

GENERAL MOTORS®

Hydra-Matic 4L30-E automatic transmission

Assembly manual

by

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2. Foreword.

This manual is not intended to be a standard work of the HOW-TO reassemble the [General Motors®](#) 4L30-E transmission, nor is it written with the professional mechanic in the back of my mind. The reason I wrote it has been solely for my own purpose.

Although realizing that 99.9 % of the people won't even consider taking a transmission that's playing up out of their car let alone disassemble it, it has been a very interesting experience. Transmissions have always been the field of professionals and hidden with a shroud of mist.

As you can understand I can not take any responsibility of the possible consequences. Not waving a red flag here. It is certainly possible for a "back yard" mechanic as I am myself to accomplish a complete rebuild of a complex assembly.

Before you start ask yourself a few questions:

- Do I have enough experience or should I stay with changing oil and spark plugs ?
- Do I have enough time ? (consider at least three to four working days)
- Do I have enough tools ?
- Do I have the workspace to arrange all the parts in an orderly manner ?

If the answers on these few questions are positive, go ahead and indulge yourself !

Good luck !

3. About the author.

Born in 1963 in the Netherlands and living abroad in various countries he and his family of five decided to settle down at the bottom of the earth in New Zealand. That's where the I suzu Trooper, and more specific the 4L30-E transmission, the main subject of this manual were bought.

Part of his education is the Naval Academy in The Netherlands. A career as a seagoing officer followed. Later he came involved in skydiving, did almost 2000 jumps and was rated as a parachute rigger.

Hans has always had a keen interest in mechanics and electronics. At the age of seven he devised his own calculation machine that worked basically with a few clothes pegs from his mother. The pegs were converted into switches using push pins. Capacitors, some wire and 3 volt light bulbs completed the part list. After soldering and many hours of trial and error the result was a working but very limited version of the modern calculator. Pushing the pegs in a certain order gave the answer to a simple addition. As money was limited the largest number the machine could handle were equal to the number of light bulbs.

At the age of twelve engines became part of his life. Starting with little 2 stroke 50cc. engines, becoming bigger and more complex with time.

Throughout his life he was always looking for technical challenges others wouldn't dare to touch. There was once an enormous Scania DS14 a 14 liter (855 cu in) V8 diesel engine in his little shed. The door had to be widened to move it in and out.

His marine career left him with a passion for the oceans. Sailing became his thing. At any stage he had a smaller or bigger sailboat and later sailing yachts. One of his biggest challenges has yet to come: building his own 13 meter (43 ft) sailing yacht and circumnavigate the globe.

Nowadays Hans is involved in property maintenance and development.

Dr. J. Havel

4. About this manual.

Throughout this manual you will find all parts to be written by it's full name followed by the part number which correspond with pictures and the drawings at the end of this manual.

For instance:

"Stick the overdrive internal gear 528 on the overdrive carrier assembly 525".

Every now and then I tried to make a sensible comment, note or remark. At least describe the way I managed to accomplish a task. As I've written before, these methods, solutions and comments are based on common knowledge, basic instinct and even some educated guesses. Following these guidelines will eventually lead you to a working transmission.

I will add one of the following four sign when extra attention is needed.



Info



Note



Stop



Caution

As English is not my first language you have to forgive me the spelling mistakes. They are left in for people who's main task in life is correcting them. Also I have given names to certain details that might not comply with the correct technical term.

5. History of the 4L30-E transmission.

It all starts back in the 60's and early 70's. Opel, the European car manufacturer starts selling their Kadett, Rekord and other models with the then popular "Trimatic" and later called "TH180" automatic transmissions.

After adding a converter clutch this trans became known as the "TH180-C". In the USA the "TH180-C" got it's fame under the name 3L30. Throughout this period all GM transmissions were and still are produced at the General Motors plant in Strasbourg, France. As both Opel and Buick were part of the General Motors group, Opel reached the US market through the Buick dealerships.

For reasons only GM knows they decided to add an overdrive to the 3L30. As the main case of the 3L30 could not accommodate the overdrive they were forced to put it in it's own case and mounted it in front of the 3L30. The 4L30-E was born ! This adaptor case has it's own valve body and even it's own oil pan.

The 4L30-E became so popular that other car manufacturers started using it. You can find this transmissions on I suzu Trooper and Rodeo's, BMW's 3 and 5 series and probably a few more brands.

The 4L30-E designation system is as follows:

- 4 four speed
- L Longitudinal
- 30 Series based on torque capacity
- E Electronic controlled

6. Tools you need.

As I mentioned before I have written this manual with the back yard mechanic in the back of my mind. The list of specialized tools had to be as short as possible. Therefore I had to think up methods to accomplish certain tasks where a special tool would otherwise be needed.

If you have a toolbox filled with the usual spanners, screwdrivers, a socket set you're 95 % OK.

The only more or less special things you need to buy or borrow are:

- A torque wrench up to 40 Newton meters (30 Ft lb)
- Some snap ring pliers. One straight and one with a bend.
- A very small punch for driving out the spring pins.
- Although not absolutely necessary a simple multi-meter for adjusting the mode switch.

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7. In the beginning there is the selector shaft assembly

Lets start with a simple job:

We're going to install the selector shaft 61 into the main case 36.

Install selector shaft seal 62 using petroleum jelly.



Assemble parking lock actuator assembly 56 and the parking lock and range selector lever 60.

Then using parking lock lever nut 57 install this into the main case 36.

Install spring pin 59 without pushing it completely in.



Forget about link 58 at this stage. It will come much later when installing the valve bodies.



8. Assembly of the Internal Components

Next step is rotating the main case 36 to vertical.

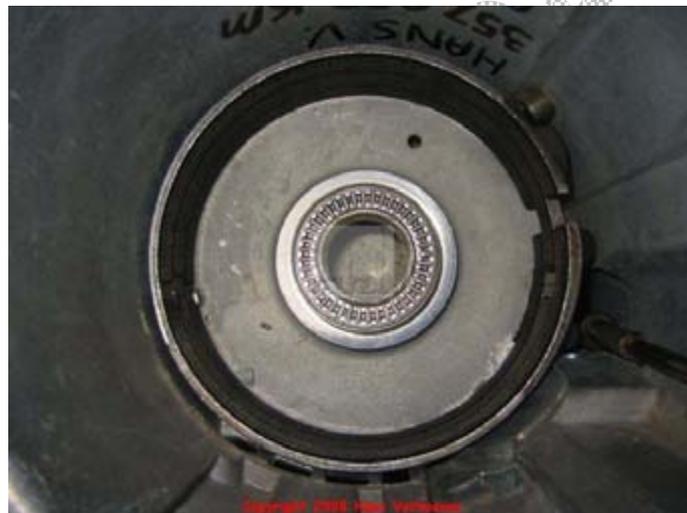


Install brake band 664 and line up the servo pin area with the hole.





Install thrust bearing 675 using petroleum jelly



Install brake or reaction sun drum 659 inside the brake band 664



9. We're going to do some planetary indexing on the Ravigneaux

Sounds good to tell your grandchildren, but it's actually an important step.
If you read and follow this procedure you can save yourself a lot of frustration.

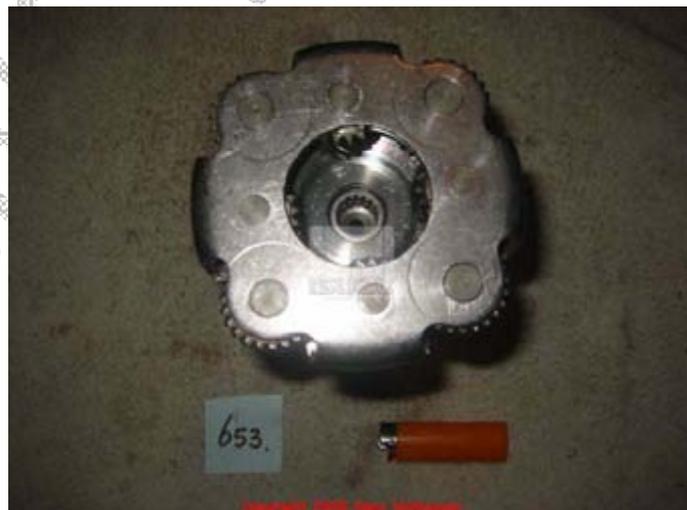
If you look carefully at the picture below you can see 2 different ID marks.
I've painted them yellow for your convenience.
One has only a single yellow mark (top right and bottom left) while the other has double yellow marks (top left and bottom right).



i With a magnifying glass you must be able to find similar spots on the teeth of the pinion gears. Beware they are sometimes very hard to find !

Align the ID marks on the long pinions to the corresponding marks on the front of the carrier 653.
Without the right alignment it's impossible to assemble the planetary carries assembly 653 on the reaction sun gear 658 and not using a sledgehammer.
Once the teeth are lined up with the ID marks slowly and WITHOUT force slide the reaction sun gear 658 onto the planetary carries assembly 653.





Next thing to do is drop the planetary carries assembly 653 into the main case 36 on top of thrust bearing 675.



Time for a check

Sticking a screwdriver or similar through the servo pin hole and hold the brake band 654 in place. Then turn the planetary carrier a couple of times and check if the ID marks still line up.



Install output shaft/input sun washer 652 and THEN the output shaft/input sun bearing 651 on top of the planetary carrier using some petroleum jelly.



10. The third clutch assembly.

Start with installing the 3rd clutch inner piston seal 635 on the 3rd clutch drum 634 inner piston using petroleum jelly. Make sure the seal isn't upside down. The biggest diameter of the conical shaped seal should be facing the drums bottom.



Install 3rd clutch outer piston seal 637 on 3rd clutch piston 638 using petroleum jelly. Make sure the check ball in piston 638 is moving freely by shaking it. A drop of clean ATF on the check ball wouldn't hurt at this stage.



Grease inside of 3rd clutch drum 634 with some petroleum jelly and place the 3rd clutch piston 638 inside the 3rd clutch drum 634.



Installing the piston 638 into the drum 634 can be hard because the new seal 637 is shaped conical and will not easily slide into the drums cylinder. Use a little hooked tool or similar to work around the edges to work the seal in.



NEVER USE EXCESSIVE FORCE !



Place the 12 piston clutch springs 611 on 3rd clutch piston 638.



Place 3rd clutch springs seat 639 on the just installed 12 springs.



Install retaining ring 640 on inner piston while compressing spring seat 639 down. Make absolutely sure the retaining ring is falling within the cavity of the spring seat.



As I do not have the correct tool to do this I made up my own sophisticated spring compressor. Made of plywood and using a vice it made the job easy. Remember to put some soft material between the vice and the drum.





Install 3rd clutch cushion ring 641 inside 3rd clutch drum 634.



Assemble steel clutch plates 642 and lined clutch plates 643 into a stack.





The correct order: steel - lined - steel - lined - steel - lined - steel - lined - steel - lined.
That's 5 steel plates 642 and 5 lined plates 643.



Plates are soaked in fresh ATF overnight.
The fifth lined plate touches the sprag race assembly 647.
Not all models of the 4L30E have a fifth lined plate, but only 4.
The thickness of my clutch pack was 20.35 mm. with new lined plates.

Install the thrust input/sun washer 644 (the thicker one) on the inner piston of 3rd drum clutch 634.



Install input shaft/gear assembly bearing 645 on washer 644.



Install retaining washer 636 on bearing 645.



Install sun gear 646 into the grooves of the lined plates of the 3rd clutch assembly we've just put together.



Make sure the grooves of the plates are "in line" with each other. NEVER use force to bring the sun gear all the way down.

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11. The sprag race assembly – where it can all go wrong !

 here and read the  very carefully.

The SPRAG RACE assembly:



The unit is made up out of 4 parts.

1. the cage assembly 650.
2. The race 647.
3. Both retaining rings 649.



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The following is a matter of trial and error.

Before you can put the complete sprag unit on top of input sun gear 646 you have to make **ABSOLUTELY** sure the sprag 650 is assembled in the proper way and can turn in the right direction only. Installing it the wrong way around will be a disaster like event.

i What happens if you do install it the wrong way is the following:

1. The car will not have reverse.
2. It even will not have first gear except in manual 1st or 2nd gear.
3. As soon as the trans will shift to 2nd gear the trans is a

So lets do it right here the first and only time !

i Install one of the copper retaining rings 649 in the sprag race 647.
Then install sprag cage 650 into the sprag race 647
Put the second retaining ring 649 on top of the sprag cage 650.
Install the complete sprag race assembly 647 on the sun gear 646.

Have a look at the three pictures on the next page.

