

J-Type Overdrive



Maybe you aren't in the habit of overhauling automatic or manual transmissions. But what if you had the opportunity to make a few extra bucks overhauling a driveline component which is very simple, and doesn't even require any adjustments during the overhaul process? Would you be interested?

Volvo overdrive units are made in England by Laycock. There are two types, the P-Type and the J-Type. Although not identical, they are very similar. This month, we'll tear down, inspect, and repair a J-Type overdrive.

The Laycock is a compact unit which bolts between the transmission and the driveshaft. Two aluminum castings bolt together to form the body of the overdrive unit.

The front section houses the following:

- A piston type oil pump driven by an eccentric on the rear of the transmission.
- A simple valve body which controls and directs fluid pressures.
- An electrically controlled solenoid which switches the overdrive between direct drive and overdrive.
- Two hydraulic control pistons which engage or disengage the overdrive clutch/hub.

The rear section is even simpler. It contains:

- A clutch/hub connected to a planetary gear set.
- A one-way, or overrunning clutch.
- The speedometer drive gear (J-Type only).
- An output flange which bolts to the driveshaft.

A one piece, steel brake drum is bolted between the front and rear housings.

That's about all there is as far as major components are concerned. There have been a few changes made in replacement parts over the years, and we'll try to help you keep track of those as we go along. If you have any doubts about specific applications, check with your parts department for the most current part numbers and applications.

We'll separate our repair into three parts:

- 1) In the car checks and tests.
- 2) Front section repairs.
- 3) Rear section repairs.

Our thanks to Volvo North America for providing many of the parts used in this overhaul. We'd also like to thank the good folks at Borton Volvo. They not only sell Volvo parts, they also overhaul these overdrives.

For more information about Volvo replacement parts and also about the Vim tool used in our overhaul, use the circle numbers below.

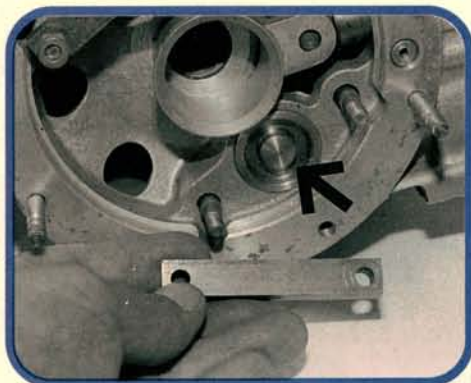
Borton Volvo
Circle No. 210

Durston Manufacturing, Vim Tools
Circle No. 211

Volvo North America
Circle No. 212

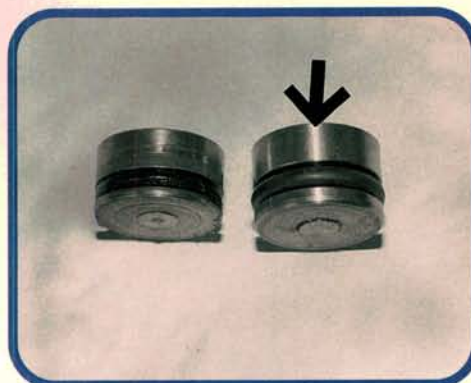
—By Ralph Birnbaum

J-Type



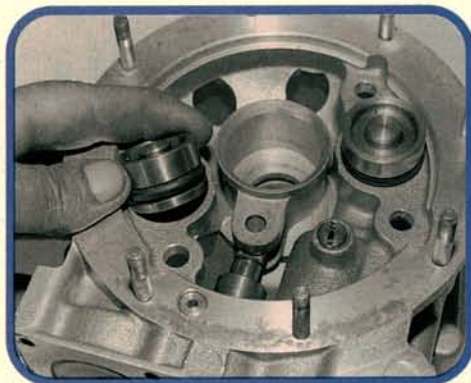
1

This overdrive isn't working. We remove it from the car and clean it. To separate the two housings, start by alternately loosening and then removing the nuts holding the piston bridges over each of the two hydraulic clutch pistons. Remove the bridges and the pistons (arrow) beneath them with a pliers.



