

Transmission: Automatic AW 30-40

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Note: AW 30/40 series electronically-controlled transmissions are used on Volvo 960 and 90-series six-cylinder cars.

Maintenance: See the [Automatic Transmission](#) section for generic data also applicable to AW 30/40 transmissions.

Checking Fluid on 960/90 Transmission.

[Inquiry] How do I check the transmission fluid level on my 960?

[Responses] Look way down just behind the throttle body intake assembly, low on the drivers side near the firewall and below the brake fluid container. You'll see a

square yellow dipstick which doesn't have a handle on it. It which accepts a 3/8 inch drive extension: stick the socket extension on it, reach down and depress the hold-down clip, and pull it out. It is sometimes easier to reach from the side of the car, reaching down low. I just reach down and pull it out myself. You'll need a long funnel to put fluid in. Be sure that the car has been driven 15 minutes or so, stop, move to and stop in each gear about 5 seconds, and back to park. Check fluid level. Don't overfill by even a small amount.

I extended the dipstick with an old clothes hanger . I cut off both ends at the bottom and looped one end into a hole in the dipstick and made another loop at the top end of the hanger so I could pull it up. It really makes life easy if you check your trans fluid frequently.

960/90 Fluid Flush.

[Tips from Mike Hale] I was riding in my Dad's 95 960 when I noticed that the shifting was a little rough. My Dad had mentioned that he also notice a pause at about 80mph when letting up off the accelerator-- It felt like the car coasted for a second or two before the gears kicked in.like putting the clutch in and letting it out on a car with a manual transmission. He had taken it to the dealer before about the problem while it was under warranty and suggested they change the transmission fluid. Volvo says that transmission fluid is permanent.it doesn't need to be changed the dealer said. Well, anybody with a shred of common sense knows that no fluid is permanent.it breaks down and gets dirty over time. So I told my Dad we'd change the fluid this weekend.what a difference it made. Not only is the coasting problem above fixed, it also shifts so smooth, you can barely feel it. As we drained the tranny, we were both amazed and disgusted at Volvo for saying it wouldn't ever have to be changed and at how dark the fluid was. For about 17 bucks we got the job done.[AI] Just a quick note on the results of my AW-30 transmission flush. 97 960 66,827 miles. Unbelievable how much the quality of the transmission shifts have improved. It made a huge difference to the plus side.

Because the transmission cooler is a little different than other RWD Volvos, I've outlined changing the fluid below. Note: IPDs new transmission flush hose DOES NOT work on 960s as they advertise (all RWD Volvos to 1998).the fittings on the 95- 960/90 are different. I called them after I received it and was told that they hadn't actually tried it on a 960/90 series.it didn't sound like it would work.

Materials:

- 12 Pack Case of Dexron III/Mercon ATF (Costco has Chevron brand ATF for \$10.79/ case)
- 4' Length of clear Vinyl tubing with a 1" Inside Diameter (available at Lowes or Home Depot for \$2/ft or from IPD.)
- 1" Hose Clamp
- 14mm wrench
- 17mm open end wrench
- 1" open end wrench
- Metal Hangar
- 3 1-gallon jugs (or equivalent sized bucket) with quart markings-I used an old antifreeze bottle with the markings already on it and a sight line on the side.

- Funnel with ½" outside diameter hose about 1½' long-Used to fill transmission through dipstick hole.

Procedure:

Start by pulling the dipstick. On 960s, there isn't a dipstick handle. It's easiest to reach under the car from the driver's side and follow the dipstick tube up OR if you have a long ½" extension bar, you can push it into the top of the dipstick and pull it out. Without a ½" bar, push up the dipstick until it's all the way out (and either grab it or let it drop to the floor). Unwind and bend one end of the hanger so it will hook in one or more of the holes on the dipstick. Insert the tube from the funnel into the dipstick tube.you'll probably have to push it in from underneath the car. Pull it up on ramps (if you have them)-the transmission pan is angled in the rear where the drain plug is so this drains more fluid (14mm drain plug). When finished draining, pour what you drained into a premarked bottle and pour that amount of fresh ATF into the tranny (approx. 2qts). Push the car down the ramps onto level ground.

