

E32 Valve Body Rebuild
By Gerald Potter
Revised April 15, 2004

Below I will describe the steps involved in removing and rebuilding the Transmission Valve Body of an e32, 93 740iL BMW. Kirt Koeller of Auto Sports Unlimited basically guided me through this entire process. I would not have been able to do this successfully without his help.

For those who don't have the time and aren't as cheap as I am, two other options exist. The first option once you remove the valve body is to ship it off to Auto Sports Unlimited and have them perform the rebuild, then you reinstall. The second option is to buy a replacement Valve Body already rebuilt and send your core in. Kirt can answer specific questions regarding these two options.

I decided to tackle this job for the learning experience and because I wanted to save some money.

I initially started documenting this procedure in case it had to be done again. The steps I performed in the rebuild are described within this document.

Supplies

- 1) 12 qt catch pan
- 2) Oil Dry
- 3) Lots of rags or shop towels
- 4) Bottle jack
- 5) Jack stands
- 6) Floor jack or ramps
- 7) 13 liters of transmission fluid BMW part # LA 2634
- 8) Rebuild kit including all springs, o-rings, check balls, orifices, and gaskets (Channel Body and Transmission Pan)
- 9) Can of spray brake cleaner
- 10) Vaseline
- 11) Envelopes

Tools

- 1) #27 Torx head socket
- 2) Ratchet
- 3) 13mm socket (for speed sensor bolt)
- 4) air ratchet (optional)
- 5) 14mm hex head key for oil drain plug
- 6) 17mm hex head key for oil fill plug
- 7) Torque wrench 20 -100 in-lbs
- 8) Torque wrench 20 -200 ft-lbs
- 9) Fluid transfer pump with 6-8' of tubing
- 10) Vice or a second set of hands

Procedure

Get the car up on either ramps or jack stands. If using ramps, make sure the hand brake is applied, the wheels chocked, and the car is firm and secure. As a safety precaution, I disconnected my battery as there will be a wiring harness loosened and connections hanging loose. Since all of your work will be under the car looking upward, it is also a good idea to wear safety glasses. Sand, dirt, and grit could easily fall down into your eye while working.

You're now ready to get going. First loosen the 17mm fill plug. You want to verify that some previous mechanic did not over tighten or strip this plug BEFORE you drain anything. Otherwise, you may find yourself using a tow service because you can't get fluid back into the pan.

I then removed the 14mm hex plug and drained the transmission fluid. The exhaust pipes are close to the drain plug so it helps if the hex key is shortened to about 1 ½ inch to clear the exhaust. You can take the key to a machine shop and have it cut to reduce the length. Removing as much fluid as possible through the drain plug reduces the amount that will still be left when the pan is loosened. Reinstall the drain plug so it does not get misplaced. Re-torque it to 34 ft-lbs.

Place a piece of wood on top of the bottle jack. Locate it at the center of the pan and raise it until it just supports the pan. No car weight should be supported by this bottle jack. It just needs to barely touch the pan.

Make sure the heads of the torx head screws that secure the pan are clean and free from dirt so they don't get stripped upon loosening. If necessary, clean the heads with a sharp pointed object. Loosen all twenty-four (24) #27 torx screws slightly. I did this by hand using a ratchet. I like to start them by hand to lessen the chance that one gets stripped. After all are started, you can use the air ratchet to remove them from the pan. The air ratchet will save considerable arm work during this step. Leave the four screws at the front of the pan in place, loosened only about 3/8" to allow the pan to rotate down somewhat. You will be lowering the pan down from the rear to drain any remaining fluid. Alternate removing the remaining screws until only one remains along each side and at the back, in addition to the four you left in place at the front. Place all the screws in an envelope and label it as "Transmission Pan Screws". I find using the envelopes to keep up with small screws and parts invaluable when the time comes to reassemble. If you like, you can also take digital pictures at any point when you think you may forget how the components are assembled.

At this point, fluid will start seeping from the pan so quickly remove the remaining side screws and those at the back. With your Oil Catch Pan located near the back of the transmission pan, hold the sump pan in place with one hand and loosen the bottle jack. Lower the pan until the fluid starts to free drain. I left the bottle jack in place to provide some support for the pan so it's not all on the front screws. The longer you can let this

drain, the less mess you will have when you finally remove the pan. I let mine drain about 3 hours (and there was still a mess).

Once the dripping has slowed, raise the pan back into place and again hold it there using the bottle jack. Remove the remaining four screws. Balancing the pan with one hand, lower the bottle jack and move it out of the way. Bring the pan down as level as possible so the parts sitting on the bottom of the pan stay in place. If they shift, it is not a major problem and can be put back in place. However, it helps to see how they are mounted if you're doing this for the first time. Remove the sump pan from under the car and move the Oil Catch Pan under the transmission to catch any oil continuing to drip.

There is a donut magnet in the bottom of the pan that sits under the plastic expansion tank. Remove the expansion tank and check the magnet for any metallic debris that could indicate potential trouble with the internal metallic parts. Clean the donut so it's free from sludge and reinstall it under the expansion tank. Also clean the inside of the pan at this point. Set the assembly aside in a plastic garbage bag to keep dust out in case you decide to stretch this repair out over time. Illustration 1 shows the pan removed. The black plastic part is the expansion tank. The donut magnet is visible under the right front three support leg.