I've dedicated this single page to this to underline the importance of it.

1.



2.



3.





If you have no access to these pictures, read carefully the instructions below.

Hold the teeth of the sun gear 646 in your **LEFT** hand.

Put the thumb of your **RIGHT** hand on the **TOP** of the sprag race assembly 647.

While **holding** the teeth of the sun gear 646 the sprag race assembly 647 should only rotate towards you.

Trying to turn it in the opposite direction will result in the sprag race assembly 647 holding or blocking.



Make absolutely sure you get this right !

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Next install the sprag retaining ring 648 around the sprag race 647.



Gently insert, not force, sun gear 646 and sprag race assembly 647 into the 3rd clutch drum 634.

When the retaining ring 648 touches the drum 634 you are almost done, but there's another thing to do and it's just a little bit tricky.

The sprag retaining ring 648 needs to be pushed into the groove of the sprag race 647 before it can be pushed way down in to it's final position. I used 2 small screwdrivers while having the complete 3rd clutch assembly held in a vice. It might give you some headaches but eventually it will work.



12. The second clutch drum.

Take the 2nd clutch drum 618 and install the new inner seal 620 using petroleum jelly.



Carefully slide on the new seal 620 in the right direction. The lip of the V shaped seal should be facing the bottom of the 2nd clutch drum 618.



Take care you do not damage the seal while installing it. It's not the easiest seal to install. Once you have it on carefully check all the way around it for proper seating.

Install the piston outer seal 621 on the 2nd clutch piston 622 using petroleum jelly.



This is a good time to see if the little check ball in the piston is freely moving. Just shake it and you should hear it rattle.



The 2nd clutch piston 622 can now be installed in the 2nd clutch drum 618. Take care not to damage the new seals. Use petroleum jelly.



Place the 22 piston springs 611 on the 2nd clutch piston 622.



Place 2nd clutch spring seat 623 on top of the springs 611.



Compress the 22 springs 611. I used a vice and two bits of plywood.

i Careful tighten the vice and guide the clutch spring seat 623 over the edge of where the retaining ring 613 is going without damaging it.

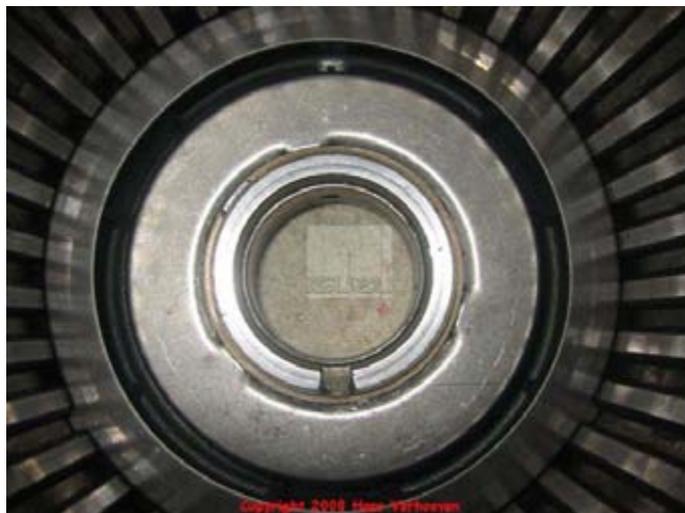


Install the retaining ring 613 and make sure the ring is fully inserted.



Assemble the 2nd gear clutch pack:

Start with wavy plate 625 on top of the 2nd clutch piston 622.



As with the 3rd clutch assemble steel plates 626 and lined plates 627 into a stack.



The correct order is:

steel - lined - steel.

That's 6 steel plates 626 and 5 lined plates 627.



Plates are soaked in fresh ATF overnight.

The thickness of my clutch pack was 25.33 mm. with new lined plates.

Some 4I30E models have a second wavy plate 625 on top of the clutch pack, thus between plate 626 and the 2nd clutch spacer 628.

Install the assembled 2nd clutch pack into the 2nd clutch drum 618.



Now place the 2nd clutch spacer 628 on top of the plates.



Install retaining ring 629.



Install ring gear 630.



And finally the other retaining ring 629 to hold the ring gear 630 in place.



Carefully inspect the seating(s) of the retaining ring(s) 629.
The whole 2nd drum assembly should fit without applying any pressure.

Time to put in the 3rd clutch assembly in the waiting main case. Maybe a final check on the planetary carrier 653 that's already installed. Also double check if the washer 652 and bearing 651 are still present.



After the 3rd clutch drum assembly is installed turn both the shaft of the 3rd drum assembly as well as the shaft of the planetary carrier a couple of times in both directions. This will ensure proper fit of what is assembled up to now and will also give you a double check on the correct alignment of the teeth in the planetary carrier 653 again. Painting them yellow would have been helpful right now to identify them. Unless you've already done so, get a torchlight.



Put in thrust washer 632 (the manual here mistakenly calls it 623) with some petroleum jelly to hold it in place. The 3 tangs should be sticking upwards.



Next put thrust washer 631 on top of thrust washer 632 using the good old petroleum jelly.



13. Installation of the 3rd clutch assembly into the 2nd clutch drum.

i Align the teeth of the lined plates 627 with each other before trying to slide it on to the 3rd clutch assembly.



Just slide it in without any kind of force. The grooves of the 3rd clutch assembly will easily slide onto the lined plates 627 of the 2nd clutch assembly. Carefully slide it in further until the teeth of ring gear 630 slide on to the teeth of the planetary carrier 653.

i An alternative method of this somewhat cumbersome procedure would be to install the 3rd clutch pack into the 2nd clutch pack BEFORE putting it in to the main case. You can do as you prefer. Not sure what the manual says about it either. Just remember to keep the teeth on the planetary carrier 653 aligned. I followed this alternative way and found it easier. Make sure the 3rd clutch pack is **all the way in** to the 2nd clutch pack.

14. It's now time to determine the "final end play".

This requires the specialized tool J-23058-A. As I don't have or was able to have a lend of it I have used the dimension of the old selective thrust washer 12. Mine was broken as they apparently often do so I had to make one myself.



i A word on thrust washers:

They come in six different sizes and are made of some sort of plastic material. They're to be distinguished by a different color representing the thickness.

Yellow	0.15 mm. - 0.16 mm.	(0.060 in. - 0.064 in.)
Red	0.17 mm. - 0.18 mm.	(0.067 in. - 0.072 in.)
Black	0.19 mm. - 0.20 mm.	(0.075 in. - 0.079 in.)
Natural	0.21 mm. - 0.22 mm.	(0.082 in. - 0.086 in.)
Green	0.23 mm. - 0.24 mm.	(0.090 in. - 0.094 in.)
Blue	0.25 mm. - 0.26 mm.	(0.097 in. - 0.101 in.)

My home made one is somewhat in the middle range of them.

I cut some grooves on both sides to get a better oil flow around it.

15. Lets get on to the reverse clutch .

Slide the reverse clutch pressure/selective plate 617 into the main case.
The notch on it should be positioned in the 11 o'clock position.
See the arrow on the picture.



Next take one (or all) of the reverse steel clutch plates 615.



 Take extra **caution** here. If you take a good look at them you will see that they have a groove on one of the notches. They must be installed with the groove at the lowest point of the main case. I believe this is to ensure proper oil flow through the oil channel in the bottom of the main case 36. See the next picture



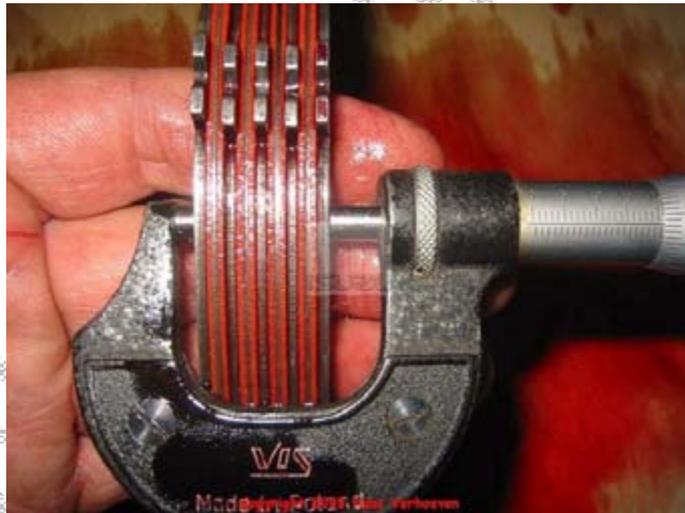
Start putting the reverse clutch plates 615 and reverse lined plates 616 together.



The correct order:

steel - lined - steel - lined - steel - lined - steel - lined - steel.

That's 5 steel plates 615 and 4 lined plates 616.



Finally put the waved plate 614 on top of the rev clutch steel plate 615. Take care not to block the oil flow by putting one of the three notches of the waved plate 614 on the lows point of the main case.



Plates are soaked in fresh ATF overnight.
The thickness of my clutch pack was 20.14 mm. with new lined plates.

Take the reverse clutch piston 610 and install the inner seal 608 and outer seal 609 with petroleum jelly. Be careful not to damage them.





16. The center support assembly

Before we can continue to put install the reverse clutch pack we need to work on a few other things.

Start gathering the pieces for the next step.



Adapter case 20.

Oil restrictor 27 (only if you have one, otherwise just forget about it).

Both gasket transfer plate to adapter 28.

Transfer plate adapter to center support 29.

The center support 30.

And the 8 center support screws 31.

Make sure you pick the right gaskets here as most likely you will find a second set in your repair kit. Line up the holes on the gaskets and compare it with the steel plate 29.



Holding them against the light proved easy to find the differences and determine the right ones.



Once you have found the right gaskets you can use petroleum jelly to "grease" the adapter case (20) grooves/surfaces.



Then stick on the transfer adapter/center support steel plate 29, followed by the second gasket 28. Again use petroleum jelly.



Put on the center support 30. On the back of it you can see a hole just over 6 mm. This hole should be in the (almost) 1 o'clock position when installed on the adapter case 20. Use petroleum jelly.



Use the eight screws 31 to fix the center support 30 on the adapter case 20.
Trust me, you can not do this wrong. The positioning of the eight screws 31 won't allow for it.

Once the eight screws 31 are in you must use your torque wrench to tighten them. The manual says 25 Nm. (that's 18 Ft Lb. or 216 in. lb).

Do this in a pattern as you would tighten the bolts of your tires while stepping up the torque. see picture.



17. Installation of the reverse clutch piston.

Next drop in the reverse piston 610 (remember the new seals 608 and 609). Gently twisting and turning the reverse piston 610 will eventually drop it in. Use petroleum jelly.



It's time for the 24 springs 611. Yeehaa, finally.



Place all 24 springs 611 into the slots on the inside the reverse piston 610.
Put the spring seat 612 on top of them.

Compress the 24 springs 611 and install the retaining ring 613 on the shaft of the center support.

18. It's time for a little MacGyver.



MacGyver is an old TV show but if you're my age you might even remember Mannix.



Compressing those springs might take about 60 kg. to 80 kg. (132 to 176 lb) or even more and I found it is the hardest part of putting together the transmission.

If you don't have the proper tool, or a enormous vice, the next thing that came to my mind was myself. I've gained some weight lately for this purpose ☺.

Make a little wooden bridge with the 2 poles about 100 mm. (about 4 in) apart. The height of them enough to freely move your hands under it. 170 mm. (6.5 in) for that matter.

Place your bridge tool on the spring seat 612 and lean with your chest on it. Doing this on the ground proved to be the easiest. Voila, springs compressed while having two hands available for the retaining spring to put on.



Install the two new oil seal rings 32 on the shaft of the center support assembly. Petroleum Jelly !



Put the thrust selective washer 12 in place. (my home made one) with petroleum jelly.



Install o-ring/seal 8 using petroleum jelly !



i Although the manual shows an actual o-ring/seal 8, the one that came in my rebuild kit was rectangle shaped and proved to work fine. Also look at the drawing of seal locations.

Put the two oil seals 33 on the main case with petroleum jelly. These two o-rings seal the channels between the two oil pans.



Finally "grease" up all the contact areas between the main and adapter case with petroleum Jelly. Especially the big seal 28 and the aluminum edges of both cases.

19. An engagement is coming up.

And it's the promise of marriage between trans and car. But for now we don't look further than the main case and adapter case. There's a lot of work left to do !

Slide the adapter case into the main case taking care not to damage the oil seals 33 and just leave it like that for now.



You can use three of the long converter housing to main case screws 4 here as a guide. Be careful not to damage the gasket and seal.