Unscrew the top cooler line at the radiator by using a 1" wrench as a counter hold so you don't break the connection. Pull the cooler line out of the 1" brass screw and push it gently aside. With the hose clamp already over the 1" vinyl hose, push the hose over the 1" brass screw and tighten the hose clamp (real tight 'til it begins to form to the sides of the brass nut). Put the end of the hose in the bottle/bucket. Have helper start the engine and let it idle (do not push the accelerator). Fluid will begin to fill the hose and bottle. If the hose is inserted into an antifreeze bottle with a tight fit, push the hose in slightly at the mouth to allow the bottle to vent (otherwise it may expand and explode). Allow 2qts to drain (Tell the helper to shut off the engine just shy of 2 qts as some in the hose will continue to drain when the engine stops). Add two qts of fresh fluid (+or- depending on how much you drained. Repeat until you've drained 8 qts and you see clean fluid. Tip: as you do this, drain each 2 qt run into gallon jugs so you can keep an accurate tally of how much you've taken out relative to the number of empty bottles of fresh ATF you put in. Carefully remove the hose and drain any fluid in it into the jug.note how much and add that amount in fresh fluid. Replace the cooler line and dipstick. Run the engine and shift through the gears. Take it for a short spin to heat up the fluid for measurement. While running the engine in Park, pull the dipstick, clean it off, reinsert it, and pull it again to measure.note the position on the HOT markings. If its low, add a little (keep in mind that if the HOT marking says you're ½ qt low, it won't take ½ to fill it because the ATF from the bottle will expand when heated. If it's overfilled, open the drain plug slightly to get some out. That ought to do it.enjoy your revamped transmission!

Fluid Specifications. Use Dexron fluid in your AW-30/40 transmission. In the Lubrizol knowledge Base site at www.lubrizol.com, they note that two European commercial vehicle automatic transmission makers have posted specs for mineral oil versus synthetic automatic transmission fluid lifetimes. Voith allows 60k km drain intervals on mineral oil and Group III (hydrocracked semisynthetics) ATFs and 120k km intervals on full synthetics, both in Dexron III specs. ZF allows 30k km for mineral oil, 60k km for part synthetic, and 120k km for full synthetic, again in Dexron. This is an indication of the value of synthetics in normal use. Mobil 1 ATF is a full synthetic.

Fluid Level. [Editor] Some anecdotal evidence exists that fluid level in the AW 30/40 is very important: even a small excess may cause strange transmission noises. So don't overfill your transmission

Flush By Draining the Torque Converter?

[Frank] Some Euro indy mechanics have suggested that a better flush is achieved by first draining the torque converter. Not true: this creates a large air gap and forces the tranny to run dry while it refills. The Volvo OEM flush procedure is through the cooler lines as noted above.

Changing the Filter. [Editor] To replace the filter screen, remove the pan. The gasket used is a silicone paste. To remove the pan once the bolts are off, use a rubber mallet and gently hit the pan from all sides a few times until it falls down. Use care since there will be about one quart of fluid left in the pan. Clean up the tranny pan and scrape off all the old gasket material. Remove the magnets in the pan and wipe the metal shards off, then take some clean ATF fluid and wipe the insides of the pan. Use Volvo gasket material, RTV, or rubber gasket material when replacing the pan. Torque spec on the pan bolts is 65 IN-lbs; on the filter bolts is 7 ft-lbs. Merely draining the pan, instead of flushing, will require about 6.25 quarts of fluid.

Transmission Model Information. See the [table](#) in the [Model Information](#) file.

Troubleshooting the AW 30/40 Series:

Transmission Not Shifting Out of Park

Symptoms. [Inquiry] My transmission will not shift out of park when I step on the brake. [Response: Bob] Shift lock solenoid not releasing. Possible causes, brake light switch, micro switch in shifter assembly. Micro switch most common. Access shifter by removing console; on passenger side near indicator is a small black switch with a metal lever. Switch about 1 in. long @1/2 in wide, mounted with a small round metal clip. There are two black wires. You have to unbolt the shifter and lift up slightly to access switch, but don't have to disconnect anything under car. Be careful removing switch retainer as its easy to break the small plastic post the switch mounts to. To test, short the two wires together with key on and brake pedal pressed. If it now comes out of park, replace or bypass the switch.

Repair Notes.

[Editor] This is a known frequent-failure item, in part because of the ridiculous design of the switch mounts on two small plastic pins with push fasteners to hold it on. The switch itself does not last long. If you replace yours, install the new one in such a way that a replacement can be easily installed.

Shift Lock Switch Replacement. [Tips from Tom Irwin] Lately, my AT has been failing to allow a shift out of PARK about 90% of the time. I have to press the Shiftlock override to get going. This car was serviced in 1996 under the recall campaign to replace a defective shiftlock microswitch inside the shifter console. The A-hah! went off in my head because I have been substantially underwhelmed about

the abilities of the dealership where I purchased the car. I got out the books and went looking for trouble. To get at this thing, it is advisable to remove the following parts, roughly in this order [applies to both 960 and 940 as noted]:

