Overdrive

Repairs and Maintenance

VOLVO
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Specifications

Reduction ratio ........................................ 0.8:1
Solenoid current draw, approx. ....................... 2 Amps at 12 Volts

Lubricant
M41 – Type ............................................. Gear oil
    Quality ............................................. API GL-1
    Viscosity ........................................... SAE 80W/90 alt. SAE 80/90
    Capacity (transm. included) ..................... 1.6 liters 1.7 US qts

M46 – Type ............................................. ATF Type F or G
    Capacity (transm. included) ..................... 2.3 liters 2.4 US qts

The oil level should be up to the filler plug hole. Transmission and overdrive are lubricated by the same oil. When oil is drained from transmission, also remove cover on overdrive and clean strainer.

Tightening torques
See specific operations

Applications

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<td>115648</td>
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Group 43
2 Transmission
## Specifications

### Oil pressures:

**Direct drive engaged** (all engine applications) ........................................... 0.15 MPa (21 psi)

### Overdrive engaged:

<table>
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<th>Engine application</th>
<th>Production date notes</th>
<th>MPa (psi)</th>
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<tr>
<td>6-cyl</td>
<td>B28: — October, 1980</td>
<td>3.2-3.6 (455-510)</td>
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<td>Turbo</td>
<td>June, 1981 —</td>
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Special tools

1797 Drift
removing rear bearing

1801 Standard handle

1845 Press tool
installing drive flange

2261 Puller
pulling drive flange

2412 Drift
installing bearing and seal

2715 Drift
installing clutch bearing

2806 Drift
installing clutch bearing

2834 Pressure gauge
checking oil pressure

5172 Crow-foot wrench
replacing solenoid valve

5183 Extractor
for relief valve

5210 Ring
assembling/disassembling
one-way clutch

2835 Centering tool
for centering splines in planetary
gear cage and one-way clutch

2836 Wrench
for plugs

2851 Drift
removing clutch sliding member

5069 Extractor
for oil seal

5082 Sleeve

5103 Drift
removing clutch bearing

5149 Wrench
torquing drive flange nut

---

Group 43
Transmission
Group 43
Transmission
Problems and remedies

Engaging problems
A new overdrive which has not been used for some time might be difficult to engage. The reason is mainly lack of "exercise" which causes the parts to stick. Some reasons:

1. Low oil level
2. Solenoid sticking or open electrical circuit.
3. Clutch sliding member sticks to the shaft.

1. Check that the oil level is up to the plug level. Low oil level can cause many problems.
2. Check solenoid operation. Switch on the ignition, engage 4th gear and switch on the overdrive. There should be a clicking sound from the overdrive solenoid.
   No clicking sound:
   Do NOT start to replace the solenoid.
   Check voltage to the overdrive connections, then to relay etc.
   Use jumper wires directly to the overdrive to check operation.
3. If the clutch sliding member sticks to the shaft:
   Drive at approx. 50 mph (80 km/h). Overdrive switched ON.
   Disengage the clutch, increase engine rpm to approx. 5000, and quickly engage the clutch again. In most cases this should free the clutch sliding member.
   Some "exercise" is recommended for new cars with sticking clutch sliding member. Drive at 50-55 mph (80-90 km/h). Coast and engage/disengage the overdrive at least 25 times. This will polish the bearing surfaces.

Operation malfunction
Overdrive does NOT engage, indicator light does NOT illuminate.
Check:
- Fuses
- Wiring
- Overdrive switch

Solenoid does NOT engage (click), indicator light illuminates.
Check:
- Switch on transmission
- Solenoid ground wire
- Solenoid

Engaging sound when re-starting.
Up to early 1978 Models.
Sometimes a sound could be heard from the overdrive when re-starting after driving with the overdrive engaged.
The reason is quite normal and does not cause any damage or abnormal wear. During normal driving the overdrive takes up the engine torque and assumes a certain position. It then causes a noise when it returns to the locked position.
It is not necessary to replace any parts or the overdrive assembly.
The design was changed during the 1978 Model production run to eliminate the sound.

