

## Overdrive Rebuild: M-46

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## M-46 Overdrive Overhaul and O-Ring Repair and Replacement

Author: [Duane Hoberg](#)

This information is intended for private use and convenience only. Please do not use for commercial gain. The accompanying overdrive (OD) parts and assembly [Image.gif](#) file is NOT intended to be the diagram that dictates your overdrive parts purchase and/or assembly. It is for reference only and could be superseded by the diagram at your local Volvo dealer. All rights to the diagram remain with Volvo. Buy parts from Duane.

Text that follows assumes above average automotive repair knowledge. If you can R & R the head you can do this. This job should take 5 to 6 hours barring major problems without removing the transmission. This is only a compilation of tips that will make the job go smoother not a complete how to do it.

I strongly suggest obtaining the Bentley Manual or the Volvo Service Manual as an assist in diagnosing and evaluating the OD unit. Going through the effort to R&R the OD then not having it work because of a broken/damaged/corroded wire, switch, or relay will destroy your day. As preventive replace the 4th gear switch on the side of the trans. Also use the accompanying diagram and text below to help in reassembly and keeping track of which O-ring goes where, (some are so close to the same size that size alone will not help you place them correctly).

**Parts needed:** Most are special order. I suggest replacing all the following gaskets, seals and o-rings or ordering all as a preventive measure. To order the correct parts you will need the number off the unit that is on the right side of the unit. The number begins with 27 then 115xxx and a serial number. Take in the whole number to your parts supplier. There is a complete list of all overdrive parts in the [table](#) below. [IPD](#) sells a basic parts kit for this job.

Numbers that follow the description or are in the text are referenced to the accompanying diagram and may not coincide with the diagram the parts counter

utilizes.

### **Gaskets and Seals:**

1. Gasket between OD unit and Rear trans housing. (Not shown on this parts listing
2. Gasket between the OD unit housing and pan. (36)
3. Washer for the filter plug (31)
4. Seal ring for OD solenoid (41)
5. O-rings
6. Rear output seal if leaking (60)

The list of O-rings below is according to internal diameter and thickness. They are cross referenced to the part number ( ) on the OD diagram. [NS] indicates Not Shown.

**O-Rings**, listed from smallest to largest diameter:

1. Top Pressure Relief Valve ( 22\* ) Thin
2. Two for the outside of solenoid ( 40 ) Thin
3. Pump Sleeve ( 11 ) Thin
4. PRV inner piston ( 24 ) Medium
5. Speedometer drive body ( NS\* ) Thick
6. Pump Plug ( 20 ) Thin
7. Lower PRV and PRV Sleeve (23\*&27) Thin
8. PRV Plug ( 29 ) Thin

\*The two rings for the prv valve seat (22 & 23) need not be replaced if the seat is not easily removable (explanation later). The Speedometer seal need not be replaced unless it is leaking.

### **Tools needed:**

1. standard metric set 11mm to 18mm (sockets, wrenches, extensions, etc.)
2. torque wrench
3. jack stands (4) or ramps and 2 stands or lift if you are so lucky
4. garage floor jack NOT A BOTTLE JACK

Special tools needed:

1. An adjustable spanner wrench or Volvo Tool #2836. For my OD unit control plugs, I used a Martin adjustable spanner wrench #482. The machinist I borrowed it from stated that spanner wrenches are usually available at bearing supply companies. Their website listing vendors is: <http://www.martinsprocket.com>. For a homemade version, see [Special Tools](#).
2. 4.5mm Allen wrench for speedometer gear OR 5/16" Allen wrench for later models (YES it is American Standard if you have/had a Tamper proof spider fitting with a Red Plastic cap over the screw).
3. 11mm offset box wrench for some of the OD to rear trans housing nuts.
4. 11mm C curved box wrench for the two top OD to rear trans housing nuts. Better yet find a short 11mm wrench about 4 inches long. Some have cut off a wrench just to make the job easier. For a homemade version, see [Special](#)

## Tools

5. 25mm or 1" thin wrench for OD solenoid. (I ground the sides off a Craftsman crows foot to allow it to fit even if the OD is on the vehicle). Looks just like the Volvo Special Tool. [Tip from Bob Haire:] I use a 1" open end cut to about 5-6" length and ground to 1/4" thick. The short handle allows the wrench to fit up in the tranny tunnel and get a good bite. I use a big box end as a leverage handle on the shank of the 1" wrench.
6. A wood block to place between the transmission and the jack.
7. Some contrivance that will allow you to fill the transmission when finished reassembling. See end.