- [960:] Both Right and left knee bolster covers. Two screws on the left and one on the right cleverly concealed behind a snap lock cover. Un-buckle and un-snap them the rest of the way. NOTE how they slide out of a plastic extruded support molded in to the kick panels. Dum-Dum's at Volvo dealer had jammed them back in, over and under these supports and tweaked them all to hell. It took awhile to get 'em back in right. Had to let them bake in the sun for a while to get a little pliable.
- Take out the ashtrays and fuse box cover (940) in the front.
- Pull up on your E-Brake. Slip a finger under the screw concealment panel and wiggle it side to side till it pops up.
- Remove two screws that secure left and right side of center console shifter and emergency brake cover to the transmission tunnel.
- [960:] Remove the two screws holding your armrest/cupholder to the junk box. NOTE: If you have ever dropped that armrest or otherwise treated it rough, you will see cracks in the hinge guides that support your release latch on the armrest/cupholder/junk box cover. Now is an excellent time to put a small drop of super glue (NOT the gel stuff) right there. It will wick in to the cracks and reinforce them.
- Empty ALL your junk out of the junk box. Use a small slotted screwdriver to lift out the screw concealment panel in the bottom of the junk box. It is tough to see, use a flashlight. Remove two screws from the bottom of the junk box.
- Lift up whole center console assembly from the rear, a few inches. Put two fingers under the wood-look trim around the rear seat ashtray bezel. Push up on two tabs and lift ashtray bezel up and away. NOTE: The little light bulb that is supposed to light up your rear seat area and the inside of your junk box usually is dead, now is a great time to replace it.
- Lift whole center console up and away and remove it from the car. NOTE: This too is a good time to scrub down the plastic mold of the center console, scrape off old food, spilled drinks, whatever. You will no doubt find a couple of dollars down there between the seats. Now you can vacuum out the seat tracks where heretofore you could not get down there with the skinniest of attachments.
- Disconnect seat heater wiring switch and lamp connectors and remove the emergency brake and shifter cover. You will have to maneuver it around the brake and shifter. If the seat heater switch lamp is out, now is the time to replace it.
- [960:] Disconnect the wiring harness that goes to the shifter, (960 Left side, 940 right) Re-route the harness end around so you have enough slack to raise the shifter a bit.
- Remove 4-10mm bolts that secure shifter. Raise shifter up an inch or two. Lift up the dust flap on left side of shifter.
- There it is, a snap-acting microswitch. If you are in PARK, it should be pushed closed by the metal pin moving with the shifter handle. The switch mounts on two fragile plastic pin extrusions from the shifter body. Two spring type retainers are supposed to be pushed on to the pins after switch is installed over them. In my case, one spring lock retainer had fallen off of the pin and was laying in the soundproofing insulation, the other one was working loose

from the other pin.

- I took off the switch, cleaned it adjusted the lever, and tested it. Then I reinstalled it and pushed the lock retainers on really tight. [Editor: if you are going to take the whole thing apart, you might want to install a new switch. Cost is around \$20. Replacements come with crimp connectors; anticipating future repairs, I used removable spade connectors insulated with heatshrink tubing. DON'T drop the small push nut fasteners when installing them: use sticky adhesive or the like on your fingers]
- Put everything back in reverse order and it works every time now. [Editor: lifespan of these things seems like around three years.]

Disabling the Entire Park-Shift-Lock System:

[Editor] Cursed 940 park-shift-lock microswitch! My 95 has been through two of these in twelve months. They are a small pain to replace, but bearable until the park-lock solenoid died. I have been parking in N and pulling the emergency brake handle to hold the car: it won't go into P. Worse, this solenoid costs over \$100 and is buried inside the shifter assembly. Worst of all, it is a positive locking device, so if it fails, or if the microswitch fails, it locks the car either into or out of park. I prepared to remove the entire idiot-proof locking assembly and be done with this annoyance. Here's how to do it:

1. Remove the center console between the seats, along with the tray containing the seat heater switches and the ashtray.
2. Drive the front of the car up on ramps. From beneath, unhook the locking palnut and unbolt the shifter assembly arm-to-transmission rod. It is probably rusted so use PBlaster. Disconnect the overdrive solenoid wire.
3. Unbolt all four shifter mounting bolts at each corner.
4. Tie off the key-removal cable at the front of the shifter and pull the ball out of the catch.
5. Pull the shifter assembly up and maneuver it so that you can work on it without pulling the wires.
6. Remove the rubber seals on both sides of the shifter box. Unhook the locking palnut on the lever side. Pull the plastic lever arm off. Note that it is parallel with the shifter knob.
7. On the side opposite the arm, use a punch to drive out the center pin.
8. Pull the shifter out of the box, being careful about the wiring.
9. The microswitch is on the passenger side, just beneath the cover, resting on two plastic pins. The park-lock solenoid is on the passenger side at the bottom, also affixed to pins. Remove the locking push fasteners and pull out the microswitch and solenoid, which are wired together. Cut the wires, leaving slack if you ever change your mind, and tape off any bare wires.
10. Re-assemble in reverse order, again being careful about the wiring. When you are underneath, clean the overdrive wire connection and preserve with silicone dielectric paste.
11. Now your car runs just like my 1990. Just don't start the car without putting your foot on the brake. Don't pull an Audi through the garage door.