Wiring harness
An improved wiring harness for the overdrive was introduced during the 1978 Model production run. VIN-s:

- 242 131 000 264 53 000
- 244 317 000 265 13 000
- 245 182 000

The new wiring harness is longer, softer and better insulated.
Modification of old type wiring harness

1. Remove the rubber bellow for the gear lever.
2. Cut the wires approx. 40 mm (1.5 inch) from the gear lever.
3. Splice two 14 gauge wires, approx. 250 mm (10") long.
4. Push on two 50 mm (2") pieces of insulation tubing.
5. Use tape to tie the wires to the gear lever, as shown.
6. Attach two spade connectors to the wire ends.
7. Loop the wires to permit maximum flexibility. Attach to the connector. It must be in the front left corner.
8. Reinstall the rubber bellow.
Checking oil pressure

The oil pressure can be checked when driving on test rollers or highway. Tests on jack or stands should be avoided for safety reasons.

1. Remove the plug under the control valve. Connect pressure gauge 2834.

2. Drive in 4th gear, overdrive NOT engaged, speed 45 mph = 70 km/h. Pressure should be 0.15 MPa = 21 psi.

3. Same conditions, but overdrive ON. Pressures should be as indicated in "Specifications" section.

4. Disengage overdrive. Check time for pressure to drop to 0.15 MPa = 21 psi. Time should not exceed 3 seconds.

Testing solenoid

1. Electrically
   Check for current at the yellow wire on the solenoid. Ignition must be on and 4th gear plus overdrive engaged.

2. Mechanical
   Remove the solenoid. Ensure that oil-ways are not blocked.
   Cover the holes between the O-rings and blow through the short end. The valve must be tight, no air may pass.
   Connect a 12V supply to solenoid.
   Blow again without covering the holes. The valve must be tight and no air may pass.

3. Running test
   If the overdrive operates properly when the gearbox is cold but not when warm, connect the solenoid to a power supply and leave until it heats up. Then check in manner previously described.

Replacing solenoid

Solenoid valve and control valve are integral and replaced as an assembly. Use 25 mm = 1" crow-foot wrench (Volvo tool 5172) for removing and installing.

1. Disconnect wires at connectors. Attach crow-foot wrench. Use extension and wrench as appropriate. Remove solenoid.
On-vehicle repairs


--- Checking/replacing relief valve ---

1. Have an oil collecting pan ready. Remove oil pan and strainer.

2. Use tool 2836 to remove the plug under the relief valve.

3. Remove the relief valve assembly.
   1 – Early production (-75)
   2 – Mid-production (76-5/83)
   3 – Late production (5/83–)
   Note shim (at arrow) for pressure adjustment.
4. Use tool 5183 to pull cylinder and seat.
   - Screw out the center screw A until the slotted part B can be inserted in the seat.
   - Screw in the center screw until tight.
   - Screw in nut C until seat and cylinder come loose.

5. Clean all parts in solvent. Blow clean and dry with compressed air.
   Carefully check for wear and damage.
   Make sure the pistons run easily in the cylinders.
   Replace defective parts.

6. Use compressed air to blow clean the control orifice prior to installation.

7. Install new O-rings on seat, cylinder and plug.
   Lubricate with oil.

8. Position the seat in the housing. Use the cylinder to press it into correct position.
   **NOTE:**
   The cylinder O-ring end should be DOWN.

9. Fit the small piston and springs in the large piston.
   Insert the assembly in the cylinder.
   Make sure the small piston fits correctly in the seat.

10. Install the plug. Torque to $19-24\text{ Nm} = 14-18\text{ ft.lbs.}$

11. Make sure the magnet is cleaned. Use a new gasket and install strainer and oil pan.
    Fill oil to plug level.
    **NOTE:**
    Make sure the relief valve cylinder is correctly assembled (see arrow).
Cleaning control orifice

Remove the solenoid.

Remove the relief valve cylinder to gain access to the control orifice.

Use compressed air to blow clean.

Checking/replacing check valve

1. Remove oil pan and strainer.
2. Use wrench 2836 to remove the center plug. Remove spring, ball and seat.
3. Clean all parts in solvent. Blow dry with compressed air. Check all parts for wear and damage. Replace as necessary.
5. Use a new gasket and install strainer and oil pan. Do not forget the magnet in the oil pan. Fill with oil (see Specifications in front of manual).