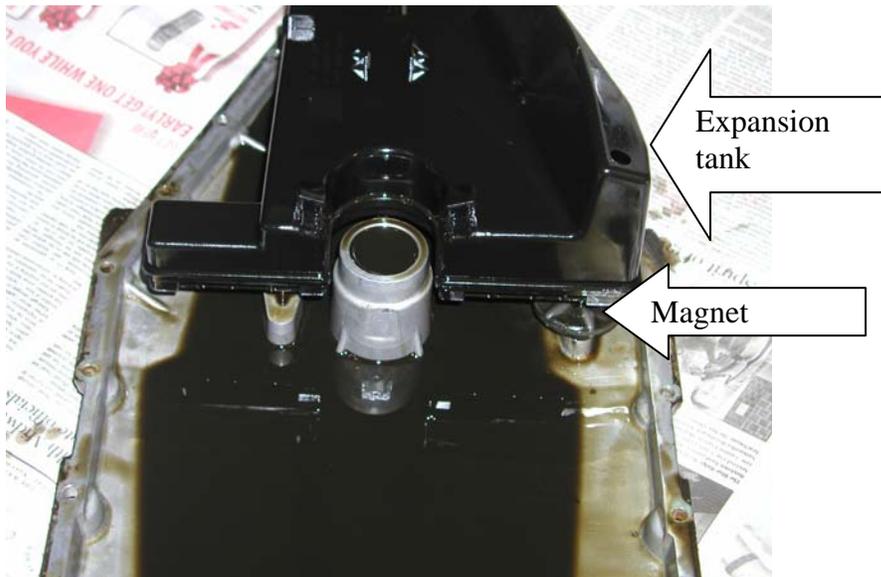


ILLUSTRATION 1

Now that the transmission sump pan is removed, you can turn your attention to removing the Valve Body from the transmission. If you look up into the transmission, you will see Housing 1 and 2 of the valve body. Housing 3 is on the top of 2 and out of sight at this point. Housing 1 is the closest to the front of the car. Before removing any screws from the valve body, you'll first need to disconnect anything that could prevent it from moving freely. Two cables need to be disconnected. First disconnect the bayonet type cable connector located on the passenger side of the transmission body. Remove the C-clamp that holds it in place then rotate the bayonet connector so that the cable hangs freely. The C-clamp is located on the outside of the transmission body housing. Push the connector

back inside the transmission body so it hangs freely. Note that there are two sealing O-rings on this connector that are replaced as part of the rebuild.

The second cable that needs to be freed is the speed sensor located at the back of the transmission housing. It is inserted straight up and comes out freely once the 13mm hold down bolt is removed. Remove this bolt allowing the speed sensor to come free. Put the bolt back in place by hand so it doesn't get misplaced.

Before you can access the screws holding the valve body to the transmission, you must first remove the fluid filter. It is held to the valve body by two #27 torx head screws. There is also an o-ring that fits around the neck on top of the filter. This presses up into the valve body. You should get a new filter, o-ring, and screws with the rebuild kit. The filter is the tan colored plastic part shown in Illustration 2. Don't worry about all the wires and solenoids shown in the picture. They are attached to the valve body, not the filter, and do not have to be touched during the rebuild. At this point, remove the filter.



ILLUSTRATION 2

Before removing the valve body, make sure you have a flat clean surface on which to work. There are many small parts that can easily be lost or mixed with the old parts.

Read all instructions that come with the valve rebuild kit. Most importantly, inventory all the parts. They should be separated into four piles; 1) Housing 1 parts, 2) Housing 2 Parts, 3) Housing 3 parts, 4) Channel Body parts. Each part is in a separately numbered bag. However, if the same type spring is used for Housing 1 and 2, both will be in one bag. Once you use the first part, place the remaining part where it will be needed later.

There are some parts in the kit that will not be needed. You will need to locate the Valve Body number stamped on Housing 2. The first three numbers stamped indicate the Valve Body type. Some of the parts will refer you to look at the valve body number to determine exactly which part in the kit is applicable. One such part is the Channel Body Gasket. There are two gaskets in the kit, however, only the one applicable to your Valve Body number is used.

At this point, the valve body can be removed. Don't worry about the shifter connector. It slips down past it freely. Note, there will most likely be some resistance even after all the hold down bolts in the valve body are removed because there are two risers with O-rings that tend to hold it in place. You'll see what I mean once the valve body is out, or for now, look at Illustration 3.

There are 12 #27 torx head screws that hold the valve body to the transmission. These screws have a larger, flatter shaped head than the other screws that are also visible on the valve body. There are ten screws in Housing 1 and two screws in Housing 2. Locate the 12 flat head screws you will be removing. Don't worry if you accidentally remove one or two of the wrong screws. There are plenty others to hold the valve body in place. See Illustration 2 to see how the valve body looks in place in the transmission. Loosen the torx screws by hand then use the air ratchet to remove completely. I left one screw in the center of Housing 1 and one in Housing 2 to hold the valve body until I was ready for it to come down. At this point I checked the screws I had removed to make sure they were all large flat head. If you leave one of these screws in place, the valve body will not drop down. Make sure you place these screws in an envelope and label as "Valve Body Hold Screws".