960 AW30-40 Shows Overheat Codes after Mountain Run.

[Inquiry] We took the 960 up the mountains. The ambient temps were in the low

60's. We topped out at just above 2,000 feet. No trailer, just 220 pounds of 'persons' between the two of us and maybe 100 pounds of gear in the trunk. As we are climbing up the last of the twisty's, I missed a switchback and had to make a tight 3 point turn. The trans went rough into reverse and started to just not act right. With a mile to go, the mode selector and dash arrow goes berserk. The lights are all blinking REALLY fast! I just throttled back and eased into the campground. This morning, no lights. We got out OK. Got home and pulled the codes... 235 Fluid Temperature too High. (above 300 degrees) Now I am running Mobil One ATF, freshly serviced just last month. My load was light, compared to what the vehicle is rated for. And the lights went out when it got cooler, so I don't suspect a defective sensor. What could be failing inside the transmission to cause, or add to an overheat condition?

[Response: Abe Crombie] Hard pulls at lower revs in higher gears causes this. Driving uphill for a distance at lower revs in either of gear ranges 3 or 4 will build oil heat due to the stall speed of torque converter. Next time pull it down into a lower gear. The transmission has a two-stage overheat program. The first stage locks up a bit sooner in the upper two gears. The second stage (when arrow blinks) goes to full pressure, shifts up sooner, and locks torque converter in second gear as well as third and fourth. The lights do blink for a stage two overheat until the temperature of the oil falls below approximately 280F. It is very easy in E mode (even in S mode) to get an unlock in 4th without a downshift to 3rd or to get unlock in 3rd without a downshift to 2nd. No need to worry about a fluid change if you had synthetic in it. The normal routine would be to drain and replace fluid, drive car, and if transmission functions okay, then send it down the road.

960 AW30-40 Self-Destructs in Hot, Hilly Climates. [Cautions from Rafael Riverol] Leaving your 960 stock with OEM radiator, no cooler, and cheap transmission oil, together with dealer maintenance according to the schedule, has resulted in a new transmission in every single one 960 I know about in Puerto Rico at around 50k miles. Not only are we talking about thousands of dollars, but a much worse never ending tale of woes and headaches. Volvo technicians tell horror tales throughout U.S. To help prevent this, install a transmission cooler. The factory kit is a simple bolt on, but not cheap. I bought one for my 960 (1995) for \$385. Of course, you should also use synthetic transmission fluid. Mobil is a good choice and readily available. If you are careful, you may want to install a Magnefine transmission oil filter (\$20, from their website) and perhaps a transmission fluid temperature gauge. If you want to mount the gauge on the pillar you can get a pod from the MVP website for about \$30. If you have a 960, I emphatically recommend you do all the above and watch your radiator and coolant like a hawk for any signs of contamination transmission oil particularly in you have the Volvo plastic radiator. But if you do the above, you should be OK as the transmission on the 960 is a Warner (Asia) unit closely related to the one in the Lexus. Be safe or you will be sorry.

960 With AW-30/40 Has Busy Shift: Electrical Glitches. [Inquiry:] I have a '92 960. The car has 95,000 miles. I have noticed that the car seems to shift frequently. The best way to describe it is that it is busy. It is more pronounced in traffic when there is a lot of stop and go. It seems as if it slipping in and out of

gear. I have had it at the dealer twice and they agree it is busy, but can not give me a reason. Any ideas?

[Response: Abe Crombie] The mileage on that car and the symptoms make it a candidate for a failing throttle position sensor. This can be monitored by their Volvo scan tool on a drive while it is overshifting. The transmission computer uses this signal read directly from TPS by Fuel computer which passes it on to trans computer. You could unplug the TPS (this will set code/turn on check eng light) and drive the car and see if it shifts less and holds gears better. There will be a default signal from ECM to TCM when the signal is missing.

[Inquiry: Similar Problem] '93 960 ran smooth and quiet before I brought it in for tranny service, and it still does. But since the servicing, the tranny searches around a bit at times. The tach indicator will jump forward and back, then forward again, and ther car lurches.

