1971-74 MOTOROLA

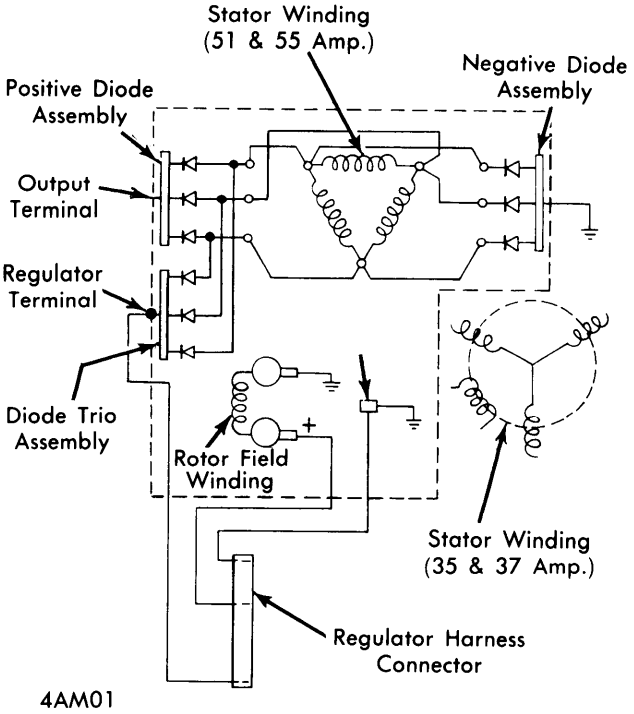
DESCRIPTION

Alternator is a three phase self-rectifying type. Main components are two end housings, stator, rotor and rectifiers. Rotor consists of a field coil encased between two six-fingered overlapping sections which are the pole pieces and produces a 12 pole magnetic field. A Delta wound stator winding is used in 51 and 55 amp. alternators and a "Y" wound stator winding used in 35 and 37 amp. alternators. Alternators used in 1973 and later in conjunction with 4-Bbl. carburetors have an extra terminal which provides seven volts to heating element of electric choke.

Identification

Motorola Model No.	Rating (Amps.)
8AL2011F	35
8AL2012F	35
8AL2015K	①55
8AL2016K	①55
8AL2025F	37

① — Alternator may be stamped 51 amps.



ALTERNATOR CIRCUIT

TESTING (ON CAR)

PRECAUTIONS

To prevent damage to alternator and regulator, observe following: Do not short field terminal of alternator to ground; do not disconnect voltage regulator when alternator is operating; do not disconnect load (output lead) from alternator while alternator is operating.

ALTERNATOR OUTPUT TEST

Connect voltmeter to battery, start engine and turn on headlights (low beam). Operate engine at 1000 RPM for approximately two minutes. Voltmeter should read 13 volts or higher. If reading is too low, perform Field Draw Amperage Test and Regulator Bypassed Test.

FIELD DRAW AMPERAGE TEST

Disconnect voltage regulator and connect an ammeter between battery positive post and wire leading to insulated brush terminal (positive) of alternator. Ammeter should indicate no less than 1 ½ ampere and not more than 3 amperes. Turn alternator rotor slowly by hand and if reading varies, slip rings require cleaning. If amperage reading is not within limits, remove brush assembly and perform continuity and isolation tests. *See Testing (Off Car).* If brush assembly and slip rings are in good condition, remove alternator for further testing of rotor field windings.

REGULATOR BYPASSED TEST

Disconnect voltage regulator and connect voltmeter to battery. Start engine and operate at idle speed. Connect ammeter between battery positive post and alternator insulated brush (positive). Observe voltage reading while slowly increasing engine speed. If 16 volts can be obtained, alternator is not defective. *CAUTION — Do not exceed 16 volts or damage to electrical components may occur.*

DIODE TRIO TEST

Diode trio assembly with one or more diodes completely opened or shorted will cause reduced alternator output and necessitate alternator disassembly to unsolder diode leads for testing. This test is to check diode assembly for marginal defects which are not affecting alternator output but may cause alternator indicator bulb to glow dimly. Test diode assembly as follows:

1) Connect voltmeter positive lead to alternator output terminal and negative lead to alternator regulator terminal. Start engine and operate at idle speed. Turn on headlights and place blower motor on high speed for approximately two minutes. *NOTE — This electrical load will heat up diode trio.* Turn off headlights and blower motor.