Make one final check to insure all connected cables are hanging freely. Remove the last large head screw from Housing 2. Next remove the last large head screw from Housing 1, holding the valve body in place with your hand just in case it drops down. It most likely will remain in place by the two o-rings, but since it weighs about 8 lbs, you don't want it to drop down on you. You're now ready to remove the valve body. Gently wiggle it back and forth. You'll need to overcome the friction resistance of the two o-rings that are inserted up into the transmission main body from the Valve body. Have some newspaper available and set the valve body aside once it drops down. Drop the valve body straight down so as not to damage the speed sensor that is mounted on top.

See Illustration 3 to see the valve body removed from the transmission. You'll notice that the bayonet electrical connector and rear speed sensor remain attached to the valve body by insulated cables. These will remain as they are. At the center of the valve body sticking up is the second speed sensor mentioned earlier. It will be loosened and removed later during rebuild.

Clean the extra fluid off the outside of the Valve Body using Brake Cleaner. Use the paper towels to dry in off. I found it easier to handle the assembly with the unit somewhat dry and free of fluid.

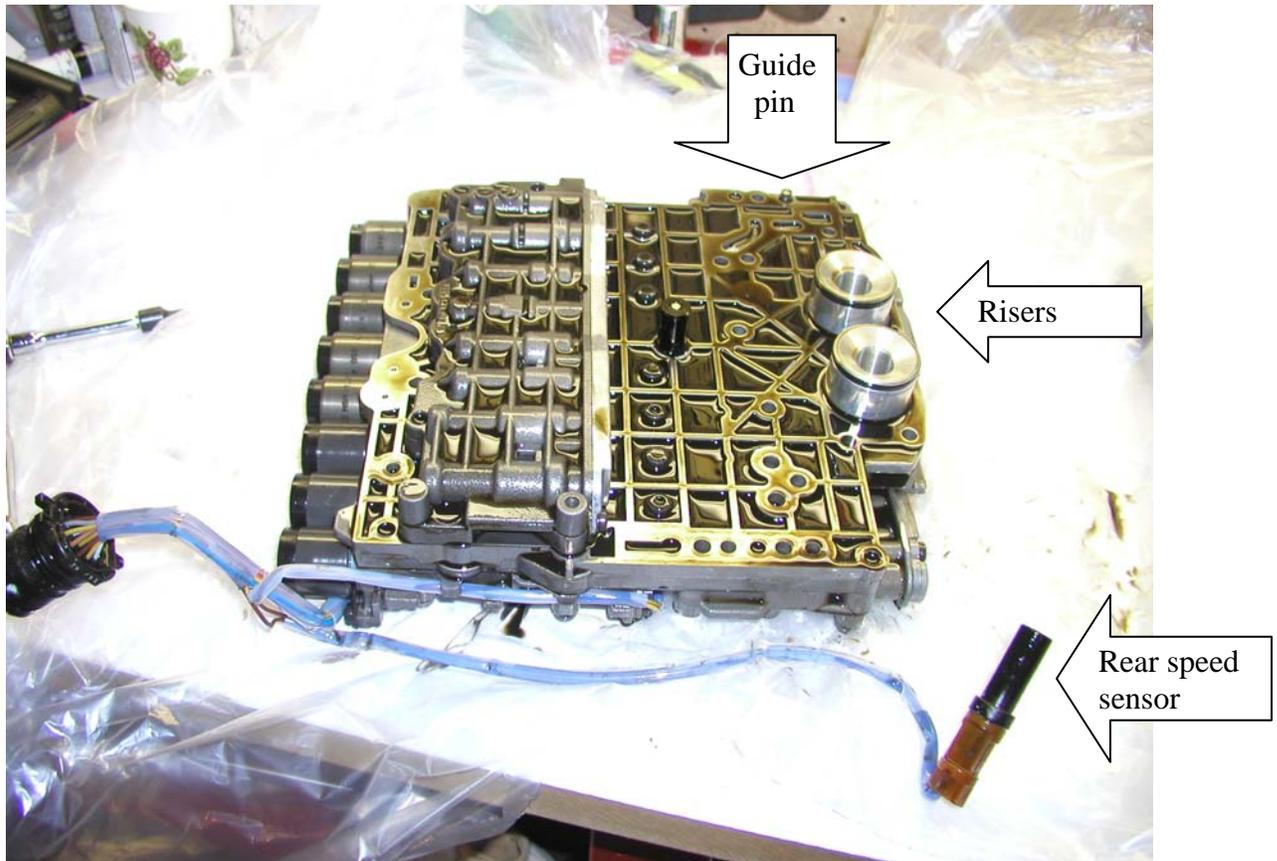


ILLUSTRATION 3

This is a good point to take a break. I covered the unit with a piece of plastic to keep any dust from accumulating on it and stopped for the day. For you masochists, you can keep going.

You are now ready to rebuild the internals on the valve body. You will need to separate the Housings. Housing 1 is the unit with the speed sensor and the stacks for fluid suction and discharge. Notice in the upper right portion of the picture on the valve body, there is a metal pin sticking up. This guide pin must be in place on reassembly. I did not do this, but now would be a good time to measure how far this pin sticks up from the valve body. If you reassemble it with the pin too high, it will bottom out in the transmission on re-installation, keeping the valve body from going up as far as it should. Make sure this pin is at the same height or slightly less when you reassemble.