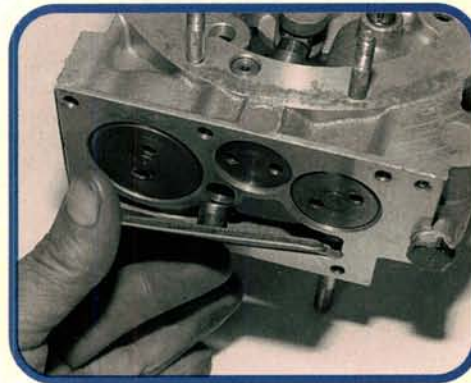
2

We've just started our teardown, and it seems we've already uncovered a major (and common) problem. The sealing o-rings on the clutch pistons are so loose in their bores that the pistons fall out. The piston bores aren't damaged in any way. Our photo shows both old and new (arrow) pistons.



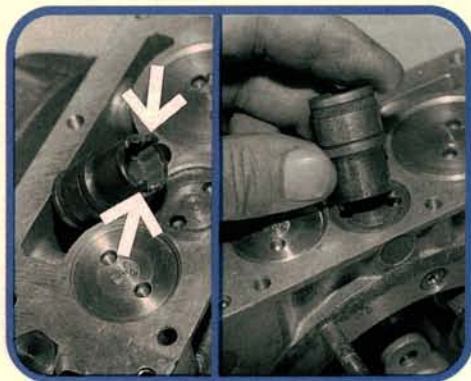
3

The clutch pistons in our unit are old. They were replaced in 1985 with pistons using a combined seal and Teflon ring. Another supersession was made in 1988. We now have these new style pistons which have a wider o-ring groove, and a big fat rubber o-ring for improved sealing.



4

Remove the nuts holding the housings together and separate the front and rear housings. Now we're ready to begin our teardown and inspection of the front section. Remove the valve body cover which is held in place by six bolts. Beneath the cover, you'll find a small filter. Twist and pull to remove it.



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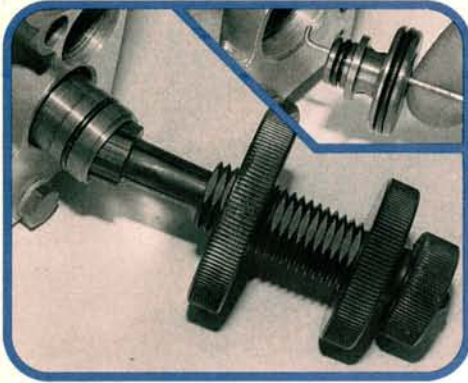
Volvo has a special tool available (P/N 2836) to unscrew the threaded plugs in the valve body section. We made a special tool out of an old 1/2 inch socket. Using this type of tool instead of a punch and hammer will allow us to torque the plugs to 22 Nm (16 ft-lb) when we replace them.



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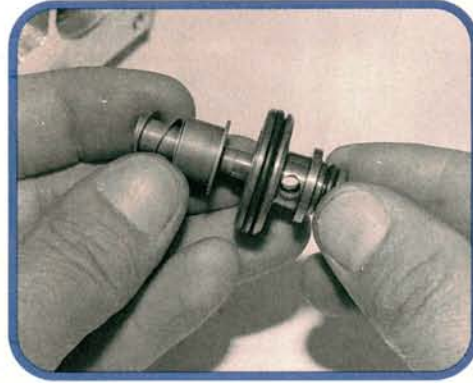
Here's what we find beneath the plugs. From left to right: (left) the pressure relief valve, (center) the oil pump check ball and seat, and (right) the oil filter. Note that the cylinder (arrow) and the relief valve seat behind it are still stuck in the housing. Volvo has a special tool for removing them.

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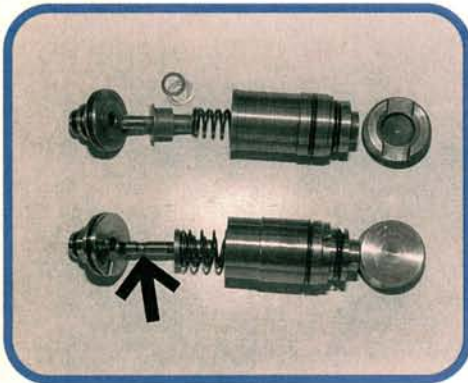
7

We don't have the special tool, but necessity and invention lead us to our Vim universal clutch centering tool. It has expandable plastic jaws which grip the inner surface of the cylinder without leaving any marks. Once the cylinder is removed, we use a small hooked wire to grab the relief valve seat above it.