20. The overdrive internal components.

Place the two new inner and outer 4th clutch piston seals 533 and 534 on the 4th clutch piston 532 using petroleum jelly.



21. Just when you thought your problems were over.... cursing is now allowed.



Just when you thought your problems were over.... cursing is now allowed.

Use petroleum jelly on all the surfaces where the clutch piston 532 is going to touch the surfaces of the adapter case.

Then get special tool J-38554. What ? You don't have one. Relax, neither did I. Now put on your women's face and play this very gently.

Place the 4th clutch piston 532 into the adapter case 20. and work the piston down as far as you dare to push it. Then stop ! It is crucial not to apply too much force here as it can easily damage the just installed piston seals 533 and 534. Remember you're a woman now.

Get a 0.06 cm. (0.02 in) feeler gauge and work the outer seal 534 very gently into the adapter case 20. Go around in very short steps. You can actually feel the seal 534 sliding into or between the piston and the adapter case. Once you have worked around completely you are able to push the piston just a little bit further downwards.

The inner seal 533 is even a bit harder to get on to the "cylinder". This one took me the better part of an hour, but I finally managed with the same method as the outer seal 534 and the use of the same feeler gauge.



The design of this inner seal 533 was newly designed by the engineers of [Transtec®](#). The inner seal was made "D" shaped for easy installation.

Finally it's in !



Place the retainer and spring assembly 531 with the retainer facing upwards inside the 4th clutch piston and install the snap ring 530. Ensure it is completely fitted into the groove.



Stick in the thrust washer for the internal gear/support 529. Tangs facing down. Use petroleum jelly to prevent it falling out.



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22. The overdrive clutch assembly.

i You need the following parts:

Overrun clutch housing 510.
Overrun clutch piston 513.
Overrun clutch release spring 514.
Release spring retainer 515.
Roller assembly 516.
Overdrive roller clutch cam 517.
Snap ring for the overrun clutch hub 518.



Note that some older models have a separate piston and seals. They are separately numbered 511, 512 and 513 in the GM's manual.

Start with rattling the overrun clutch housing 510 to hear the check ball.



Place the overrun clutch piston 513 into the overrun clutch housing 510 using petroleum jelly.



Install overrun clutch release spring 514 with the "springs" upward.



Place release spring retainer 515 with the rim upwards.



Then the roller assembly 516 goes on top of the release spring retainer 515 in such a way that the overdrive roller clutch cam 517 can be installed after this, check if all of the ten rollers are present !



Gently put the overdrive roller clutch cam 517 in the roller assembly 516.



Compress the assembly and install the snap ring for the overrun clutch hub 518.



For compressing I use two same length pieces of timber and a tie rip.

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23. It's plate time again !



You need the following parts:

One waved overrun clutch plate 520. (not on all models).

Two steel overrun clutch plates 521.

One lined overrun clutch plate 522 (although some models have two plates, I have only one).

One thicker steel backing plate for the overrun clutch 523.

One snap ring for the overrun clutch housing 524.

Start by putting the waved plate 520 into the overrun clutch housing.



Build up the clutch pack containing steel, lined and backing plate 521, 522 and 523.



The correct order:
steel - lined - steel - backing plate.





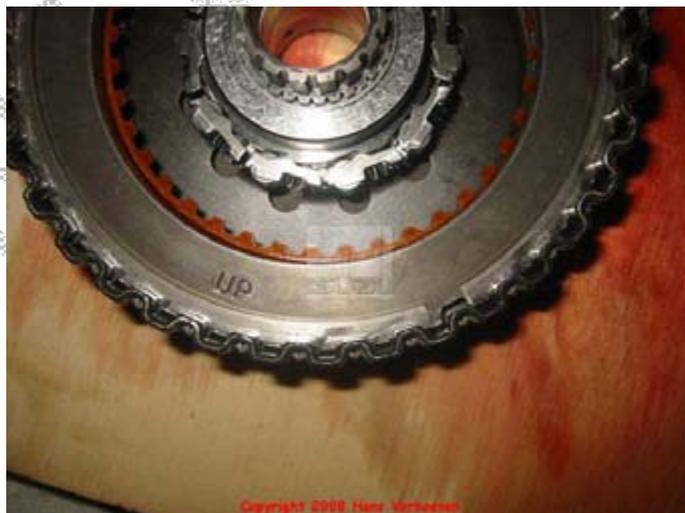
Plates are soaked in fresh ATF overnight.
Some 4L30E's have an extra lined plate 522 in them.
The thickness of my clutch pack was only 6.52 mm. without the backing plate 523 and 10.52 mm. including the thicker backing plate 523.



Put some extra attention to this backing plate 523.
It is supposed to be installed with the "UP" mark on the outside of the clutch pack. See picture.



Install snap ring 524 onto the overrun housing.



24. The overdrive sun gear

Next step is to install the overdrive sun gear 519.



If you carefully look at it, it has a shiny and a darker side with "teeth marks of the snap ring 524. The shiny side has to go into the overdrive carrier assembly 525.

Below you'll find a picture of the overdrive sun gear 519.

Note the blue ribbon I put through one of the oil ports for easy identification.



Place the overdrive carrier assembly 525 onto overdrive sun gear 519 i.e. on top of the assembled overrun clutch.



The overdrive carrier assembly 525 comes as a prefabricated part. Notice the bearing on the inside and give it some fresh ATF before you install the unit on the sun gear 519.



25. On to that big rod – The turbine shaft.

You can finally get that long steel rod called the turbine shaft 506.



Strip off the three oil seals 508 and seal 505.

Install the three oil seals 508 with some petroleum jelly.

STOP Wait to install oil seal 505 as it has to go on later.

Now gently slide the turbine shaft 506 into the overdrive assembly starting from the overrun clutch housing 510 side and slide it all the way through. One of the oil seals 508 should disappear into the housing 510 leaving just two visible.

Install snap ring 526 on the turbine shafts end. (on the carrier assembly 525 side).



Put thrust bearing 527 on top of the overdrive carrier assembly 525 in a way the turning inner part is touching the carrier 525.



Stick the overdrive internal gear 528 on the overdrive carrier assembly 525 while having the teeth greased with fresh a dab of petroleum jelly.



 Note that the overdrive internal gear 528 only turns counter clockwise and blocks in the opposite direction. This is what it is designed to do. I am not getting to technical here as we're only rebuilding a trans ☺.

Make sure thrust washer 529, the one with those two tangs, is still on the bottom of the adapter case.

You can now put the whole assembly into the adapter case.

26. The 4th clutch assembly.

The 4th gear clutch pack has four steel plates 502 and only two lined plates 503.



The correct order:

Steel - lined - steel - steel - lined - steel.

That's 4 steel plates 502 and only two lined plates 503.

No it's not a typing error, there are indeed two steel plates on top of each other, although some models of the 4L30E have an extra lined plate. Mine hasn't.



First find out how the steel plates fit in to the adapter case.



Tip: the shallowest notch goes in the 5 o'clock position.





Lower the stack of plates into the adapter case.



Plates are soaked in fresh ATF overnight.

The thickness of my clutch pack was 12.51 mm. with new lined plates.

Put the 4th clutch retainer 501 on top of the clutch pack with the approximate 30 mm wide (just over 1 in) cavity at the six o'clock position facing upwards. That is towards you ☺.



27. The oil pump assembly.

Lets start putting the oil pump assembly back together.



But first a little lecture.

As always assemble all parts with petroleum jelly.

Most of the parts like valves and sleeves have a tight fit. By now you should have cleaned them thoroughly with rags, compressed air and a cleaning agent. There is no need to use any significant force on any of the parts. The use of excessive force is more likely to do damage. At this stage I am not going to describe every single part and how it should be put together. If you're still reading this you must either be a nerd or desperate.

It should be easy enough for you to find out by looking at the pictures and drawings.

For the assembly of the oil pump we need the following:

1. Pressure regulator assembly (parts 203-204-205-206-207-208)



2. Converter clutch control valve (parts 210-211-212-213)



3. Throttle signal accumulator assembly (parts 214-215-216-217)



Once you have put all these parts into the oil pump assembly 209 you can install the two oil pump drive gears 201 and 202.



Done with that ? Easy enough wasn't it. Took me less than 5 minutes.

28. Ring the bell, it's time for the bellhousing.

To be correct it's not a bell housing but a converter housing. But who cares.

Get that cleaned salad bowl 6 on your workbench and put some petroleum jelly on the areas where the pump is going.



Place the oil pump body wear plate 9. You can not install this one wrong. The holes for the screws won't match up if you tried.



What's that part just left of the screwdriver ?

Stick on the oil pump assembly with the arc at the 12 o'clock position facing the wear plate 9. Again, this one can't be installed wrong either.



Turn the converter housing 6 on its side and install the five screws holding the oil pump assembly 10. Go hand tight (loose) for now. DO NOT install the converter housing ring seal 3 yet.



Turn it all back over again and try if you can "wiggle" the converter housing 6 on the oil pump assembly 10 by a few mm. It should have a loose fit for reasons explained later.

Install seal 8 around the pump and stick on gasket 11 using petroleum jelly.



Another word on so called "end play" is in place here. You could or maybe even should use special tools J-24773-1 and J-25002 here. I don't have them, and therefore have no way to determine the end play. I only re-install here what I have taken out when disassembling the tranny.

Place the thrust selective washer 12 on the oil pump assembly. Use petroleum jelly to hold it in place while you turn over the converter housing 6.



Don't forget to tighten the converter housing plug 7. An interesting little screw that blocks of one of the main ATF flows. Need to do some research on it.

Before you can put the assembly together you might have a look at where the actual holes for the seven long screws 4 are. One is located in a not so obvious spot at the bottom of the adapter case 20. There are two more holes where you would expect to fit more screws 4. One is at the somewhat 1 o'clock position, the other at 8 o'clock. **DO NOT** stick screws in here. Especially the one on the 1 o'clock position has the adapter case gasket on the bottom just waiting there to be punctured by you. Don't think that it would harm anything, but better safe than sorry.

29. Installation of the convert housing on the adapter case.

Slide the converter housing 6 and oil pump assembly 10 on the vertical standing adapter case 20. Use two or better three of the long screws 4 as a guide. REMEMBER: Be careful not to damage gasket 11.



Once the converter housing 6 is installed on the adapter case 20, take the remaining screws 4 and slide them into the converter housing 6. It's a good idea to put petroleum jelly on them.

Hand tighten all the seven screws 4.

Get seal 3 and put petroleum jelly on all it's surfaces.



DO NOT try to tap it into place using a hammer or similar. Just use the three screws 2 to EVENLY work it all the way down in it's seat.

Check if the converter housing is still a bit loose.

For the final stage get the torque converter 1. By this time you should have flushed it a couple of times with clean ATF. As you cannot easily open it up and give it a good clean, there's probably a lot of dirt on the inside. I tried to empty it by constantly shaking and turning the inside pressure plate and stator assembly. When it was almost empty I filled it up with half a liter (about half a quart) of fresh ATF and started all over again. I did this for a couple of days.



Grease up the splines on the oil pump shaft and slide the torque converter 1 onto the oil pump shaft. Ensure that the converter's shaft is fully seated on the oil pump shaft and give it a couple of turns and very gently take it off again.

Then start to torque up the seven long screws 4. Torque to 40 Nm. (30 Ft lb or 360 In lb). Go in increments of 10 Nm. (7.5 Ft lb or 90 lb in). And don't forget to tighten in a nice pattern.

In case you wondered what about the oil pump screws ?

Finally put in the torque converter one more time, give it a couple of turns, take it out and start to torque up the five screw 5 for the oil pump 10. They need 20 Nm. (15 Ft lb or 180 in lb).

All left to do is the little oil seal 505 on the turbine shaft.



30. The accumulator piston assembly.

Put the whole transmission on your workbench facing the valve bodies side up.

 The parts needed here are: 13, 14, 15, 16, 17, 18, 19.



Put the new ring 19 on the accumulator piston 18. Use petroleum jelly. Put the two o-ring seals 15 into the adapter case 20 Using petroleum jelly.



Assemble the rest of the unit. Refer to the pictures and drawings.

For compressing the stiff accumulator piston spring and installing the snap ring 13 I used ordinary human power.

Below are extra pictures to guide you.



Note: Use petroleum jelly for installation and on the new seals and o-rings.

HAN

31. The servo piston assembly.



The fourteen parts needed are 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102 and 103.

Put the new steel piston ring 98 on the servo piston 97.



Rotate the output shaft of the planetary carrier 653 counter clockwise as seen from the back end of the main case 36 to ensure the brake band 664 is in the right position to match up with the apply rod 102. You can also do a visual check by peeking through the servo piston hole on the bottom of the main case 36.

