SERVICE PROCEDURES

SYSTEM TESTING

When the ammeter shows a discharge at higher engine speeds, a charging system component (alternator, regulator, drive belt, circuit breaker, or wiring) has obviously failed or, the accessory load is excessive. The serviceman's problem is to determine which component is not performing. The On-The-Plane alternator output tests will quickly indicate whether the alternator is, or is not, the faulty component on charging systems incorporating the Electro-Mechanical Voltage Regulator (C611001-0102).

The On-The-Plane procedure should be limited to finding which of the two major components (alternator or electro-mechanical regulator) is defective and must be removed from the aircraft. Any additional testing that is required to repair the component after it has been removed should be performed on the bench.

When the system components appear to be functioning but the battery is undercharged (indicated by slow cranking), or overcharged (indicated by excessive water usage) the system should be tested and the suspected part removed for bench testing.

VISUAL INSPECTION

A careful visual inspection of the complete aircraft charging system is an important part of any test procedure.

1. Check the "ALT" circuit breaker; reset if found open.
2. Inspect the battery for corroded cable connections and for dust and battery electrolyte on the top.
3. Check the drive belt for tension and a glazed condition (belt driven model).
4. Check the drive gear, driven gear and coupling for physical damage (gear driven model).
5. Check all connectors in the system to be sure they are clean and tight.
6. Inspect the alternator and regulator and wiring for signs of physical damage.

ON-THE-PLANE TEST PROCEDURES

CAUTION

Do not attempt to operate the regulator unless it is well grounded to the airframe. The 3 wires included in the ship's harness to the regulator do not include a ground return circuit. Ground return is accomplished thru the regulator mounting base.

Before making these tests be sure the ship's master switch is functioning properly and the "ALT" circuit breaker is closed (set).

Checking The Voltage Regulator

The calibration of the voltage limiter should be tested on a test machine. It is possible, however, to determine if the field relay is operating and if it is the cause of a "no charge" condition.

1. Turn master switch off.

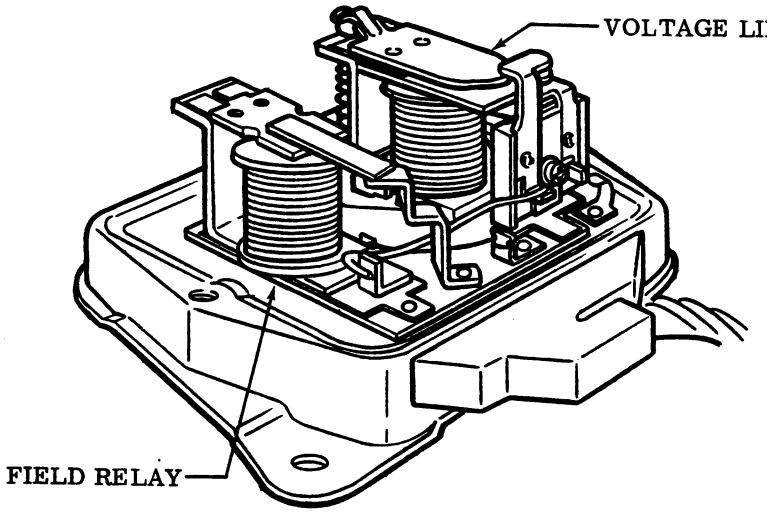

FIGURE 6

2. Remove engine cowl and connect a voltmeter or test lamp between the alternator field terminal and ground.
3. Observe the meter or lamp while the master switch is turned on and off several times. The meter must indicate battery voltage or the lamp must come on each time the master switch is turned on. The meter must show no reading or the lamp must go off each time the master switch is turned off.

CONCLUSIONS

If the relay does not close when the master switch is turned on, the relay coil or the wiring harness is open. Check the harness for a broken wire or poor connection. If harness connections are good replace the voltage regulator assembly.

Checking The Alternator

1. Turn master switch of the aircraft to the "OFF" position.
2. Disconnect plug connector at the voltage regulator and connect a jumper wire from the "A" terminal to "F" terminal of the plug connector as shown.

