

1992 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

Several precautions must be observed when performing work on alternator equipment.

- If the battery is removed for any reason, make sure that it is reconnected with the correct polarity. Reversing the battery connections may result in damage to the one-way rectifiers.
- Never operate the alternator with the main circuit broken. Make sure that the battery, alternator, and regulator leads are not disconnected while the engine is running.
- Never attempt to polarize an alternator.
- When charging a battery that is installed in the vehicle, disconnect the negative battery cable.
- When utilizing a booster battery as a starting aid, always connect it in parallel; negative to negative, and positive to positive.
- When arc (electric) welding is to be performed on any part of the vehicle, disconnect the negative battery cable and alternator leads.
- Never unplug the ECM while the engine is running or with the ignition in the **ON** position. Severe and expensive damage may result within the solid state equipment.

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NOTE: On some models, it will be necessary to remove the air pump and position it to one side to gain access to the alternator.

[Except 850/C70/S70/V70](#)

1. Disconnect the negative battery cable.
2. Loosen the alternator adjusting bolts (if equipped).
3. Remove the drive belt from the alternator pulley.
4. Disconnect the electrical leads to the alternator.
5. Remove the alternator adjusting bolts (if equipped) and mounting bolts.
6. Remove the alternator from the vehicle.

To install:

7. Install the alternator into the bracket.
8. Install the mounting bolts and the adjusting bolts (if equipped).
9. Tighten the mounting bolts only and, if equipped, leave the adjusting bolts loose.
10. Connect the electrical leads to the alternator.
11. Install the drive belt around the alternator pulley.
12. Adjust the tension on the belt (non-serpentine) as outlined in Section 1 and tighten the adjusting bolts (if equipped).
13. Connect the negative battery cable.
14. Verify the operation of the alternator.

[850/C70/S70/V70](#)

1. Disconnect the negative battery cable.
2. Remove the drive belt from the engine.
3. Remove the power steering pump and tensioner bracket mounting bolts, then lift the assembly up and rest it on top of the engine.
4. Disconnect the electrical leads to the alternator.
5. Remove the alternator mounting bolts.
6. Remove the alternator from the vehicle.

To install:

7. Install the alternator onto the engine and tighten the mounting bolts.
8. Connect the electrical leads to the alternator.
9. Install the power steering pump and tensioner bracket and tighten the mounting bolts.
10. Install the drive belt.
11. Connect the negative battery cable.
12. Verify the operation of the alternator.

Fig. 1: Release the tensioner . . .



Fig. 2: . . . and remove the drive belt

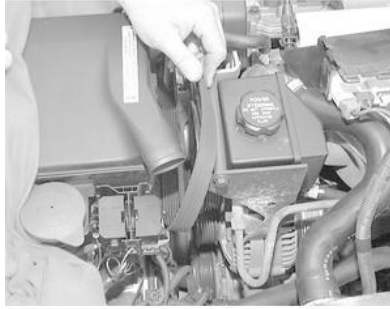


Fig. 3: Remove the mounting bolts from the bracket . . .



Fig. 4: . . . and note their location for installation (they are different lengths)



Fig. 5: After the bolts are removed, lift the bracket and place the alternator on top of the engine

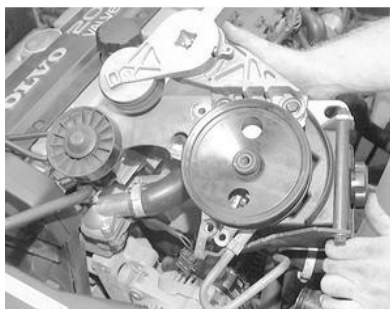


Fig. 6: Detach the electrical connectors from the back of the alternator



Fig. 7: Remove the cover from the battery cable connection on the rear of the alternator . . .



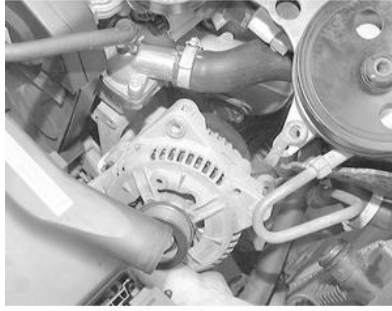
Fig. 8: . . . then unfasten and remove the cable from the alternator



Fig. 9: Unfasten the alternator mounting bolts . . .