Slide the apply rod 102 into the adjust sleeve 101 and put the spring seat cushion 100 onto the rod.



Put the servo piston screw 96 only a few turns into the adjust sleeve 101.



Make sure that the rounded tip of the apply rod 102 is going to touch the brake band 664.



Next one up is the (biggest) servo piston return spring 103 and the smaller servo piston cushion spring 99 which goes inside the bigger servo piston return spring 103 and rests on the spring seat cushion 100.



Be careful with the new steel servo piston seal 98. Use a little flat screwdriver to work it into the cylinder.



Press on the servo piston 97 to install the retaining ring 93. I used this rather unconventional method of compressing the servo piston 97. Using two of the valve body screws 70 and a hacksaw. You can devise your own way of doing it, but for me it worked rather well.



Notice the two valve body screws 70 to hold down the hacksaw.

Install the servo piston clip 94 and servo screw nut 95.
You might have to pull the servo piston adjust sleeve a little bit out.



IMPORTANT: YOU MUST USE A TORQUE WRENCH TO DO THIS NEXT STEP.
We are going to adjust the brake band 664 by tightening the servo adjusting screw 96.
Adjust the torque wrench to **EXACTLY 4.5 Nm (3.33 Ft lb or 40 in lb)** and tighten the screw 96.
Once you have done this **BACK OFF** the screw 96 **EXACTLY FIVE TIMES**.
Then tighten up the servo screw (locking) nut to **18.5 Nm (13.65 Ft lb or 164 in lb)** while holding the servo adjusting screw 96.

We're done for now. Don't put the gasket 92 and cover 91 on yet.



32. The extension case assembly

Before we start on both the valve body's we're going to the extension assembly.



Parts needed are:

Breather pipe 37
Breather pipe o-ring 38
Reservoir 39
Extension case gasket 42
Extension case 43
Speed sensor seal 44
Speed sensor 45
Extension assembly seal 50
Extension to main case screws 52
Parking lock pawl spring 53
Parking lock pawl 54
Seal parking lock wheel 667
Parking lock wheel 668
Speedo wheel 672
Retaining ring 673

First put in the reservoir 39.



Then install the breather pipe 37 and o-ring 38. The breather pipe 37 holds the reservoir 39 in place, and that's exactly the reason you couldn't get it out in the first place 😊

Next install a new steel seal ring 667 on the parking lock wheel 668 and hooking the two ends of the seal together. Use petroleum jelly.



i Use a small flat screwdriver to "work" the seal into the case.

Insert the parking lock wheel 668 into the main case. Use petroleum jelly to grease all the surfaces prior to installation.

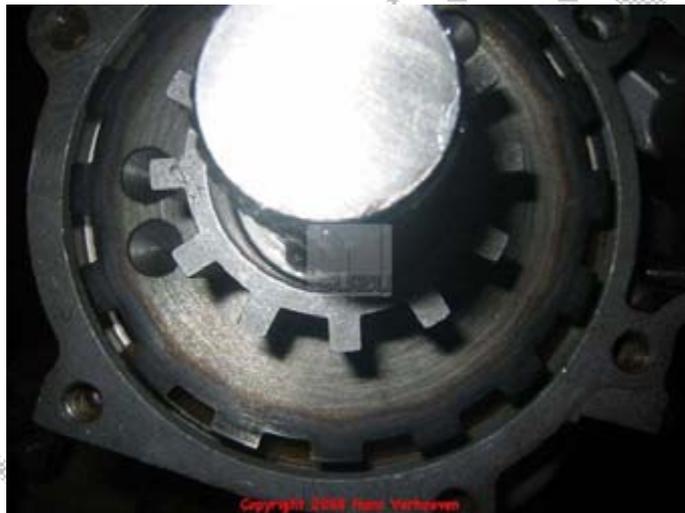
🎵 If it is completely inserted the wheel should be sticking out of the main case approximately 14 mm. (0.55 in).



Slide the speedo wheel 672 onto the output shaft. Use petroleum jelly.



Install the retaining ring 673. On the picture below it's hard to see, but you can just identify one of the little holes in the retaining ring 73.



Let's get on to the actual extension housing 43.

Install parking pawl lock spring 53 and Parking lock pawl 54 in extension housing using petroleum jelly



Stick the extension case gasket 42 on the extension case 43 using petroleum jelly.



Install the extension case 43 on the main case. Use the seven extension to main case screws 52 and tighten up to 32 Nm. (24 Ft lb or 288 in lb)



Push the parking lock pawl 54 a little out of the way to make room for the parking lock actuator 56.



Not covered by the manual are the two steel pint that line up the extension housing with the transfer case. Keep them with the extension case 43.



Last thing to do here is to put in the extension case seal 50. Install it with the "closed" side outwards (i.e. towards the transfer case) Use the red loctite on the outside and petroleum jelly.



33. The adapter case valve body.

As with the oil pump assembly, I am not going to describe into detail every part. Use the pictures and drawings as a reference.

We start with the adapter case valve body.



Parts you need:

Adapter case electrical connector 22
Screw and washer assembly 23
Adapter case bottom pan gasket 68
Adapter case harness assembly 69
Valve body screws 70
Adapter valve body gasket 72
Adapter valve body transfer plate 73 (steel)
Adapter case to transfer plate gasket 104
Check ball 317 (only one)
Adapter case valve body 401
Solenoid force motor screw 402
Force motor retainer 403
Force motor solenoid 404
3-4 accumulator plug 405
Spring pin 406
3-4 accumulator valve 407
3-4 accumulator control valve spring 408 (optional, but it's in mine)
3-4 accumulator control valve 409
Feed limit valve spring 410
Retainer ring 411
Feed limit valve 412
Plug filter seal 413
Screen plug 414
Force motor screen assembly 415
Torque converter clutch ON/OFF solenoid N.C. 416
Washer for the TCC solenoid 417

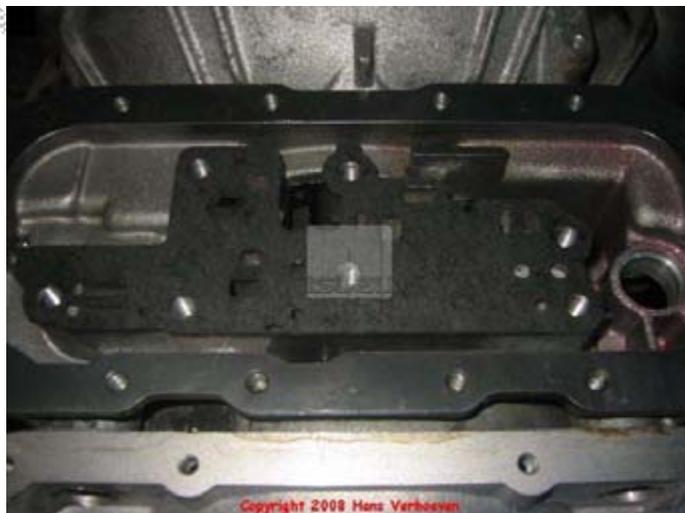
At this point it is easiest to have the complete transmission upside down on your workbench.



First put check ball 317 in the right spot on the adapter case. See picture for the correct location.



Stick adapter case to transfer plate gasket 104 on the adapter case using petroleum jelly.



Next to go on is the steel adapter valve body transfer plate 73. Use petroleum jelly.



On top of the steel adapter valve body transfer plate 73 goes adapter valve body gasket 72. Again using petroleum jelly.



Assemble the rest of the adapter case valve body 401.



Take extra care not to break the plastic connectors on the solenoids. After the plastic has been immersed in ATF for a couple of years, sixteen in my trans, I have found the plastic become a little brittle and easily to break. A new solenoid will easily set you back a couple of hundred dollars. So be gentle on them.

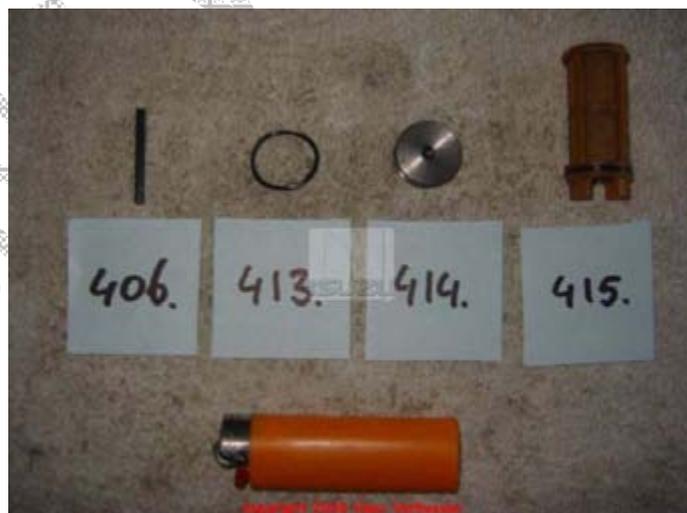
Take a good look at the pictures and drawings for details.

Change the o-rings and seals on the solenoid 416.

There are a inner and outer o-ring which vary slightly in diameter.



Change o-ring 413 on the screen plug 414.



Next runner up is the feed limit valve 412.



Then the 3-4 accumulator assembly.



Spring 408 is optional, but if it's there put it back in.

Followed by the solenoid force motor 404.



The assembled adapter case valve body 401 should look like this by now.



Before sticking the adapter case valve body 401 the wiring harness has to go in place. Route it through the channel in the adapter case before you put the completely assembled adapter case valve body 401 on the adapter case. Stick in the seven screws 70 and hand tighten them.



Use a torque wrench set to 20 Nm. (15 Ft lb or 180 in lb) and tighten the seven screws 70.

i Don't forget to set your torque wrench back to zero after using it.

Connect the harness to the solenoid and force motor.

For the torque converter clutch ON/OFF solenoid N.C. 416 or TCC in short you can't go wrong. Don't forget single the negative ground connector (white)

Force motor 404 link up: only two wires, blue and yellow. Put the yellow wire on the outermost connector and the blue on the inner.

Put a new seal on the adapter case electrical connector 22, then push it in it's position from outside the adapter case 20 carefully aligning that little notch into the cavity.





Connect the adapter case harness assembly 69 and the adapter case electrical connector 22 plus that little plastic protector without a name.



i Have you noticed the Fluid temperature sensor in the harness ? It's a temperature sensitive resistor (actually a thermistor)



Finally the adapter case bottom pan gasket 68 with some petroleum jelly, and the adapter case bottom pan 67 with the 12 screws 23.





Here you can see a couple of old magnets. They came from an old computer hard drive and are at least five times stronger than the original magnet.

Just later I decided the best place for those two extra magnets would be on the outside of the adapter case bottom pan 67 as the strength of the magnets might influence the working of the electrical parts on the inside of the pan. Just my two cents



34. The main valve body assembly.

There's a big part list here to work with, but relax, most of them can't go in wrong.



