ALTERNATOR - CHRYSLER 40/90-AMP & 50/120 AMP

1988 Chrysler LeBaron Convert/Coupe

1988 ELECTRICAL
Chrysler Motors 40/90 & 50/120 Amp Alternators

FWD Models

DESCRIPTION

The charging system consists of an alternator, electronic voltage regulator (EVR), Single Module Engine Controller (SMEC), voltmeter, battery, and connecting wires. The alternator has 12 built-in silicon rectifiers which convert AC current to DC. The alternator consists of a rotor, stator, rectifiers, front and rear covers and a drive pulley.

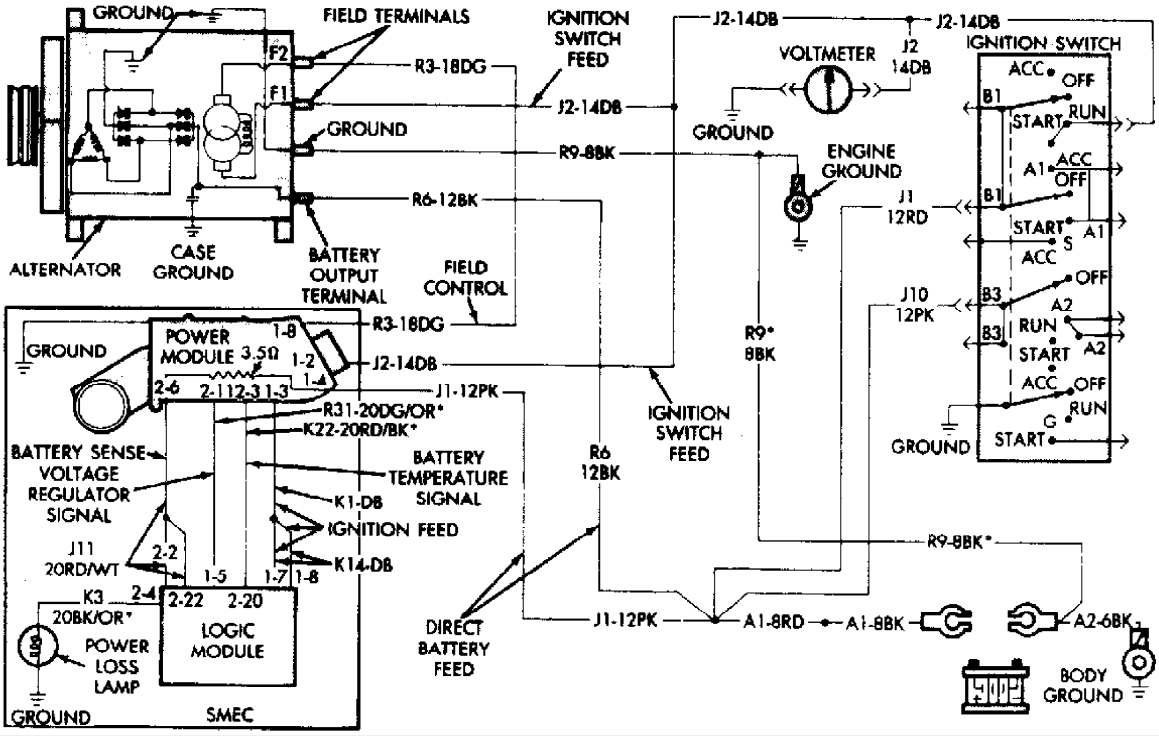

Fig. 1: View of 40/90 Alternator, 50/120 alternator is similar. Courtesy of Chrysler Motors.

OPERATION

ELECTRONIC REGULATOR

The electronic regulator is contained within the engine's electronics SMEC. It is a device that regulates vehicle electrical system voltage by limiting output voltage that is generated by the alternator. This is accomplished by controlling amount of current that is allowed to pass through alternator field winding.

The alternator field is turned on by the SMEC. The SMEC looks at battery temperature to determine control voltage. The field is then driven at a duty cycle proportional to the difference between battery voltage and desired control voltage. One important feature of the

electronic regulator is the ability of its control circuit to vary regulated system voltage up or down as temperature changes. This provides varying charging conditions for battery regardless of ambient temperatures.

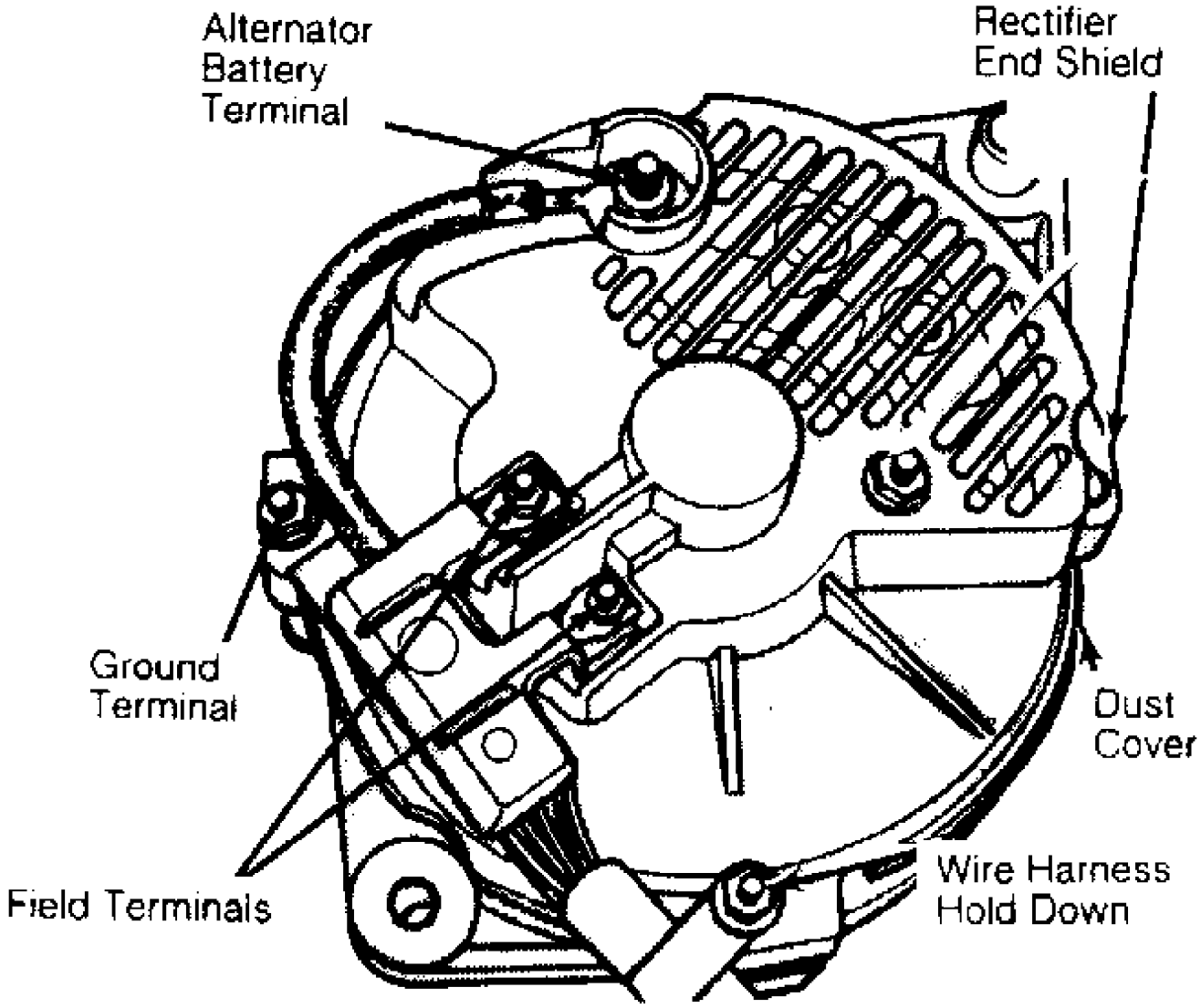

Fig. 2: Chrysler Motors 40/90 Amp Alternator Charging System
Courtesy of Chrysler Motors.