Turn the unit over so you have access to all the screws holding the housings together and to the screws securing the speed sensor. Remove the screws and bracket securing the speed sensor. They are the two screws near the center of the housing shown in Illustration 4. Place these parts in an envelope and label as "Housing 1 Speed Sensor screws". Loosen the blue plastic cables from the brackets securing them to the housing

and move them out of the way. See Illustration 4 and 5. At this time, remove all the screws holding Housing 1 to the assembly.

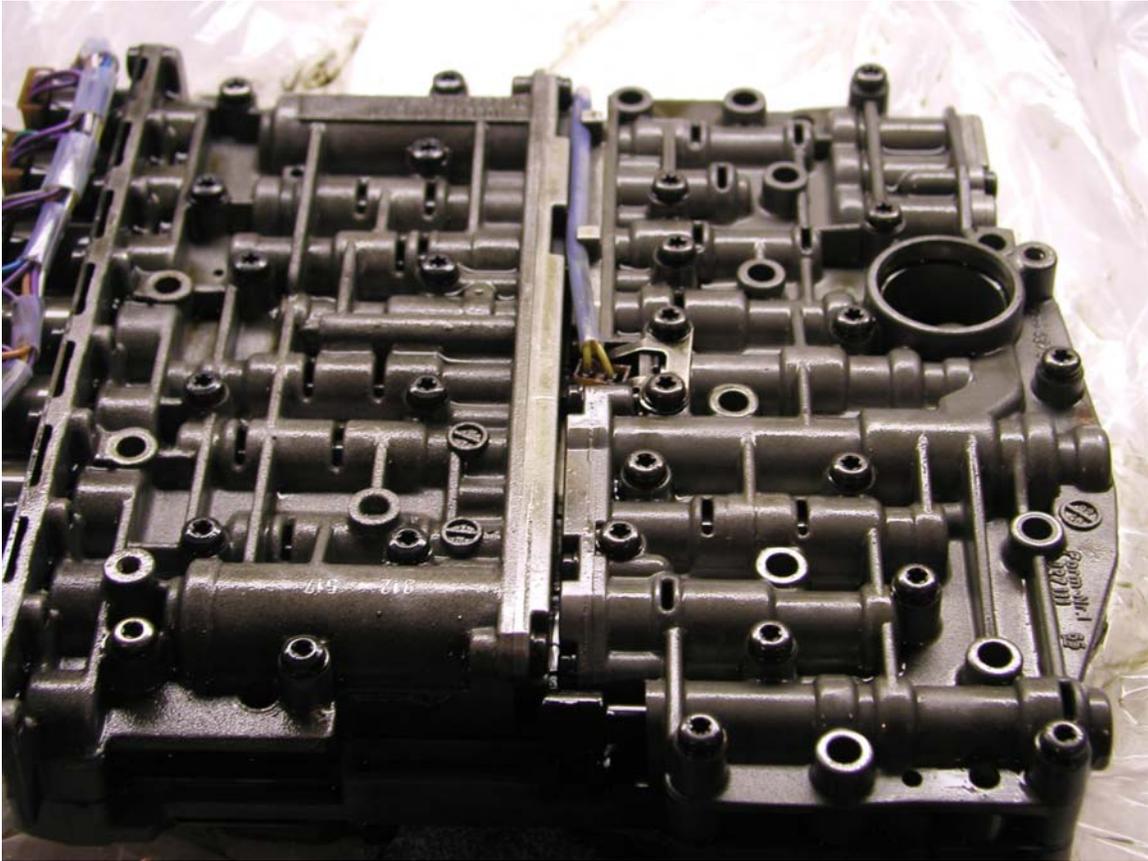


ILLUSTRATION 4

Illustration 4 also clearly shows where the valve body hold-down screws were located (large diameter holes). This picture should aid you in locating them in advance.



ILLUSTRATION 5

Illustration 6 shows Housing one completely removed and flipped back off of the Channel Body.



ILLUSTRATION 6

Using the spray brake cleaner, clean the channels on the back of Housing 1. Dry the unit off.

Illustration 7 shows Housing 1 on its side ready to have the end screws and covers removed. There are nine screws that keep all the valve trims and springs in place. Loosen all the screws but leave one in on each end of both covers. This will keep the tensioned springs from going all over your garage. Remove the screws on each end while holding the cover on, loosen the last screw and slowly release the tension. Place all these screws in an envelope marked “In Progress”, but don’t seal the envelope. This is just to keep up with them.

Lay the housing down flat in the same orientation as shown on the instructions that come with the rebuild kit. Proceed to replace all the parts called for in the instructions. Pay attention to the shift lever valve on the upper left side of the Housing in Illustration 7. It will be replaced, however, this is the part that the mechanical shift mechanism connects to in the transmission and **MUST BE ALIGNED** with the shifter as the valve body is

pressed back up into the transmission. Once you have replaced all the parts, make sure none are sticking (press down on the valve trim pieces and make sure they move freely in the cylinders. I found one of my old pieces completely stuck in Housing 1 and I got it to move freely after exercising it several times before installing the new part. Hopefully at this point, you have a vice on your workbench. If you don't, it will help to have a second set of hands as you use the cover to compress all the parts back down into the Housing. Uniform application of pressure will make sure all parts go straight down into the Housing and don't get pinched. Get at least two hold down screws in place (each end) before releasing pressure on the cover. Put the other screws in and hand tighten only. Make sure the cover is lined up then torque all screws down to 71 inch-lbs (8 N-M). Although the instructions say 51 in-lbs, Kirt recommends using 71 in-lbs and this is what I followed.