Parts needed:

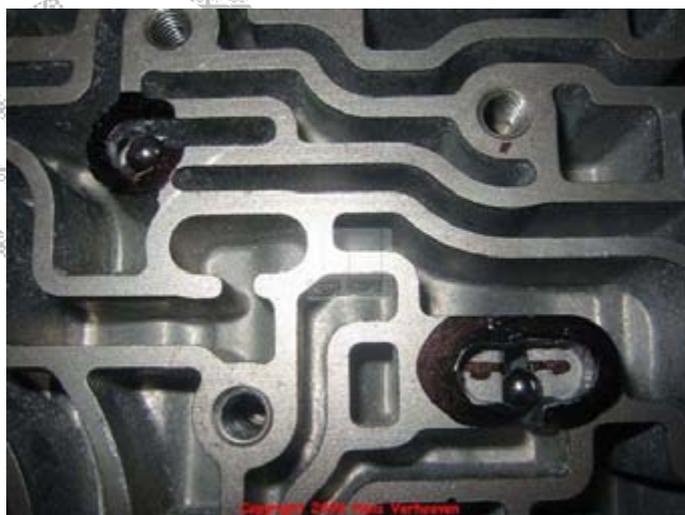
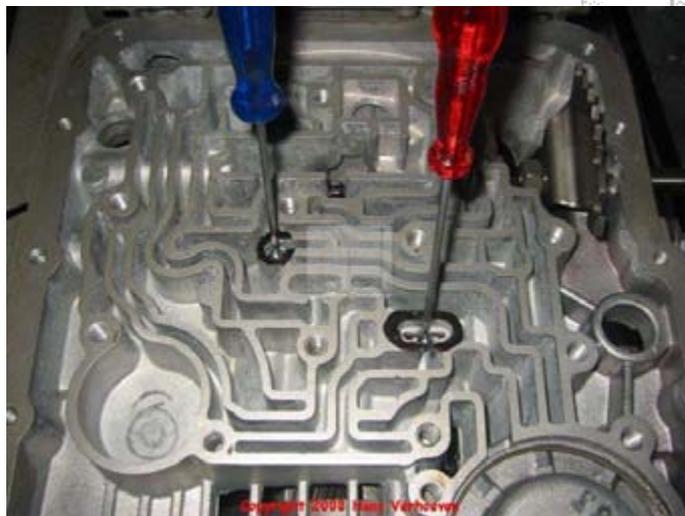
Sixteen screw and washer assembly 23
Electrical connector main case 55
Manual valve link 58
Twelve valve body screws 70
Bottom pan main case gasket 75
oil filter 79
Main case harness assembly 80
Manual detent roller and spring assembly 82
Main valve body to transfer plate gasket 86
Main valve body transfer plate 87 (steel)
Transfer plate to main case gasket 88
Two transfer plate on valve body screw 89
Main case valve body 301
Three spring pin 302
ON/OFF solenoid assembly 303
1-2 & 3-4 shift valve 304
Two 1-2 & 3-4 shift spring 305
Two Valve retainer 306
ON/OFF solenoid N.O assembly 307
2-3 shift valve 308
Two spring pins 309
Valve bore plug 310
Low pressure control valve spring 311
Low pressure control valve 312
Three check balls 317
1-2 accumulator control valve 318
1-2 accumulator control spring 319 (optional, but there's one in mine)
1-2 accumulator valve 320
Waved washer for the PWM solenoid 321 (PWM = Pulse Width Modulated)
PWM solenoid pin 322 (PWM = Pulse Width Modulated)
Band control solenoid assembly 323 (see below for a little write up)
PWM solenoid screen assembly 324
Screen plug 325
Manual valve 326

 A few general remarks before you start.

Use the pictures and drawings to work your way through the assembly of the main valve body 301. Don't forget the new o-rings on the solenoids. Use plenty of petroleum jelly on the moving parts and the cylinders of the valve body 301. Also use a little block of wood to keep the main valve body free from the workbench. Otherwise you might damage one of the plastic connectors of the solenoids. They're prone to break easily remember. When hammering those spring pins in, avoid them sticking out of the surface of the valve body .

Good luck. The clock starts now ! 4 minutes, beat that ! Nah, just kidding. Take your time.

Put two of the three check balls in the main case. See the picture for the right locations.



Next stick the transfer gasket main case 88 on with petroleum jelly to hold it in place.



Take the 3rd check ball 317 and place it in the right spot on the main case valve body 301. Again, look at the picture. Use a dab of petroleum jelly to hold it in place and prevent it falling out.



Put the main valve body to transfer plate gasket 86 on the main case valve body 301 using petroleum jelly.



The steel main valve body transfer plate 87 is next. Use the two transfer plate on valve body screws 89 to fasten the plate.



i Use a couple or all the twelve valve body screws 70 to get proper alignment of the plate and gaskets. Use 13 Nm of torque (9.58 Ft lb or 115 in lb) to tighten.

Place the complete valve body assembly on the main case. Carefully align all the holes but don't put ANY of the valve body screws 70 in yet.

One of the things lying on your workbench is the manual valve link 58. Be careful not to drop it into the main case when installing it. Link up the manual valve 326 with the parking lock and range selector lever 60.

i The manual valve link 58 has a short and long end. The short end links to the parking lock and range selector lever 60, the long end fits in the drilled hole at the end of the manual valve 326.



Take the Manual detent roller and spring assembly 82 and position the roller on the parking lock and range selector lever 60.



Now you can gently put in 9 of the twelve valve body screws 70 and hand tighten them first. Leave out the three valve body screws 70 that hold the oil filter 79.

Install the Servo piston gasket 92, the servo piston cover 91 and use the four servo cover screws 90. Tighten to 25 Nm. (18 Ft lb or 216 in lb).



Put the main case harness assembly 80 on the main valve body 301. Pay attention to the routing of the wires. There is a "channel" cut out of the main valve body 301 to accommodate for the harness to run through. It's mainly protected and held in place by the oil filter 79.



You still haven't put in the three remaining valve body screws 70.

Install a new seal on the electrical connector main case 55 using petroleum jelly on both connector and main case. Gently work the electrical connector main case 55 into the main case.



Connect the main case harness assembly 80 to the electrical connector main case 55. Look at the picture for reference on wire colors.



Now start tightening the first nine of the twelve valve body screws. There should be no screws in three of the holes at this stage. They get to be done when installing the oil filter 79 just after this. Torque: 20 Nm. (15 Ft lb or 180 in lb).

Install the new oil filter 79 using the three remaining valve body screws 70.



Take the last of the gaskets, the bottom pan main case gasket 75 and the remaining sixteen screw and washer assembly 23. Use 11 Nm. of torque (8 Ft lb or 96 in lb)

One last thing to do is the filler tube seal 26. Use petroleum jelly.



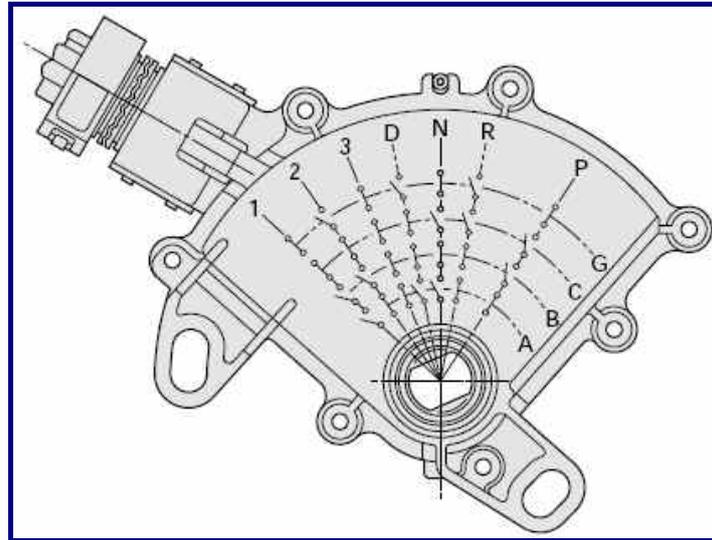
You might have to put in the two oil cooler fittings 34 and 35.



35. A word on the mode switch.

The mode switch is located on the left hand side of the main case. No, you're not gonna find it lying on your workbench. Unless you've taken the whole switch and harness out, it's still dangling under the vehicle.

It's a good idea to clean it's internals.



Unscrew the cover to expose the inner parts. Clean the inside thoroughly and re-grease the copper strips with some dielectric grease, a NON-conducting grease .



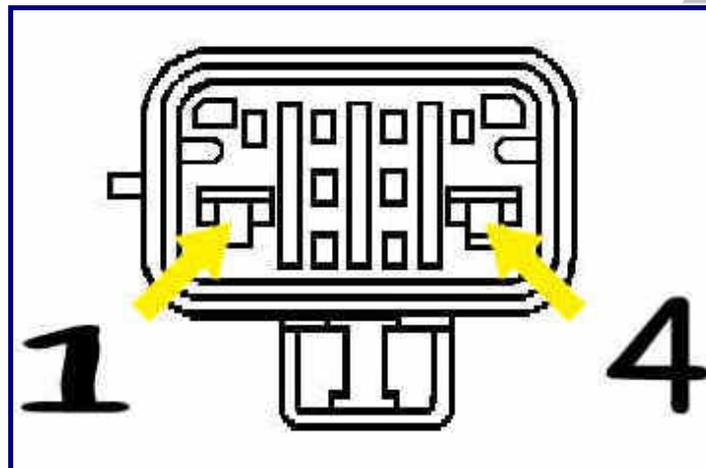
Once installed you need to set the mode switch. There are two procedures you can follow.

Procedure 1: Without using a multi meter.

1. Put the car in neutral.
2. Remove the selector lever from the mode switch.
3. Remove the cover.
4. Loosen the two 10 mm. mounting screws.
5. By rotating the mode switch you can line up the slot in the mode switch housing with the selector shaft bushing.
6. Insert a 2,4 mm punch (3/32 in) in the slot.
7. Tighten the two 10 mm. screws.

Procedure 2: Using a multi meter.

1. Put the car in neutral.
2. Disconnect the mode switch connector. It's located in front of the air filter box and it's the biggest of the three you'll find there. (black).
3. Connect a multi meter set to resistance between terminals 1 and 4.
4. Loosen the two mounting screws of the mode switch and find the range of electrical contact by turning the entire mode switch.
5. Then fix the mode switch to the middle of that range and tighten the two mounting screws.



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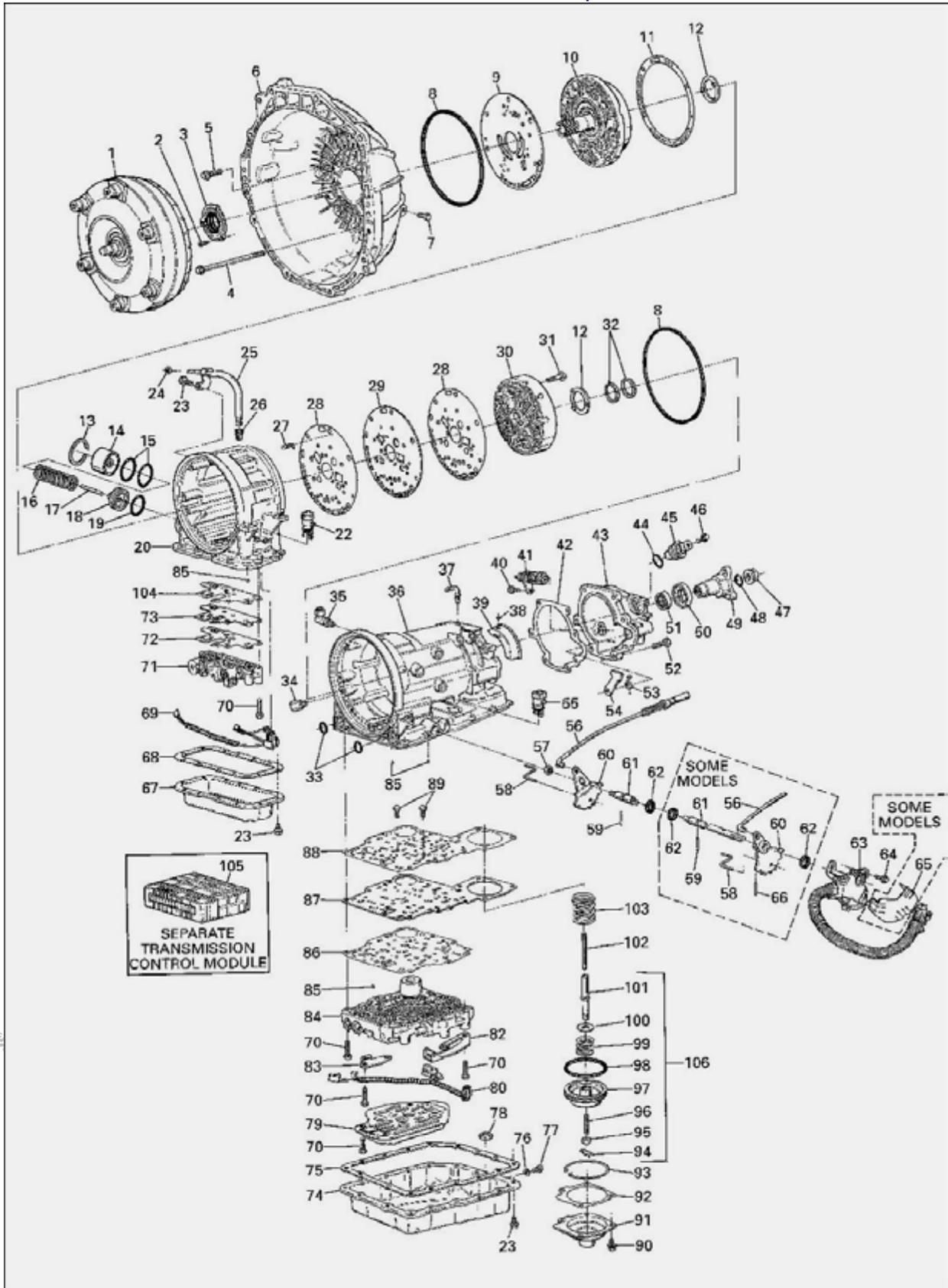
Hydra-Matic 4L30-E automatic transmission

Illustrated part list

Following images are a reproduction from the original
1992 General Motors Corporation - Powertrain Division.

