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Volvo Gear-reduction Starter
VN, VHD

Starter Motor

Gear-reduction

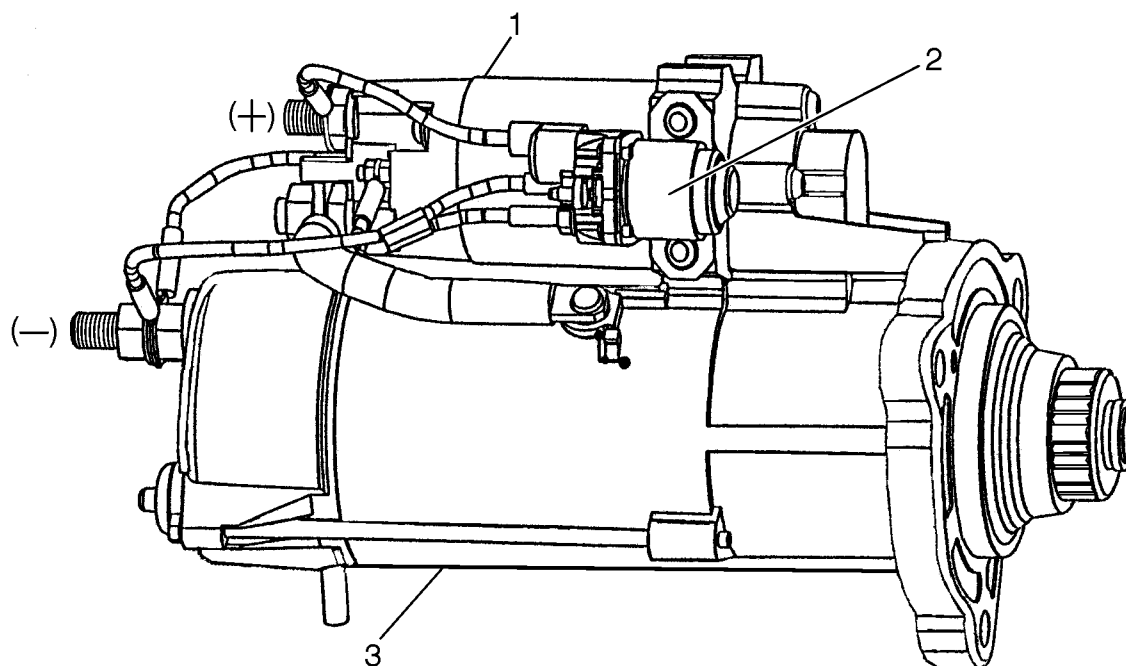
The following information covers the design and function, troubleshooting, schematic and service procedures for the Volvo Gear-reduction Starter.

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Starter Motor

Volvo Gear-reduction Starter



- 1 Solenoid
- 2 Heavy Duty Relay
- 3 Starter

In December 2001, Volvo began installing a gear-reduction starter on Volvo D12 engines on a limited basis, which will be future standard equipment. The new starter design is manufactured by Mitsubishi Electrical Company and is sometimes referred to as the Melco starter. The principal benefits of the new design include:

- Improved reliability
- Reduced size and weight
- 1/3 Lower amperage draw

Note: The Volvo Gear-reduction Starter can only be replaced with another Volvo Gear-reduction Starter.

Note: The Volvo Gear-reduction Starter has the battery cables and main engine harness routed and clipped outboard of the solenoid and heavy duty relay. The Delco 42MT starter has the main engine harness routed inboard of the solenoid. The (+) battery cable(s) is routed outboard of the solenoid and the (-) battery cables are routed outboard of the solenoid or below the starter. Therefore, the Volvo Gear-reduction Starter is not completely interchangeable with the Delco 42MT starter that was standard on earlier model Volvo D12 engines.

Note: Due to pinion differences, neither the Volvo Gear-reduction Starter nor the Delco 42MT starter used on earlier Volvo D12 engines are interchangeable with starters of other engine manufacturers.

The diagram illustrates the electrical system for a vehicle, showing the battery, ignition switch, horn, and various relays and fuses. The components are labeled as follows:

- Battery:** A 12V battery with terminals labeled 1 (positive) and 2 (negative).
- Ignition Switch:** A switch with terminals labeled 3 (NO), 4 (COM), and 5 (NC).
- Horn:** A horn with terminals labeled 6 (NO) and 7 (COM).
- Relays:** Two relays are shown, one labeled 5 and one labeled 6. Relay 5 has terminals labeled 1 (NO), 2 (COM), and 3 (NC). Relay 6 has terminals labeled 1 (NO), 2 (COM), and 3 (NC).
- Fuses:** A fuse is shown with terminals labeled 1 and 2.
- Wiring:** The wiring connects the battery to the ignition switch, horn, and relays. The positive terminal of the battery is connected to terminal 1 of the ignition switch. The negative terminal of the battery is connected to terminal 2 of the ignition switch. The ignition switch is connected to the horn and the relays. The relays are connected to the horn and the battery.