## Procedure and Tips.

1. [Abe Crombie] Put the car in Reverse and dump the clutch to kill the idling engine as the last thing you do before repairs are started. There are two splined hubs contact the trans output shaft, one from the OD one-way clutch and the other from the OD planetary gear set. The splines get loaded in two opposing direction in every gear except R and when the OD is engaged. The grasp of these two splined hubs from opposing directions gets a pretty good lock on the trans output shaft.
2. Drain transmission and OD unit. When removing OD pan catch the filter screen (35) which will fall out when the pan comes down. Remove the Overdrive unit. See Bentley Manual.
3. Tip: Support the transmission forward of the support cross member and remove transmission support and clean the nuts/studs on the OD as best you can. Clean studs allow fingers to remove nuts instead of wrenching them all the way off. See below.
4. Using the 11mm C wrench (or shortened wrench) and 11mm wrench (alternate between them if necessary), remove the two nuts & lock washers at the top of the OD housing to rear trans housing, one each side below the bottom of the shift lever. The nuts are located to the transmission side of the unit just above the front of the pan. If you do not have the short version of the 11mm wrench, you may have to carefully push the trans to the side to gain enough room to get the wrench to fit on the nut and move it. DO Not use the open end of the wrench, it will not fit properly and will round the nut making removal of the transmission necessary. I found this out pulling the OD from a vehicle in a salvage yard and had to drop the whole trans to get on the nut with a six point socket. Not fun on a 98 degree day. These two nuts are the most difficult to remove and install. Be patient, I could only move them 1/12 turn at a time until the lock washer was free then used my fingers. [Bruce Young] With the transmission as low as possible, the top 2 nuts were easily accessed and removed with a 1/4" ratchet and a 7/16"/11mm socket after the socket was shortened by another 1/8" inch or so—to a nominal .700" overall). Some masking or friction tape on the socket made it grippable for easy finger-turning without the ratchet, once the nuts are loose.

Carefully lowering the transmission slightly helps. There is not much clearance between the firewall and the valve cover with wires and hoses in between. There are a total of eight nuts and studs. Some studs will come out, that's OK. Leave the bottom two until last.

Flex the OD unit by pushing up (do not jack it up or you will bend the output shaft of the trans) on the rear of the unit to allow just enough clearance to get a screwdriver or pry bar between the units to help pry the units apart. Do not drive the pry bar/screwdriver between the units.

Remove the OD unit from the output shaft by moving it straight back in line with the transmission (about 15") while supporting it.

[Potential problem: OD seized together] I didn't unload the splines as noted above. Now, loosening the eight 11mm nuts as described above, I can not get OD unit to come apart. I'm currently not trying to make the break at rear of transmission cast iron housing, but at the next joint back which has 8 - 11mm nuts in a roughly round pattern

[Response: Rick Mordahl] The proper thing to do is to run the car up to speed on stands, engage and disengage the od 4 or 5 times, then with the od engaged, let the wheels coast slowly down to a stop. Do not disengage od with the switch or put the trans in neutral until the wheels stop after you disengage the clutch. The reason to do this is that the cone clutch, when it disengages quickly slams back into place and puts tension on the splines in the planetary. [See Crombie note above.] If the tranny is out of the car, take the oil pan off, and pry the bearing carrier/cone clutch assy towards the front of the transmission. While wiggling the cone clutch, pull the od back. This is actually a whole lot easier to do with the trans still in the car- the top two 7/16 nuts (remember this is english) are a bit tough to remove, but not impossible. As you pull the od back, rotate the shaft to allow the pump eccentric to disengage smoothly from the pump. Do not beat on things or you will break stuff, and that is not necessary. Be persistent, wiggle the cone clutch and it should come off.

[Response: Duane Hoberg] Separation is difficult at times. Prep as follows. Remove the solenoid. This will remove all hydraulic pressure, if any, inside the OD unit. Also, rotate output shaft of OD in clockwise direction as you look at the rear of the OD. Bang with a plastic mallet just forward of the point on OD rear case where it tapers to the output flange as you rotate the shaft. Then: With a plastic or wood mallet, tap firmly around the adapter ring where you removed the bolts while applying side pressure at the rear of the OD with your hand 180 degrees opposite where you are hitting. Hit on the adapter ring toward the transmission. A manual impact wrench so to speak. Work around a couple of times. This is usually easier with the OD in the car as more pressure can be applied without moving the tranny although you cannot get around the whole OD. Kinda hard to hit with the car body in the way. IF the OD does not move away from the adapter, do not drive anything between to separate the case. You will most likely crack the adapter. If a space opens up and you can get a screwdriver or similar in without driving it there, use it as a lever and push on the output flange area of the OD opposite to open up the other side. Insert another screwdriver and pry apart. It usually lets go with a pop if you are using this method by now. If all above fails, you will have to remove the rear case of the OD and dismantle forward and it still may be difficult if the pump cam follower is holding the unit in place.