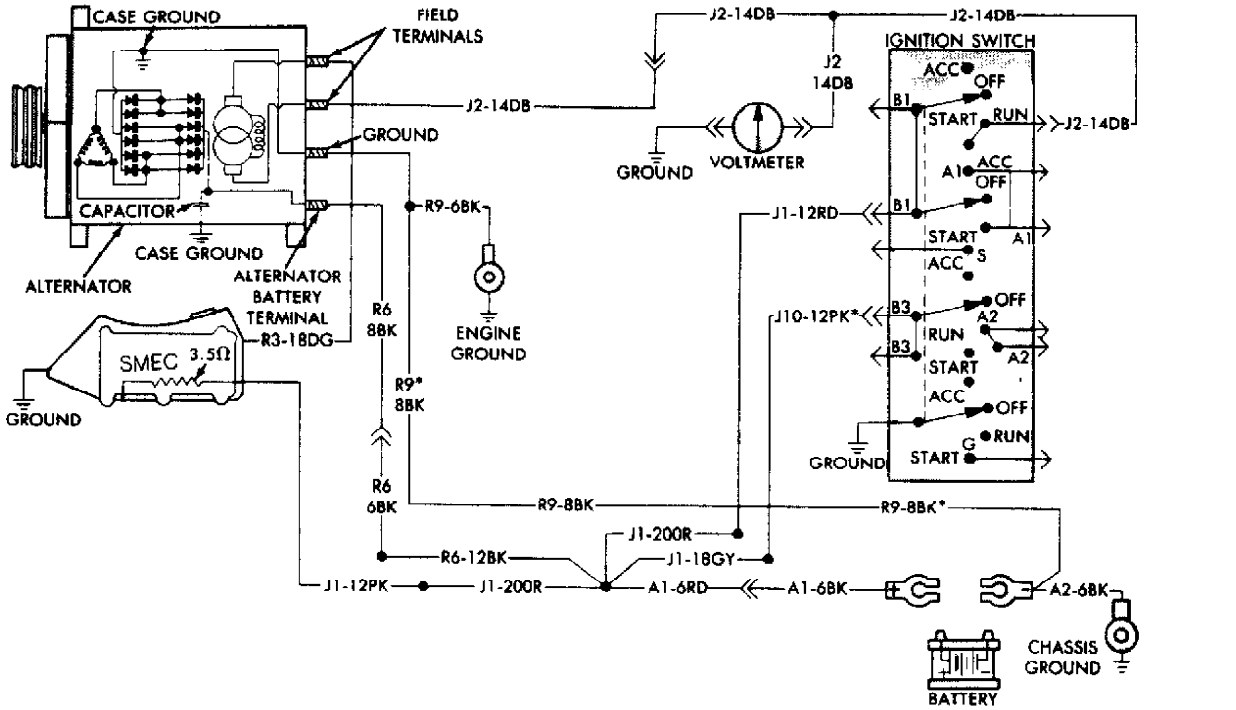

Fig. 3: Chrysler Motors 50/120 Amp Alternator Charging System
Courtesy of Chrysler Motors.

ON-BOARD DIAGNOSTIC SYSTEM

If the on-board diagnostic system senses that one of the critical circuits is bad during a predetermined amount of time during the monitoring cycle, it will consider this a real problem and will put a fault code into memory. Each input and output circuit monitored by the on-board diagnostic system has its own fault code. The fault code will stay in memory as long as the circuit continues to be bad. However, if the problem does not happen again after the fault code is put into memory, the SMEC is programmed to clear the memory after 50 to 100 engine starts. The memory can also be cleared by disconnecting the battery and reconnecting it.

FAULT CODES

Fault codes are 2-digit numbers that identify which circuit is bad. In most cases they do not identify which component in a circuit is bad. Therefore, a fault code is only a result, not necessary the reason for the problem. However, in some cases, as a result of the design of the driveability test procedure, a fault code can be the reason for the problem. It is important that the test procedure be followed in order to understand what the fault codes of the on-board diagnostic system are trying to tell.

Indicator Codes

Indicator codes are 2-digit numbers that will tell if certain sequences or conditions have occurred.

ATM Test Codes

ATM test codes are 2-digit numbers that identify various

circuits that will be used during diagnostics.

Sensor Access Codes
Sensor access codes will be the same as some ATM test codes. They will be used to access a sensor readout.

Engine Running Test Codes
Engine running test codes are 2-digit numbers. They will be used to access sensor readouts while the engine is running.

DIAGNOSTIC READOUT BOX

A diagnostic readout box is used to put the system into a diagnostic test, circuit actuation test, switch test, sensor test and engine running test modes. These 5 modes of testing are required to properly diagnose the system and will be used in the diagnostic test procedures. See Fig. 4.

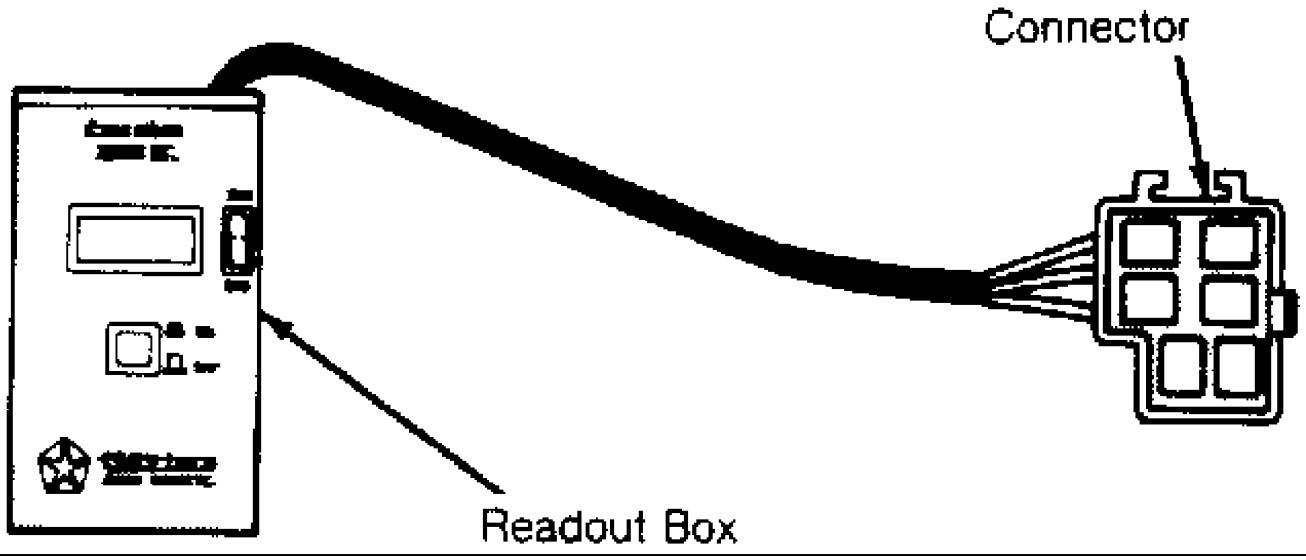

Fig. 4: Diagnostic Readout Box
Courtesy of Chrysler Motors.