Cleaning oil filter

1. Remove oil pan and strainer.
2. Use wrench 2856 to remove the plug. Remove seal and oil filter. Discard seal.
3. Clean all parts in solvent. Blow clean and dry with compressed air.
4. Install oil filter, new seal and plug. Torque to 19–24 Nm = 14–18 ft.lbs.
5. Use a new gasket and install strainer and oil pan. Do not forget the magnet. Fill with oil (see Specifications in front of manual).
Replacing oil seal at output shaft

1. Disconnect the drive shaft at the overdrive flange.
2. Remove the nut. Use puller 2261 to pull the drive flange.
3. Use extractor 5069 to remove the oil seal.
4. Use drift 2412 to install the new seal.
5. Use press tool 1845 to install the drive flange.
7. Reconnect the drive shaft.
On-vehicle repairs

Replacing one-way clutch

1. Jack up rear end.
2. Unload the overdrive:
   - Start engine and engage overdrive.
   - Depress the clutch pedal and switch off the engine.
3. Disconnect the drive shaft at the overdrive flange.
4. Disconnect the speedometer cable at the overdrive.
5. Disconnect the solenoid ground wire.
6. Have an oil collecting pan ready. Remove the nuts retaining the overdrive housings. Remove the spring washers and the seals at the two upper studs.
7. Remove overdrive rear housing. Clamp it in a vise with soft jaws.
8. Remove snap ring and oil slinger.
Use ring 5210 to facilitate disassembly and assembly of one-way clutch.


Alternate method, if no ring tool is available:
Carefully remove one-way clutch. The rollers are loose.

10. Rotate the one-way clutch in the ring tool so that the rollers come out, one by one.

Freewheel components.
10. Disassemble and clean the one-way clutch.

11. Always use the new type hub, with high cams (see illustration) when reassembling.

12. Check the roller cage for damages and wear. Replace as necessary.

14. To assemble, install the spring in the holes in the cage.

15. Install the new type cam hub correct way, see illustration.

16. Install cage and hub assembly in ring tool.
17. Turn the cage assembly while installing the rollers.

NOTE: Position opening of the ring tool toward space between rollers as shown.

18. Make sure the thrust washer is properly located. If necessary, use grease to hold it in place.

NOTE: Thrust washer and output shaft must be mating parts.
On-vehicle repairs

19. Position ring tool and one-way clutch assembly. Turn one-way clutch hub clockwise while pressing one-way clutch into position.

Alternate method:
Assemble the one-way clutch.
1 - hub
2 - roller cage
3 - spring
Rotate the roller cage clockwise to end. Use the key (4) to lock it in position. Install the rollers. Hold them in position with a rubber band (5).

Alternate method, cont.
Make sure the thrust washer is properly located. Install the one-way clutch. Remove the rubber band.

NOTE: Thrust washer and output shaft must be mating parts.
20. Install oil slinger and snap ring.

21. Clean the mating surfaces of the housings. Install new gasket.

22. Make sure the gasket in front of the brake has not been damaged when removing the clutch.

23. Install overdrive rear housing.

24. Install the seals on the two upper studs. Install spring washers and nuts. Torque to: 7–16 Nm = 5–12 ft.lbs.

25. Reconnect the solenoid ground wire.

26. Reconnect the speedometer cable at the overdrive. 4–6 Nm = 3–4 ft.lbs.

27. Reconnect the drive shaft at the overdrive flange.

28. Fill with correct oil (see Specifications in front of manual). Start the engine and engage the overdrive when driving. Recheck oil level after driving.
Removing overdrive from vehicle

It is important to avoid torsional stresses in the shaft between the planetary gear carrier and the one-way clutch.

Prior to removing the overdrive, it is advisable to drive the vehicle with the overdrive engaged and then disengage with the clutch depressed.

If this is forgotten, or not possible, the torsional stresses can be removed by engaging/disengaging the overdrive in vehicle. This can be accomplished by connecting an oil line under 2.0-2.5 MPa = 280-350 psi pressure to the connection for the pressure gauge. With this pressure connected, the overdrive can be engaged/disengaged by switching on ignition and the overdrive switch.

1. Disconnect the drive shaft from the overdrive flange.
2. Position a support under the engine.
3. Remove the cross member under the transmission.
4. Lower the engine rear end.
5. Disconnect the wires at the solenoid.
6. Remove the nuts retaining the overdrive to the transmission.
7. Pull the overdrive straight backward until released from the transmission output shaft.
Disassembling overdrive

Clamp the overdrive in a vise with soft jaws. Remove the solenoid ground wire.

