

The alternator charging system is a negative (-) ground system which consists of an alternator, a regulator, a charge indicator, a storage battery and wiring connecting the components, and fuse link wire.

The alternator is belt-driven from the engine. Energy is supplied from the alternator/regulator system to the rotating field through 2 brushes to 2 slip-rings. The slip-rings are mounted on the rotor shaft and are connected to the field coil. This energy supplied to the rotating field from the battery is called excitation current and is used to initially energize the field to begin the generation of electricity. Once the alternator starts to generate electricity, the excitation current comes from its own output rather than the battery.

The alternator produces power in the form of alternating current. The alternating current is rectified by 6 diodes into direct current. The direct current is used to charge the battery and power the rest of the electrical system.

When the ignition key is turned *ON*, current flows from the battery, through the charging system indicator light on the instrument panel, to the voltage regulator, and to the alternator. Since the alternator is not producing any current, the alternator warning light comes on. When the engine is started, the alternator begins to produce current and turns the alternator light off. As the alternator turns and produces current, the current is divided in 2 ways: part to the battery to charge the battery and power the electrical components of the vehicle, and part is returned to the alternator to enable it to increase its output. In this situation, the alternator is receiving current from the battery and from itself. A voltage regulator is wired into the current supply to the alternator to prevent it from receiving too much current which would cause it to put out too much current. Conversely, if the voltage regulator does not allow the alternator to receive enough current, the battery will not be fully charged and will eventually go dead.

The battery is connected to the alternator at all times, whether the ignition key is turned *ON* or not. If the battery were shorted to ground, the alternator would also be shorted. This would damage the alternator. To prevent this, a fuse link is installed in the wiring between the battery and the alternator. If the battery is shorted, the fuse link is melted, protecting the alternator.

## ALTERNATOR PRECAUTIONS

Some precautions should be taken when working on this, or any other, AC charging system.

- Never switch battery polarity.
- When installing a battery, always connect the grounded terminal first.
- Never disconnect the battery while the engine is running.
- If the molded connector is disengaged from the alternator, never ground the hot wire.
- Never run the alternator with the main output cable disconnected.
- Never electric weld around the truck without disconnecting the alternator.
- Never apply any voltage in excess of battery voltage while testing.
- Never jump a battery for starting purposes with more than 12 volts.

## CHARGING SYSTEM TROUBLESHOOTING

There are many possible ways in which the charging system can malfunction. Often the source of a problem is difficult to diagnose, requiring special equipment and a good deal of experience. This is usually not the case, however, where the charging system fails completely and causes the dash board warning light to come on or the battery to become dead. To troubleshoot a complete system failure only 2 pieces of equipment are needed: a test light, to determine that current is reaching a certain point; and a current indicator (ammeter), to determine the direction of the current flow and its measurement in amps.

This test works under 3 assumptions:

- The battery is known to be good and fully charged.
- The alternator belt is in good condition and adjusted to the proper tension.
- All connections in the system are clean and tight.

*In order for the current indicator to give a valid reading, the vehicle must be equipped with battery cables which are of the same gauge size and quality as original equipment battery cables.*