TROUBLE SHOOTING

NOTE: See the TROUBLE SHOOTING - BASIC PROCEDURES article in the GENERAL TROUBLE SHOOTING section.

TESTING (ON-VEHICLE)

OUTPUT RESISTANCE TEST

Alternator output wire resistance test will show amount of voltage drop across alternator output wire between alternator "Bat" terminal and positive battery post.

1) Before starting test make sure vehicle has a fully charged battery. Turn ignition off. Disconnect negative battery cable. Disconnect alternator output wire from alternator output battery

terminal.

2) Connect a 0-150 ampere scale DC ammeter in series between alternator "Bat" terminal and disconnect alternator output wire. Connect positive lead to alternator "Bat" terminal and negative lead to disconnected alternator output wire.

3) Connect positive lead of volt/ohmmeter tester (range of 0-18 minimum) to disconnected alternator output wire. Connect negative lead of volt/ohmmeter to positive battery cable at positive post.

4) Remove air hose between SMEC and air cleaner. Connect one end of a jumper wire to ground and with other end probe Green "R3" lead wire on dash side of Black 8-way connector.

NOTE: DO NOT connect Blue "J2" lead of 8-way connector to ground. Both "R3" and "J2" leads are Green on alternator side of the 8-way connector. At dash end of 8-way connector "R3" is green and "J2" is blue.

5) Connect an engine tachometer and reconnect negative battery cable. Connect Variable Carbon Pile Rheostat (C3950) between battery terminals. Be sure carbon pile is in open or off position before connecting leads.

6) Start engine. Immediately after starting, reduce engine speed to idle. Adjust engine speed and carbon pile to maintain 20 amperes flowing in the circuit. Observe volt/ohmmeter reading. Reading should not exceed .5 volts.

7) If a higher voltage drop is indicated, inspect, clean and tighten all connections between alternator "Bat" terminal and positive battery post. A voltage drop test may be performed at each connection to locate connection with excessive resistance.

8) If resistance tested okay, reduce engine speed, turn off carbon pile and ignition. Disconnect negative battery cable. Remove test ammeter, volt/ohmmeter, carbon pile and tachometer.

9) Remove jumper wire between 8-way Black connector and ground. Connect alternator output wire to alternator "Bat" terminal post. Reconnect negative battery cable. Reconnect hose between SMEC and air cleaner.

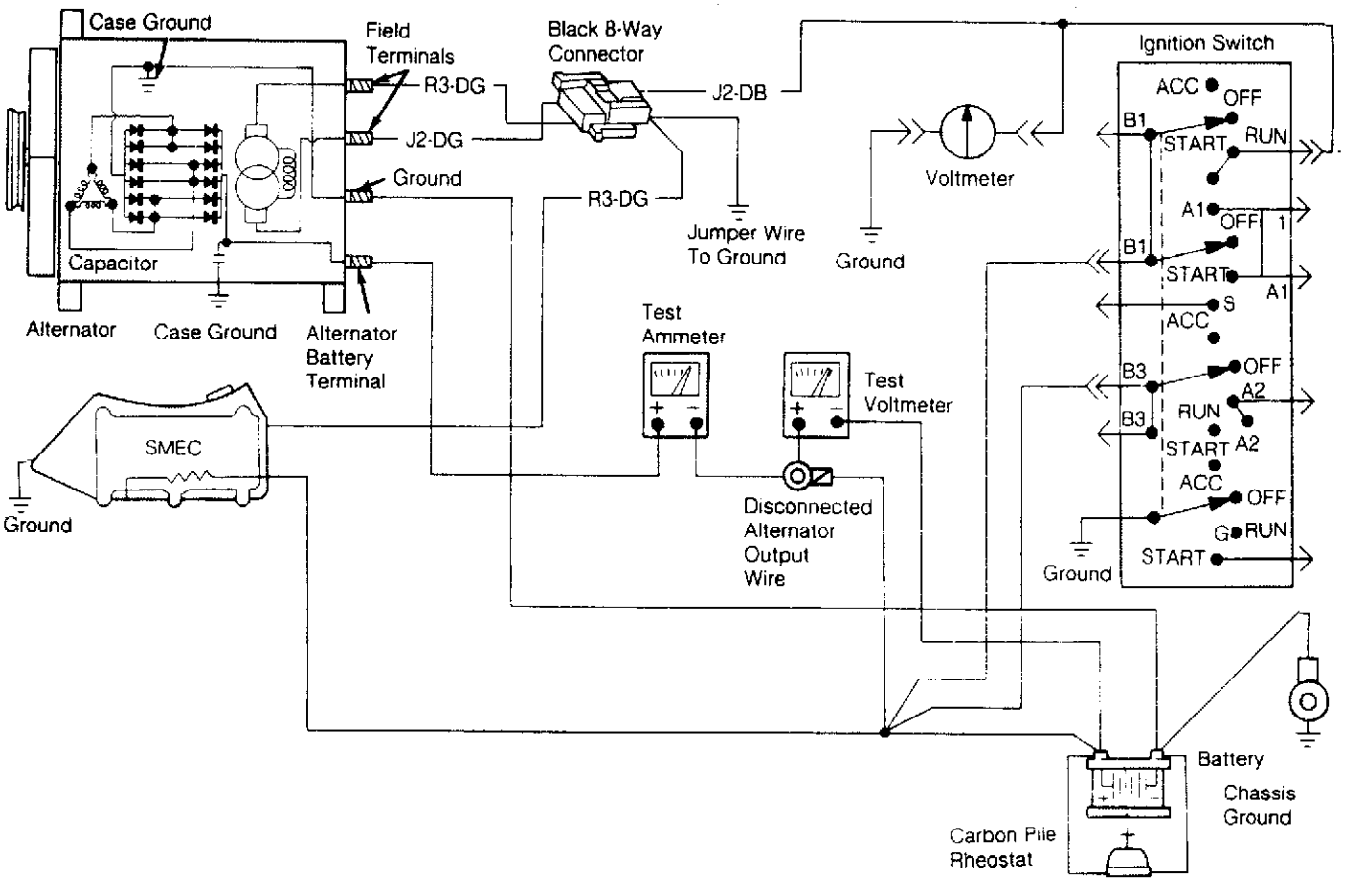

Fig. 5: Current Output Resistance Test, 50/120 shown. 40/90 similar. Courtesy of Chrysler Motors.

CURRENT OUTPUT TEST

Current output test determines whether or not alternator is capable of delivering its rated current output.

1) Before starting any tests make sure vehicle has a fully charged battery. Disconnect negative battery cable. Disconnect alternator output wire at the alternator battery terminal.

2) Connect a 0-150 ampere scale DC ammeter in series between alternator "Bat" terminal and disconnected alternator output wire. Connect positive lead to alternator "Bat" terminal and negative lead to disconnected alternator output wire.

3) Connect positive lead of volt/ohmmeter (0-18 volt range minimum) to alternator "Bat" terminal. Connect negative lead of volt/ohmmeter to a good ground. Connect an engine tachometer and reconnect the negative battery cable.

4) Connect Variable Carbon Pile Rheostat (C3950) between battery terminals. Be sure carbon pile is in open or off position before connecting leads.

5) Remove air hose between SMEC and air cleaner. Connect one end of a jumper wire to ground and with other probe Green "R3" lead on dash side of Black 8-way connector.