HANS VERHOEVEN

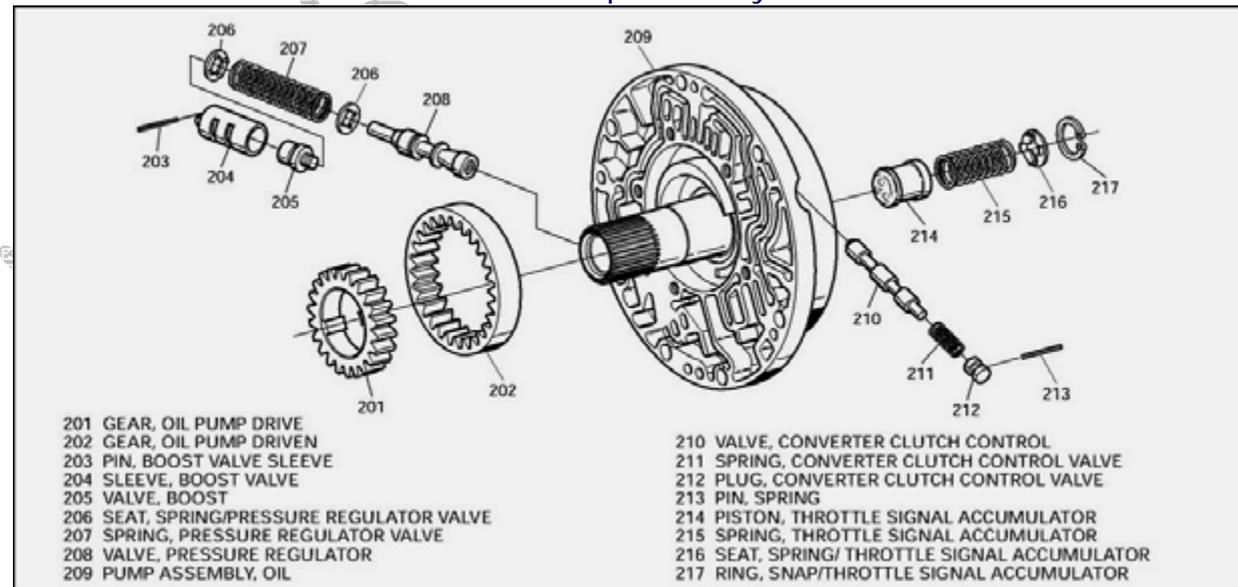
36. Case and associated parts.



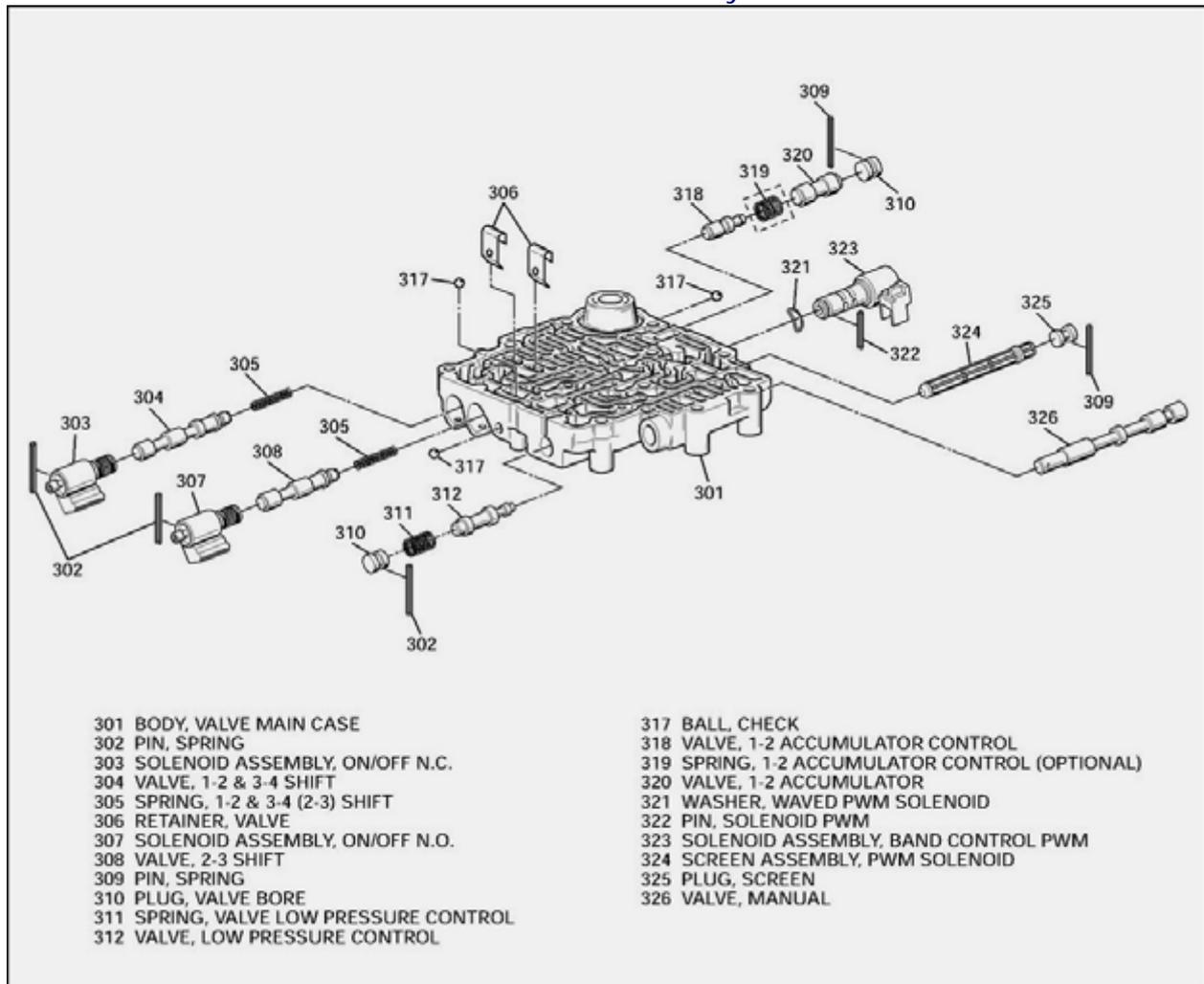
37. Case and associated part list.

- | | |
|---|--|
| 1 CLUTCH ASSEMBLY, CONVERTER | 54 PAWL, PARKING LOCK |
| 2 SCREW, SEAL RING ASSEMBLY | 55 CONNECTOR, ELECTRICAL/MAIN CASE |
| 3 SEAL RING ASSEMBLY, CONVERTER HOUSING | 56 ACTUATOR ASSEMBLY, PARKING LOCK |
| 4 SCREW, CONVERTER HOUSING/MAIN CASE | 57 NUT, PARKING LOCK LEVER |
| 5 SCREW, CONVERTER HOUSING/OIL PUMP | 58 LINK, MANUAL VALVE |
| 6 HOUSING, CONVERTER | 59 PIN, SPRING |
| 7 PLUG, CONVERTER HOUSING | 60 LEVER, PARKING LOCK & RANGE SELECTOR |
| 8 SEAL, O-RING | 61 SHAFT, SELECTOR |
| 9 WEAR PLATE, OIL PUMP BODY | 62 SEAL, SELECTOR SHAFT |
| 10 PUMP ASSEMBLY, OIL | 63 MODE SWITCH ASSEMBLY |
| 11 GASKET | 64 SCREW & CONICAL WASHER ASSEMBLY |
| 12 WASHER, THRUST SELECTIVE | 65 SHIELD, MODE SWITCH |
| 13 RING, SNAP | 66 PIN, SPRING |
| 14 COVER, 3-4 ACCUMULATOR PISTON | 67 PAN, BOTTOM/ADAPTER CASE |
| 15 SEAL, O-RING 3-4 ACCUMULATOR | 68 GASKET, BOTTOM PAN/ADAPTER CASE |
| 16 SPRING, 3-4 ACCUMULATOR PISTON | 69 HARNESS ASSEMBLY, ADAPTER CASE |
| 17 PIN, 3-4 ACCUMULATOR PISTON | 70 SCREW, VALVE BODY |
| 18 PISTON, 3-4 ACCUMULATOR | 71 VALVE BODY ASSEMBLY, ADAPTER CASE |
| 19 RING, 3-4 ACCUMULATOR PISTON | 72 GASKET, ADAPTER VALVE BODY |
| 20 CASE, ADAPTER | 73 PLATE, ADAPTER VALVE BODY/TRANSFER |
| 22 CONNECTOR, ELECTRICAL/ADAPTER CASE | 74 PAN, BOTTOM/MAIN CASE |
| 23 SCREW & CONICAL WASHER ASSEMBLY | 75 GASKET, BOTTOM PAN/MAIN CASE |
| 24 SEAL "O" RING, FILLER TUBE | 76 GASKET, OIL DRAIN PLUG |
| 25 TUBE ASSEMBLY, FLUID FILLER | 77 PLUG, OIL DRAIN |
| 26 SEAL, FILLER TUBE | 78 MAGNET, CHIP COLLECTOR |
| 27 RESTRICTOR, OIL | 79 FILTER, OIL |
| 28 GASKET, TRANSFER PLATE/ADAPTER | 80 HARNESS ASSEMBLY, MAIN CASE |
| 29 PLATE, TRANSFER ADAPTER/CENTER SUPPORT | 82 ROLLER & SPRING ASSEMBLY, MANUAL DETENT |
| 30 SUPPORT ASSEMBLY, CENTER | 83 PLATE, POSITIVE STOP |
| 31 SCREW, CENTER SUPPORT | 84 VALVE BODY ASSEMBLY, MAIN CASE |
| 32 RING, OIL SEAL | 85 BALL, CHECK |
| 33 SEAL, O-RING MAIN CASE | 86 GASKET, MAIN V.B./TRANSFER PLATE |
| 34 FITTING, COOLER | 87 PLATE, MAIN V.B./TRANSFER |
| 35 FITTING ASSEMBLY, COOLER | 88 GASKET, TRANSFER/MAIN CASE |
| 36 CASE, MAIN | 89 SCREW, TRANSFER PLATE ON V.B. |
| 37 BREATHER, PIPE | 90 SCREW, SERVO COVER |
| 38 SEAL, O-RING | 91 COVER, SERVO PISTON |
| 39 RESERVOIR | 92 GASKET, COVER/SERVO PISTON |
| 40 SCREW, SPEEDO DRIVEN GEAR ASSEMBLY | 93 RING, RETAINING SERVO PISTON |
| 41 GEAR ASSEMBLY, SPEEDO DRIVEN | 94 CLIP, SERVO PISTON |
| 42 GASKET, EXTENSION CASE | 95 NUT, SERVO SCREW |
| 43 EXTENSION ASSEMBLY | 96 SCREW, SERVO PISTON |
| 44 SEAL, O-RING/SPEED SENSOR | 97 PISTON, SERVO |
| 45 SENSOR ASSEMBLY, SPEED | 98 SEAL, RING/SERVO PISTON |
| 46 SCREW, SPEED SENSOR | 99 SPRING, CUSHION/SERVO PISTON |
| 47 NUT, OUTPUT SHAFT/DRIVE FLANGE | 100 SEAT, CUSHION SPRING |
| 48 SEAL, O-RING/DRIVE FLANGE | 101 SLEEVE, SERVO PISTON ADJUST |
| 49 FLANGE, DRIVE | 102 ROD, APPLY/SERVO PISTON |
| 50 SEAL, EXTENSION ASSEMBLY | 103 SPRING, RETURN/SERVO PISTON |
| 51 BEARING, NEEDLE/EXTENSION | 104 GASKET, ADAPTER CASE/TRANSFER PLATE |
| 52 SCREW, EXTENSION/MAIN CASE | 105 TRANSMISSION CONTROL MODULE |
| 53 SPRING, PARKING PAWL LOCK | 106 SERVO PISTON ASSEMBLY |