[Response: John O] Changing ATF will not make the trans act up unless someone put in the wrong fluid (like Ford Type F, not likely). What I've seen a couple of times with early 960s (especially '92s) was a corrosion (oxidation) problem affecting the large electrical harness connectors on the left, upper area of the transmission, seen from under the car and near the dipstick area. Remove the plugs from the bracket, unplug them and spray inside with electrical contact cleaner, let it dry then re-install with silicone dielectric grease smeared insided the wire connectors. I've seen this help a couple of our customers who previously experienced unusual trans problems and worth trying before condeming the trans itself.

[Tip from Tom Irwin] Those connectors can be hard to separate: use caution, they crack easily.

960 AW30-40 W/E Lights Flashing: Gear Position Sensor PNP Switch Replacement.

PNP Symptoms.

If both W and E are flashing and your UP arrow on the dashboard is on, the (in)famous PNP switch is the most likely cause of your symptoms. If you can read error codes, if the code is 313, it is the PNP switch. It is good to shift a couple of times from P to L and back to 'refresh' contact points in PNP. [Rafael Riverol] Usual failure mode is: the PNP switch fails on the highway, AT enters "limp home" mode (fourth gear in D and third L), ATF then overheats, orange arrow and E,S,W lights flash,and ATF smells burnt. OBDI reads missing or shorted PNP signal and overheated ATF. [Walt Poluszny] When it happens, use your left hand to turn the ignition key to the start (crank) position and hold it there. With your right hand, slowly move the shift lever forward and/or reward until the starter engages. If this works, your P/N sensor is out of adjustment or bad.

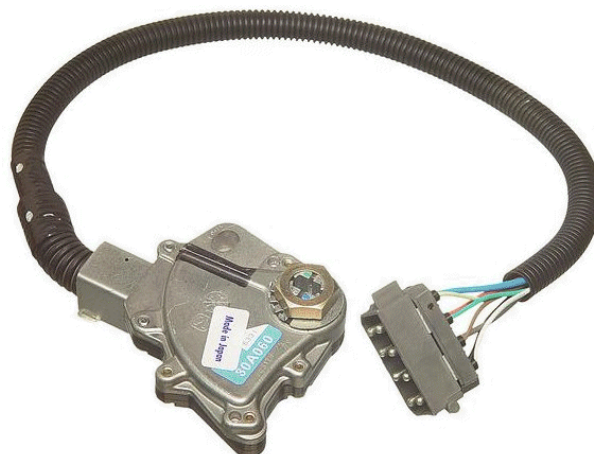
What Not to Do. [John Roberson] If your PNP switch is failing, try moving the shifter several times to reactivate the PNP and then restart the car. If it starts in first gear, not third, and shifts fine through all gears until stopping then you can drive the car. If it is still stuck in third **do not drive** as the tranny will heat up and

cause real problems.

PNP Diagnosis. Put the trans in PARK. Turn the key to #2. Step on the brake and attempt to shift out of Park. Does it happen? If so, your PNP is working.

PNP Description.

[Inquiry] Does anybody know where the starter inhibitor switch or neutral safety switch is located on the transmission for a 94 960 w/ automatic trans. Also tips on removing it would be much appreciated. I think it is sticking when cold. Starts OK on initial start up for the day, or when warm or hot, but when turned off when cold (anything less than 15 minutes) will not crank. Battery, alt., starter all check out. It seems the trans is not sending the signal to the ignition switch.



[Tips from B and Stan Sexton] The PNP or gear position sensor is located on the right side of the transmission case. It slips over the manual linkage shaft and bolts to the case. The wiring routs to the left side of the trans, where it is attached to a short metal rail toward the front of trans. The pigtails are long and the clips are released by squeezing with a needle nose plier from atop the trans pan lip.

Mine gave out at 48,000 miles. When it fails, you will have 3rd gear only and the check engine and tranny dash lights will go on. The switch R&R at a Volvo dealer runs between \$300 and \$400. I decided to buy the switch from Nils Sefelt Volvo in Houston on the Internet for \$110.00 plus \$8.00 shipping UPS instead, and do the labor myself.

[Tip from JohnG] DO NOT purchase an aftermarket (Scan Tech) switch. Spend the extra \$10-\$10 and get an OE one.... trust me.