There are also three springs that must be replaced on the opposite end of Housing 1. This cover is much smaller, and the springs are under considerably less compression. Replace these parts and torque these screws back down to 71 in-lbs. Congratulations, Housing 1 is now complete and can now be set aside.

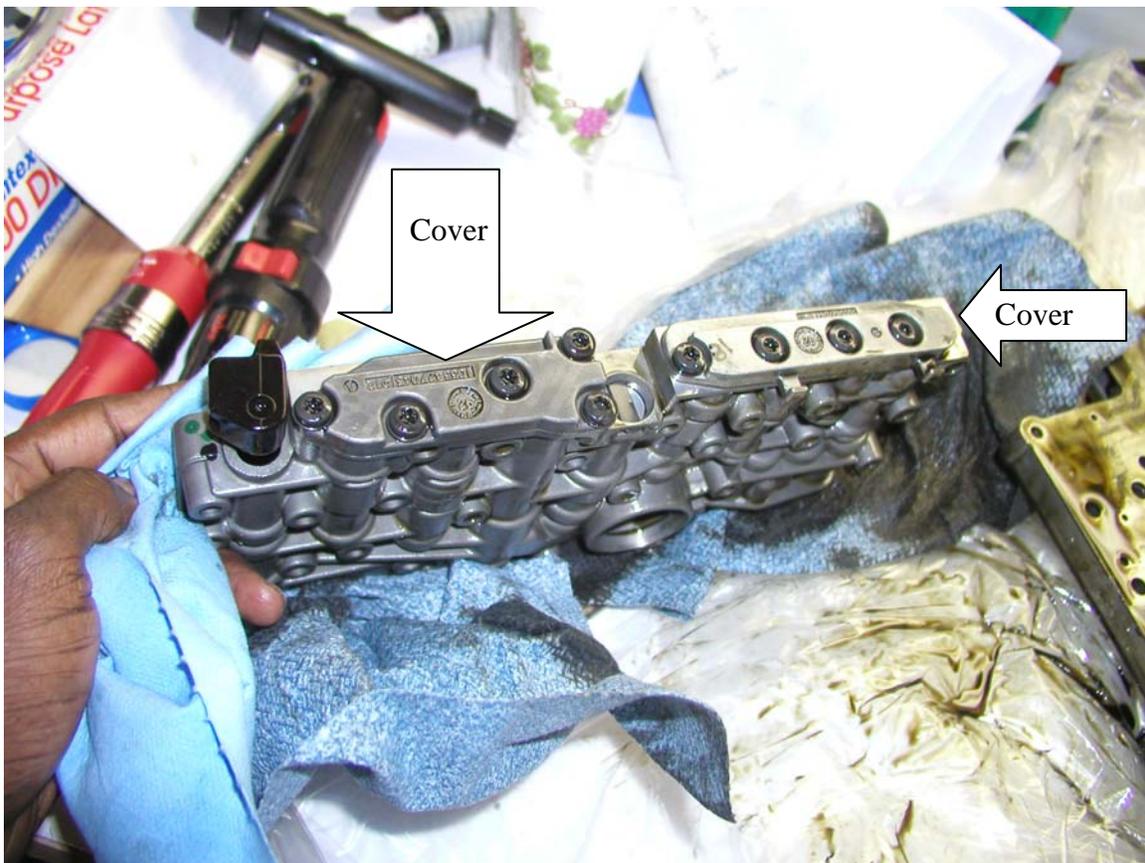


ILLUSTRATION 7

Proceed to remove Housing 2 from the Channel Body. Illustration 8 shows Housing 2 attached to the Channel Housing. Don't worry about the wiring and solenoids on the end; you will not be touching these parts, assuming your solenoids are good.