NOTE: DO NOT connect Blue "J2" lead of 8-way connector to ground. Both "R3" and "J2" leads are Green on alternator side of the 8-way connector. At dash end of 8-way connector "R3" is green and "J2" is blue.

6) Start engine. Immediately after starting engine reduce speed to idle. Adjust carbon pile and engine speed in increments until a speed of 1250 RPM and volt/ohmmeter reading of 15 volts is obtained. DO NOT allow voltage to read above 16 volts.

7) If readings are less than specified and alternator output wire resistance is not excessive, alternator should be removed from vehicle and bench tested. After current output test is completed, reduce engine speed, and turn off carbon pile and ignition.

8) Disconnect negative battery cable. Remove test ammeter, volt/ohmmeter, tachometer and carbon pile. Remove jumper wire between 8-way Black connector and ground.

9) Connect alternator output wire to alternator "Bat" terminal post. Reconnect negative battery cable. Reconnect air hose between SMEC and air cleaner.

NOTE: Be sure to check on-board diagnostics fault codes. They play a major role in diagnosing a charging system failure.

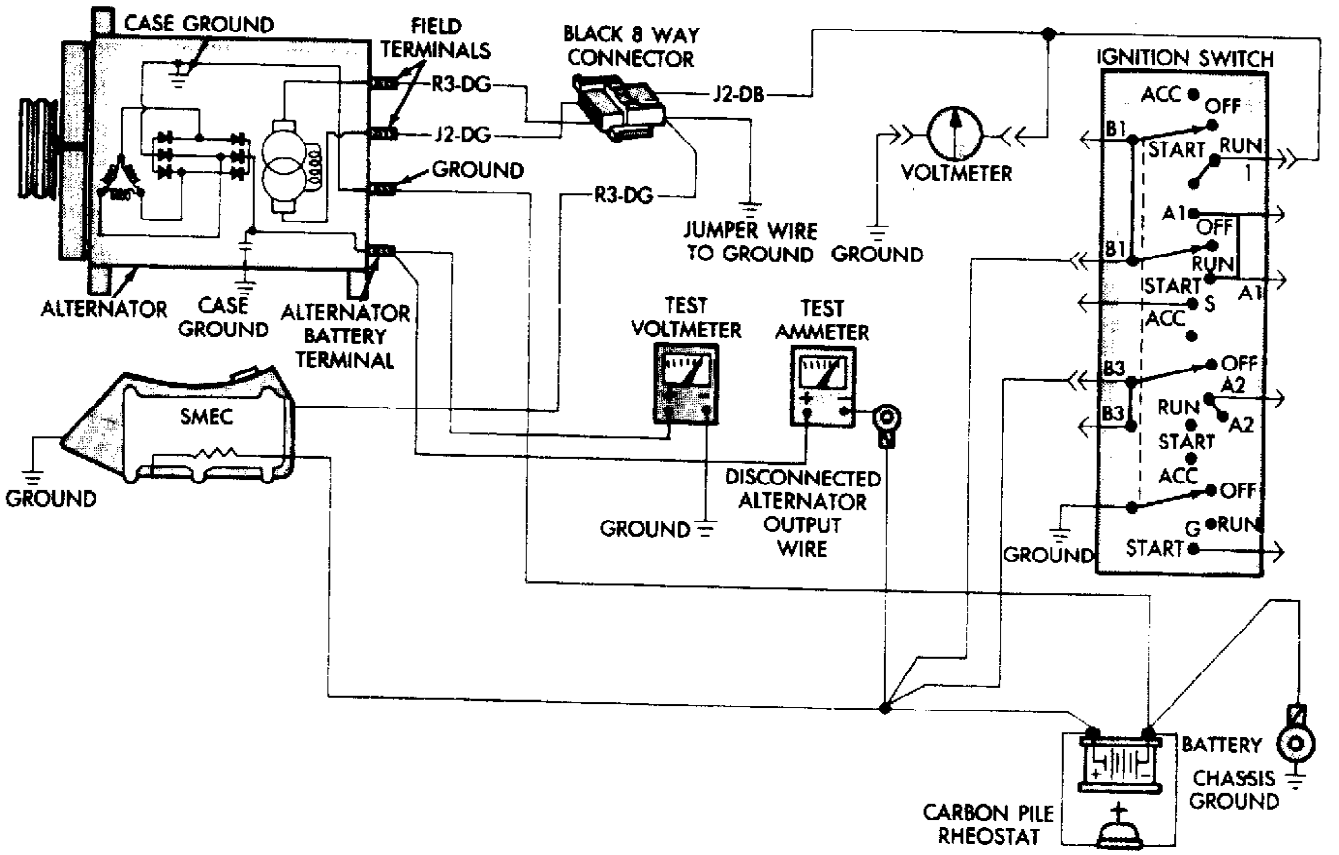

Fig. 6: 50/120 Current Output Test, 40/90 similar.
Courtesy of Chrysler Motors.

DIAGNOSTIC SYSTEM

ENGINE RUNNING TEST MODE

1) Connect Diagnostic Readout Box (C4805) to mating connector in wiring harness by left front shock tower. Make sure read/hold switch is in the "Read" position.

2) Start engine and observe display of readout box. When oxygen sensor is at operating temperature, the display will show if oxygen system is switching rich/lean by alternately displaying "0" (lean) and "1" (rich).

3) When engine is running in Neutral or Park and the oxygen system is displayed, idle motor system can be checked by moving read/hold switch to hold position. Engine speed should increase to about 1500 RPM.

4) When engine is running, oxygen switching is displayed and read/hold switch is in "Read" position. Press and hold ATM button until desired engine running test code appears on the display, then release button.

5) Move read/hold switch to hold position. The SMEC will now use the readout box to display output of selected sensors or it will run engine in a specified mode for diagnosis.

6) All readings displayed are to be divided by 10 except coolant sensor and engine RPM which are to be multiplied by 10. Battery voltage, manifold vacuum, and vehicle speed are actual and no correction is required.

POWER LOSS/LIMIT LIGHT

If for some reason diagnostic readout box is not available, SMEC can show fault codes by means of flashing power loss/limit light on instrument panel cluster. To activate this function turn ignition key on-off, on-off, on within 5 seconds. The power loss/limit light will then come on for 2 seconds as a bulb check. Immediately following this it will display a fault code by flashing on and off.

There is a short pause between flashes and a longer pause between digits. All codes displayed are 2 digit numbers with a 4 second pause between codes. Any number of codes can be displayed as long as they are in memory. The light will flash until all of them are displayed.

Switch Test Mode

After all codes are displayed, switch function can be verified. The light will turn on or off when a switch is turned on or off. Unlike the diagnostic readout box the power loss/limit light cannot do the following:

* Once the light begins to display fault codes, it cannot be stopped. If you lose count it will be necessary to start all over again.
* The light cannot display any codes related to "88" diagnoses or blank displays.
* The light cannot show if the oxygen feedback system is switching (lean-rich) and if the idle motor system is operational.
* The light cannot perform the actuation test mode, sensor test modes or engine running test.

LIMP-IN MODE

If information from critical sensors fails certain on-board diagnostic tests, the SMEC goes into a "limp-in mode", turns on the power loss/limit light and substitutes a modified signal in place of the failed one, in order to keep vehicle driveable. The following is a description of each charging system "limp-in" mode.

Battery Voltage Sense

If this signal drops below 4 volts after the engine has been running for one minute, fault Code 16 is recorded in memory and the power loss/limit light is turned on. At this time the SMEC will

operate the charging system at a fixed rate.