PNP Replacement. [Procedure by Walt Poluszny/John Gislason]

Removing PNP Switch:

1. Do not undertake this until you have the replacement switch in hand: cleaning the old one will not work.
2. Raise the front of the car; jack stands are preferable.
3. Chock wheels and put transmission in Neutral.
4. Apply penetrating oil to the six (4 front, 2 rear) 14 mm exhaust pipe nuts.
5. If needed, remove three 10 mm bolts that hold on the O2 Sensor wiring to the trans. cross member.
6. Remove one 10 mm nut and three plastic wire retainers for O2 Sensors on frame above Cat. Conv.
7. Loosen all six 14mm exhaust nuts, drop the rear of the pipe. Remove 3 of the 4 front 14 mm nuts so that 1 nut is still holding the pipes up. Pipe should swing from side to side to make clearance to the PNP switch. [Editor] Plan on rusted nuts which may have to be cut off.
8. If needed, remove two 10 mm nuts and fender washers holding heat shield

above Cat. Conv. on

9. If needed, disconnect 17 mm trans. cooler return line on transmission. This line is usually installed very tight and dry. I suggest buying a very good quality flare nut wrench and soaking it 4-6 times overnight with PBlaster or a penetrating oil. Use two wrenches, one on the fitting itself and the other on the nut. You will have to give it a whack to pop it loose then apply teflon tape to the threads when you re-install. [James Steven] This step may not be needed. I was able to remove and replace the switch with the exhaust and cooling line in place; putting the gearshift in neutral permitted rotation of the switch housing until it cleared the cooling line.
10. Allow trans fluid to drain from fitting before continuing (approx. 1.5 quarts). Drains slowly, will take about 1/2 hour.
11. Remove 12mm bolt from top of PNP switch. Caution : it is easy to round this nut. It has a small head and is soft. Use a six point socket and take it slow.
12. Pry 4 metal retaining fingers away from 22 mm nut on PNP Switch shaft.
13. Remove 22 mm nut on PNP switch.
14. Evenly pull PNP switch off trans shaft.
15. Cut cable tie above PNP switch on the wiring harness.
16. Clip the remaining three cable ties and loosen the metal retainer on the drivers side of the transmission holding the PNP switch wiring harness
17. The PNP Switch wiring harness is the middle of three wiring connectors attached to the front of the transmission on the driver's side.
18. Slide the middle connector approx. 3/8 inch forward. This will release the connector from the mounting bracket making it easier to separate the two ends.
19. Grip the connectors with both hands ensuring you are squeezing the clips on each side of the connector to release it while pulling the two pieces apart. They are in very tight and will require some force to separate. I had to spray the connector with penentrant to help loosen it.
20. You can now pull the PNP switch out from either side of the transmission.

Installing the New PNP Switch:

1. Install new PNP Switch over the slotted trans shaft and feed wiring harness over the top of the trans to the driver's side.
2. Optional) Add a rubber (neoprene) washer to the 12 mm bolt between the PNP switch and the washer so that the bolt won't have to be installed too tight and the switch won't rotate after adjustment. The bolt is soft and has a small head and can easily be stripped so be careful.
3. Add a drop of blue (medium strength) lock-tite to the end of this 12 mm bolt before installing and securing the PNP switch. The top bolt is very challenging to start into the hole since the space is too small for one's hand. Use tape to hold the bolt on an extension.
4. Install securing washer with 4 small fingers over the slotted shaft and secure with 22 mm nut. Torque to 5 ft. lbs., then bend the fingers over the nut so it can't back off.
5. Adjust PNP switch in one of three ways in order of preference:
 1. Use tool 9995475 and align PNP switch such that the fine line is visible thru the slot in the tool. Then tighten 12mm bolt (torque unknown, but it does not need to be too tight because of the rubber washer).
 2. Turn ignition on (do not start), put Transmission in Reverse and rotate

the PNP switch until the backup lights come on. Rotate switch until the back up lights go back out and center the switch. Then tighten 12mm bolt (torque unknown, but it does not need to be too tight because of the rubber washer).

3. Line up PNP switch such that the indicator line on the switch is vertical and parallel with the slotted trans. shaft (with the trans. In Neutral). Then tighten 12mm bolt (torque unknown, but it does not need to be too tight because of the rubber washer).
6. 6. Add a new wire tie above the PNP switch replacing the one removed earlier. (optional)
7. Reconnect trans. Cooler return line.
8. Install Cat. Conv. heat shield with two 10 mm nuts and fender washers
9. Reconnect exhaust pipes, torque 14 mm flange bolts to 30 ft. lbs, and bolts at the rear of the cat. To 18 ft.lbs.
10. Re-attach one 10 mm nut and three plastic wire retainers for the O2 sensors to the chassis.
11. Re-attach the three 10 mm bolts holding the wiring harness for the O2 sensors to the transmission cross member
12. Plug the new connector to the wiring harness and slide the connector back onto the bracket.
13. Add new wire ties where appropriate to keep wires from chaffing, being sure the new wiring harness is in the metal clip as well.
14. Check all connections for leaks and/or chaffing.
15. Add new ATF fluid to makeup for amount lost. (approx. 1.5 quarts)
16. Start vehicle, check for exhaust and transmission fluid leaks.
17. Back car off of ramps or remove from stands and test drive the car thru all ranges L, 3, D, N, R, P.