[Response: Aceman] There is an aluminum sleeve in the OD unit that rides on the out-put shaft of the transmission. That shaft is a cam. It is cast steel. If the trans has been allowed to run low on fluid the alum sleeve will seize on this cam just like

a frozen bearing. the only way is to break it loose. Chances are you will need to go to the bone yard and buy another od unit for parts.

Clean well, disassemble the valves, replace O-rings lubricating well with ATF and reassemble. Tips for Overdrive O-rings: Be sure to lube well with fluid before reinstalling.

Remove the OD solenoid (39) from the unit AND the pressure port plug (8) just to the right of the pan. This will allow whatever fluid still left in the unit to drain out as you work and not cause problems by creating a vacuum as you try to pull some of the pistons out.

There are two metal bars visible from the front of the unit (52). Remove them and remove the pistons (49) below them. The seals around these are usually what is causing the OD not to work.

You will probably have to use a pair of pliers to pull the pistons from their bores. They may be a little difficult but if you did step A you won't be pulling against the fluid still in the passages between all the valves and pistons. Sometimes pushing on the other piston helps push the other out.

Removing the O-rings (50) from the pistons. The trick I like to use to remove O-rings is by using a pair of narrow needle nose pliers. Open the pliers and grab the O-ring at points about 90 degrees apart, squeezing the pliers causes the ring to stretch up so the pliers can clamp on it (or I can slip a toothpick underneath it) without touching the piston. Doesn't mar the surface of the piston that way. With new O-rings the pistons will take some effort to install. That's good.

Removing the center plug (19). (Check Valve) It will seem very stiff as it has an O-ring (20) on it. Just underneath the plug is a spring (17) which holds a check ball (18) into a dimple on a plate (16) inside a pump sleeve (10). All parts are necessary. DO not loose them. The pump sleeve can be removed by pushing it out from inside the front of the OD unit while supporting the piston and cam socket (12 & 13). There is a flat and slot to one outer side of the sleeve. The sleeve must be reinstalled in the same orientation with the slot toward the hole the screen fits into in the bottom of the unit. Remove and replace the O-ring on the sleeve (11) and plug (20). Lube all well and reinstall. NOTE: The pump piston (12) cannot be removed from the cam follower(13) without damage, leave them attached. When reinstalling the piston and cam follower assembly, it (12 & 13) must go into the sleeve (10) before the sleeve is seated in the housing. Install the cam follower with the sloped side of the cam follower toward the front of the OD.

The pressure relief valve (21) has many parts and must be replaced in the same sequence and relationship. See [M-46 Overdrive Pressure Relief Valve Tool](#) for information on building a tool to remove this valve. The plug (28) too has an O-ring (29) on it and will be stiff. Pull the piston with a pair of pliers. Spacer washers and shims (25) are located between the inner spring and the control piston. The outer sleeve (26) can be removed by inserting your thumb, bending your thumb, then pulling the sleeve out. Mine came out without much effort. Some are more difficult than others. Sometimes you need to hook the hole toward the bottom of the sleeve to pull it out. Be careful to not scratch the bore. The seat (parts between 22 & 23) at the top of the bore requires a special tool to remove. A piece

of stiff wire bent into a hook will work just as well if the seat O-rings (22 & 23) allow it to come out. If it doesn't want to release with a little effort do not take it out. The O-rings are holding it in place and are still good. (the later from three different shop's mechanics). The hole in the outer sleeve when reinstalled should line up with the hole in the casting.

### **Reinstallation:**

Clean surfaces between the OD unit and rear trans housing, install gasket on OD unit, rotate output shaft of trans with eccentric cam so cam lobe is in the extreme down position. Liberally lube the cam. Then lube the cam follower (13) on the OD.

Position cam follower on OD unit in position straight up, centered L & R on hole in housing and pump piston all the way down.