Battery Voltage Too High

If the SMEC senses that the battery sense voltage is more than one volt above the desired control voltage, fault Code 46 is recorded in memory and the power loss/limit is turned on. If these 2 sensor signals return to within specifications while the engine is running, the power loss/limit light will turn off and the charging system will return to normal operation. The fault code will remain in memory for evaluation by the SMEC but will be cleared after 50 to 100 engine starts if the fault does not happen again.

DIAGNOSTIC TESTING

Test 1A Checking Charging Circuit for Fault Codes

1) Connect Diagnostic Readout Box (C4805) to engine harness connector. Turn ignition on-off, on-off within 5 seconds. If Codes 88-12-55 are displayed, it indicates no faults. Go to next step.

2) If Codes 88-12-16-55 are displayed, Code 16 indicates a battery voltage for charging system fault. Go to Test 3. Record all codes. Turn ignition switch off and disconnect and reconnect battery connector.

3) Start engine and run for 2 minutes. If Codes 88-12-46-55 or 88-12-41-46-55 are displayed, Code 46 or 41-46 indicates an alternator field (charging system output to high) fault. Go to next step.

4) If Codes 88-12-41-55 or 88-12-41-47-55 are displayed, Code 41 or 41-47 indicates an alternator field (charging system output to low) fault. Go to next step.

5) If Codes 88-12-47-55 are displayed, Code 47 indicates an alternator output fault. Check for a loose fan belt then check battery and alternator systems. Record all codes. See Fig. 7.

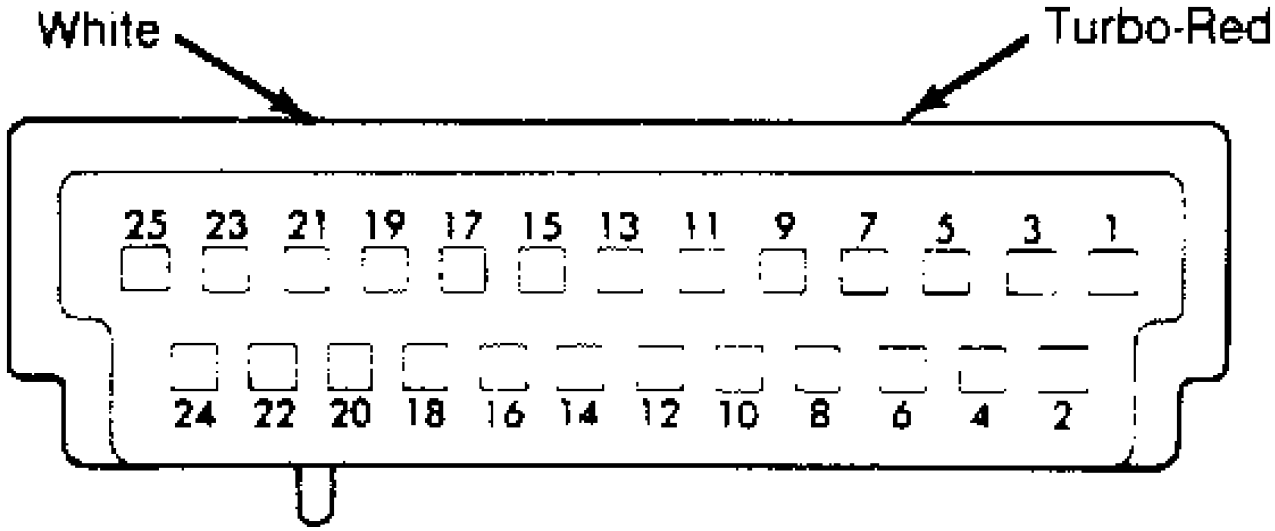

Fig. 7: SMEC Connector
Courtesy of Chrysler Motors.

6) If the same code appears before and after engine is started and problem still exists, check that the diagnostic readout box is operational and that there is not an open circuit in the wires between the SMEC diagnostic connector.

7) If a code does not reappear after engine is started problem no longer exists. Go to TEST 1B.

Test 1B Checking For Intermittent Failures

The majority of intermittent failures are caused by wiring and connections. The only way to find them is to try to duplicate the problem. Since the SMEC can remember where they are, the ATM and sensor test modes can be used in an attempt to locate them. If a fault code does not reappear, the following procedure should be used to determine if the wiring and connections are the cause of the problem.

1) If fault Code 41 does not reappear, use ATM Test Mode 09 as indicated. Connect a volt/ohmmeter to the Dark Green wire of headlight to dash harness 8-way connector terminal of alternator and check pulsations of meter.

2) When in test mode 09, move all connections and wires in circuit. When a bad connection or wire is located, the ATM test will stop when an open wire condition is detected.

3) If a fault Code 16 or 44 does not reappear, use Sensor Test Mode 01 or 07. When in test mode 01 or 07, move all connectors and wires in circuit. When a bad connection or wire is located, display on readout box will change.

Test 2 - Checking Sensor Calibration, Battery Temperature Circuit

1) This test will check battery temperature sensor. Connect diagnostic readout box to engine harness connector, sensor test Mode 01. Display reading on readout box should be between .2-3.0 volts.

2) Check for battery draindown condition. Put the system in engine running test Mode 61. Divide reading on display by 10. If display on readout box is not reading between 2 and 5 volts, replace SMEC.

Test 3 - Checking for Fault Code 16

1) This test will check for direct battery feed to SMEC. Circuit is also memory feed to SMEC. Code 16 with lower battery voltage will turn on power loss/limit light.

2) Connect readout box to engine harness connector. Place system in sensor test mode 07.

3) Display on readout box should be within one volt of battery voltage. If display reads "00", disconnect 60-way connector of control module and check voltage at terminal 41. See Fig. 8.

4) If display on readout box is reading within one volt of battery voltage, repair wire in cavity No. 22 of SMEC (Black on EFI and Blue on turbo vehicles) connector. Check for open circuit to wiring harness splice. See Fig. 7.

5) Connect a jumper wire between cavities No. 2 and 22 of SMEC (Black on EFI and Blue on turbo vehicles) connector. If not okay, replace SMEC. Before replacing SMEC, make sure terminal in cavity No. 22 is not crushed so that it cannot touch SMEC pin.

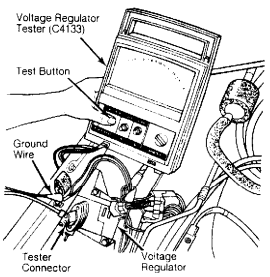

Fig. 8: Power Module 60-Way Connector
Courtesy of Chrysler Motors.

Test 4 - Checking for Fault Codes 41-46 or 46

1) This test will check field circuit to SMEC. Disconnect the

SMEC 14-way connector. Connect a volt/ohmmeter between cavity No. 14 and ground. Turn ignition switch to "RUN" position.

2) Volt/ohmmeter reading is within one volt of battery voltage. If okay, go to TEST 5. If volt/ohmmeter reading is 0-1 volts, repair alternator field circuit for short to ground.

Test 5 - Checking Alternator Field Control to Power Module for Short Circuit

1) This test checks field circuit thru the SMEC. Turn ignition off. Reconnect SMEC 14-way connector.

2) Disconnect SMEC 60-way connector. Use the following procedure to determine "F1" from "F2".

3) At the alternator trace one of the field terminal wires back to the Black 8-way connector at rear of battery. Green wire to Green wire at connector will be "F2". Green wire to Blue wire at connector will be "F1". Tag alternator and use for future test procedures.

4) Connect volt/ohmmeter between "F2" wire on dash side of Black 8-way connector and ground. Turn ignition switch to "RUN" position. Voltage reading should be within one volt of battery voltage. If okay, go to Step 5).