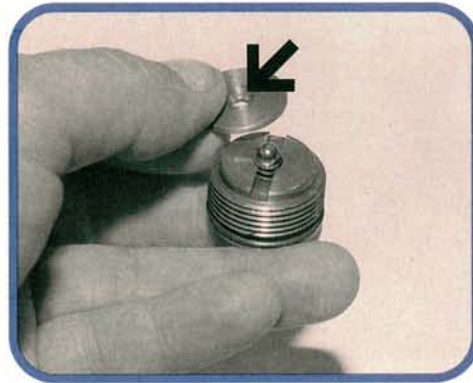
8

Our overdrive unit had been slipping. We check the relief valve and seat for signs of scoring or wear. We also inspect the bore of the cylinder we removed in step 7. All in all, this old relief valve has seen better days. We order an entire relief valve assembly, Volvo P/N 271454-1.



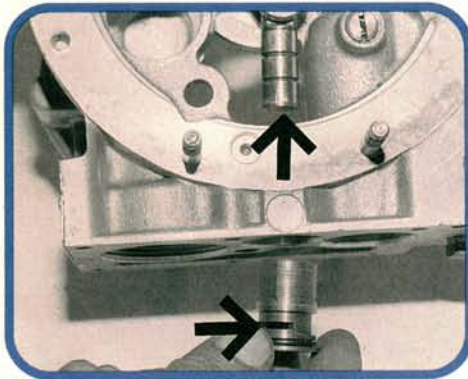
9

Old (top) and new (bottom) pressure relief assemblies. See the shims for the old style valve? If you install only the new style relief valve, (arrow) discard the shims, and install the new inner spring which comes with the new valve. There will be times when a new valve and spring will be all you need.



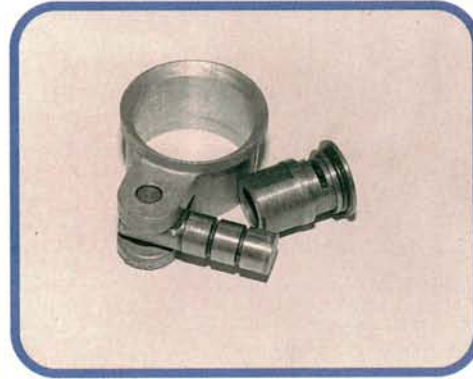
10

The piston type oil pump is driven by an eccentric on the back of the transmission. After removing the concealment plug below the pump, we retrieve the check valve. Blow through the valve. Minor leaks between the ball and seat (arrow) can be fixed by placing the ball in the seat and striking it with a soft mallet.



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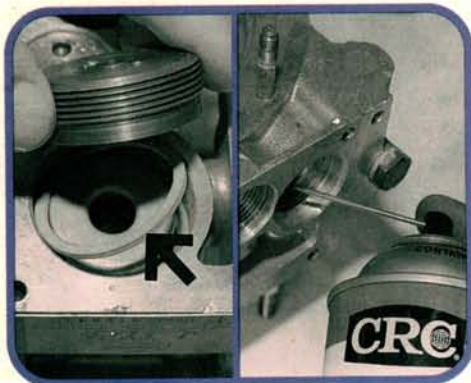
Remove the pump body and slide the pump piston up and out. Later, when you reinstall the pump body, make sure the oil inlet slot (arrow) faces toward the inlet filter cavity as shown. Improper installation of the pump body will block the oil passage. The pump will probably make a knocking noise as a result.