- 1 Batteries
- 2 Ground
- 3 Starter Relay
- 4 Starter Solenoid
- 5 Cowl Mounted Relay
- 6 Key (Ignition) Switch "Start" Signal
- 7 Optional Fourth Battery

Troubleshooting

Starter Motor Troubleshooting

Volvo Gear-reduction Starter

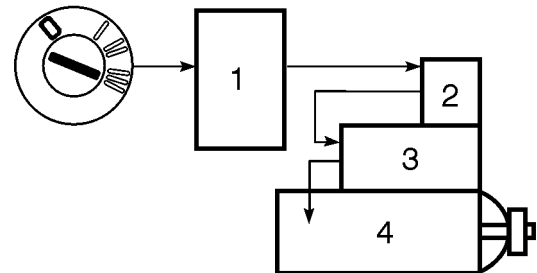
The troubleshooting procedures for the Volvo Gear-reduction Starter are the same as the procedures for the previous starting system. For further information, refer to service information in Group 3.

Please note the following points during troubleshooting procedures:

- The Volvo Gear-reduction starter is equipped with a starter-mounted relay in addition to the cowl-mounted starter relay. When performing troubleshooting, the 'Switch' terminal on the starter-mounted relay receives the start signal from the cowl-mounted starter relay. If working properly, the starter-mounted relay will then deliver the start signal to the 'SW' terminal in the starter solenoid.

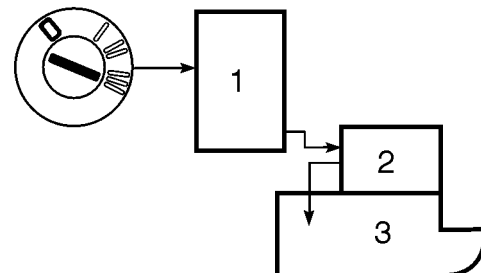
Note: With Delco 42MT starters, the start signal is delivered directly to the "SW" terminal on the starter solenoid.

- The starter-mounted relay is not a serviceable part at this time. It must be replaced with a new starter.
- The Volvo Gear-reduction Starter is not equipped with an internal overcrank protection feature. To prevent starter overheating, do not crank the engine for more than 30 continuous seconds. If the starter is operated for more than 30 continuous seconds, wait 10 minutes before attempting to start the vehicle again.



Volvo Gear-reduction Starter

- 1 Cowl Mounted Relay
- 2 Starter Relay
- 3 Starter Solenoid
- 4 Starter



Delco Starter

- 1 Cowl Mounted Relay
- 2 Starter Solenoid
- 3 Starter

3311-03-02-01 Starter Motor, Replacement

Volvo Gear-reduction Starter



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



WARNING

Always wear eye protection when working around batteries to prevent the risk of injury due to contact with sulfuric acid or an explosion (If contacted with sulfuric acid, flush immediately with water and get medical attention).



WARNING

Batteries may contain explosive gases. To help minimize the risks of explosion, personal injury and burns, avoid sparks or open flames near batteries. Do not smoke when servicing batteries.



CAUTION

If there are other ground cables connected to the battery (such as engine ECUs, satellite system, etc.), disconnect those grounds first, then remove the main battery ground cable. Electronic modules may be damaged when additional grounds are connected/disconnected without the main battery ground connected. Disconnect the main battery ground last.



CAUTION

Possible damage to electronic components. Turn the vehicle ignition switch OFF before disconnecting or connecting any electronic components. Failure to de-energize circuits may result in permanent damage to electronic components.

Note: The Volvo Gear-reduction Starter can only be replaced with another Volvo Gear-reduction Starter.

Note: In some installations, replacing of the starter may be aided by removing of additional components or wiring not referenced in this information, or affected by alternate battery cable routing due to alternate battery mounting locations.

Removal

1

Turn the ignition key to the "OFF" position and remove the key.

2

Disconnect ground wiring from the electrical equipment connected directly to the batteries, such as the ECUs, satellite systems, etc.

3

Disconnect the main battery ground cable(s).

4

Remove the splash shield.

5

Remove the inner fender assembly.

6

Loosen or remove the battery cable mounting support brackets, if needed to allow enough slack for removal of the battery cable terminals at the starter.

7

Remove the positive and negative cables/wiring and "switch" terminal wire from the starter relay. Note the cable/wiring position for installation.

8

Remove the engine ground terminal connector.

9

Disconnect the engine wiring harness connector. Remove the engine wiring harness support clamp and pull the harness away from the starter area.

10

Remove the starter mounting bolts and remove the starter from the vehicle.

Installation

11

Install the replacement starter and torque-tighten to 85 ± 15 Nm (63 ± 11 ft-lb).

85 ± 15 Nm
(63 ± 11 ft-lb)

12

Position the engine wiring harness and engage the connector. Install the engine wiring harness support clamp.

13

Install the engine ground cables and secure and torque-tighten the bolts to 48 ± 8 Nm (35 ± 6 ft-lb).

48 ± 8 Nm
(35 ± 6 ft-lb)

14

Install all starter wiring and cables. Torque-tighten the battery cable terminals to 25 - 30 Nm (18 - 22 ft-lb). Torque-tighten the switch terminal to 2.5 Nm (22 in-lb).

25 - 30 Nm
(18 - 22 ft-lb)
2.5 Nm.
(22 in-lb)

15

Attach the battery cables in the mounting support brackets.

16

Install the inner fender assembly.

17

Install the splash shield.

18

Install the main ground cable(s).

19

Install ground wiring from the electrical equipment connected directly to the batteries.

20

Torque-tighten the battery terminal nut(s) to 19 ± 1 Nm (14 ± 1 ft-lb).

19 ± 1 Nm
(14 ± 1 ft-lb)