DESCRIPTION AND OPERATION

The alternator is mounted high at the front of the engine and is driven from a crankshaft pulley via a 'vee' drive belt. The alternator contains an integral regulator.

70 Amp Alternator

1. Engine Speed Sensor Connection (W Terminal)
2. Warning Lamp (D+ terminal)
3. Output Connection (B+ Terminal)

Figure 3-139

Alternator Operation

With reference to Figure 3-140.

When the key start switch is turned on a small current flows from the battery through the rotor field wiring. The circuit is made via the charge indicator warning lamp, alternator terminal D+, the rotor field winding, the alternator regulator and ground.

At this stage the warning light is illuminated and the rotor partially magnetized.

When the engine is started and the partially magnetized rotor revolves within the stator windings, a 3-phase alternating current is generated. A constant portion of the generated current is converted to direct current by the three field diodes incorporated in the rectifier pack.

This direct current is fed back to supplement the current flowing through the rotor field winding.
This action results in an ever increasing magnetic influence of the rotor along with an associated rapid rise in generated output current and voltage.

During the rise in generated output voltage (reflected at the D+ terminal) the brilliance of the warning lamp is reduced and when the voltage at the D+ terminal equals that at the battery side of the warning light, the lamp is extinguished.

The voltage continues to rise until the predetermined regulated voltage level is reached.

In the event of drive belt breakage, the voltage will not build up within the alternator and so the charge indicator light will remain on to indicate failure.
TESTING AND TROUBLESHOOTING

Service Precautions

To avoid damage to the components of the alternator charging system, service precautions must be observed as follows:

- NEVER make or break any of the charging circuit connections, including the battery, when the engine is running.
- NEVER short any of the charging components to ground.
- ALWAYS disconnect the battery ground cable (negative) when charging the battery on the machine using a battery charger.
- ALWAYS observe correct polarity when installing the battery or using a slave battery to start the engine.

CONNECT POSITIVE TO POSITIVE AND NEGATIVE TO NEGATIVE

Preliminary Checks

Prior to electrical testing, thoroughly inspect the charging and electrical system.

Check all leads and connections for continuity and tightness.

Check the Battery

Using a hydrometer, check the individual battery cells. The battery should be at least 70% (1.230 specific gravity) charged and in good condition.

Check the Drive Belt

Inspect the alternator drive belt and pulley, ensuring that both are clean, free from oil and grease and in good condition.

Fan Belt

1. The fan belt should be removed in the following manner.
2. Loosen the three alternator attaching bolts, twist the alternator toward the engine and remove the fan belt from the pulley.

Inspection and Repair

1. Check the fan belt for evidence of fraying or wear and replace if in any doubt

Reassembly

1. Installation of the fan belt is the reverse of the removal procedure, but ensure the V-belt is positioned correctly onto all of the pulleys. Twist out the alternator to achieve a 0.39" (10 mm) freeplay on the belt at its longest length and tighten the bolts to 15 ft. lbs. (20 N·m).

Check the Warning Lamp

Turn on the key start switch and check that the warning lamp is fully illuminated.

If the warning lamp is not fully illuminated check the bulb. If the bulb is not the cause of the fault, carry out the alternator wiring connections test as detailed under initial tests in this section.

If the warning lamp is illuminated, start the engine and run above idling speed. The lamp should go out.

If the lamp does not go out, stop the engine and remove the wire from the D+ terminal. If the lamp now goes out a faulty alternator component is indicated. Conduct the Alternator Components Tests as detailed in this section.

If the warning lamp remains illuminated, check for a short circuit to ground between the D+ cable end and the warning lamp.

Initial Tests

The initial tests may be performed without removing any of the charging circuit components from the machine and enable the following items to be checked:

- Alternator wire connections
- Alternator charging current and controlled voltage
- Alternator charging circuit volt drops
- Alternator maximum output performance

Test equipment required:

- Voltmeter (0–30 volts moving coil type)
- Millivoltmeter (0–1 volt)
- Ammeter (0–110 amperes moving coil type)
- 1.5 ohm, 110 amperes variable load resistor

NOTE: Most commercial test equipment incorporates several testing devices within a single unit. Use such equipment in accordance with the manufacturer's instructions.
Alternator Wiring Connections Test

NOTE: The main power lead \( (B+) \), 2, and the warning light lead \( (W+) \), 1, attach to the alternator through a common slip fit connector. Conducting certain of these tests may require use of suitable jumper leads to make the necessary connections. Sixteen gauge wire is sufficient for the \( W+ \) connection. Use ten gauge wire minimum as a jumper for the \( B+ \) connection.

1. Disconnect the battery.

2. Disconnect the \( B+ \), 2, and \( D+ \), 3, terminals from the alternator.

3. Reconnect the battery and turn the key start on but do not start the engine. Connect a voltmeter, 4, between each terminal and ground. 1. Battery voltage should be registered.

If battery voltage \((\pm 0.5 \text{ V})\) is not registered, a continuity fault in the external cable circuitry must be traced and remedied. Refer to the circuit diagram shown in Figure 3-140.

4. Connect the \( D+ \) terminal, warning lamp (pink) wire, to ground. The warning lamp should illuminate.

5. Disconnect the battery and reconnect the removed alternator cable connections to the alternator.

NOTE: If the warning lamp fails to illuminate when the cable is reconnected to the alternator, a fault is indicated in the alternator regulator or rotor circuits. Ensure that the \( D+ \) terminal is clean and then conduct the alternator component tests as detailed in this section.

Charging Current and Controlled Voltage Tests

1. Ensure all of the machine electrical components are switched off and the key start switch is in the 'off' position.

2. Disconnect the battery negative terminal and disconnect the \( B+ \) terminal, 4, of the alternator.

3. Connect an ammeter, 1, between the removed (red) cable, 3, and the \( B+ \) alternator terminal.