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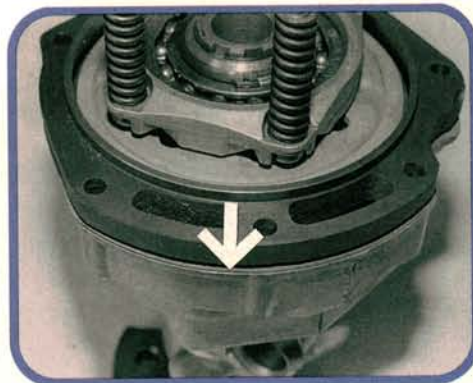
Here's a closer look at the pump assembly. Minor surface imperfections on the pump piston can be polished with super fine emery paper. Make sure the piston slides smoothly through the entire length of the pump body. Our pump looks good, and we'll reuse it.

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The final bore in the front section contains a cylindrical oil filter. New filters are available. Just pop out the old one and install a new filter and seal (arrow). Flush out all the oil passages with spray cleaner. If you need to dig out stubborn dirt, use a wooden match stick, not a metal pick.



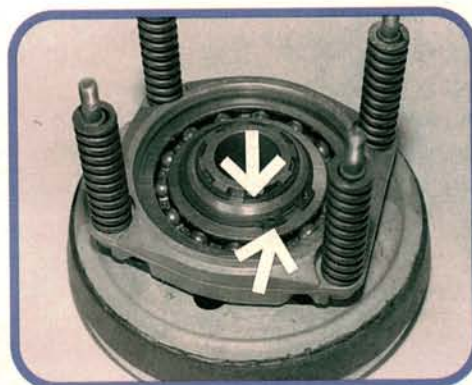
14

Remove the clutch hub from the rear section. The fit between the steel hub and the aluminum rear section may be a tight one. Tap around the perimeter with a plastic mallet. Resist the temptation to drive wedges between the surfaces or you may gouge the aluminum. Always install a new gasket (arrow).



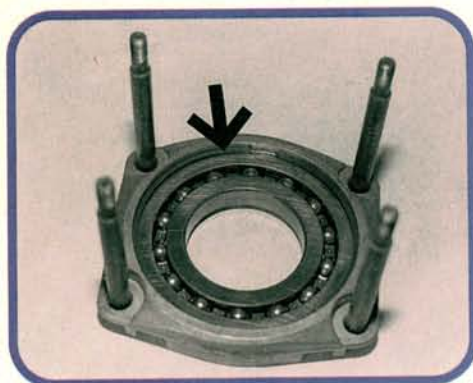
15

Lift the cone clutch assembly up and out of the planetary set. The sun gear is splined to the cone clutch and held in place by a snap ring. Our photo shows the inner and outer clutch linings on the cone. Check them for signs of wear, cracking, or separation from the cone. Check the teeth on the sun gear.



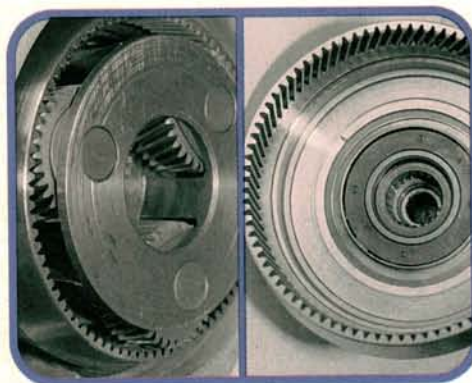
16

Our arrows show the snap rings which hold the bearing assembly and sun gear in place. Remove them to install the bearing carrier and sun gear on a new clutch lining. Measure the free length of the four clutch springs ($55.5 \text{ mm} \pm 1.5 \text{ mm}$). Replace them if they aren't all the same length or are undersized.



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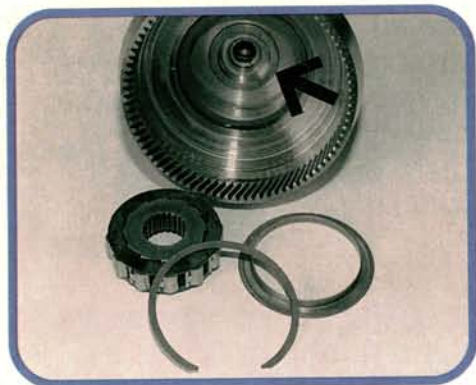
Here's the cone clutch bearing assembly removed from the cone clutch. There's one last snap ring to remove if you're replacing the bearing. The noise from a bad cone clutch bearing will be most noticeable in direct drive. For the record, all of the parts in this assembly tested good and were used again.