Align the splines at the bottom of the opening that the trans output shaft inserts through. This is best done with a long thin screw driver. The second set of splines will only turn one way. They will turn very easily in the correct direction. Do not force.

Slide OD over output shaft of trans rotating rear flange to help align splines. The unit should slide up until about 1/2 to 3/4 of an inch from the trans. Check alignment of the cam and socket. Adjust position of the cam and follower using the rear output flange. Slide the OD rearward without allowing the studs to clear the holes. With a very sharp forward motion push the OD forward. It will seem to hesitate at the point where the cam contacts the socket then slide home as the socket (13) adjusts to the cam. This may take a few tries. Mine took 8 tries over 20 min. Each time I realigned the cam and follower before trying it again and before I tried the sharp forward motion.

Refill with fresh fluid as able. DO NOT use Dexron. It will allow bad things to happen inside your TRANSMISSION....the OD could care less. Your fluid choice is limited to Type F ATF, a straight 30w Motor oil if temp never gets below 20 degrees F. or a synthetic trans fluid that is Type F specific. Other synthetic transmission fluids not Type-F specific can cause problems within the OD by being too slippery.

I used a fill device I got from K-Mart that screws to the bottle, has a twist type on/off valve with about a 12" length of clear vinyl tube about 1/2" in diameter. It just fit inside the trans fill hole, and allowed me to turn the bottle upside down into the area just below the intake manifold. Dumped 2.4 quarts into the trans and spilled maybe 2 to 3 ounces after the unit was full. Slick little device.

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### **M-46 Overdrive Parts List.**

See the exploded diagram at [M-46 Overdrive Exploded Parts Diagram](#)

Overdrive parts for Volvo Type J Overdrive units are available through Duane Hoberg: ODGuru at kc.rr.com . All numbers referenced to Volvo drawing PV 430 42559. Email for current prices and availability. If Duane cannot help, contact Gearvendors at <http://www.gearvendors.com/> . They currently have the license for

manufacturing on the Laycock units and have parts.

Part # with NA are not available through this source.

#### Volvo Illus. # Part Description Required

- 1 Factory Reman. Overdrive Unit 1
- 2 Main Casing 1
- 3 Stud 8
- 4 Stud Short (bottom 4) 4
- 4a Stud Long (top 2) 2
- 5 Relief Valve Ball 1
- 6 Relief valve spring 1
- 7 Relief valve Plug 1
- 8 NA
- 9 Pressure Port Washer 1
- 10 Pump Body & #11 1
- 11 O-Ring 1
- 12 to 15 Pump Plunger Kit 1
- 16 to 18 Non Return Valve Kit 1
- 19 Pump Plug 1
- 20 O-Ring 1
- 21 Complete Assembly Not Available
- 22 O-Ring 1
- 22a Relief Valve Assembly 1
- 23 O-Ring 1
- 24 ? Only In Kit? Unable to cross reference
- 24a Dashpot sleeve 1
- 25 NA
- 26 NA
- 27 O-Ring 1
- 28 Dashpot Plug 1
- 29 O-Ring 1
- 30 Filter 1
- 31 Washer-Pressure Filter 1
- 32 Plug-Pressure Filter 1
- 33 Oil Pump Sump Cover 1
- 34 comes with sump cover #33
- 35 Suction Filter 1
- 36 Oil Sump Gasket 1
- 37 NA
- 38 NA
- 39 Overdrive solenoid 1
- 40 O-Ring 2
- 41 Solenoid Washer 1
- 42 Brake Ring 1
- 43 Sliding Member (Cone Clutch) 1
- 44 Thrust Bearing Housing 1
- 45 NA
- 46 Thrust Bearing 1
- 47 Circlip-Retaining 1