Fig. 10: . . . and remove the alternator



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Voltage Test

1. Make sure the engine is **OFF**, and turn the headlights on for 15–20 seconds to remove any surface charge from the battery.
2. Using a DVOM set to volts DC, probe across the battery terminals.
3. Measure the battery voltage.
4. Write down the voltage reading and proceed to the next test.

No-Load Test

1. Connect a tachometer to the engine.

CAUTION

Ensure that the transmission is in

Park and the emergency brake is set. Blocking a wheel is optional and an added safety measure.

2. Turn off all electrical loads (radio, blower motor, wipers, etc.)
3. Start the engine and increase engine speed to approximately 1500 rpm.
4. Measure the voltage reading at the battery with the engine holding a steady 1500 rpm. Voltage should have raised at least 0.5 volts, but no more than 2.5 volts.
5. If the voltage does not go up more than 0.5 volts, the alternator is not charging. If the voltage goes up more than 2.5 volts, the alternator is overcharging.

NOTE: Usually under and overcharging is caused by a defective alternator, or its related parts (regulator), and replacement will fix the problem; however, faulty wiring and other problems can cause the charging system to malfunction. Further testing, which is not covered by this book, will reveal the exact component failure. Many automotive parts stores have alternator bench testers available for use by customers. An alternator bench test is the most definitive way to determine the condition of your alternator.

6. If the voltage is within specifications, proceed to the next test.

Load Test

1. With the engine running, turn on the blower motor and the high beams (or other electrical accessories to place a load on the charging system).
2. Increase and hold engine speed to 2000 rpm.
3. Measure the voltage reading at the battery.
4. The voltage should increase at least 0.5 volts from the voltage test. If the voltage does not meet specifications, the charging system is malfunctioning.

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NOTE: To avoid confusion, remove and tag the spark plug wires one at a time, for replacement.

If a distributor is not keyed for installation with only one orientation, it could have been removed previously and rewired. The resultant wiring would hold the correct firing order, but could change the relative placement of the plug towers in relation to the engine. For this reason, it is imperative that you label all wires before disconnecting any of them. Also, before removal, compare the current wiring with the accompanying illustrations. If the current wiring does not match, make notes in your book to reflect how your engine is wired.

Fig. 1: 2.3L 4-Cylinder Engines Firing Order: 1-3-4-2
Distributor Rotation: Clockwise

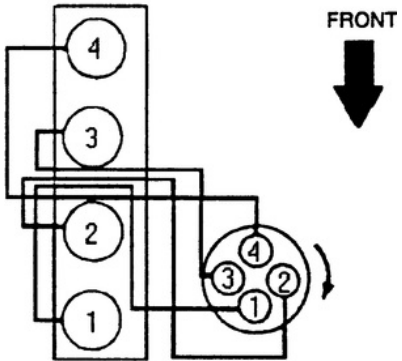


Fig. 2: 2.8L 6-Cylinder Engine Firing Order: 1-6-3-5-2-4
Distributor Rotation: Clockwise

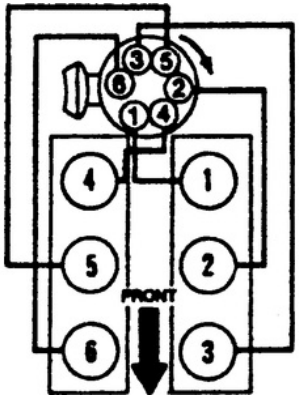


Fig. 3: 2.9L 6-Cylinder Engines Firing Order: 1-5-3-6-2-4
Distributorless Ignition

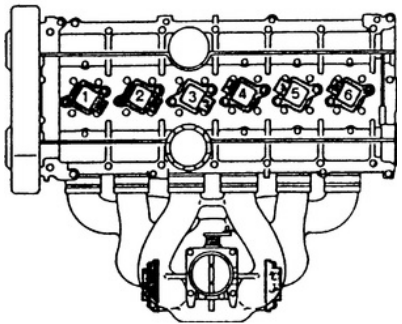
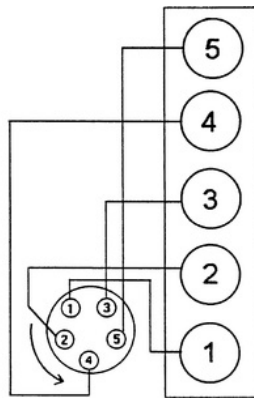


Fig. 4: 2.3L and 2.4L 5-Cylinder Engines Firing Order: 1-2-4-5-3
Distributor Rotation: Counterclockwise



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The starting system includes the battery, starter motor, solenoid, ignition switch, circuit protection and wiring connecting the components. An inhibitor switch is included in the starting system to prevent the vehicle from being started with the vehicle in gear.