An autopsy of the switch reveals it is really a very simple electrical contact switch but subject to moisture and salt contamination. There are numerous springs keeping electrical contact certain. After opening it up, it appears that on one side of the switch, the grease is yellow and looks new, on the middle and right side of the switch it is as black as carbon and a strange texture making me think the knife-slide contacts are arcing and burning the grease. This black 'stuff' finds it's way between the contacts causing a fault. I figure it will fail without warning and need replacing every 4 years.. After replacing the switch, you can reset the tranny light by pulling out fuse # 14 (if I remember right: the drivetrain diagnostics fuse.) The check engine light takes a mechanic with a scan tool to reset. Go to an independent Volvo place and pay him to do it (another \$32.00).

Alternative PNP Technique. [Ladson Geddings] This is the second time I have replaced the PNP switch in my 960 and I decided to try something a little different to remove the switch. This time I removed the switch in about an hour and most of that time was spent thinking about it and setting up for the job. Jack up the front of the car and secure the front wheels on a set of ramps by setting the parking brake and chocking the back wheels.

Removal: Put the car in "N" and with a 4 inch grinder fitted with a cutoff wheel, or similar tool, remove the exposed part of the switch shaft flush with the installed switch shaft nut. Remove the two nuts, disconnect the connector, remove the wire ties and slip the switch off the shaft and off the car.

Install:

1. Dress the switch shaft with a file to remove the burrs; install the new switch, wiring, connector and tighten the shaft nut just enough to feel it tightly snug to the switch shaft...don't over do it; bend the keeper washer to hold the nut; install the other small bolt and tighten it enough to hold the switch to the body of the transmission. You will be tightening it down later. The top bolt is very challenging to start into the hole since the space is too small for one's hand. Use tape to hold the bolt on an extension.
2. Now place the car in PARK, and rotate the switch so the car will turn over the engine at that selection point...I used a screwdriver and tapped it lightly with a hammer to rotate the switch.

Check that the backup lights will turn on when the selector is in "R" and the car will turn over the engine in "N." Keep rotating the switch by tapping it easily until all three conditions are met, i.e., the car will start in "P" and "N" and the backup lights will work in "R;" tighten down the small bolt and re-check the operation of the selector one last time.

Notes. In my opinion this is way too sensitive a switch and is too difficult to adjust for this application. I believe the cause of the switch failure is it's close proximity to the exhaust system, without an aluminum deflector to reflect the heat; over time the switch is heat soaked many times and it fails. By the way the brand of my replacement switch is Scan Tech and it works fine at a much lesser price.

PNP Preventive Maintenance? [Rafael Riverol] To avoid such headaches and AT replacements at a cost of several thousand dollars, perhaps maintenance should include PNP overhaul (cleaning the inside electrical parts and regreasing, and perhaps replacing the wire loom or patching it with electrical tape if frayed) when we flush ATF every two or three years. I found I did not have to touch exhaust pipe or ATF line to get to the PNP switch. So it can be overhauled with little trouble, particularly if the car is on a lift, and expense. This would be a good time to clean and repack with dielectric grease AT electrical connectors on the driver side of AT by ATF filler tube.

960/90 Shift Indicator Bulb Replacement. [Peter Penguin] -- Depending on the year, the AW 30 gear shift lever light can be easy or extremely hard to replace. the 1995 (and possibly 1994) have the light bulb mounted in a small square plastic holder (about 1/4 inch square) with two wires about 24 inches long. The bulb is not replaceable by itself (the entire set up is about 20 dollars). There is no discussion in the factory manual how to replace it (or even where the wires go). It is a real pain -This is what you have to do:

- Remove every thing from around the shift unit (this includes both side panels, all of the plastic housings, the ash tray and the fuse unit). See [above](#) for tips. Do not try to take apart the shift unit itself.
- Look at the drivers side of the shift unit and you will see two wires (white and yellow) going into the lower part of the middle of the drivers side of the shift unit. pull those wires straight down and the plastic housing and bulb will pop out. The wires themselves loop beneath the fuse unit, then along the

passenger side of the shift unit, then beneath the passenger floor mat.

- You will have to have a narrow snake about 12 inches long to feed the wires beneath a heating duct in the left side of the passenger floor (very tight clearance). The connector is on the left side of the passenger compartment about ankle height (below the carpet). Once you find it, it is easy to replace the wires in the housing.
- Feed the new wires back into place.
- Now comes the fun part. The new bulb housing just snugly fits into a square hole at the bottom of the left side of the shift unit. If you use a mirror you can see it. You have to get it just right (it takes time) and it is a very awkward hand position - but you can do it.
- Now put everything back together. I suppose you could cut the wire just below the fuse unit and splice in the new wires. The bulb is friction welded to the connectors in the plastic housing. I have not yet figured out how to replace just the bulb. I decided to tackle this myself late last year.