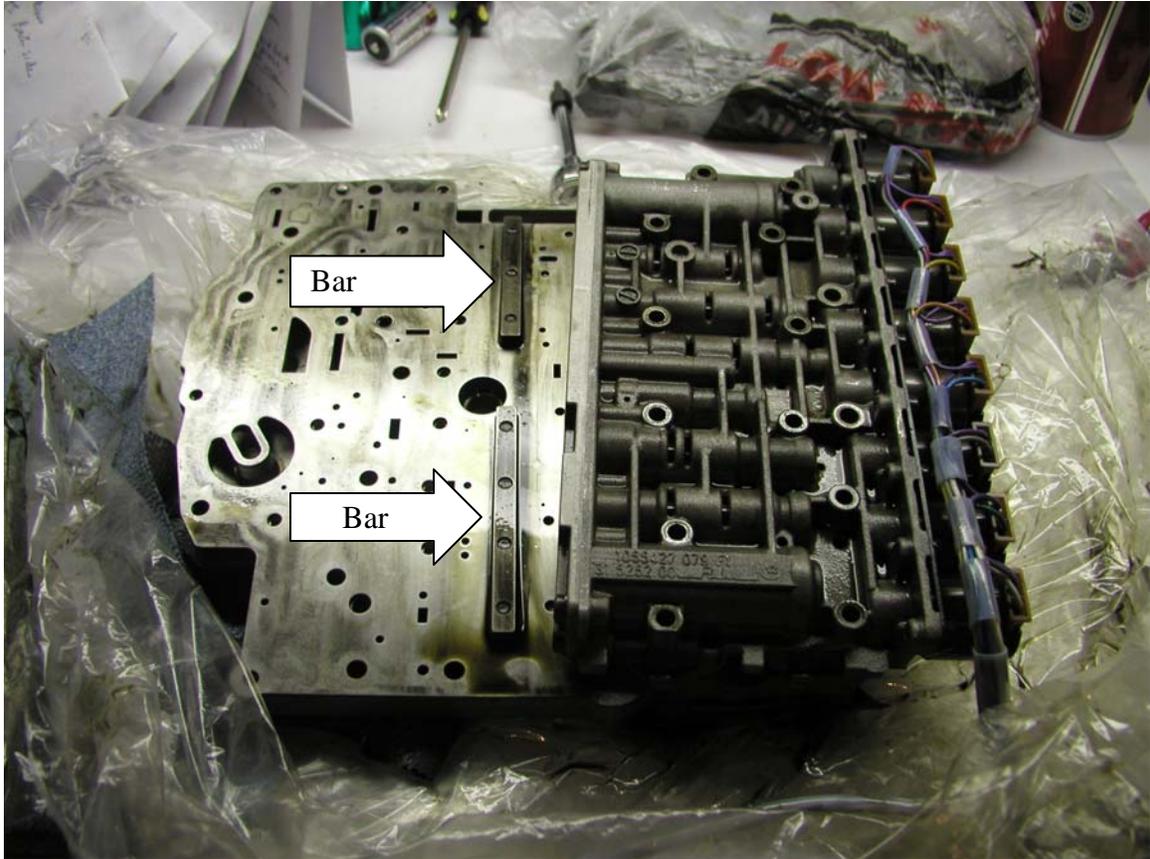


ILLUSTRATION 8

Illustration 9 shows Housing 2 loose from the Channel Housing and the end cover accessible. Note, Housing 3 is on the back side underneath the channel body, and is also loose at this point. The screws securing Housing 2 also hold Housing 3 in place.

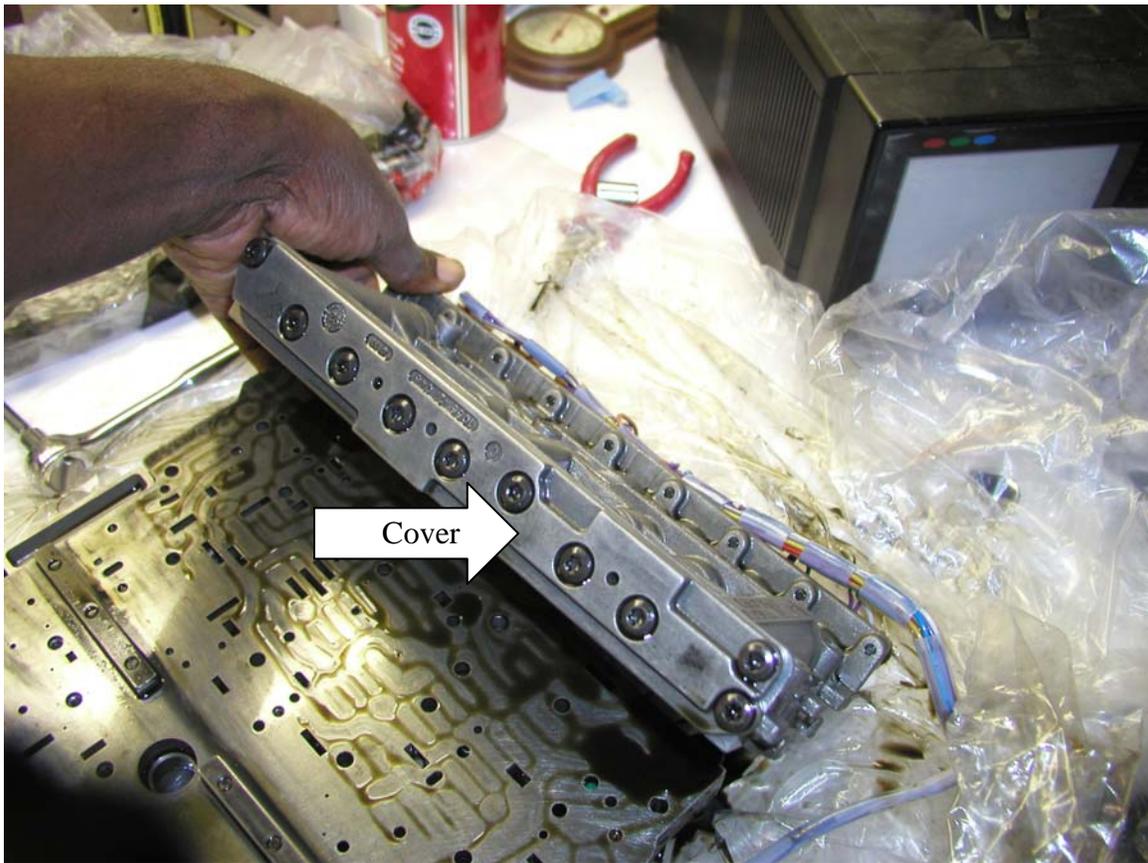


ILLUSTRATION 9

For Housing 2, repeat the procedure outlined above for Housing 1, again leaving one screw on each end and in the middle for last. Don't forget to clean Housing 2 using the spray can of brake cleaner. Replace the parts using the instructions supplied with the rebuild kit.