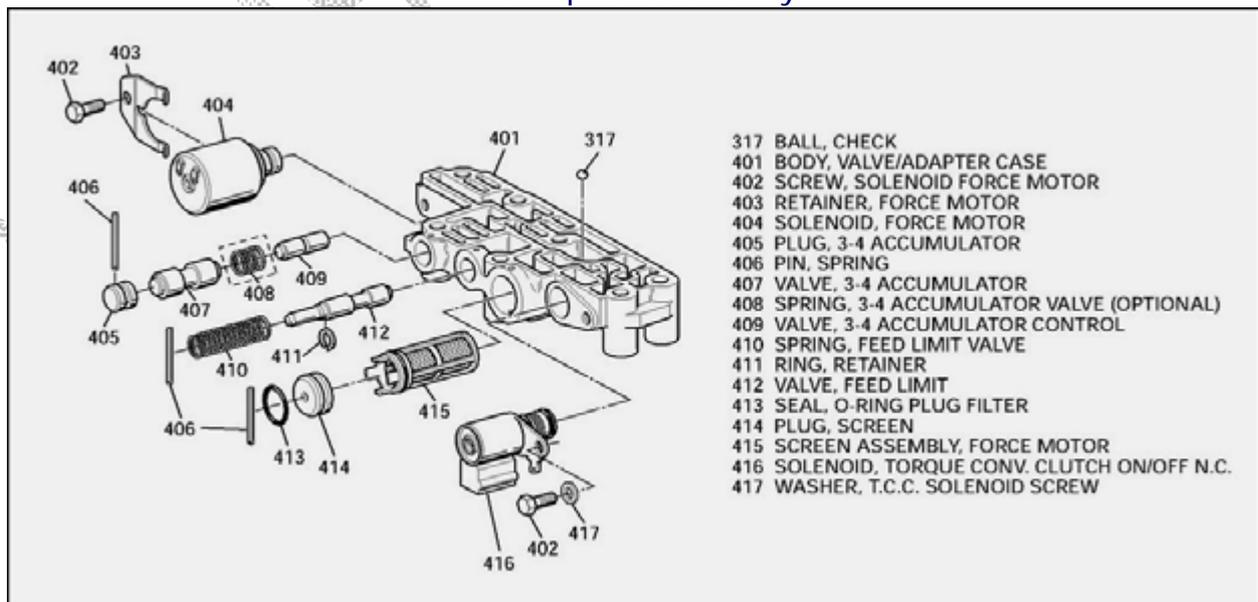
38. Pump assembly.



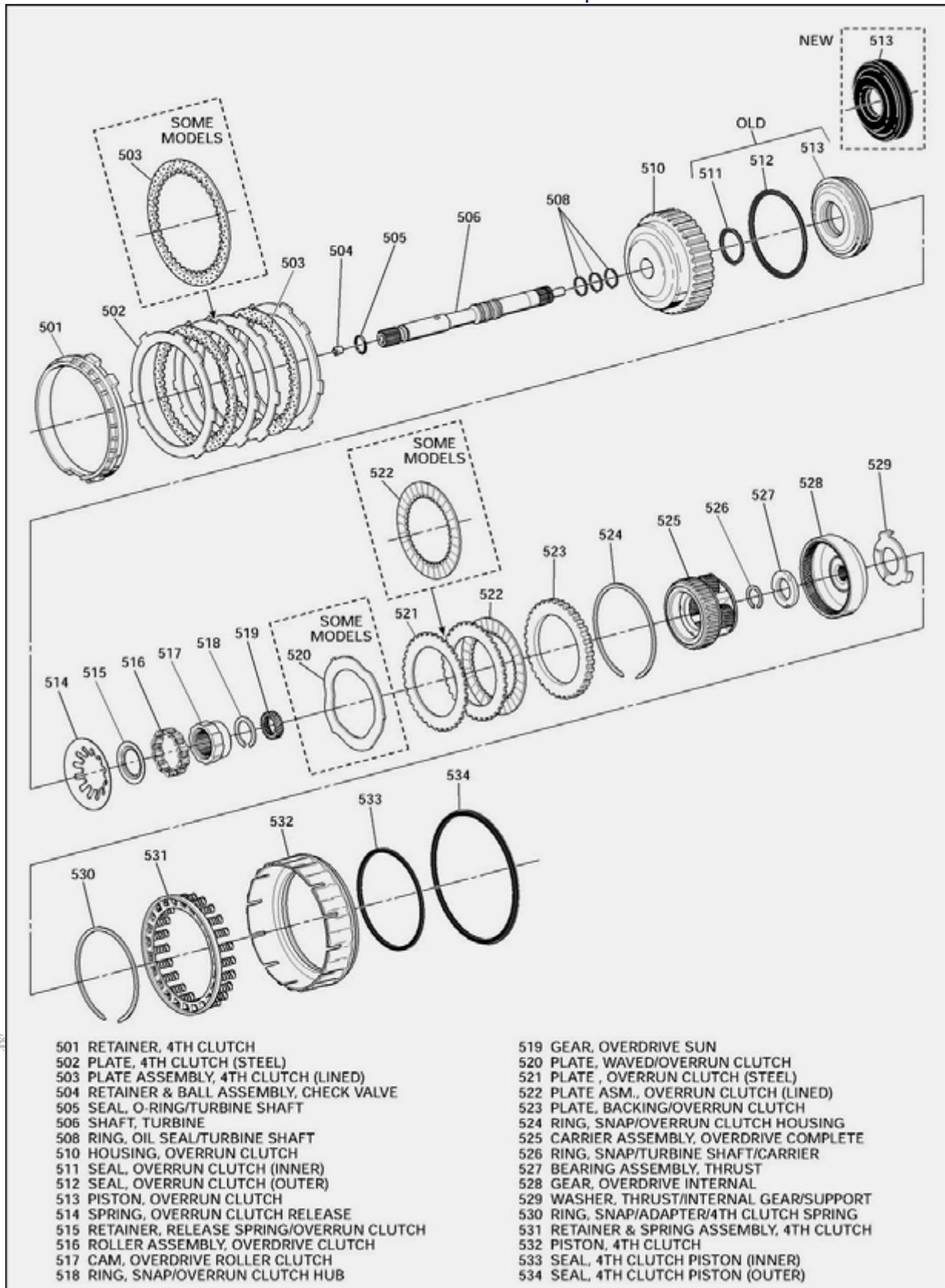
39. Main valve body.



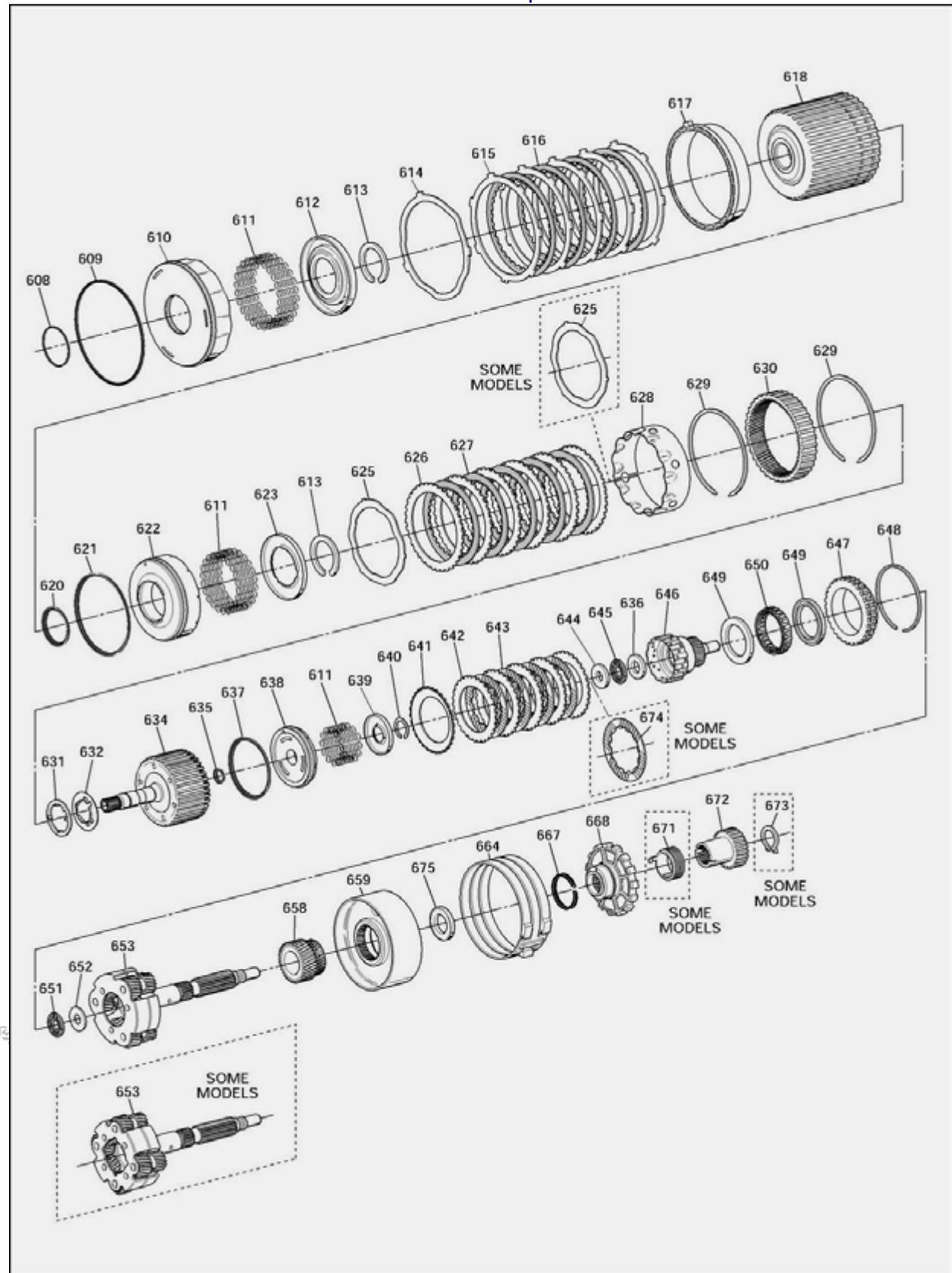
40. Adapter valve body.



41. Overdrive internal components.



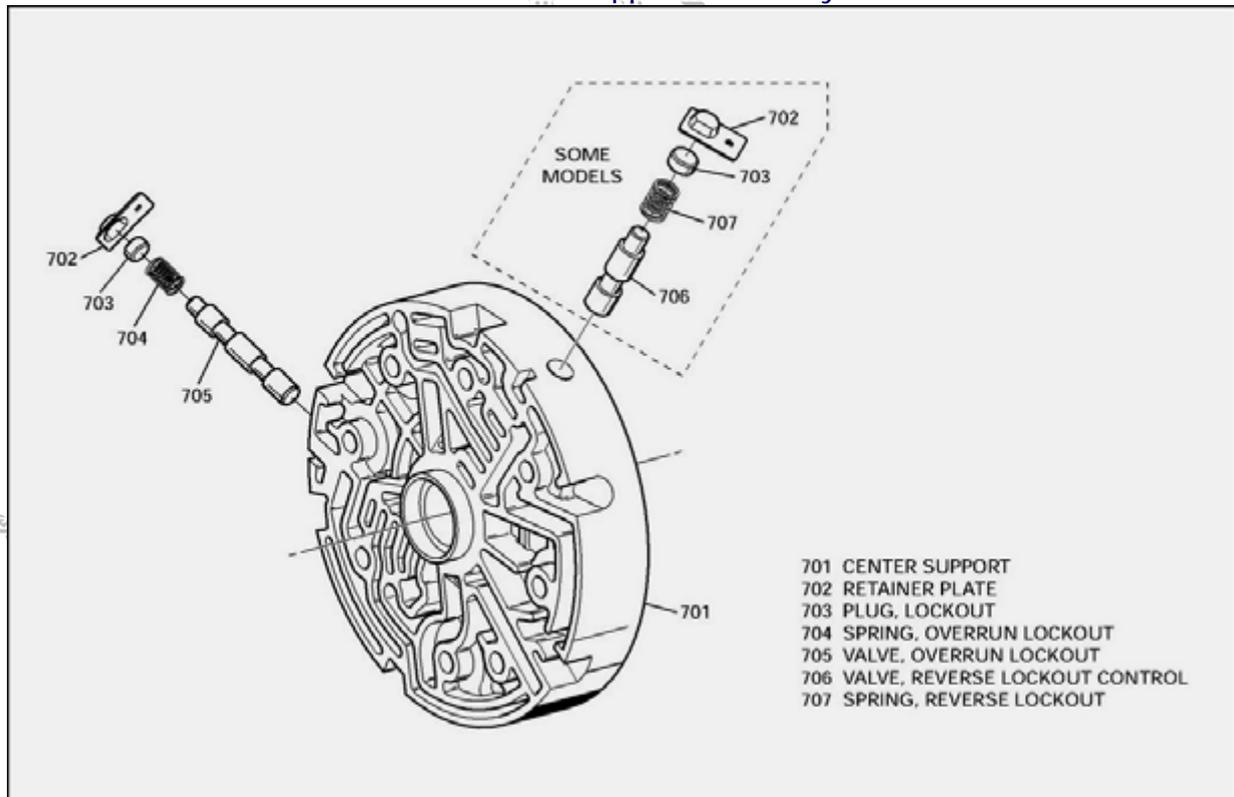
42. Internal components.