   NOTE: Fabricate a jumper wire as shown in the illustration.
3. Turn off all accessory equipment.
4. Turn master switch to "ON" position and start the engine.

5. Increase engine speed to 1500 RPM and observe the ship's ammeter.

CAUTION

Components of the electrical system may be damaged if the engine is operated for over two minutes with the jumper wire connected.

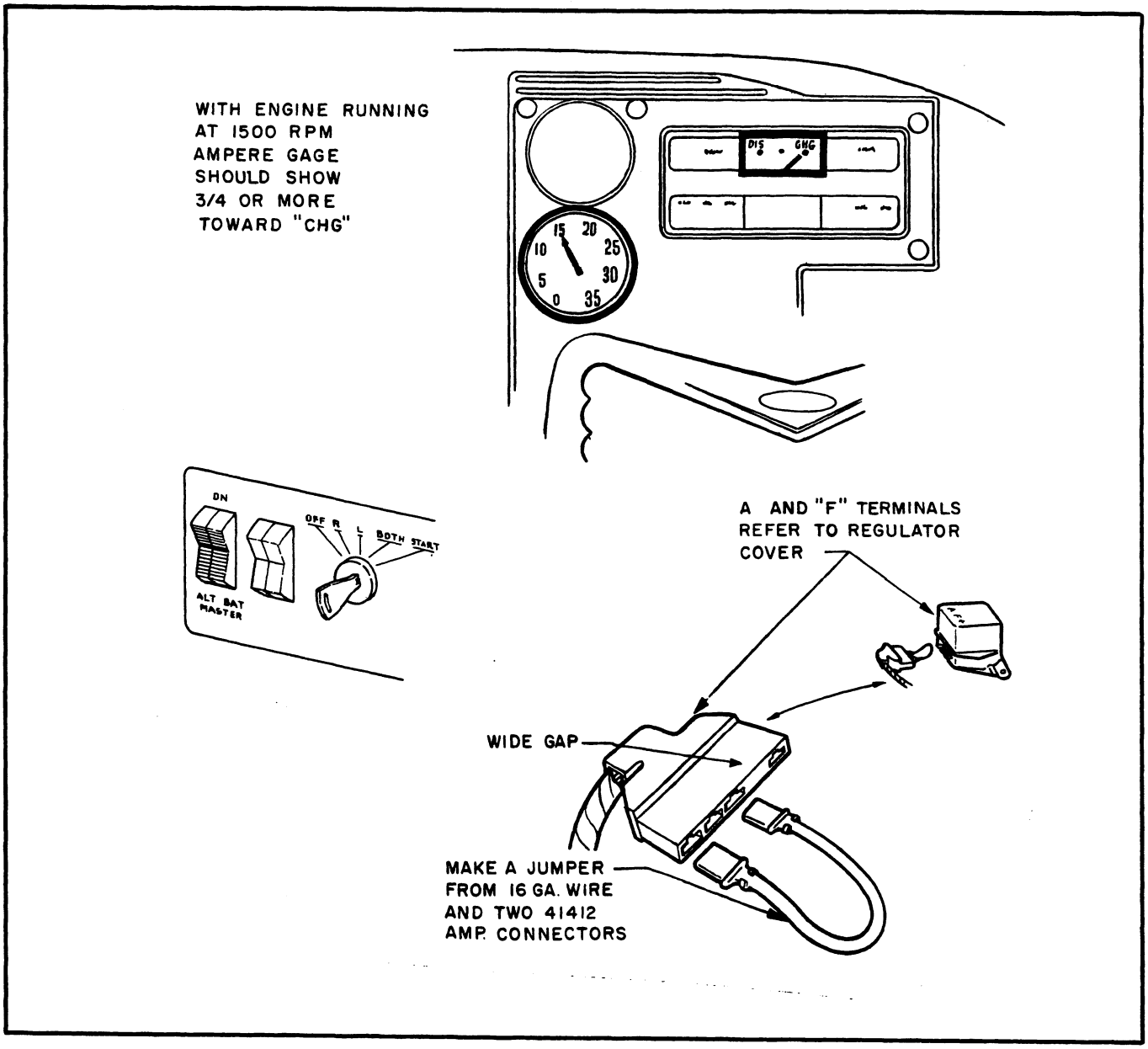

FIGURE 7

TEST CONCLUSIONS

If the pointer of the ship's ammeter was 3/4 of the way or more toward full "charge" position, the alternator is functioning properly and the cause of the trouble is the voltage regulator.