2) If voltmeter reading is over .6 volts and alternator output was satisfactory in an earlier test, remove diode trio assembly for bench test to determine if diode assembly or solder joints are cause of problem. If meter pulsates, either diode trio, a positive diode or one of soldered connections is beginning to break down under heat and alternator must be disassembled. If voltmeter reading is under .6 volts, diode trio assembly is functioning properly.

AC TERMINAL TEST

To check voltage at AC terminal, connect a voltmeter from the terminal to a known good ground. Start engine. Voltmeter reading should be approximately seven volts.

VOLTAGE REGULATOR

Overcharging — An overcharge condition is due to excessive voltage applied to alternator field. Excessive voltage may be caused by poor regulator ground, a defective battery or voltage regulator. Check regulator ground by connecting a jumper wire from regulator case to battery negative terminal.

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If voltage drops, repair regulator ground. Check black wire connection of regulator to black wire of engine compartment harness.

Voltage Regulator Test – Connect voltmeter to battery, turn headlights on low beam and operate engine for several minutes to bring regulator up to operating temperature. Operate engine at 1000 RPM and note voltage. Voltage reading should be within specifications for temperature of regulator.

Specification

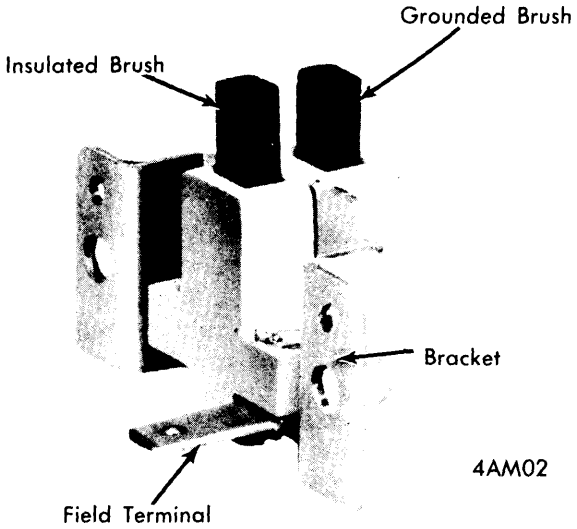
Ambient Temperature	Voltage Reading
0-50°F	14.2-15.3
50-100°F	13.7-14.8
100-150°F	13.1-14.3
150-200°F	12.7-13.8

TESTING (ON BENCH)

NOTE – Alternator must be disassembled before individual components can be checked.

BRUSH ASSEMBLY TEST

Connect an ohmmeter (or test lamp) between field terminal and bracket. Resistance should be high (infinite) or test bulb should not light. If resistance is low or test bulb lights, brush assembly is shorted and must be replaced. To test for continuity, connect ohmmeter to field terminal and insulated brush, resistance should be zero. Move brush and brush lead wire, resistance should not vary. Connect ohmmeter to bracket and grounded brush, resistance reading should be zero.



BRUSH ASSEMBLY TEST

STATOR (IN-CIRCUIT TEST)

1) When making in-circuit stator leakage tests, some consideration must be given to rectifier diodes that are connected to stator winding. A shorted diode in negative rectifier would make stator appear to be shorted. Thus diode plate and stator must be checked individually after alternator has been disassembled if a defect is suspected.

2) Use a suitable diode continuity light tool (J-21008) or a DC test lamp. *CAUTION – Do not use a 120 volt test lamp or diodes will be damaged.* Connect test lamp lead to diode and ground other test lead. Reverse test leads, test lamp should light in one direction only. If test lamp does not light in either direction, this indicates that all three diodes are open. If test lamp lights in both directions, stator winding is shorted to stator, or one of negative diodes is shorted. If a malfunction is evident, check stator again when alternator is disassembled.

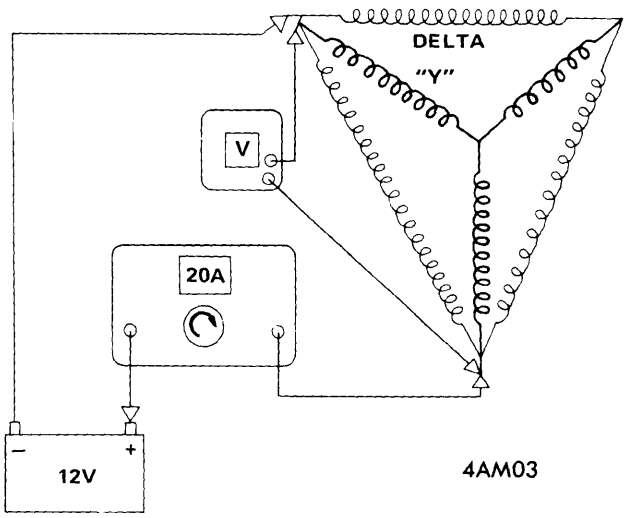
STATOR (SHORT TEST)

To test stator for shorts to ground between stator coil windings use a suitable test lamp or ohmmeter. With one probe of test lamp on stator pole frame, touch each of stator leads with other probe. If lamp lights, stator windings are grounded.