Remove the solenoid ground wire.

Remove the bridges.

Remove the nuts holding front and rear housings together.

NOTE: Loosen crosswise to avoid tension.

Remove front housing and brake drum. Remove the springs. Lift out the clutch with thrust bearing and sun gear.
Disassembling overdrive

Remove the planetary gear carrier.

Front housing

Remove pump link and pump piston.

Use a copper drift to tap loose the brake drum.

Position the front housing with the front end DOWN.
Connect compressed air to the hole for the solenoid valve. Blow out the pistons.
Disassembling overdrive

Clamp the front housing in a vise with soft jaws. Remove the oil pan.

Remove the strainer. Use wrench 2836 to remove the three plugs.

Remove in order:
1. Oil filter.
2. Check valve with spring, ball and seat. Remove pump cylinder.
3. Remove relief valve.
   a. Early production (−75).
   b. Mid-production (76–5/83)
   c. Late production (5/83–)

Note shim (at arrow) for pressure adjustment.

Use extractor 5183 to pull cylinder and seat.
- Screw out the center screw A until the slotted part B can be inserted in the seat.
- Screw in the center screw until tight.
- Screw in nut C until seat and cylinder come loose.

Group 43
Transmission
Disassembling overdrive

**Clutch sliding member assembly**

Remove the snap ring. Pull out the sun gear.

Remove the snap ring. Use drift 2851 and a plastic mallet to tap out the clutch disc.

Remove the large snap ring. Use drift 5103 and a plastic mallet to tap out the bearing.

**Planetary gear assembly**

Use a screwdriver to pry loose the oil slinger.
Use a screwdriver to pry loose the lock pins. 
**NOTE:**
The pins may have to be drilled out.

Remove the gear shafts. Remove planetary gears and thrust washers.
Remove needle bearings and spacers from the planetary gears.

### Rear housing

Remove snap ring, oil slinger, one-way clutch assembly and thrust washer.

**NOTE:**
Also see page 15 for procedures using ring tool 5210 when removing one-way clutch assembly.

Remove the speedometer gear assembly.
Disassembling overdrive

Attach wrench 5149 and remove the drive flange nut.

Use puller 2261 to pull the drive flange.

Press out the output shaft.

Remove spacer sleeve (1) and speedometer drive gear (2).

Group 43
Transmission
Disassembling overdrive

Pull off the bearing on the output shaft.

Use drift 1797 and standard handle 1801 when pressing out the bearing in the rear housing.
Use sleeve 5082 to support the housing.

Cleaning and checking

Clean all parts with solvent and blow them dry with compressed air. Pay particular attention to filters and oil passages.
Make sure the orifice in the channel between the relief and control valve is open. If compressed air is not enough, use a pointed wooden stick. Hard objects must not be used, since this can alter the bore of the channel.
Make sure the groove inside the ring gear on the output shaft is properly cleaned. Dirt easily collects there due to the centrifugal force.
After cleaning, check all parts carefully for wear, cracks or other damages.
Use a 12-volt battery to check the solenoid. The current draw should be 1.5–2.0 Volts. Check valve movement when engaging/disengaging.

Make sure filter and strainer are not damaged.
Check the hydraulic system pistons for wear and abrasion.
Check the valves for wear. Make sure the springs are not damaged.
Check all gears and ball bearings for wear.
If a planetary gear has to be replaced, the other two must also be replaced at the same time. Otherwise the planetary gear assembly may cause noise.
For the same reason, both needle bearings for a planetary gear should be replaced at the same time.
Check the brake drum for scoring, cracks and wear.
Check the clutch disc linings for wear and heat deformations.
Assembling overdrive

Use new gaskets, O-rings, lock plates and seals. Exercise utmost cleanliness. The hydraulic system is very sensitive to dirt.

Rear housing

Use drift 2412 to install bearing in rear housing.

New output shaft

During the 1979 Model production run, a new output shaft and thrust washer were introduced.

To hold the thrust washer between the one-way clutch and output shaft better in position:

- thrust washer thickness was increased from 2.5 mm to 3.8 mm.
- the shaft groove depth was increased from 1.9 mm to 3.2 mm.

The new thrust washer 1232644-3 is used with the new output shaft 1232646-8.