Set Housing 2 aside, flip the assembly over and proceed to rebuild Housing 3 following the above instructions for Housing 1 and 2.

Next, clean the fluid from the Channel body and proceed to separate it so you can access the gasket. Note that before you can access the gaskets and other parts, you must first remove the screws from the bars that are on the Channel Body. See Illustration 8 above. Illustration 10 shows the old gasket immediately after separation. Illustration 11 shows the new gasket in place. Remove any old gasket material that sticks to the Channel Body before installing the new gasket. Remember, the rebuild kit contains two separate gaskets. Make sure you select the one appropriate for the number on your Valve Body.



ILLUSTRATION 10



ILLUSTRATION 11

At this point, you are ready to replace all the small restriction orifices, check balls and filter in the Channel Body. Following the instructions that come with the kit, replace these parts. Kirt suggested I use a dab of Vaseline to hold the orifices in place. This was valuable advice during reassembly. Without it, they tend to fall out. The Vaseline will simply melt and be absorbed into the fluid once it's up to temperature.

You are now ready to reassemble the Valve body. Start by lining up all the parts of the Channel body so the gasket is seated properly. Assemble the two bars back to the Channel Body to hold it in place. Only hand tighten the screws at this point. Line up Housing 2 and 3 and install the screws that hold it in place. Again hand tighten.

Install Housing 1 back on the unit by hand tightening the screws. At this point, make sure that the guide pin is installed straight and no higher than originally installed. Once you are sure everything is lined up, torque all screws down to 71 in-lbs. Double check that all screws are torqued. Reinstall the speed sensor using the hold down bracket and screws.

You now need to replace the old O-rings. Remove the two risers from Housing 1. An o-ring is on each end. Only one is visible. See Illustration 3 above. Wiggle each riser and pull it straight out. Remove the old o-rings from each end. The risers are symmetrical so it does not matter which end goes into the housing. If there is not an o-ring on the end,

that means it remained in the transmission body. You'll need to get back under the car and remove it. Wet each new o-ring using some of the transmission fluid and install them on each riser.

Also, replace the o-rings on the bayonet fitting of the electrical connector at this time. Snap the blue insulated electrical wiring back in place as shown in Illustration 4 and 5.

This is a good point to take a break. The rebuild effort is now complete. Since I was not in a huge hurry, I rested and did not start re-installation until the next day.

First get the envelope that contains the hold down screws for the valve body. You need to get at least one of the central screws in place to relieve the weight from your arms. The valve body goes straight up into the transmission. Make sure the two fluid stacks on Housing 1 line up with the holes in the transmission. **VERY IMPORTANT:** make sure the shifter lever in Housing 1 lines up and engages the metal connector in the transmission as you push the valve body up. If you have it lined up correctly, everything, including the guide pin will fit correctly. Install one of the hold down screws to secure the unit. Proceed to install the remaining 11 hold down screws and hand tighten. Go back and torque all 12 screws to 71 in-lbs.

Next reinstall the rear speed sensor and secure the electrical cables back under the hold downs. Torque this bolt to 96 inch-lbs. Insert the bayonet electrical connector back through the transmission body and reconnect. Re-install the C-clamp that holds it in place.

Next, remove the new fluid filter from the rebuild kit. Install the supplied o-ring on the lip and insert it up into the Valve Body. Use the two new screws to attach the filter to the Valve Body. Torque these two #27 torx screws to 71 in-lbs.

You're ready to reinstall the transmission pan. Make sure all the old gasket material is removed from the seating surfaces. Install the new gasket and make sure the holes line up. Install the pan starting with a hole on each side near the middle. Use the bottle jack again to help lift the transmission sump pan up and hold it in place. Make sure all the holes remain lined up and start installing the remaining screws. Hand tighten the screws until all are installed. Torque these screws to 84 in-lbs, alternating diagonally. Next, reconnect your battery.

You are now ready to pump transmission fluid back into the pan. The dealer sells the fluid in 5 liter containers at \$140 per container. If there is another source for the fluid, I could not find it. It took 3 containers although some remained after I finished. Although you could put some of the old fluid back in, it seems after all the work that's done and with a new filter installed, it only makes sense to put in fresh fluid. The fluid transfer pump I bought only screws on gallon size containers and the LA 2634 comes with an oversize opening. I transferred fluid into a clean one-gallon container, then, screwed the pump on. If you find a larger container with the correct opening to fit the pump, then use that instead.

Loosen the 17mm fill plug and insert the pump hose up and into the pan. Slightly bend the hose forward so the fluid doesn't spill back out and the hose is held in place. Pump

fluid into the pan until it just starts to overflow the fill hole. Now would be a good time to transfer more fluid into the gallon container. Since the entire system has drained, you will need to start the engine and let the system, including the torque converter refill. With the car running, continue pumping fluid into the pan until it again overflows. Replace the fill plug and tighten it slightly. We will torque it later after we add more fluid. At this point I got the car off the ramps, removed the chocks, checked that everything was clear and drove it a short distance. You can avoid the mistake I made in not putting enough fluid in initially. The steps mentioned in this paragraph are what I SHOULD have done. Instead, I drove it with not enough fluid and got a “TRANS PROG” alarm and it defaulted back into 4th gear. Anyway, following the above instructions will help you avoid this issue. The dealer recommends checking the level with the fluid temperature around 50 degree C. Although not exact, I drove it about ½ mile; just enough to start heating up the fluid. My goal was to get the fluid to temperature, then with the car running, make one final check of the fluid with the car as level as possible. Remember when I initially performed my fill, the car was on ramps. If you have your car level on jack stands or a lift, you merely need to run the car until the fluid is up to temperature then add more until it overflows. Since I used ramps, I drove it back into the garage, lifted it from one side, inserted the fill hose then lowered the car back onto its wheels. I then topped off the fluid and reinstalled the fill plug and tightened it to 72 ft-lbs.

