

QUICK REFERENCE GUIDE

TESTING 6 AND 12 VOLT STARTING AND CHARGING SYSTEMS

Using Sun's VAT-40

This condensed procedure will detect starting and charging problems, using manufacturer's specifications with vehicle at normal operating temperature. Tests can be made under other conditions, but standard specifications will not apply. (Specifications shown here are for 12 volt systems.) For complete test information, consult the VAT-40 instruction manual.

CALIBRATION AND HOOKUP

All tests (except those requiring the use of the FIELD SELECTOR) can be made without disconnecting any vehicle leads because of the tester's clamp-on ammeter pickup. Ammeter readings will be accurate as long as the vehicle battery voltage is 4.5 volts or higher.

- A. Check each meter's mechanical zero. Adjust if needed. See Figure 1.
- B. Rotate the LOAD INCREASE control fully counterclockwise to "OFF."
- C. Connect the tester LOAD LEADS to the battery terminals, Red to positive, Black to negative.
- D. Set the VOLT SELECTOR to "INT. 18 V."
- E. Set the TEST SELECTOR to #2 CHARGING position.
- F. Adjust ammeter to read ZERO using the electrical ZERO ADJUST control.

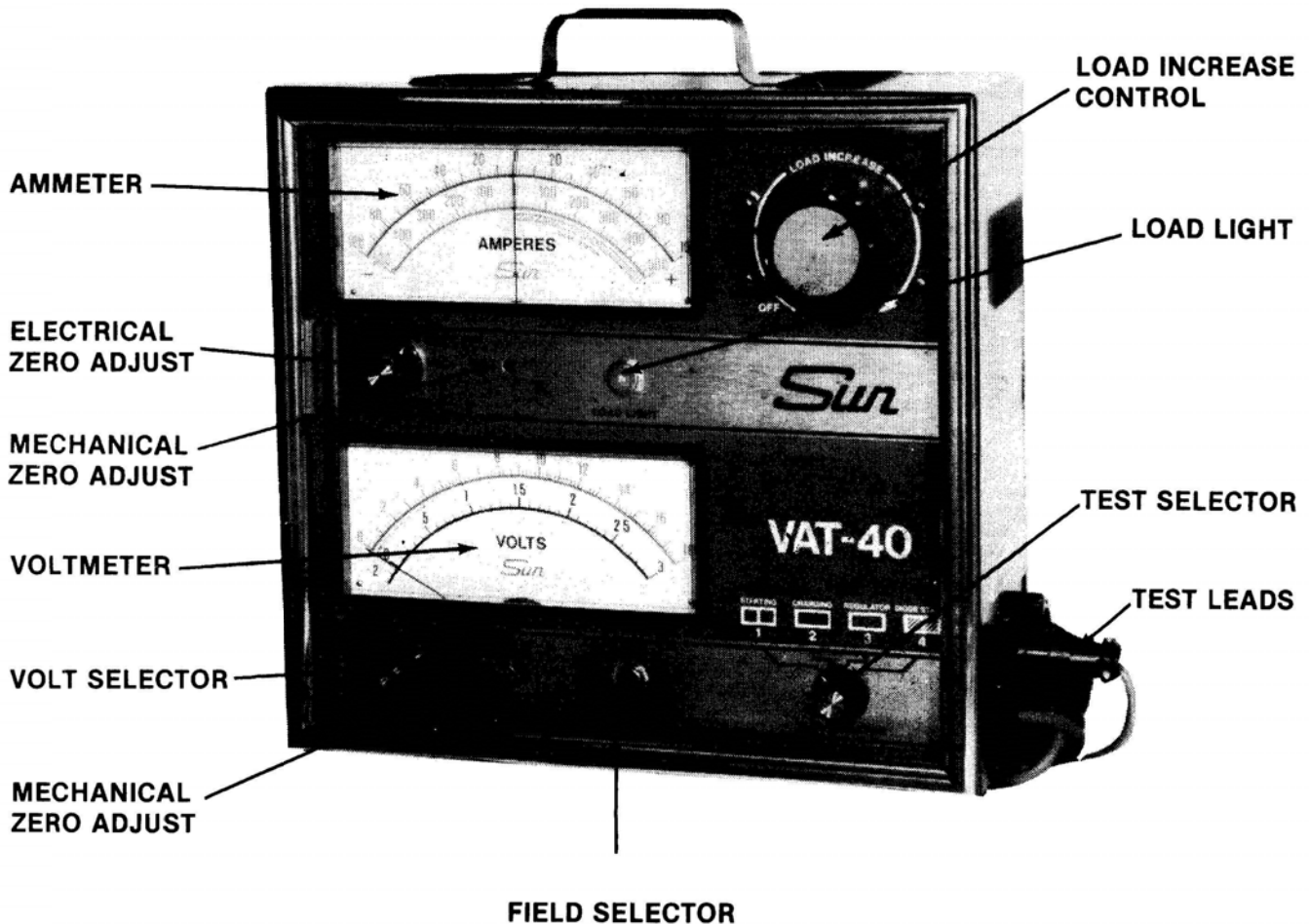


Figure 1—Volt Ampere Tester Model VAT-40.

TEST #1 STARTING

A. Battery Performance

1. Connect the Green clamp-on AMPS PICK-UP around either **tester** load cable (disregard polarity). See Figure 2, A.
2. Set the TEST SELECTOR to the #1 STARTING position.