The old thrust washer 380715-3 is used with the previous type output shafts 380679-1 and 1232105-5.
Assembling overdrive

1. Use drift 2412 to press the bearing on the output shaft.

2. Install speedometer drive gear (2) and spacer (1) on the output shaft.

3. Use a piece of wood to support the output shaft. Use drift 2412 to press on the rear housing.

4. Use drift 2412 to press in oil seal in rear housing.

Group 43
Transmission
Assembling overdrive

Position the drive flange on the output shaft. Install washer and nut. Use wrench 5149 to hold the drive flange while torquing the nut.  
165–180 Nm = 120–130 ft.lbs.

Install speedometer gear assembly. Bolt torque: 4–6 Nm = 3–4 ft.lbs.

One-way-clutch

Always use the new type hub with high cams, see illustration. Check the roller cage for damages and wear. Replace as necessary.

To assemble, install the spring in the holes in the cage.

Group 43
Transmission
Assembling overdrive

Install the cam hub correct way, see illustration.

Install cage and hub assembly in ring tool.

Turn the cage assembly while installing the rollers.

NOTE:
Position opening in ring tool toward space between rollers as shown.
Make sure the thrust washer is properly located. If necessary, use grease to hold it in place.

Position ring tool and one-way clutch assembly. Turn one-way clutch hub clockwise while pressing one-way clutch into position.

NOTE:
Thrust washer and output shaft must be mating parts.

Alternate method:
Assemble the one-way clutch.
1 - hub
2 - roller cage
3 - spring
Rotate the roller cage clockwise to end. Use the key (4) to lock it in position the rollers. Hold them in position with a rubber band (5).
Assembling overdrive

Alternate method, cont.

Make sure the thrust washer is properly located. Install the one-way clutch. Remove the rubber band.

**NOTE:**
Thrust washer and output shaft must be mating parts.

Install oil slinger and snap ring.
Planetary gear assembly

Install needle bearings and spacers in the planetary gears.
Install planetary gears and thrust washers. Press in the shafts.

Install the locking pins.

Position the oil slinger on the planetary gear carrier.
Use a drift or chisel to secure it.

NOTE:
The oil slinger must be a tight fit against the planetary gear carrier.

Position the planetary gear assembly on the output shaft.
Use centering tool 2835 to guide the splines in planetary gear carrier and one-way clutch.
Assembling overdrive

**Clutch sliding member assembly**

Use drift **2806** to install the bearing in the bearing retainer. Install the snap ring.

Install the bolts. Use drift **2715** to press on bearing and retainer assembly.

Position the sun gear in the clutch disc. Install the snap ring.

Position the clutch assembly on the output shaft. Install the springs.

*Group 43
Transmission*
Assembling overdrive

Front housing

Install:
1. Oil Filter, seal and plug.
2. Pump cylinder, seat, ball, spring and plug.
3. Pressure relief valve and plug.
   a. Early production (-75)
   b. Mid-production, note the shims (arrow).
   c. Late production, note the shims (arrow).

Note shim (at arrow) for pressure adjustment.

Use wrench 2836 to torque the plugs.
19–24 Nm = 14–18 ft.lbs.

Install strainer and oil pan. Do not forget to clean the magnet.
Torque the bolts to:
7–10 Nm = 5–7 ft.lbs.

Position the pistons in the cylinders.
Position gasket and brake drum on front housing.

Assemble rear and front housing.
NOTE:
Gasket between brake drum and rear housing.
Torque the nuts crosswise to:
7–16 Nm = 5–12 ft.lbs.
NOTE:
The two upper studs have nylon seals.
The narrow end toward the housing.

Install the bridges and tighten the nuts.
7–16 Nm = 5–12 ft.lbs.

Install solenoid and ground wire.
Torque the solenoid to:
42–55 Nm = 30–40 ft.lbs.
Assembling overdrive

Remove centering tool 2835. Install pump link and pump piston.
Installing overdrive

1. Position the overdrive on the transmission output shaft. Install the nuts. Torque to: 7–11Nm = 5–8 ft.lbs.

2. Raise the transmission and install the cross member.

3. Reconnect the wires at the solenoid.

4. Reconnect the drive shaft.

5. Fill with oil to plug hole level.
   M41: SAE 80W/90
   M46: Automatic Transmission Fluid

6. Recheck oil level after driving approx. 10 miles = 15 km.
ASE CERTIFIED

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(U.S.A. only)

Service literature

Your most important special tool