5) With ignition switch in "RUN" position. Voltmeter should read either 11-13 volts or 0-1 volt. Test pin 11 of 14-way connector short to ground. Test should read an open circuit. If both tests are not as specified, replace SMEC. Before replacing SMEC make sure Dark Green wire is not shorted to SMEC connector or alternator connector. See Fig. 9.

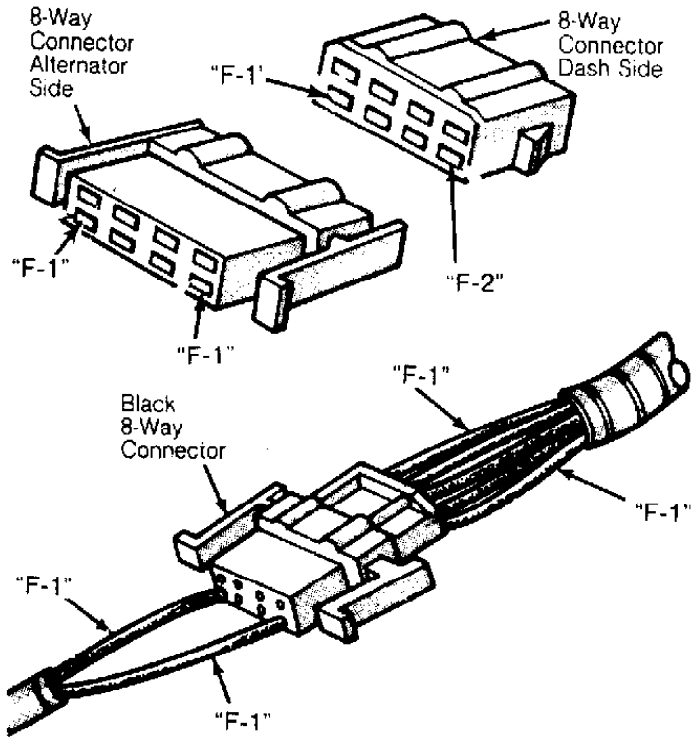

Fig. 9: "F1" & "F2" Connector ID
Courtesy of Chrysler Motors.

Test 6 - Checking Alternator Field Control to SMEC for a Short Circuit

1) This test checks wire at SMEC connector . Disconnect SMEC 60-way connector. Turn ignition off.

2) Disconnect 14-way connector from SMEC. Connect a volt/ohmmeter between cavity No. 11 of SMEC 14-way connector and ground.

3) If volt/ohmmeter is not showing continuity, replace SMEC. If volt/ohmmeter is showing continuity, repair short circuit to ground at cavity wire No. 11.

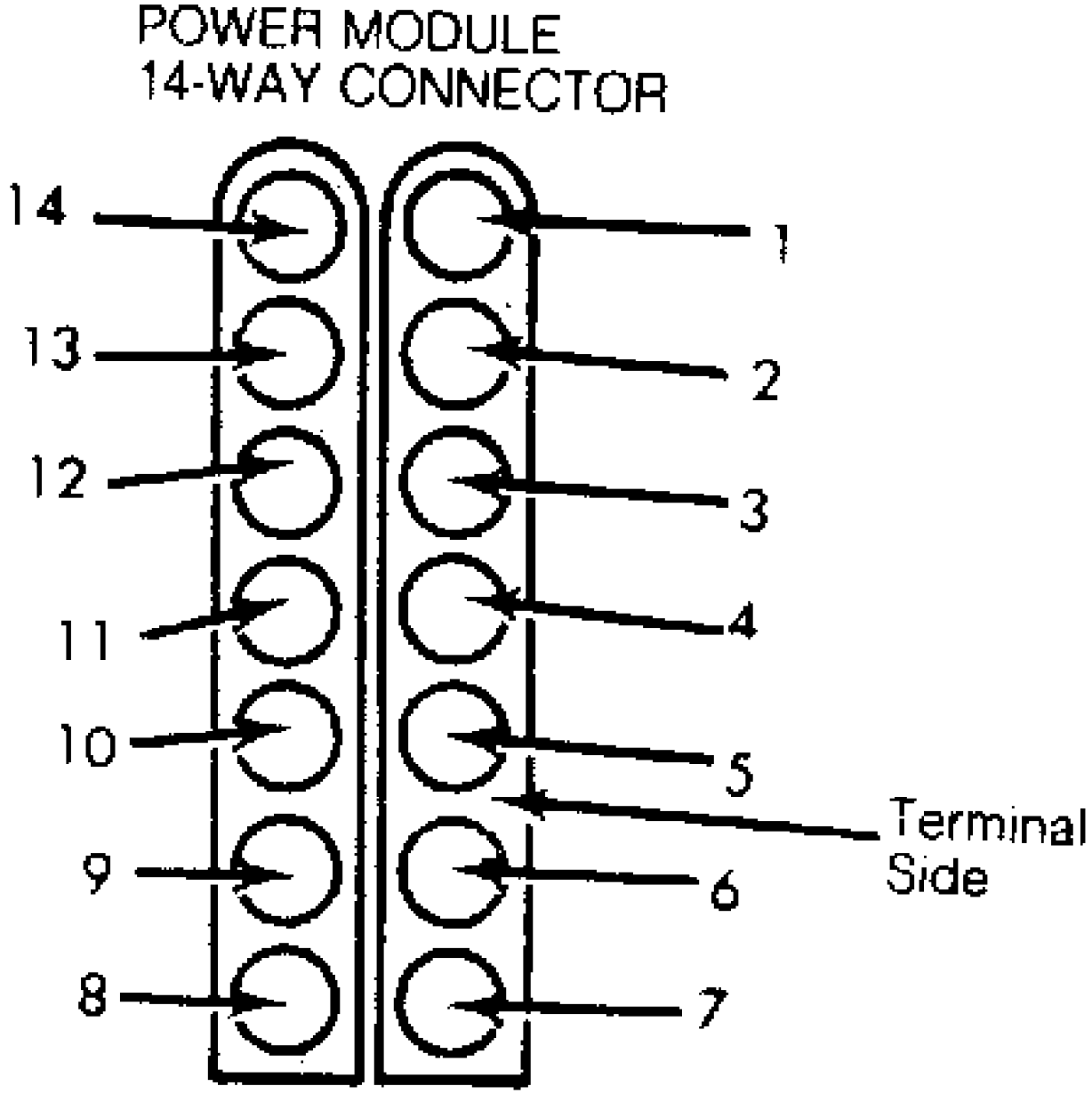

Fig. 10: Power Module 14-Way Connector
Courtesy of Chrysler Motors.

Test 7 - Checking for Fault Codes 41 or 41-47
Alternator Field Charging System Output to Low

1) Connect one end of a jumper wire to a good engine ground. Start engine. Put system into engine running test mode 67. Note voltage reading displayed on readout box.

2) Very quickly touch other end of jumper wire between "F2" wire on dash side of Black 8-way connector and ground. Volt/ohmmeter should show an increase in voltage.

3) If voltage increases, alternator is operating correctly. Go to TEST 8. If voltage does not increase, this indicates alternator is not operating. Check for voltage to alternator field.

Test 8 - Checking Alternator Field Control Circuit of Power Module

1) Turn engine off. Disconnect SMEC 14-way connector. Connect a volt/ohmmeter between cavity No. 14 of 14-way connector and ground. Turn ignition switch to "RUN" position.