960 AW30-40 Converter Locks Up and Does Not Disengage Correctly.

[Symptom] My 1992 960 shudders when the transmission locks up. Most times it works fine except for repeated locking and unlocking in slow traffic. Occasionally when trying to stop the converter is reluctant to unlock and the whole car shudders until it drops to 500 rpm when it finally unlocks. [Response: AreJohn] See DCS43-02-1194 Sticking Lock-Up Solenoid, AW 30-40 960 1992, which describes your problem to a tee. Fix is to replace the lock-up solenoid and is a common problem. The part lists for about \$250.

960 AW30-40 Torque Converter Module Fried. [Tip from Jim Bowers] The TCM, which governs torque converter lockup, in the AW3-40 can fry through the wrong voltages leaking into the module. A common way for this to happen is for the ground connections to get bad. This allows kick-backs from actuating coils etc. to get by snubber/protective circuits. Do the things that [ensure the grounds stay good!](#) Always disconnect the battery, or otherwise ensure the circuits are unpowered, before plugging or unplugging connectors in the system.

On-Board Diagnostic Codes for AW-30-40 Series Automatic Transmissions.

[Tips from Tom Irwin]

These electronically-controlled transmissions also contain a diagnostic code series that you can access easily from the engine DLC module (the same one as used for the ignition and fuel injection codes.) Note that this Mode 1 procedure for code retrieval works only for OBD-I (pre-1996) 960 cars.

1. Open DLC, (Diagnostic Link Connector) insert Test lead into hole #1.
2. KEY IN position 2, engine NOT running.
3. Push and hold DLC button for >1second, but, <3 seconds and release. (have your pen and paper ready)
4. Codes are three digits, separated by pauses, so a 314 would look like: -*-*-*-* (pause) -*-* (pause) -*-*-*-*
5. After a longer pause, additional codes will be given, when you see the first code again...you have returned to the starting point
6. Code 1-1-1 means all Clear, no codes set.

7. To erase codes, all codes must have been read off at least once, then press and hold the button for >5sec. release, wait for LED to light, then hold button for >5 sec again. And you are cleared.

There is also a self-test mode 3 you can enter which is a two man job. One enters the code through the DLC and the other guy is under the car feeling for each solenoid and other device to activate in sequence. Then, you can run through all the gear positions and modes and the DLC will respond with a code that shows the input was good or not. Good for isolating bad components.

Diagnostic Trouble Code Table for AW 30/40 Series Transmissions: Mode 1

1-1-1	No faults found by onboard diagnostic (OBD) system
1-1-2	Solenoid S1 short-circuit to battery voltage
1-1-3	Transmission control module (TCM) fault
1-1-4	Program selector open-circuit or short-circuit to ground
1-2-1	Solenoid S1 short-circuit to ground or control module fault
1-2-2	Solenoid S1 open-circuit
1-2-3	Solenoid STH short-circuit to battery voltage
1-2-4	Mode selector faulty or short-circuit to ground
1-3-1	Solenoid STH open-circuit, short-circuit to ground, or control module fault
1-3-2	Transmission control module (TCM) fault
1-4-1	Faulty load signal from ignition control module (ICM)
1-4-2	Oil temperature sensor short-circuit to ground
1-4-3	Oil temperature sensor circuit, open circuit
2-1-1	Transmission control module (TCM) fault

2-1-2	Short-circuit to battery voltage in solenoid S2 circuit
2-1-3	Throttle position signal too high
2-2-1	Short-circuit to ground in solenoid S2 circuit or control module fault
2-2-2	Solenoid S2 open-circuit
2-2-3	Throttle position sensor signal too low
2-3-1	Throttle position sensor signal sporadic
2-3-2	Speedometer signal missing
2-3-3	Incorrect speedometer signal
2-3-5	High oil temperature
2-4-5	Break or short-circuit in torque-limiting signal circuit
3-1-1	RPM signal from transmission missing
3-1-2	RPM signal from transmission faulty
3-1-3	FAulty signal from gear position sensor
3-2-1	Shift time too long
3-2-2	Incorrect gear ratio
3-2-3	Lock-up slips or is not engaged
3-3-1	Short-circuit to battery voltage in solenoid SL circuit
3-3-2	Solenoid SL open-circuit or control module fault
3-3-3	Short-circuit to ground in solenoid SL circuit or control module fault



Transmission Removal. See the [FAQ section](#) for AW-70, which is similar to that for the AW-30.

[Volvo Maintenance FAQ for 7xx/9xx/90 Cars](#)