When the ignition key is turned to the **START** position, current flows and energizes the starter's solenoid coil. The solenoid plunger and clutch shift lever are activated and the clutch pinion engages the ring gear on the flywheel. The switch contacts close and the starter cranks the engine until it starts.

To prevent damage caused by excessive starter armature rotation when the engine starts, the starter incorporates an over-running clutch in the pinion gear.

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The automobile charging system provides electrical power for operation of the vehicle's ignition and starting systems and all the electrical accessories. The battery services as an electrical surge or storage tank, storing (in chemical form) the energy originally produced by the engine driven generator. The system also provides a means of regulating generator output to protect the battery from being overcharged and to avoid excessive voltage to the accessories.

The storage battery is a chemical device incorporating parallel lead plates in a tank containing a sulfuric acid/water solution. Adjacent plates are slightly dissimilar, and the chemical reaction of the 2 dissimilar plates produces electrical energy when the battery is connected to a load such as the starter motor. The chemical reaction is reversible, so that when the generator is producing a voltage (electrical pressure) greater than that produced by the battery, electricity is forced into the battery, and the battery is returned to its fully charged state.

The vehicle's alternator is driven mechanically, by a belt(s) that is driven by the engine crankshaft. In an alternator, the field rotates while all the current produced passes only through the stator winding. The brushes bear against continuous slip rings rather than a commutator. This causes the current produced to periodically reverse the direction of its flow. Diodes (electrical one-way switches) block the flow of current from traveling in the wrong direction. A series of diodes is wired together to permit the alternating flow of the stator to be converted to a pulsating, but unidirectional flow at the alternator output. The alternator's field is wired in series with the voltage regulator.

The regulator consists of several circuits. Each circuit has a core, or magnetic coil of wire, which operates a switch. Each switch is connected to ground through one or more resistors. The coil of wire responds directly to system voltage. When the voltage reaches the required level, the magnetic field created by the winding of wire closes the switch and inserts a resistance into the generator field circuit, thus reducing the output. The contacts of the switch cycle open and close many times each second to precisely control voltage.

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NOTE: The following procedure applies only to externally mounted regulators; on vehicles whose alternators have integral regulators, the alternator must be removed for service or replacement.

1. Disconnect the negative battery cable.
 2. Disconnect the harness from the regulator.
 3. Remove the regulator retaining screws.
 4. Remove the regulator from the vehicle.
- To install:**
5. Install the regulator into place and tighten the retaining screws.
 6. Connect the harness to the regulator.
 7. Connect the negative battery cable.

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1. Disconnect the negative battery cable at the battery.
2. Disconnect the leads from the starter motor.
3. Remove the starter motor retaining bolts.
4. Remove the starter motor from the vehicle.

To install:

5. Position the starter motor to the flywheel housing.
6. Apply locking compound to the bolt threads and install the retaining bolts finger-tight.
7. Tighten the bolts to approximately 25 ft. lbs. (34 Nm).
8. Connect the starter motor leads and the negative battery cable.

Fig. 1: Unfasten the nut retaining the starter cables . . .



Fig. 2: . . . and remove the starter cables



Fig. 3: Unfasten the starter retaining bolts . . .



Fig. 4: . . . and remove the starter from the engine



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The easiest way to test the performance of the starter is to perform a voltage drop test.

NOTE: The battery must be in good condition and fully charged prior to performing this test.

1. Connect a voltmeter between the positive and negative terminals of the battery.
2. Turn the ignition key to the **START** position and note the voltage drop on the meter.
3. If voltage drops below 11.5 volts, there is high resistance in the starting system.
4. Check for proper connections at the battery and starter.
5. Check the resistance of the battery cables and replace as necessary.
6. If all other components in the system are functional, the starter may be faulty.

NOTE: Many automotive parts stores have starter bench testers available for use by customers. A starter bench test is the most definitive way to determine the condition of your starter.