3. Observing the Red Ammeter scale, turn the LOAD INCREASE control clockwise until the ammeter reads 3 times the battery ampere hour rating, or ½ Cold Cranking Current at 0° F.

NOTE: If the test load cannot be reached and the battery voltage is below 9.6, the battery performance is poor. Perform Sun 3 Minute Battery Test, Sun #692-270.

4. Maintain load for 15 seconds and note Green Voltmeter scale reading. Then return LOAD CONTROL to off.

Test Indications:

- a. Voltage with load applied is 10.0 or more, battery performance is GOOD. Battery is serviceable.
- b. Voltage with load applied is 9.6 to 9.9, battery is serviceable, and Starting System Test can be performed. However, battery needs further testing. Perform Sun 3 Minute Battery Test.
- c. Voltage with load applied is below 9.6 volts. Battery is either discharged or defective and further testing is needed. Perform Sun 3 Minute Battery Test.
- d. Test load cannot be reached. Perform Sun 3 Minute Battery Test.

B. Starting System

This test should be made only with a serviceable battery.

1. Turn off all lights and accessories and close all doors.
2. Connect the Green clamp-on AMPS PICK-UP around the **vehicle** ground battery cables. (Disregard polarity.) If more than one cable is connected to battery post, place clamp around all cables. See Figure 2, B.

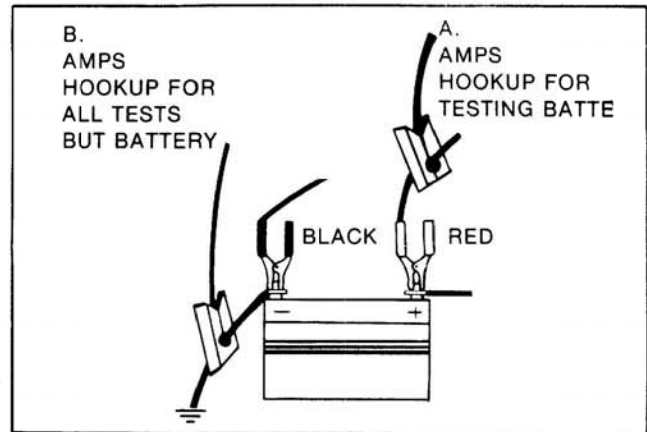


Figure 2—Test connections for Ammeter.