18

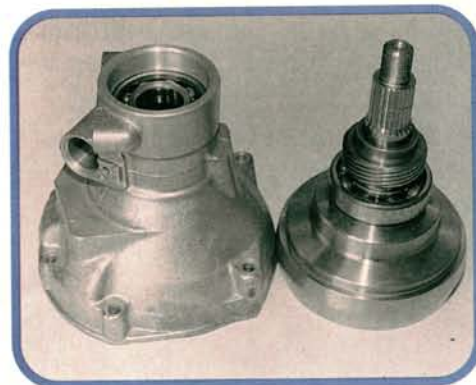
Planetary gear sets have long had a good reputation for durability, and these are no exception. As a precaution, we inspect the planet gears for damage, and clean everything up. With the planetary set removed, we carefully clean the ring gear teeth in the output hub.

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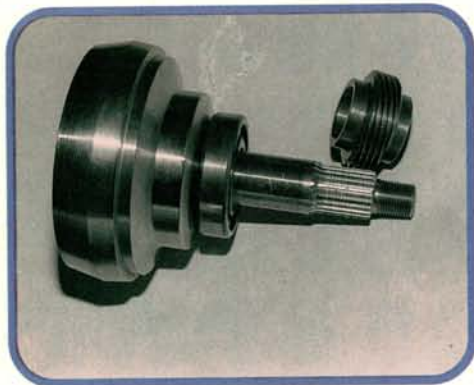
19

To replace a bad one way clutch, remove the snap ring and retainer and install a new one. On J-Types, there's a thrust washer (arrow) below the clutch. Depending on when it was made, the washer will be either 2.5 or 3.8 mm thick. Either one should protrude 0.6 mm above the surrounding surface.



20

To remove the output shaft, remove the output flange nut. Remove the flange, and press the shaft through the rear bearing. Our photo shows the output shaft separated from the case. The rear oil seal has also been removed. The bearing in the case can now be driven out from the inside with a brass drift.



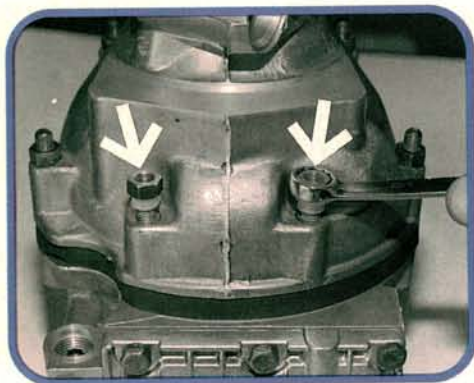
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Notice that the spacer between the two output shaft bearings is the speedometer drive gear on J-Types. On P-Types there is no speedo gear, and a straight sleeve is used. Bearing replacements are a fairly straightforward press operation. Nothing tricky here either.



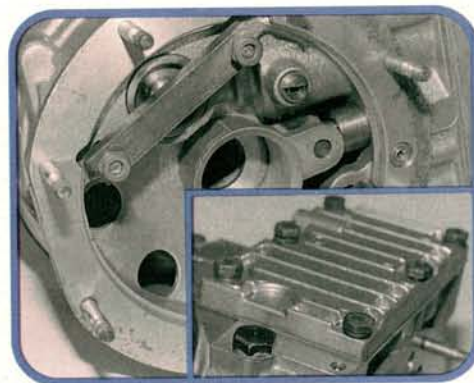
22

Press a new bearing into the case. Lightly lube the bearings with ATF. Install a new oil seal. Slide the threaded end of the output shaft through the bearing, and reinstall the output flange. Hold the flange tight, and tighten the locknut on the shaft to 175 Nm (130 ft-lb).



23

Assembly tips. Don't forget the two gaskets (one on either side) of the steel clutch hub. As you reassemble the case halves, draw the housings together evenly by alternately tightening the case nuts. All the nuts use lock washers except the two shown in our photo (arrows). These use nylon sealing washers.