If the ammeter indicated less than 1/2 "charge", a faulty alternator, a poor connection, or a broken wire in the wire harness or plug connector is indicated. Check the harness; if all connections are good, remove the alternator for bench testing and repairs. Refer to "Alternator Bench Tests", Page 63.

REMOVING OR INSTALLING THE ALTERNATOR

Before removing the alternator from the aircraft, make the "On-The-Plane" test as outlined on Page 6.

CAUTION

The output terminal of the alternator is "hot" whenever the master switch is on. Grounding the output terminal or the lead wire can cause the "ALT" circuit breaker to open or cause damage to the alternator.

NOTE

TURN THE MASTER SWITCH OFF BEFORE REMOVING THE PLUG CONNECTOR AT THE ALTERNATOR

When installing an alternator, never close the master switch until all wiring harness connections have been made and are properly tightened.

CAUTION

When adjusting the drive belt tension, use a 1" open wrench on alternators having front housings with rectangular lugs. On older models without the special lug always place the pry bar against the front housing. Never pry against the stator (steel center) section of the alternator or against the rear housing or through bolts. Never pry against the engine mount or engine mount leg as dammage to the engine mount or leg may occur.

POLARIZING - Each time the master switch is turned on, voltage is applied to the field coil which electro-magnetizes the poles. Any other polarizing is not necessary and may result in damage to components or wiring.

CAUTION

NEVER ATTEMPT TO POLARIZE THE ALTERNATOR OR REGULATOR

VOLTAGE LIMITER TESTS - ELECTRO-MECHANICAL REGULATOR

Voltage limiter tests are essential when battery water usage or state of charge are causes for complaint. A double contact regulator operates over slightly wider voltage limits than the common single contact limiter. Upper stage operation occurs at moderate engine speeds or when the load (amperage) is relatively high. Lower stage operation occurs at the higher engine speeds with light electrical loads and usually determines the battery state of charge.

A broken or faulty armature spring or dirty upper contacts will reduce the output of the alternator. Therefore, upper stage operation must be tested whenever the system output is low and the alternator and field relay are known to be functioning properly.

Testing the voltage limiter is best accomplished on a test machine equipped with a variable speed electric motor to drive the alternator. This test machine should have a load ammeter, a field current ammeter, a voltmeter, an adjustable load (carbon pile) and a 12 volt battery. This type of test machine will be found in some aircraft service stations and in most automotive electrical repair shops.