3. Leave the TEST SELECTOR in the #1 STARTING position.
4. Prevent the engine from starting during the cranking test.
 - a. Gasoline engines with externally mounted ignition coil: Remove the coil high tension leads at the distributor center tower and connect the disconnected lead to engine ground.
 - b. Gasoline engines with integral mounted ignition coil: Disconnect the ignition switch lead from the ignition system assembly. Do not allow lead to touch ground.
5. Crank engine while observing Green Voltmeter reading and Red Ammeter reading.

Test Indications:

- a. Ammeter reading should not exceed maximum specified.
- b. Voltage should be at or above minimum specified.
- c. Cranking speed should be normal.

NOTE: If no specification is available, a rule of thumb is:

Starter current draw

Large 8 cylinder engines—reading under 250 AMPS—OK

Small 8 cylinder engines and 6 cylinder engines—reading under 200 AMPS—OK

Cranking Voltage

See manufacturer's specifications. If not specified, 9.6 volts or higher.

Experience and tests of good starting systems will provide the best test data when no specification is available.

GOOD — Within manufacturer's specifications.

BAD—Perform voltage drop tests of cables and solenoid to determine whether trouble is in the starter, cables, or solenoid.

6. Restore engine to starting condition.

TEST #2 CHARGING

- A. Leave the Green clamp-on AMPS PICKUP around vehicle ground cable or cables. See Figure 2, B.
- B. Set the TEST SELECTOR to the #2 CHARGING position.
- C. Turn the ignition switch to the run position and read rate of discharge on the Ammeter.
- D. Start engine and adjust speed to approximately 2000 rpm, or to manufacturer's specified test speed.
- E. Adjust the LOAD INCREASE control slowly as required to obtain the highest reading on the Blue Ammeter scale. Do not drop voltage lower than 12 volts.

NOTE: For charging systems rated above 100 amperes use the #1 STARTING position and read the Red 0-500 amp scale.

- F. Rotate LOAD INCREASE control to OFF.
- G. Add the ammeter readings obtained in Steps C and E for total alternator output, and compare total to manufacturer's specification.

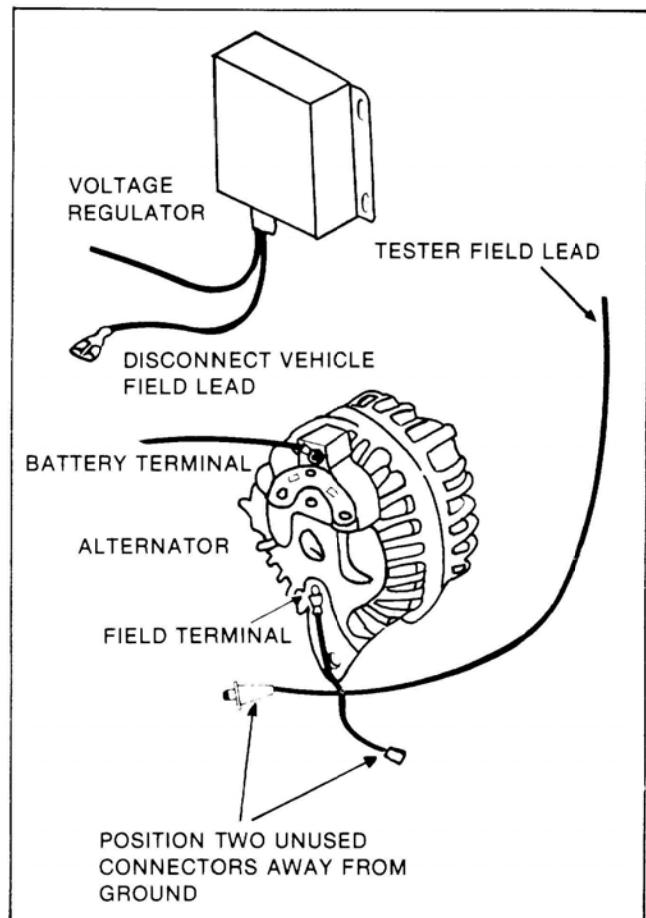
GOOD—Alternator/Generator output within 10% of manufacturer's specification. Proceed to Step #3.

BAD —Output not within 10% of specifications. Proceed to test #2A "Output Tester FIELD SELECTOR."