STATOR (LOAD TEST)

1) This test is performed with diodes unsoldered from stator leads. Use a voltmeter, ammeter, a variable load control and a fully charged 12 volt battery to test stator (see illustration). Connect negative lead to any stator lead and connect positive lead to load control. Connect remaining load control lead to either of the remaining two stator leads. Connect voltmeter to stator leads and adjust load to draw 20 amperes. Allow windings to heat up for approximately 15 seconds and note voltmeter reading. On 35 or 37 amp. alternators, reading should not exceed 4.2 volts (1971-73) or 8.2 volts (1974). On 51 or 55 amp. alternators, reading should not exceed 7.7 volts (1971-73) or 6.5 volts (1974).

2) Reduce amperage draw to zero, disconnect voltmeter and load control test leads from stator and connect to other remaining stator lead. Apply 20 ampere draw and note voltmeter reading. Variance between each winding must not exceed .7 volt (35 or 37 amp. alternators) or .6 volt (51 or 55 amp. alternators).



STATOR LOAD TEST

ROTOR (FIELD COIL TEST)

To test for ground, use a suitable 110 volt test lamp. Place one test probe on a slip ring and other probe on rotor core. If bulb lights, rotor winding is grounded. Test for shorted windings by connecting ammeter and rheostat in series from battery negative post to rear slip ring and jumper wire from battery positive post to front slip ring. Voltmeter should be connected

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across slip rings. Slowly reduce resistance of rheostat to zero. With battery voltage of 12.4-12.8 volts, field current should draw 1.8-2.5 amps. Excessive current draw indicates shorted windings and less than minimum current draw indicates open windings.

DIODE TRIO

Use a suitable testing tool which draws a one amp. load (maximum) at 12 volts. *NOTE — An ohmmeter or test light will not shown diode breakdown caused by heat.* Unsolder wires at diode trio and attach tester to a 12 volt battery. Attach negative clip of tester to threaded stud terminal of diode trio and positive clip to one of diode trio terminals. Test lamp should light. Keep load on diode for 1-3 minutes and if light flickers or goes out, diode is defective. Test second and third diodes in same manner.

RECTIFIER DIODES

Unsolder wires from diodes using needle nose pliers attached between diode and solder joint to absorb heat. Use a suitable testing tool which draws about 15 amperes. Attach tester to a 12 volt battery and connect test leads to diode heat sink and diode lead so lamp lights. Maintain test load on diode for 1-3 minutes and if light flickers or goes out, diode is defective. Reverse leads and if lamp lights, diode is defective. Test other diodes using same procedure.

OVERHAUL

DISASSEMBLY

1) Remove brush assembly by removing two self tapping screws and cover. Pull brush assembly back just far enough to clear locating pins, and tip brush assembly away from housing. Do not pull brush assembly straight away from alternator as one of the brushes may drop between slip rings and become broken. Scribe a line across front housing, stator and rear housing. Remove through bolts. Separate housings by using two screwdrivers to pry housings apart. Do not burr stator core with screwdrivers, and do not insert screwdrivers deeper than $\frac{1}{16}$".