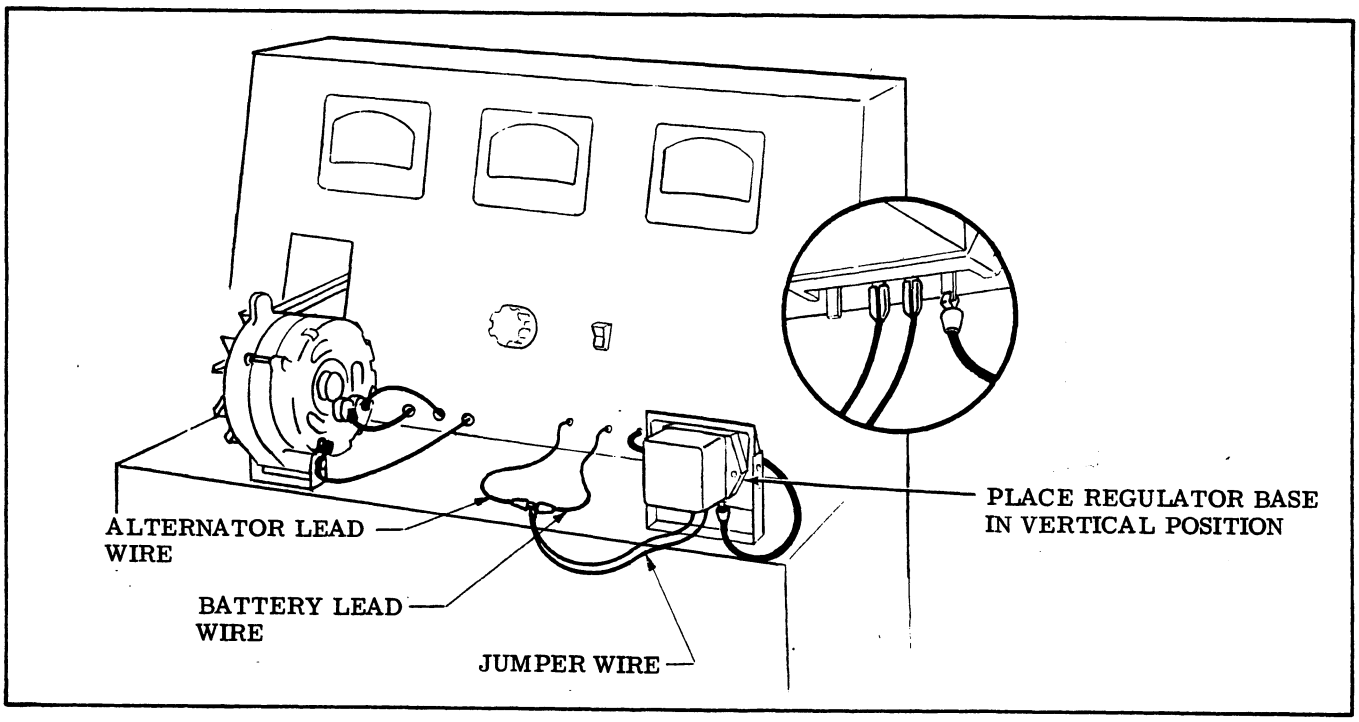

FIGURE 8

REGULATOR BENCH TESTS

The procedures outlined are general and cover the important factors related to the testing of the 15 volt Cessna Alternator Regulator. Refer to the instructions supplied by the manufacturer of the test machine for operating details.

1. A 60 ampere Cessna Alternator must be used to supply the electrical current for the regulator test. Operate the alternator at 4500 to 4700 rpm.