TEST #2A OUTPUT TEST USING TESTER FIELD SELECTOR

NOTE: This test is to determine if alternator or voltage regulator is bad and is only required if system fails Charging Test #2. The test is for alternator charging systems only. Refer to the instruction manual for testing DC charging systems.

- A. Stop engine and disconnect the vehicle lead from the alternator field terminal (or disconnect the regulator connector plug if field terminal is inaccessible). See Figure 3.



**Figure 3— Field lead connections
for testing alternator.**

- B. Select proper lead terminal and connect the Blue tester field lead to the alternator field terminal (or to the field lead in the regulator connector plug).

CAUTION: Never use Blue field lead with voltage regulator connected.

NOTE: Refer to "Special Alternator Test Information" card Sun #692-855 for identifying field terminal, and for instructions on bypassing regulators on Delcotron alternators with **internal** voltage regulators.

- C. Set the TEST SELECTOR to the #2 CHARGING position for systems rated at less than 100 amperes, or to the #1 STARTING position for systems rated over 100 amperes.
- D. Start engine and adjust the speed to the manufacturer's specified rpm.
- E. Rotate the LOAD INCREASE control clockwise until the voltmeter indicates approximately 2 volts less than system voltage.
- F. Hold the spring loaded FIELD SELECTOR in position A or B as indicated on the "Special Alternator Test Information" reference card.

NOTE: Positions reverse on positive ground systems. "A" becomes "B" and "B" becomes "A". However, no damage will occur if the wrong position is used. If it is unknown which system applies ("A" or "B"), test in each position.

- G. Adjust the LOAD INCREASE control as required to obtain a reading on the voltmeter as specified by the manufacturer.
- H. Observe the reading on the proper ammeter scale.
- I. Release the FIELD SELECTOR switch, turn LOAD INCREASE control off and stop engine.
- J. Add the ammeter reading observed in Step H to the reading observed in Step C under alternator/generator output Test #2, and compare total to manufacturer's specification.

GOOD—Output falls within 10% of manufacturer's specifications. Check vehicle wiring, replace **voltage regulator** and retest system

BAD —Output does not fall within manufacturer's specifications. Replace or repair **alternator** per manufacturer's instructions and retest system.

TEST #3 VOLTAGE REGULATOR

- A. Set the TEST SELECTOR to the #3 REGULATOR position.

- B. Operate engine at approximately 2000 rpm, or at the test speed specified by the manufacturer.
- C. Note reading on Green Voltmeter scale after voltmeter reading ceases to rise, usually when current drops to 10 amps or less. (See manufacturer's specifications.)

GOOD—Voltage reading within manufacturer's specifications.

BAD —Voltage above or below specified voltage range. Replace voltage regulator and retest.

TEST #4 DIODE STATOR

- A. Set engine to test speed; and with TEST SELECTOR set in the #3 REGULATOR position, adjust the LOAD INCREASE control if necessary to obtain a charge rate of at least 15 amperes.

NOTE: If at least 15 amps was not obtained in Test 2A, alternator is defective and should be replaced or repaired. Diode test is not valid.

- B. Set the TEST SELECTOR to the #4 DIODE STATOR position, and observe the Red and Blue DIODE STATOR scale. Turn load control OFF, return engine speed to idle, and stop engine.

GOOD—Meter reads in Blue area of DIODE STATOR scale.

BAD —Meter reads in Red area of DIODE STATOR scale. Replace or service alternator per manufacturer's instructions and then retest system.

TEST #5 CHARGING SYSTEM REQUIREMENTS

- A. With engine stopped and TEST SELECTOR in position #2, turn on all vehicle accessories, ignition switch, headlights at high beam, air conditioning, windshield wipers, rear window defroster if so equipped, etc.
- B. Note reading on ammeter. This ammeter reading is the total accessory load. Compare this reading to the total alternator output reading obtained in Test #2, Step G. Total alternator output reading should exceed total accessory load reading by at least 5 amps.



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