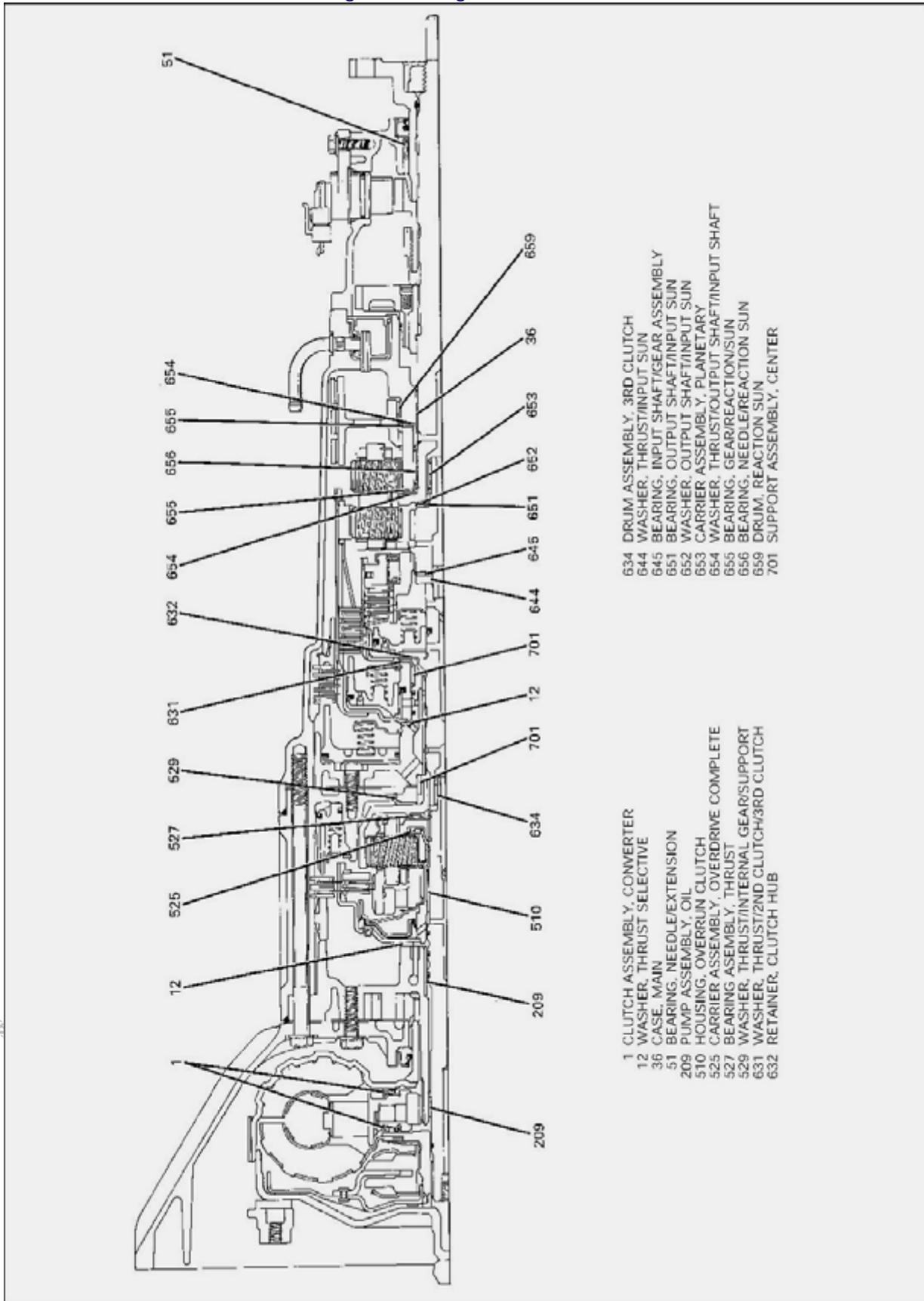
43. Internal components part list.

608 SEAL, REVERSE CLUTCH PISTON (INNER)	638 PISTON, 3RD CLUTCH
609 SEAL, REVERSE CLUTCH PISTON (OUTER)	639 SEAT, SPRING/3RD CLUTCH
610 PISTON, REVERSE CLUTCH	640 RING, RETAINING
611 SPRING, PISTON CLUTCH	641 PLATE, SPRING CUSHION/3RD CLUTCH
612 SEAT, SPRING/REVERSE CLUTCH	642 PLATE, 3RD CLUTCH (STEEL)
613 RING, RETAINING	643 PLATE ASSEMBLY, 3RD CLUTCH (LINED)
614 PLATE, WAVED/REVERSE CLUTCH	644 WASHER, THRUST/INPUT SUN
615 PLATE, REVERSE CLUTCH (STEEL)	645 BEARING, INPUT SHAFT/GEAR ASSEMBLY
616 PLATE ASSEMBLY, REVERSE CLUTCH (LINED)	646 GEAR ASSEMBLY, INPUT SUN
617 PLATE, REVERSE CLUTCH PRESSURE/SELECTIVE	647 RACE ASSEMBLY, SPRAG
618 DRUM ASSEMBLY, 2ND CLUTCH	648 RING, RETAINING/SPRAG
620 SEAL, 2ND CLUTCH PISTON (INNER)	649 RING, RETAINING
621 SEAL, 2ND CLUTCH PISTON (OUTER)	650 CAGE ASSEMBLY, SPRAG
622 PISTON, 2ND CLUTCH	651 BEARING, OUTPUT SHAFT/INPUT SUN
623 SEAT, SPRING/2ND CLUTCH	652 WASHER, OUTPUT SHAFT/INPUT SUN
625 PLATE, WAVED/2ND CLUTCH	653 CARRIER ASSEMBLY, PLANETARY
626 PLATE, 2ND CLUTCH (STEEL)	658 GEAR, REACTION SUN
627 PLATE ASSEMBLY, 2ND CLUTCH (LINED)	659 DRUM, REACTION SUN
628 SPACER, 2ND CLUTCH	664 BAND ASSEMBLY, BRAKE
629 RING, RETAINING	667 SEAL, RING/WHEEL PARKING LOCK
630 GEAR, RING	668 WHEEL, PARKING LOCK
631 WASHER, THRUST/2ND CLUTCH/3RD CLUTCH	671 GEAR, SPEEDO WHEEL
623 THRUST WASHER, CLUTCH HUB	672 WHEEL, SPEEDO
634 DRUM ASSEMBLY, 3RD CLUTCH	673 RING, RETAINING
635 SEAL, 3RD CLUTCH PISTON (INNER)	674 PLATE ASSEMBLY, 3RD CLUTCH (LINED)
636 WASHER, RETAINING	675 BEARING, THRUST ASSEMBLY
637 SEAL, 3RD CLUTCH PISTON (OUTER)	

44. Center support assembly.



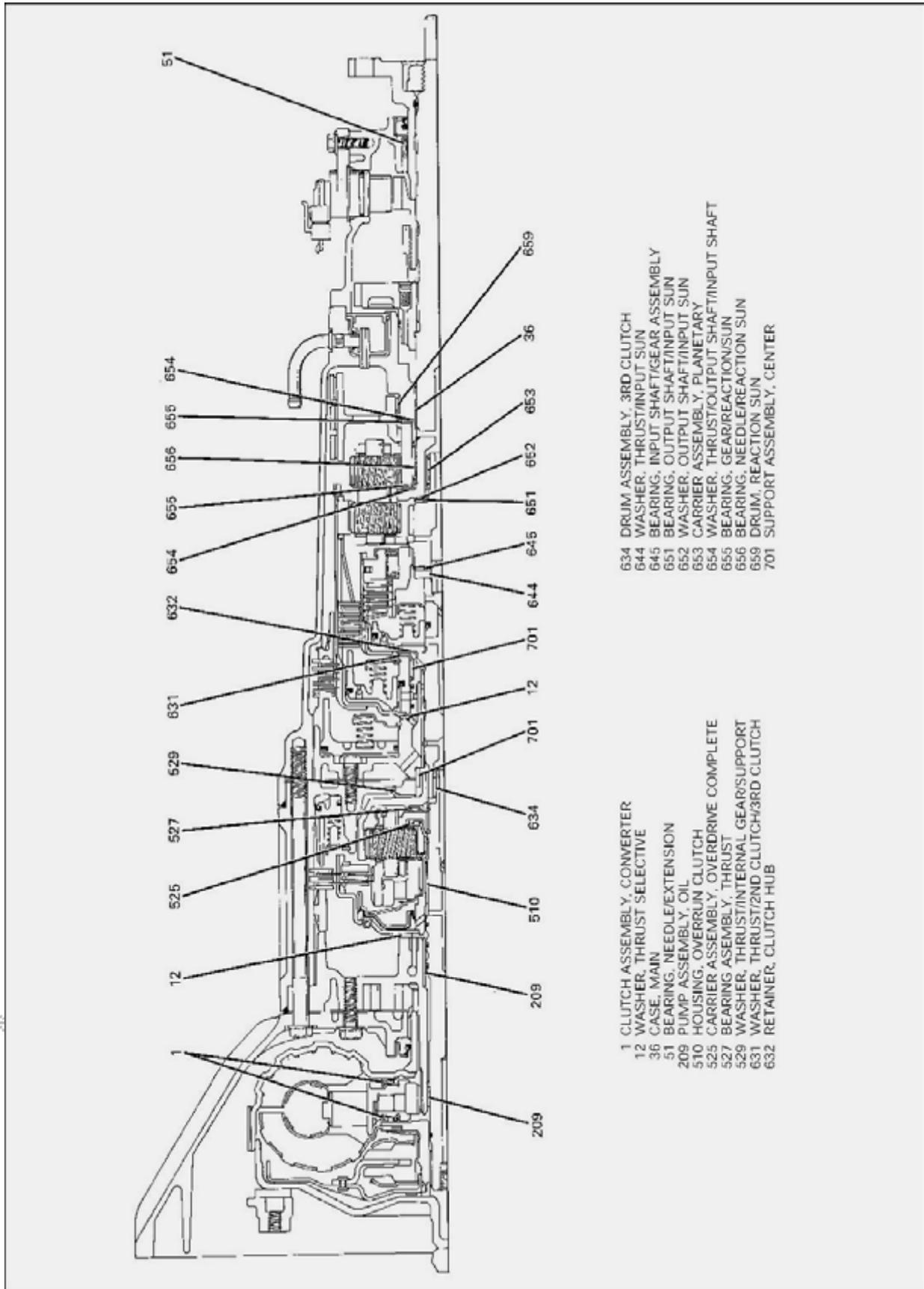
45. Bushings, Bearings & Washer Locations.



- 1 CLUTCH ASSEMBLY, CONVERTER
- 12 WASHER, THRUST SELECTIVE
- 36 CASE, MAIN
- 51 BEARING, NEEDLE/EXTENSION
- 209 PUMP ASSEMBLY, OIL
- 510 HOUSING, OVERRUN CLUTCH
- 525 CARRIER ASSEMBLY, OVERDRIVE COMPLETE
- 527 BEARING ASSEMBLY, THRUST
- 529 WASHER, THRUST/INTERNAL GEAR/SUPPORT
- 631 WASHER, THRUST/2ND CLUTCH/3RD CLUTCH
- 632 RETAINER, CLUTCH HUB

- 634 DRUM ASSEMBLY, 3RD CLUTCH
- 644 WASHER, THRUST/INPUT SUN
- 645 BEARING, INPUT SHAFT/GEAR ASSEMBLY
- 651 BEARING, OUTPUT SHAFT/INPUT SUN
- 652 WASHER, OUTPUT SHAFT/INPUT SUN
- 653 CARRIER ASSEMBLY, PLANETARY
- 654 WASHER, THRUST/OUTPUT SHAFT/INPUT SHAFT
- 655 BEARING, GEAR/REACTION/SUN
- 656 BEARING, NEEDLE/REACTION SUN
- 659 DRUM, REACTION SUN
- 701 SUPPORT ASSEMBLY, CENTER

46. Seal locations.



47. The Legal Talks.

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