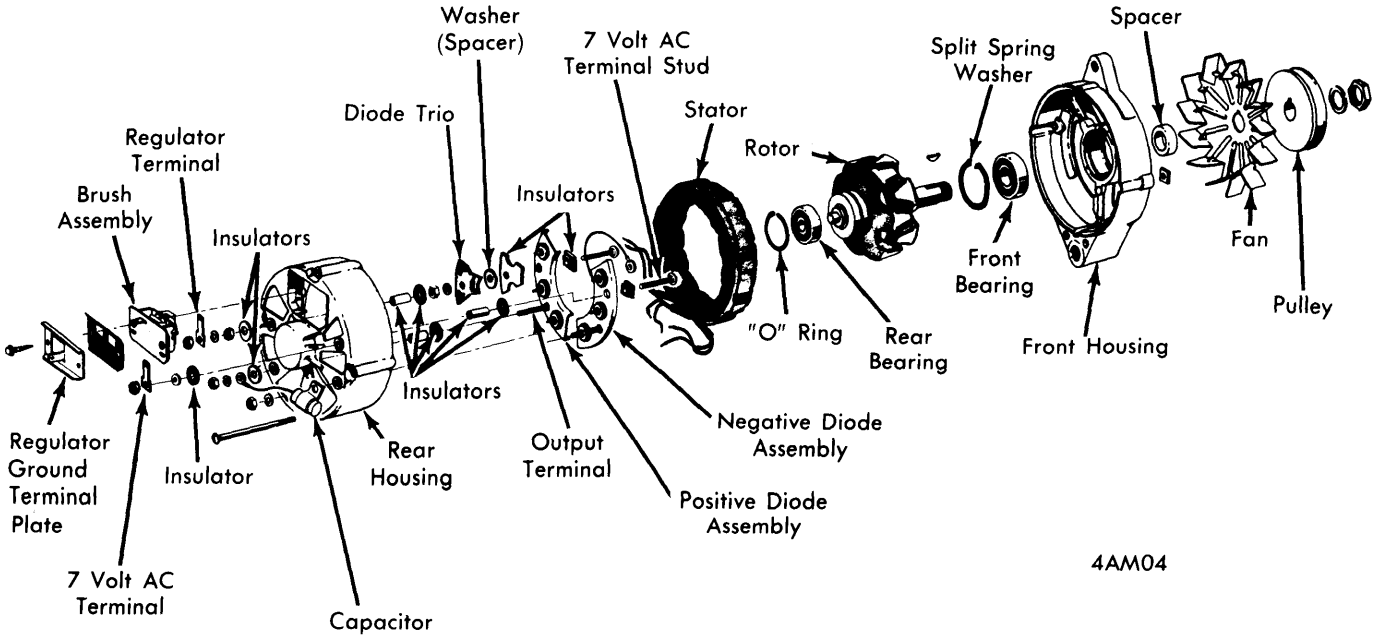
2) Remove four lock nuts and insulating washers, then separate stator from rear housing. Do not unsolder stator to diode wire junctions, remove stator and diodes as an assembly. *CAUTION — Avoid bending stator wires at junctions.* Remove nylon sleeve and insulating washer from regulator stud. Remove hold down nut and unsolder leads.

3) Remove rotor from front housing only if field coil and/or front bearing is defective. Bearings are permanently lubricated and sealed. Use a double-jaw puller to remove pulley. Unseat split ring washer by inserting suitable tool (J-21157) through opening in front housing and compressing washer while exerting pressure towards rotor. Remove washer only after rotor and front bearing have been removed. Remove rotor and front bearing by tapping rotor shaft. *NOTE — Split ring washer must be removed from its retaining groove before attempting to remove front bearing.*

REASSEMBLY

1) Clean bearing and inside of bearing hub. Support front housing, and using a suitable tool, apply sufficient pressure to outside race to seat bearing. Insert split ring washer in groove of hub. *CAUTION — Do not compress washer with any object that can slip off and damage bearing seal.*

2) *NOTE — Make certain split ring washer has been installed prior to assembling front housing and rotor.* Before installing rotor into front housing, clean any rust or corrosion from shaft. Lightly lubricate shaft. Using a suitable tool (J-21156) apply pressure to seat front bearing against shoulder on rotor shaft. Bearing drive tool must fit inner race of bearing. A small press can also be used to install rotor, or rotor can be installed by tapping on end of rotor shaft with a soft faced hammer.



DISASSEMBLED ALTERNATOR (TYPICAL)

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3) Install fan and pulley spacer, key, fan and pulley. Use a 7/16" socket to fit inside race of rear bearing and apply pressure to drive bearing against shoulder of rotor shaft. Install flat fiber washers on positive diode attaching studs, and on 7 volt terminal (if equipped). Install stator into rear housing.

4) Install plastic sleeves on all insulated terminals. Install flat fiber washers, metal flat washers and lock nuts. The 7 volt terminal (if equipped) has a polarizing blade. This blade is identified by a short protruding tab that prevents regulator harness from being installed on this terminal. Before tightening this terminal, check that diode wire end does not contact heat sink. Install the two terminal blades and tighten securely.

5) Before installing rear housing, be sure slip rings are clean. Align scribe marks on front housing and stator assembly. Check that insulating washers are installed on regulator and battery post terminals. When equipped with 7 volt terminal, note that it also serves as a negative diode attaching stud. This is the only negative diode assembly that must be installed from rear housing. Install through bolts and tighten securely. Turn rotor and check for free movement.