24

When you reinstall the bridges over the hydraulic pistons, use new nuts. Tighten them alternately in a criss cross motion. Final torque for the nuts is 10 Nm (7 ft-lb). Install a new gasket on the oil pump cover (shown in the lower part of our picture). Torque on these bolts is also 10 Nm.



In-Car Tests

- The overdrive unit is engaged by pressing a button in the center of the gearshift knob. Don't condemn an overdrive for refusing to engage before you've tested the wiring between the switch and the solenoid on the overdrive. The wiring at the base of the shifter can break, creating an open circuit.
- Check the solenoid itself. If the solenoid has an open circuit, it won't engage the overdrive, even if the electrical circuit from the OD switch is good. Exercise the solenoid plunger with 12 volts and ground to make sure it's working properly. Make sure the ground wire on the case is tight.
- Check the fluid level in the overdrive unit. If the fluid is full (and clean) and the solenoid is working, test fluid pressure. Remove the plug at the test port on the front section, and connect a transmission pressure gauge. Make sure the gauge will handle pressures up to 600 PSI.
- Run the car at about 40 MPH on a lift and watch the pressure gauge. With the overdrive disengaged (OFF), the pressure should be 21 PSI. Engage the overdrive, and watch for pressure to increase to the recommended specs. See our accompanying chart for a list of specs for different applications.

Pressure Chart

Pressure test specs for overdrive units have changed somewhat from the original specs used with asbestos linings. We'll list both the original specs for older units, and newer modified specs for later units using non asbestos linings. Non asbestos linings have better friction qualities, and they also have a wider contact surface. As a result, later pressure specs for non asbestos linings are lower than they were for some earlier applications. Direct drive pressure should be 21-22 PSI at 45 MPH.

J-Type Pressure Specs

1989 Specs—Overdrive Engaged

D24T and gas turbo rebuilt with non asbestos lining	444-483 PSI
D24T with original asbestos lining	400-440 PSI
Gas turbo with old style asbestos lining	554-596 PSI

1991 Specs—Overdrive Engaged

All turbocharged with non asbestos linings	405-450 PSI
All others with non asbestos linings	390-420 PSI

Questions and Answers

1) What's the most likely cause of a bearing noise in both direct drive and overdrive? The noise disappears briefly, just as the overdrive is engaged. Then it's back again.

Check both of the output shaft bearings.

2) There is a driveline bearing noise. But the frequency of the noise seems to decrease when the overdrive is engaged. What is it?

The transmission and not the overdrive is the probable cause. Check for a bad output shaft bearing in the tranny.

3) Direct drive is noisy. The noise disappears when the overdrive is engaged. What should be checked?

The bearing on the cone clutch is bad.

4) What if the clutch brake and brake drum are in good shape? The ones in this unit show no signs of overheating or cracking. Can they be reused?

Yes. Make sure that the four springs on the cone clutch bearing retainer are still the correct length, and all of equal length. Install new ones if necessary.

5) The shop manual suggests that all P-Type overdrives, and cars with turbos use an asbestos free cone clutch lining. What about replacement linings for the J-Type?

Volvo supplies only non asbestos linings as replacements. Since there is a difference in the width of the linings, always install a new clutch hub when replacing an asbestos clutch with a new, non asbestos replacement. J-Types may have come from the factory with either asbestos or non asbestos linings. Have the transmission serial number handy when you call for parts.

6) Is the relief valve and its components available as assembly?

Yes. In fact, the relief valve assembly was replaced in this overhaul. The kit (P/N 271454-1) includes a new relief valve (valve and seat), new springs, a new sleeve, and a new plug.

7) Can the new style relief valve be installed in an old relief valve assembly?

Yes. But the new valve will come with a replacement inner spring. Use the new spring and discard the shims along with the old relief valve.

8) What about replacement of all those rubber seals? Are they available as replacement parts?

All seals are available as replacement parts, although new pistons with the improved larger seals are a recommended upgrade for any overdrive being rebuilt. Please note that new style clutch pistons must be used when upgrading the seals since the seal groove is now wider.