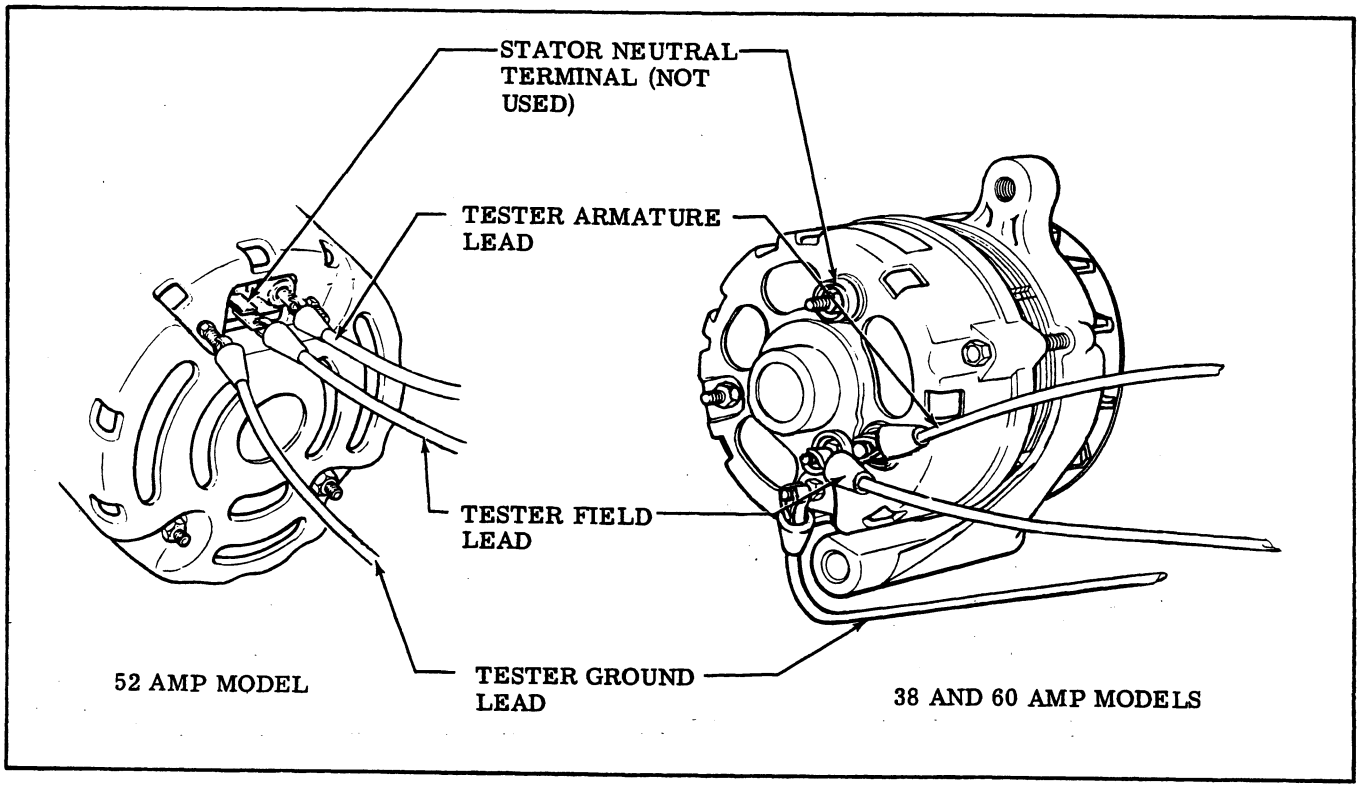

FIGURE 9

2. The tester battery must be in good condition and fully charged; 1.260 specific gravity, minimum.

3. Mount the regulator in the same position as it is in the aircraft. All connections must be tight and secure.

4. The ALTERNATOR and BATTERY lead wires of the test machine must be connected together and a jumper used to connect the test machine to the regulator.

