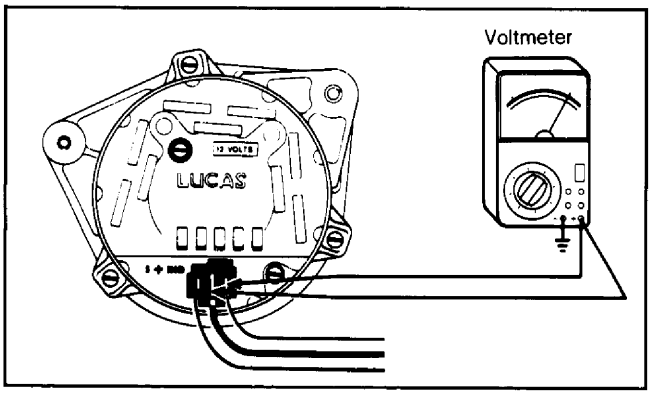
If 12 volts is indicated, regulator is faulty.

7) If reading is now 0.5 volts, but 12 volts was registered in step **5)**, check brushes, rotor, and slip rings.

NOTE: If warning light operates with ignition "OFF", but goes out when switch is "ON", check voltage at "IND" terminal with switch in "OFF" position. If battery voltage is indicated, diode pack is faulty.

8) Start engine, and run it at a constant 2500 RPM. With voltmeter negative lead attached to ground, attach positive lead to "IND" terminal. *See Fig. 5.* Note voltage. Then connect positive lead to alternator's main output terminal. Voltage readings should be the same. If a difference of more than 0.5 volt exists, suspect diode pack.

Fig. 5: Voltage Tests at "IND" and Main Output Terminals



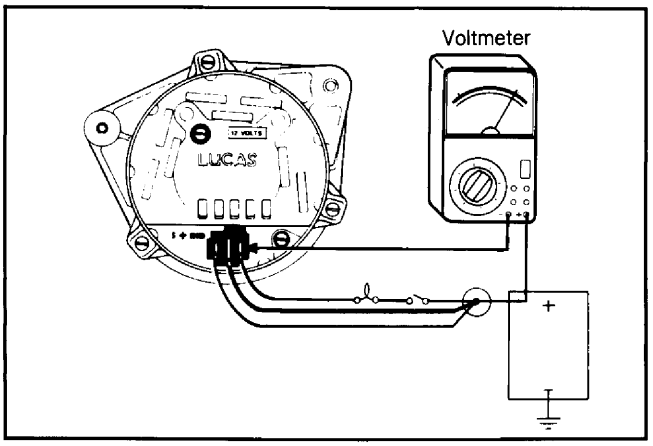
Run engine at 2500 RPM. Readings should be same.

9) Connect voltmeter between battery insulated terminal and alternator's main output terminal. *See Fig. 6.* Start and run engine at approximately 2500 RPM. Voltmeter should not exceed 0.5 volt.

10) If higher reading exists, check wiring from alternator to battery for loose or dirty connections.

NOTE: If warning light glows while engine is running at normal charging speeds, problem is probably a faulty diode pack or dirty or loose connections in battery-to-alternator wiring.

Fig. 6: Voltage Test at Main Output and Battery Insulated Terminals



If more than 0.5 volt, check battery-to-alternator circuit.

11) Disconnect battery ground cable. Disconnect alternator. Connect an ammeter between main output terminal and disconnected output lead. *See Fig. 7.*