1. Turn off all electrical components on the vehicle. Make sure the doors of the vehicle are closed. If the vehicle is equipped with a clock, disconnect the clock by removing the lead wire from the rear of the clock. Disconnect the positive battery cable from the battery and connect the ground wire on a test light to the disconnected positive battery cable. Touch the probe end of the test light to the positive battery post. The test light should not light. If the test light does light, there is a short or open circuit on the vehicle.
2. Disconnect the voltage regulator wiring harness connector at the voltage regulator. Turn *ON* the ignition key. Connect the wire on a test light to a good ground (engine bolt). Touch the probe end of a test light to the ignition wire connector into the voltage regulator wiring connector. This wire corresponds to the *I* terminal on the regulator. If the test light goes on, the charging system warning light circuit is complete. If the test light does not come on and the warning light on the instrument panel is on, either the resistor wire, which is parallel with the warning light, or the wiring to the voltage regulator, is defective. If the test light does not come on and the warning light is not on, either the bulb is defective or the power supply wire from the battery through the ignition switch to the bulb has an open circuit. Connect the wiring harness to the regulator.
3. Examine the fuse link wire in the wiring harness from the starter relay to the alternator. If the insulation on the wire is cracked or split, the fuse link may be melted. Connect a test light to the fuse link by attaching the ground wire on the test light to an engine bolt and touching the probe end of the light to the bottom of the fuse link wire where it splices into the alternator output wire. If the bulb in the test light does not light, the fuse link is melted.
4. Start the engine and place a current indicator on the positive battery cable. Turn off all electrical accessories and make sure the doors are closed. If the charging system is working properly, the gauge will show a draw of less than 5 amps. If the system is not working properly, the gauge will show a draw of more than 5 amps. A charge moves the needle toward the battery, a draw moves the needle away from the battery. Turn the engine *OFF*.

- Disconnect the wiring harness from the voltage regulator at the regulator connector. Connect a male spade terminal (solderless connector) to each end of a jumper wire. Insert one end of the wire into the wiring harness connector which corresponds to the *A* terminal on the regulator. Insert the other end of the wire into the wiring harness connector which corresponds to the *F* terminal on the regulator. Position the connector with the jumper wire installed so that it cannot contact any metal surface under the hood. Position a current indicator gauge on the positive battery cable. Have an assistant start the engine. Observe the reading on the current indicator. Have your assistant slowly raise the speed of the engine to about 2000 rpm or until the current indicator needle stops moving, whichever comes first. Do not run the engine for more than a short period of time in this condition. If the wiring harness connector or jumper wire becomes excessively hot during this test, turn off the engine and check for a grounded wire in the regulator wiring harness. If the current indicator shows a charge of about 3 amps less than the output of the alternator, the alternator is working properly. If the previous tests showed a draw, the voltage regulator is defective. If the gauge does not show the proper charging rate, the alternator is defective.