2) If volt/ohmmeter reading is within one volt of battery voltage. Go to TEST 9. If volt/ohmmeter reading is zero, repair open circuit from 14 to 8-way connectors.

Test 9 - Checking Charging System Field Control Circuit

1) Turn ignition off. Disconnect 60-way connector from SMEC. Connect a volt/ohmmeter between F2 cavity in dash panel connector and ground.

2) Connect one end of a jumper wire to cavity No. 14 of 60-way SMEC connector. Turn ignition on. Very quickly touch other end of jumper wire to ground, observe volt/ohmmeter.

3) If volt/ohmmeter reading is zero to one volt, replace SMEC. If volt/ohmmeter is not showing zero to one volt, check wiring for open circuit between 14-way and 60-way connectors.

Test 10 - Checking Alternator Field Circuit Between 60-Way and 14-Way Connectors

Turn ignition off. Disconnect 60-way and 14-way connectors from the SMEC. Test for continuity from cavity No. 11 of 14-way connector and cavity No. 14 of 60-way connector. If there is continuity, replace SMEC.

Test 11 - Checking for Voltage to Alternator Field Circuit

1) Turn ignition off. Connect volt/ohmmeter to Dark Blue "F1" terminal of Black 8-way connector and ground. Turn ignition switch to "RUN" position.

2) If volt/ohmmeter reading is within one volt of battery voltage, repair alternator or alternator field wires of engine wiring harness for an open circuit to the alternator.

3) If volt/ohmmeter reading is zero volts, repair open circuit in Dark Blue wire to wiring harness splice.

BENCH TESTING

ROTOR ASSEMBLY TEST

1) Check field slip rings for excessive wear or roughness. If slip ring has only minor damage, clean with a fine emery cloth. If slip rings are too badly damaged, rotor must be replaced.

2) Using a volt/ohmmeter, test for continuity from one slip ring to the other. Test should show a closed circuit. Using a volt/ohmmeter, test for continuity from both field coil slip rings to rotor shaft or core.

3) Test should shoe open circuit. If failure is detected in either test, replace rotor assembly. See Fig. 11.

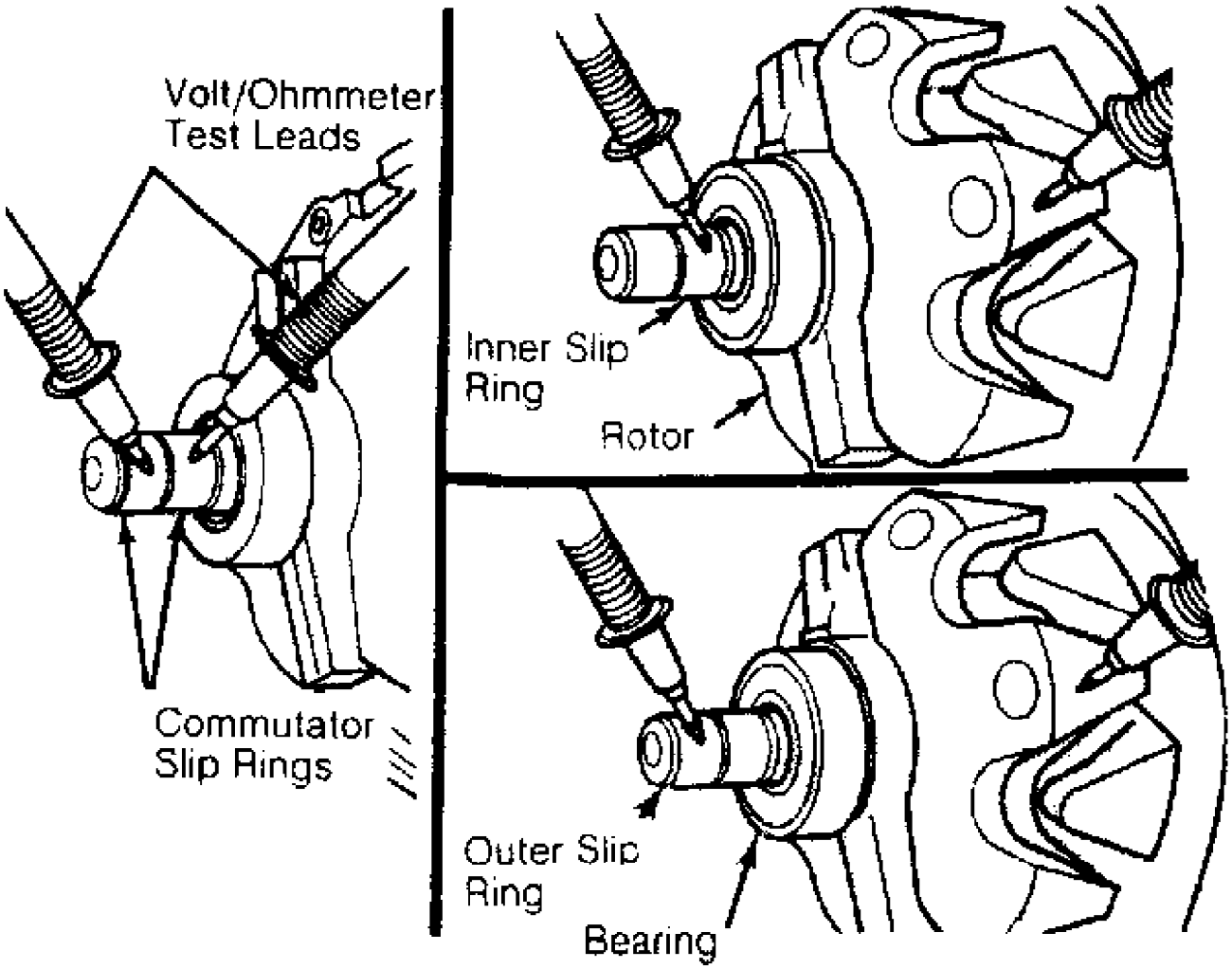

Fig. 11: Testing Rotor Continuity
Courtesy of Chrysler Motors.

STATOR ASSEMBLY TEST

1) Check stator for worn or broken leads, distorted frame, or burned windings. Clean a small area of stator frame for making a good electrical contact. Using a volt/ohmmeter, test for continuity from stator leads to frame. Test should show an open circuit. See Fig. 12.

2) Test for continuity from one stator lead to other leads. Test should show a closed circuit. If failure is detected in either test, replace stator assembly.