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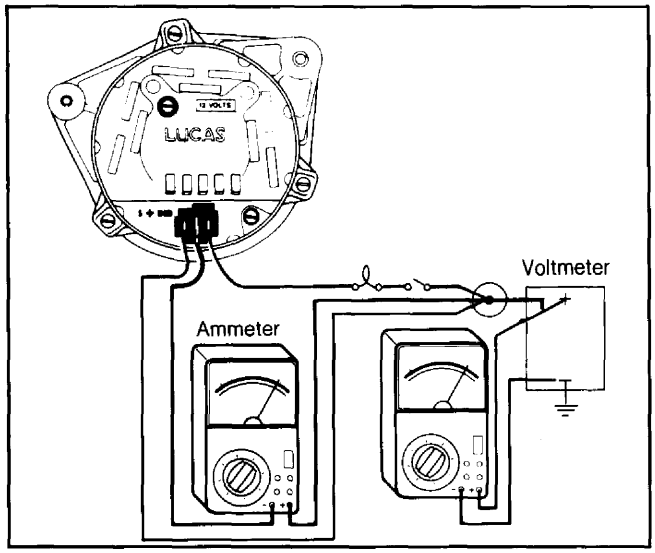
Connect a jumper wire between "IND" terminal and "IND" lead.

Fig. 7: Voltage Test Under Accessory Load



Ammeter should indicate maximum alternator output.

12) Reconnect battery cable, and switch on all accessories (except wipers) for 1 minute. Start and run engine at normal charging speed. Ammeter whould indicate maximum output for alternator.

13) If output is low, use jumper wire to short metal link on regulator to ground, and repeat step **12)**. If maximum output is now indicated, suspect regulator. If output is still low, suspect stator windings.

14) Disconnect battery ground cable. Connect ammeter in series with alternator main output cable and starter solenoid. Reconnect battery cable. Connect voltmeter across battery terminals.

15) Start and run engine at normal charging speed, until ammeter reads less than 10 amps. Voltmeter should read 13.6-14.4 volts. An incorrect reading indicates that regulator is faulty.

OVERHAUL

DISASSEMBLY

1) Remove end cover, and note wire positions and color. Remove capacitor screw, rectifier lead, and capacitor. Remove surge protection diode lead from brush box and rectifier. Remove diode retaining screw and diode.

2) Note arrangement of regulator brush box and other connections. Remove screw, and lift out regulator. Remove brush box. Brushes, slip ring, and rotor can now be checked.

3) To remove rectifier, unsolder stator cable ends. Remove terminal nut and damper blocks. Loosen nuts and remove rectifier.

NOTE: Position of all washers, spacers, and insulators must be noted for proper assembly.

4) Mark position of stator ring in end brackets to ensure correct reassembly. Remove through bolts from alternator frame, and carefully slip end bracket and stator off of rotor. It may be necessary to tap lightly on an extractor or tube placed against outer bearing journal to separate rotor from end bracket.

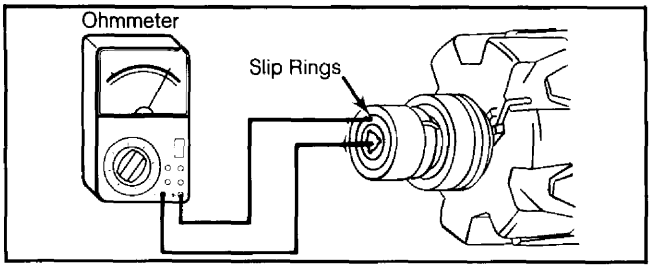
5) Complete disassembly, if required, by removing fan, pulley, Woodruff key, and fan spacer. Press rotor from drive end bracket, and remove bearing from bracket. Replace as necessary.

BENCH TESTING

Rotor Resistance

Connect ohmmeter leads to each slip ring, and read resistance of field coil. *See Fig. 8*. Resistance should be 3.2 ohms (18 ACR) or 3.6 ohms (25 ACR).

Fig. 8: Checking Alternator Rotor Resistance

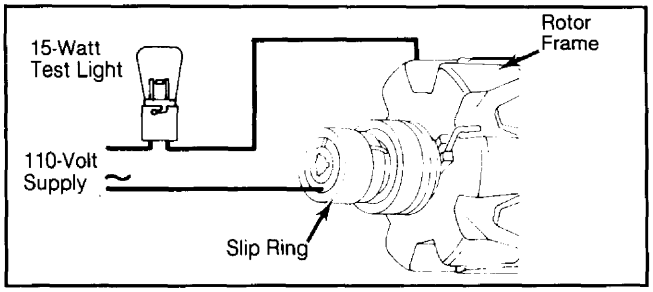


Connect ohmmeter leads to each slip ring.