## REMOVAL & INSTALLATION

### 2.2L Engines

#### CHRYSLER ALTERNATOR

See Figures 1, 2, 3, 4 and 5

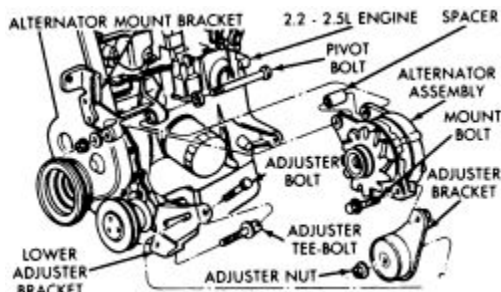


Fig. 1: Alternator mounting-2.2L and 2.5L engines

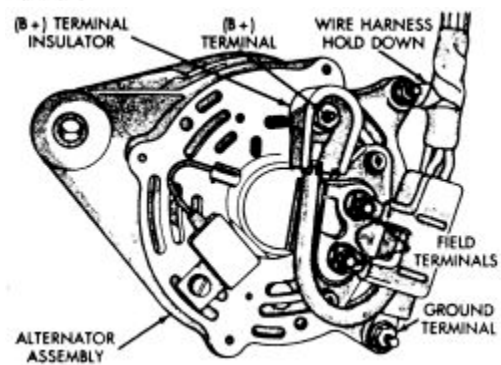


Fig. 2: Disconnecting alternator wiring-2.2L and 2.5L engines

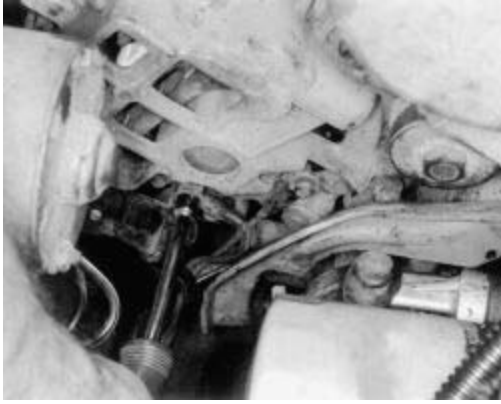


Fig. 3: Disconnecting alternator wiring

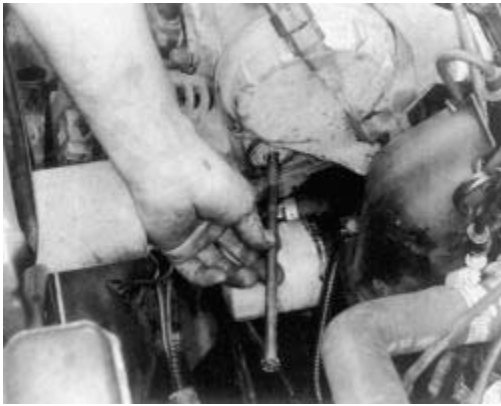


Fig. 4: Removing the pivot bolt and nut



Fig. 5: Removing the alternator from the vehicle

1. Disconnect the negative battery cable.
2. Label and disconnect the wiring (for easy installation).
3. Remove the air conditioning compressor drive belt, if equipped.
4. Loosen the alternator adjusting bracket bolt and adjusting bolt. Remove the alternator belt.
5. Remove the bracket and mounting bolts.
6. Remove the pivot bolt and nut.
7. Lift the alternator from the vehicle.

*When lifting the alternator out of the vehicle on some years with A/C, clearance may be restricted by the condenser cooling fan assembly or the A/C compressor and mounting bracket assembly, if so, removal of one of these items will be necessary.*

To install:

8. Position the alternator against the engine.
9. Install the pivot bolt and nut.
10. Install the mounting bracket bolts, and adjusting bolt.
11. Install drive belts and adjust to specification.
12. Tighten all the mounting bolts and nuts.
13. Connect all alternator terminals.
14. Connect the negative battery cable.

## BOSCH ALTERNATOR

1. Disconnect the negative battery cable.
2. Disconnect the wiring and label for easy installation.
3. Remove the air conditioning compressor drive belt.
4. Loosen the alternator adjusting bracket locknut and adjusting screw. Remove the alternator belt.
5. Remove the bracket locknut and mounting bolt.
6. Remove the pivot bolt and nut.
7. Remove the alternator from the engine.

To install:

8. Position the alternator against the engine.
9. Install pivot bolt and nut.
10. Set the mounting bracket in place and install the bracket mounting bolt and locknut.
11. Install the drive belts and adjust to specification.
12. Tighten all the mounting bolts and nuts.
13. Connect all alternator terminals.
14. Connect the negative battery cable.

## 2.5L Engines

See Figures 1 and 2

*2.5L engines were equipped with either Chrysler or Bosch alternators.*

1. Disconnect the negative battery cable.
2. Remove the drive belts.
3. Remove the adjusting bracket-to-engine mounting bolt.
4. Remove the adjusting locking bolt and nut, then remove the mounting bracket.
5. Position the alternator to gain access to the wiring.
6. Disconnect the wiring and label for easy installation.
7. Remove the pivot bolt, nut, and washers.
8. Remove the alternator assembly from the engine.

To install:

9. Position the alternator assembly against the engine.
10. Loosely install the pivot bolt, washers, and nut.
11. Attach all wiring connectors to the alternator.
12. Position the mounting bracket in place, then install engine mounting bolt.
13. Loosely install the adjusting locking bolt and nut.
14. Install the drive belts, and adjust to specification.
15. Tighten all mounting bolts and nuts.
16. Connect the negative battery cable.

## 2.6L Engines

*2.6L engines were equipped with Mitsubishi alternators.*

1. Disconnect the negative battery cable.
2. Disconnect the wiring and label for easy installation.
3. Remove the adjusting strap mounting bolt.
4. Remove the drive belts.
5. Remove the support mounting bolt and nut.
6. Remove the alternator assembly.