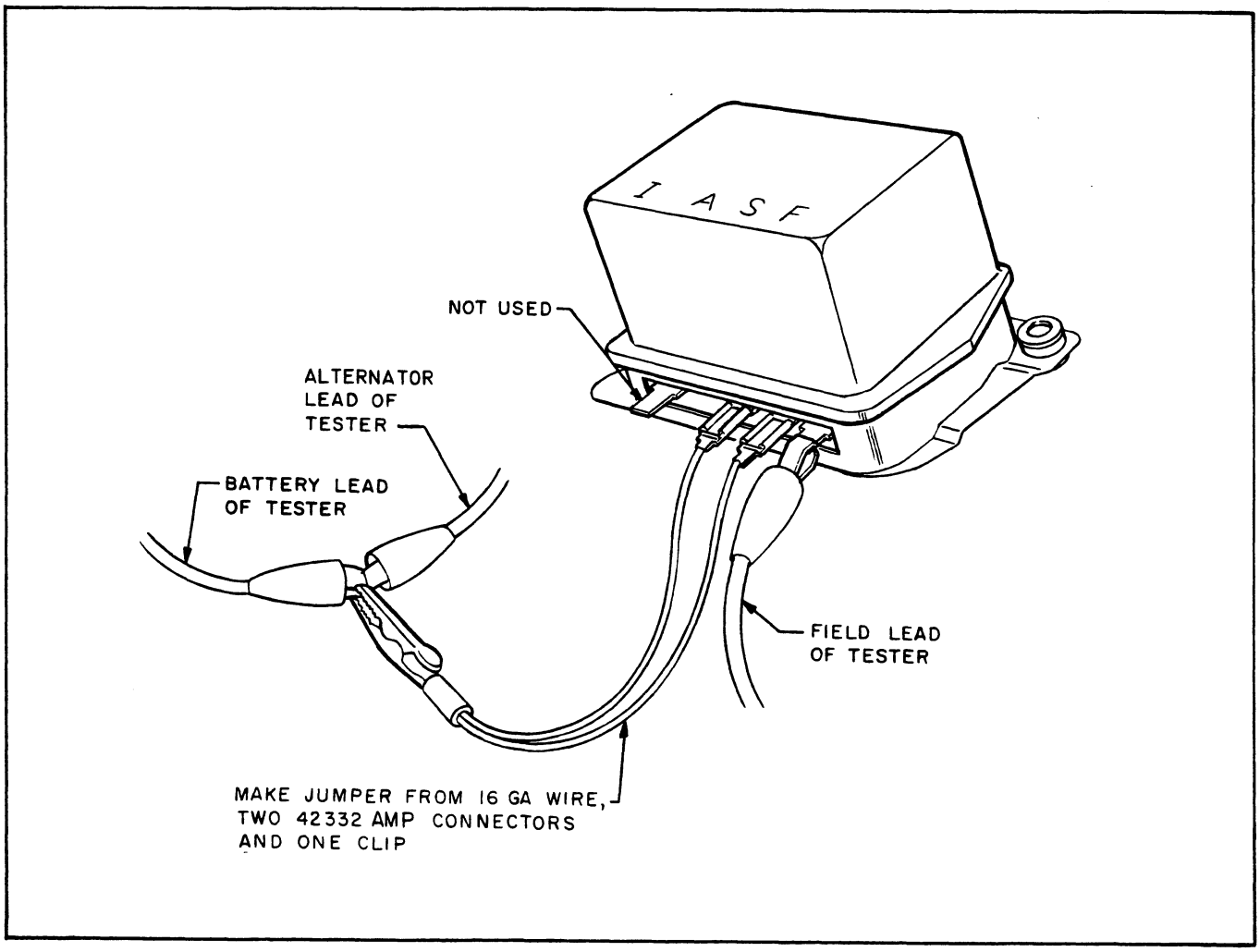

FIGURE 10

5. The voltage regulator temperature must be normalized when the calibration of the voltage limiter is observed. Operate for 20 minutes at .2 to .6 amperes field current (lower Stage operation). An air blast must be provided to maintain the regulator case temperature within 5°F of room temperature.

6. The regulator must be cycled before taking a voltage limiter reading. Cycling is accomplished by momentarily interrupting the circuit to the regulator "S" terminal.

7. Maintain the field current at 0.2 to 0.6 ampere, cycle the regulator and read the LOWER STAGE voltage limiter calibration. Voltage setting should be 13.9 to 14.6 volts at 75°F. See voltage versus temperature chart in regulator specification section for voltage setting at other temperatures.

8. Increase the alternator load current to obtain a field current of 1.2 to 1.6 amperes and read the UPPER STAGE voltage limiter calibration. The voltage must not be higher than the lower stage voltage but can be as much as 0.5 volts lower.
Example: Lower stage voltage is 14.0 volts at 75°F; upper stage voltage should not be higher than 14.0 volts, nor lower than 13.5 volts.

TEST CONCLUSIONS

The lower stage voltage should be within specifications when the regulator temperature is normalized. If lower stage voltage reading is not within specifications, replace the regulator.

The upper stage "shift" voltage should not increase (zero voltage difference); a decrease of 0.5 volt maximum, from the lower contact voltage setting, is satisfactory. When the contact surfaces are in good condition and all other resistors, coils, etc., are normal, transfer (shift) voltage change will normally be correct. If voltage changes more than the specified amount, regulator replacement is recommended.

Erratic operation is indicated when the voltmeter pointer is jumpy and unsteady. Check for loose connection, loose drive belt, or intermittent loads.

TEST PROCEDURES

VOLTAGE LIMITER CHECKING - ELECTRO-MECHANICAL REGULATOR

The amount the voltage changes when operation shifts to the lower contacts is controlled by the contact and core gaps. These adjustments are controlled during manufacture and are not recommended as a service procedure.