Insulation Test

Using a 110-volt A.C. supply and a 15-watt test lamp, check for insulation between one of the slip rings and rotor frame. *See Fig. 9*. If lamp lights, rotor is shorted.

Fig. 9: Checking Insulation with a 110-Volt Test Lamp

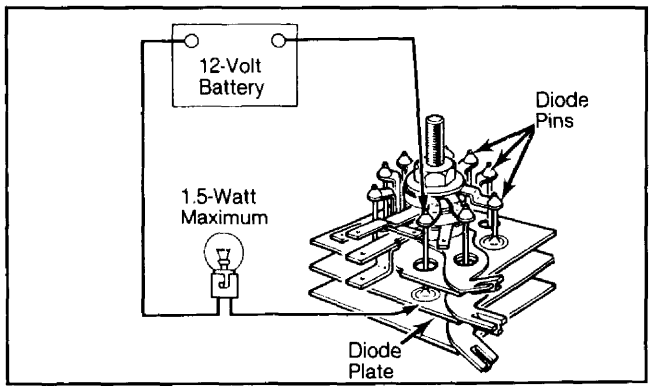


15-Watt lamp should not light.

Diodes

1) Connect a 12-volt battery lead, with a 1.5-watt (maximum) test lamp connected in series, to a diode plate. Connect other battery lead, in turn, to each diode pin. *See Fig. 10*. Then reverse the connections.

Fig. 10: Testing Diodes in Rectifier Assembly



Test lamp should be 1.5 watts maximum.

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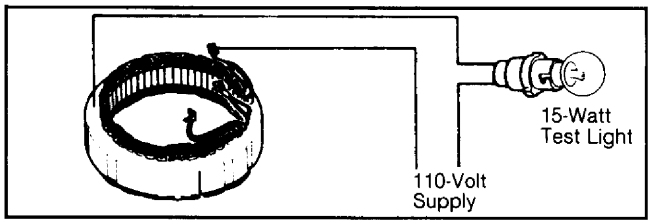
2) Lamp should light (with current flow) in one direction only. If lamp lights in both directions or fails in both, rectifier pack must be renewed.

Stator Tests

1) Connect 12-volt battery and 36-watt test lamp to 2 of the stator connections. Repeat test using any other combination of 2 of the 3 connections. If lamp fails to light in either test, stator has an open coil.

2) Using 110-volt, 15-watt test lamp, check for insulation between any one of the 3 stator connections and stator laminations. *See Fig. 11.* If lamp lights, stator should be replaced.

Fig. 11: Testing Stator Assembly Insulation



Wires at each connection should be soldered.

PARTS REPLACEMENT

Regulator

Aluminum casing of control unit must not make contact with alternator body when installed. (Shorted field circuit could result in maximum alternator output at all times regardless of battery condition.)

Diodes

In event of defective diodes, heat sink and rectifier assembly should be replaced. Protect diodes from excessive heat when soldering, by using pliers on diode pin as a thermal shunt.

Brushes

Installed brushes must extend at least .2" (5 mm) from housing and springs should indicate 9-13 oz. tension when brush is pushed back flush with housing. If beyond limits, replace brush assembly.

REASSEMBLY

1) Reverse disassembly procedure, and note the following. When installing slip ring end bearing, ensure that it is fitted with open side facing rotor and that it is seated fully.

2) When replacing rotor to drive end bracket, support inner track of bearing with piece of tubing. DO NOT use drive end bracket as the only support for the bearing when fitting rotor.

3) Resolder stator connections. Reconnect regulator leads, ensuring correct arrangement.