- 48 Circlip-Sliding Member 1
- 49 Piston Operating 2
- 50 O-Ring/Operating Piston 2
- 50a NA
- 51 NA
- 52 Bridge Piece Kit 1
- 53 Locking Nut 4
- 54 Rear Case 1
- 55 Annulus 1
- 56 Thrust Washer 1
- 57 Front Annulus Bearing 1
- 58 NA
- 59 Rear Annulus Bearing 1
- 60 Rear Oil Seal 1
- 61 NA
- 62 NA
- 63 Flange Washer 1
- 64 Flange Nut 1
- 65 Clutch Assembly 1
- 66 Clutch Cage 1
- 67 Clutch inner member 1
- 68 Oil Thrower 1
- 69 Spring clip 1
- 70 to 77 NA
- 78 Sunwheel 1
- 79 Circlip-Sunwheel 1
- 80 Rear Main Case Gasket 1
- 81 Rear Case Gasket 1
- 82 Locking Washer 6
- 83 Copper washer 2
- 84 Nut 6
- Numbers 85 & Up Not Shown
- 85 Gasket, Adaptor to Casing 1
- 86 Gasket Kit (36,80,81,85) 1
- 87 Overdrive O-Ring Kit
- (11,20,22,24,27x2,29,40x2,50x2,94) 1
- 88 Bearing Kit (46,57,59,60,99) 1
- 89 Oil Pump Cam 1
- 90 Woodruff Key for Cam 1
- 91 Circlip for cam 1
- 92 Spring Ring for Cam 1
- 93 Speedo Output Bearing 1
- 94 Speedo Bearing O-Ring 1
- 95 Speedo Gear Oil Seal 1
- 96 Speedo Connector 1
- 97 Speedo Conn. Hold Down Bolt 1
- 98 Ring Spring 1
- 99 Roller Set 1

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For further illustration, see the [M-46 Exploded Parts Diagram](#)



**M-46 Piston Replacement.** [John Sargent] My son's 1984 760T with M46/OD recently started dropping out of overdrive in hot weather. The problem is worn overdrive actuating piston seals. The original seals had a blue Teflon sealing ring, and the seals give trouble with age. The upgraded new pistons use a nice fat rubber o-ring which gives better service. I ordered two new pistons (part number 6814454), and two new o-rings (part number 6814455-9), and the gasket (part number 380618-9) between the OD and the transmission. Once I had the parts I jacked the rear of car up, started the engine, and shifted through the gears and into OD. Once into OD I stuck the clutch in and hit the brakes. This procedure unloads the pressure on the transmission output shaft splines so the OD will slide off of the transmission. You can also shift into reverse and very firmly let the clutch out and achieve the same thing. The picture to the right shows where I like to put my jack stands.

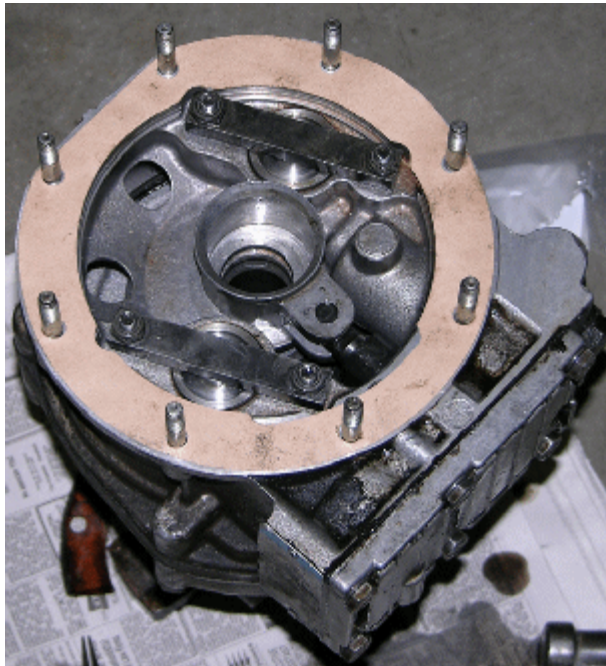


The next step is to remove the driveshaft and transmission crossmember. The transmission will drop slightly, and this helps lots to get at the eight 7/16" nuts which hold the OD to the transmission. I use a fine tooth 1/4" drive ratchet and 7/16" socket to remove the eight 7/16" nuts. This will nicely let you get the even the top two nuts. The ratchet and socket might not work on a 240, but they do the job fine on a 700 series. Be sure to clean all of the dirt you can from the joint between the OD and transmission. It is easier to clean it off before it gets on to the inside parts. Sometimes a little gently tapping on the output flange helps get the OD off of the transmission. If you didn't unload the OD from the transmission output shaft, you are going to be wishing you had.

The new (black o-ring) and old (blue o-ring) pistons can be seen below. They fit tighter than the old pistons, even before the seals go into the bore.



The OD with new pistons and gaskets is shown below. Clean the back of the transmission off and remove all traces of the old gasket. It will look like this when you are ready to slide the overdrive back on. It might take several tries to get the pump collar (for lack of a better description) around the cam on the output shaft. Slide the OD back on and start re-assembly



Once done, re-fill with type F ATF or synthetic motor oil. This overdrive works perfectly again.



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