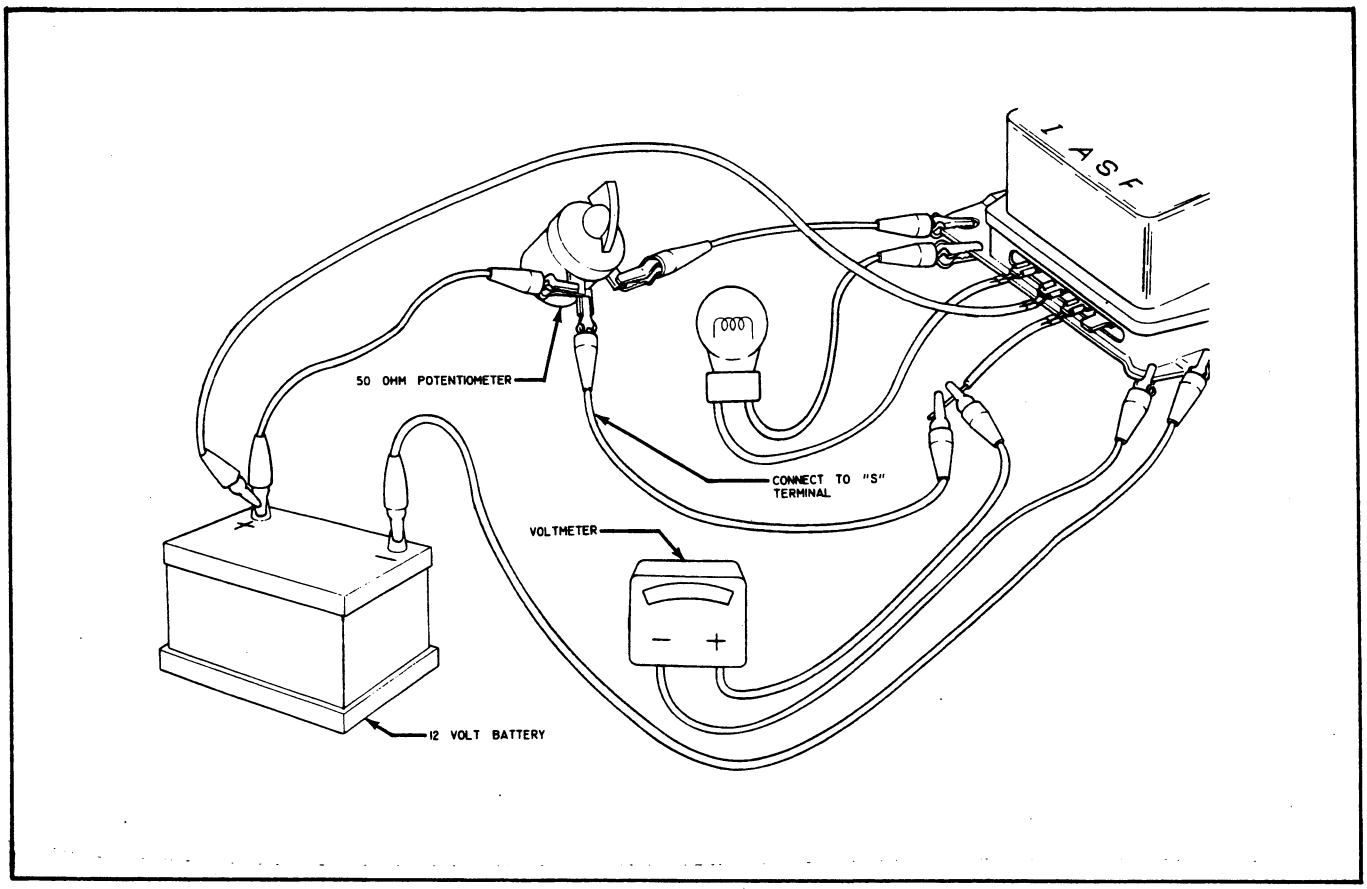

FIGURE 11