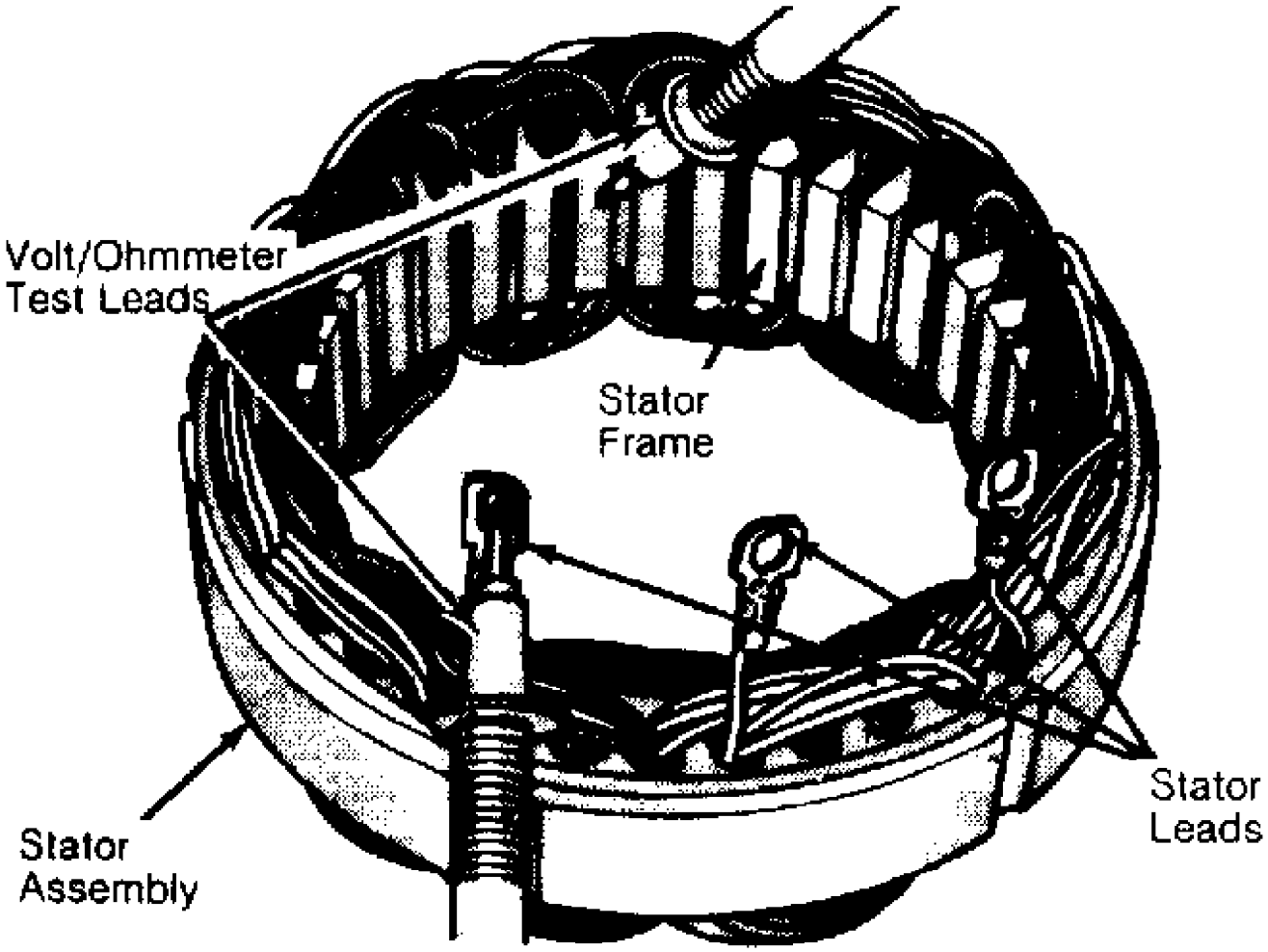

Fig. 12: Testing Stator Coil to Frame
Courtesy of Chrysler Motors.

RECTIFIER TEST

1) Remove positive diode leads from negative diode leads. Using a volt/ohmmeter, test for continuity from positive heat sink to each positive diode leads.

2) Reverse test probes and repeat test. The test should show continuity in one direction only. Test for continuity from negative heat sink to each negative diode leads.

3) Reverse test probes and repeat test. The test should show continuity in one direction only. If failure is detected in either test, replace rectifier assembly.

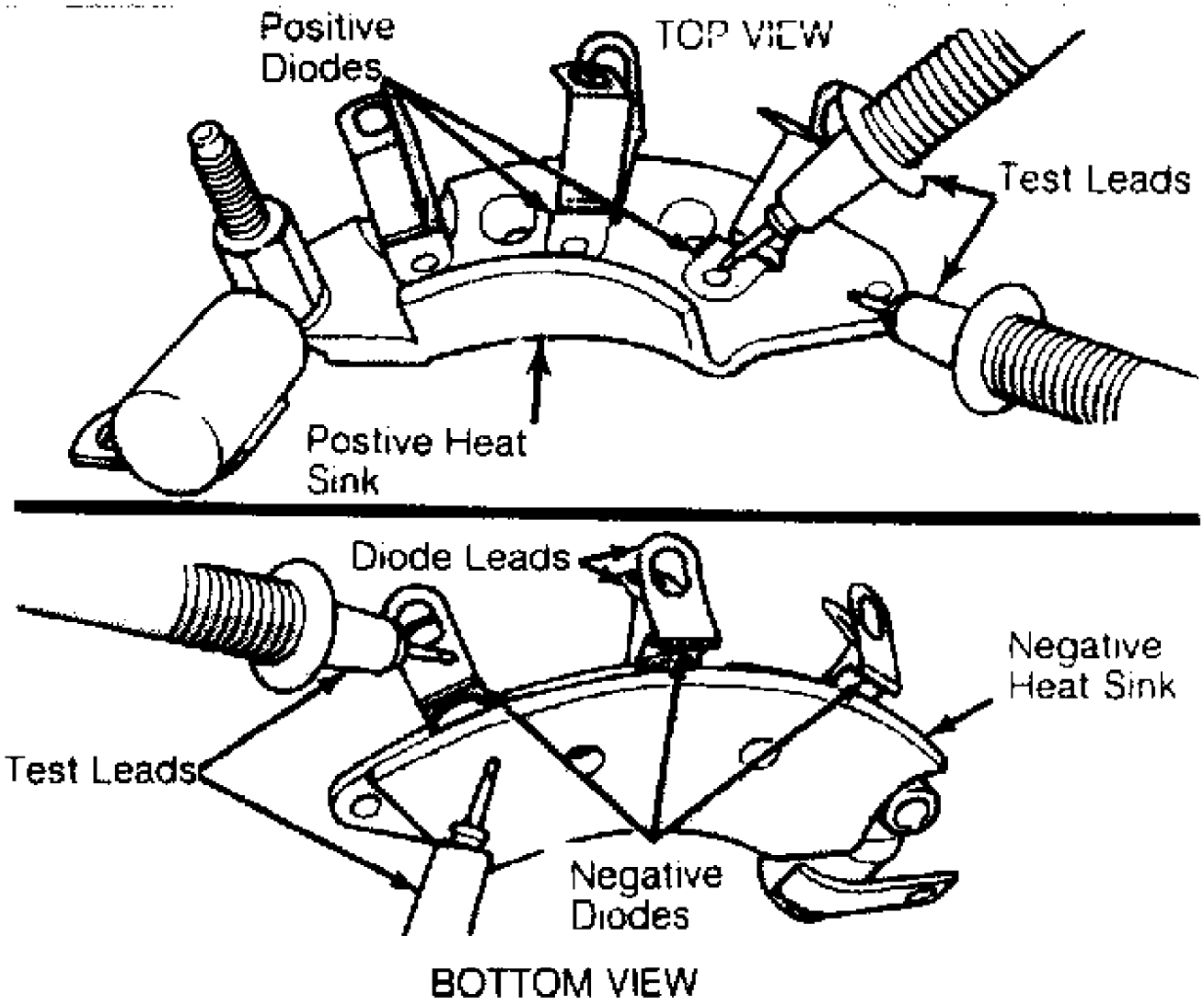

Fig. 13: Testing Negative & Positive Rectifiers
Courtesy of Chrysler Motors.

BRUSH HOLDER TEST

1) When testing brushes and brush springs make sure that brushes move smoothly in brush holder. Sticking brushes require replacement of brush holder assembly.

2) With a volt/ohmmeter touch one test probe to inner brush, and other probe to field terminal. If there is no continuity, replace brush assembly. With the volt/ohmmeter touch one test probe to outer brush and other to field terminal. If there is no continuity, replace brush assembly.