Well, this completes the project. You now just need to verify you have no leaks and test drive the car. As for my BMW, it has never shifted smoother. My problem of the transmission not going into reverse and of hard shifts when going from Drive to Fourth are a thing of the past.

As an addendum to this write-up, I've added this final section that shows what some of the components that must be replaced during the rebuild effort look like. In Illustration 7 and 8 above, the individual cylinders that comprise each housing are clearly visible. Within these cylinders, you will find the multiple springs and fluid throttling components that are shown in Illustration 12.

Within the channel body in Illustration 11, you will find the components shown in Illustration 13 below. This includes a small screen filter, small restriction orifices, and the infamous check ball that usually is the cause of this entire effort. The o-rings shown in Illustration 12 go on the risers that connect the valve body to the transmission housing. The good thing about the entire kit is that similar components are each shipped in separate baggies with both part number and position number labels attached. See Illustration 12. The position numbers relate to the instruction set that come with the rebuild kit and clearly show where in the valve body each component goes. This setup makes locating the correct part for replacement a simple process.



ILLUSTRATION 12

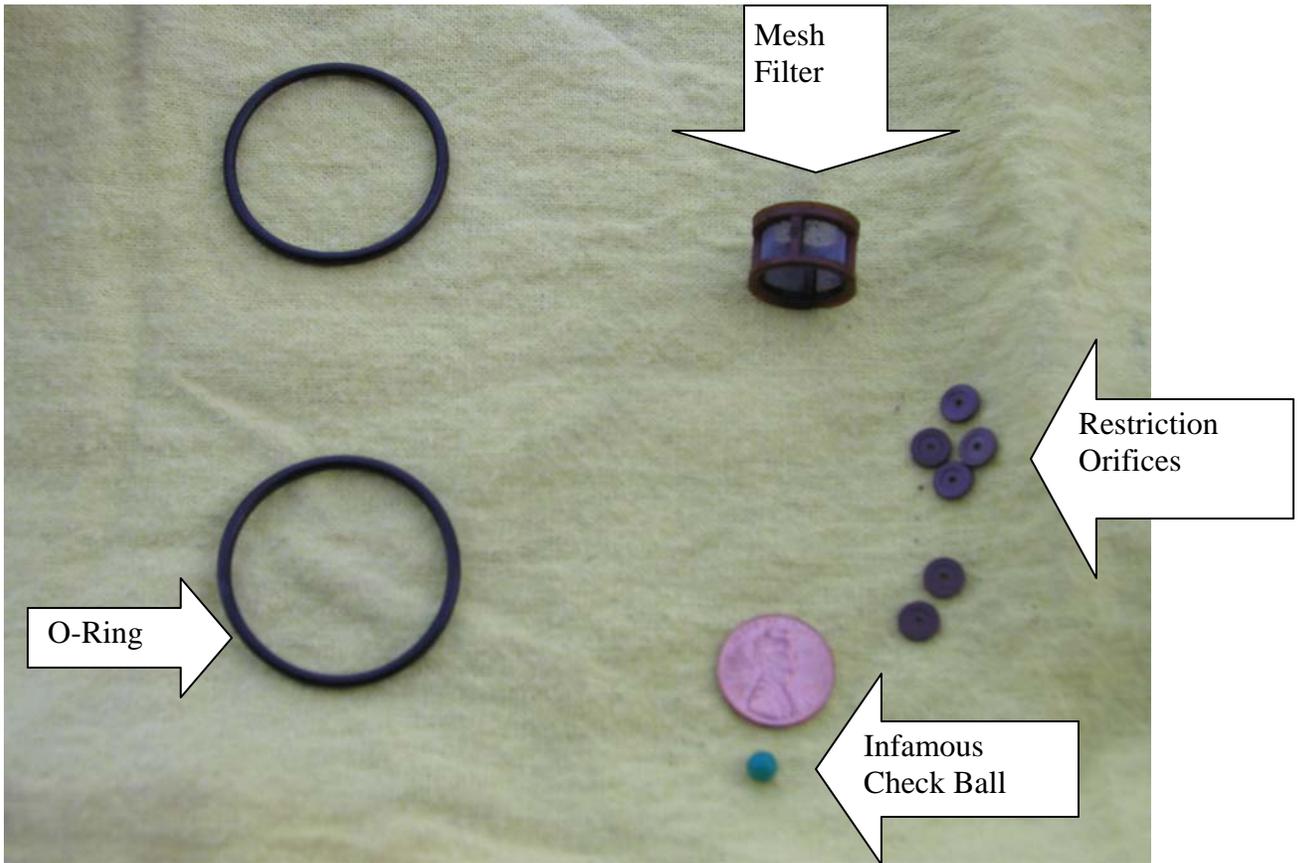


ILLUSTRATION 13