To install:

7. Position the alternator assembly against the engine, then install the support bolt.
8. Install the adjusting strap mounting bolt.
9. Install the alternator belts and adjust to specification.
10. Tighten all the support bolts and nuts.
11. Connect all of the wiring terminals to the alternator.
12. Connect the negative battery cable.

## 3.0L Engines

See Figures 6 and 7

*The 3.0L engines were equipped with either the Nippondenso or Bosch alternators.*

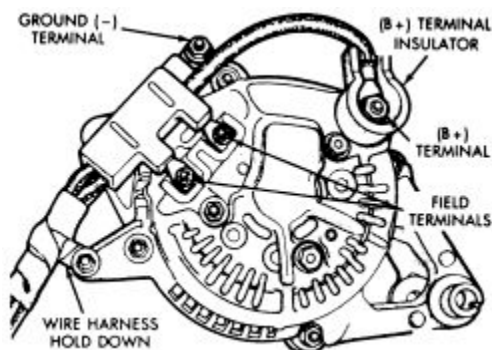


Fig. 6: Disconnecting the alternator wiring-3.0L engines

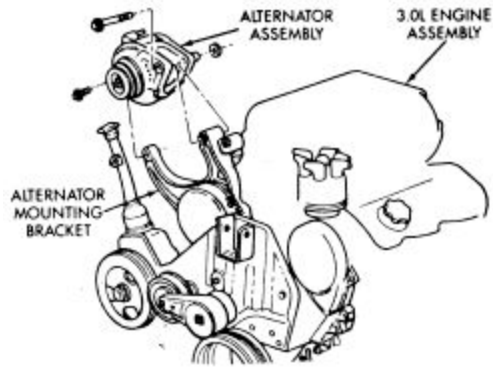


Fig. 7: Alternator mounting-3.0L engines

1. Disconnect the negative battery cable.
2. Install a  $\frac{1}{2}$  in. breaker bar in the tensioner slot. Rotate counterclockwise to release belt tension and remove poly-V belt.
3. Remove the alternator mounting bolts (2).
4. Remove the wiring and remove alternator.

To install:

5. Position the alternator onto the engine, then install the wiring.
6. Set the alternator against the mounting bracket and install the mounting bolts.
7. Rotate the tensioner counterclockwise and install poly-V belt.
8. Connect the negative battery cable.

### 3.3L and 3.8L Engines

*The 3.3L and 3.8L engines were equipped with the Nippondenso alternators.*

1. Disconnect the negative battery cable.
2. Remove the alternator drive belt, by relieving the tension on the dynamic tensioner.
3. Loosen the nut on the support bracket at the exhaust manifold, do not remove it.
4. Remove the alternator tensioner/power steering bracket bolt.
5. Remove the tensioner stud nut and remove the tensioner.
6. Remove the alternator mounting bolts.
7. Remove the power steering reservoir from the mounting bracket, do not disconnect the hoses, and position it out of the way.
8. Remove the alternator support bracket bolts. Remove the intake plenum to alternator bracket bolt and remove the alternator support bracket from the engine.
9. Remove the alternator from the engine and disconnect the electrical leads.

To install:

10. Install the alternator in position on the engine and connect the electrical leads.
11. Install the alternator support bracket, tighten the retaining bolts to 40 ft. lbs. (54 Nm).
12. Install the power steering reservoir on the mounting bracket.
13. Install the alternator mounting bolts, tighten the bolts to 40 ft. lbs. (54 Nm).

14. Install the tensioner and tensioner mounting stud. Install the retaining nut on the exhaust manifold.
15. Install the alternator belt, insert a  $\frac{1}{2}$  in. extension into the square hole in the tensioner and turn the tensioner. Tighten the tensioner bolt.
16. Connect the negative battery cable.