

This is a message from sjwoody at Ford Truck Enthusiasts Forums

(<http://www.ford-trucks.com/forums/index.php>).

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This is the message:

Hope this helps.....

Notes from SJWoody

The following applies to 1991 to 1994 and maybe some 1995 Ford Explorer transfer case electric shift motors. Please read the entire article before beginning work. These procedures worked for me, and were written several weeks after the job was accomplished. The information I had at the time of work came from www.glue.umd.edu/~singletn/web/pages/tcase.html, which I believe doesn't exist anymore. If there are any errors, they are mine and are likely due to the lag in time of this writing from the actual work done. This is an effort to consolidate the information from my 13 pages of hard copy of the site listed above, plus my own experience. Please let me know of any omissions or improvements that can be made. I am not a professional auto mechanic, but as mentioned earlier, these procedures worked for me. Before approaching the problem with the transfer case motor, consider that there are four possible issues, which may come up during the repair.

1. The motor brushes and commutator may be contaminated and need cleaning.
2. The actuator stop has a rubber or plastic bumper, which has likely become brittle and has fallen off the post it's mounted on.
3. The limit switch plate (printed circuit plate), and contact fingers for the plate may need corrosion cleaned from the contacts using a pencil eraser and an aerosol contact cleaner.
4. The limit switch plate may have just rotated, since the mount screws only apply pressure to the cover, and don't positively lock the plate in position.

The following description covers the first three issues. These seem to be the most common problems with the system. The fourth issue will be addressed at the end of the article. There are two major components to the assembly: the motor, and the actuator (or, gearbox). To remove the assembly from the transfer case, begin by removing the vibration dampener. This isn't necessary, but will make working on the motor assembly much easier. Remove the motor assembly from the transfer case as follows:

1. Disconnect the negative battery cable. Disconnect the harness connector at the shift motor assembly. (Note how the harness is routed. A quick picture with the digital camera may prove useful on reassembly).
2. All wires will be disconnected at this point except the brown wire leading to the speed sensor. Some people have just cut the wire and spliced it back after completing the repair. This isn't necessary. With a pair of hemostats, small pair of needle-nose pliers, or just a really small screwdriver, you can remove the red plug inside the connector. With this plug out, carefully pry the locking tab to the side of the pin and pull gently on the wire. This should release the pin from the connector. On reassembly, simply push the pin back into the connector until you hear the "click", and then reinstall the red plug.
3. There is a bracket on the back end of the motor, opposite the actuator. Remove the single bolt that holds this bracket to the transfer case.
4. Remove the three hex (not torx) bolts holding the assembly to the transfer case. Remove the motor assembly from the transfer case and take it to a workbench for further work.

NOTE: At this point you can see the shaft sticking out of the transfer case. Its triangular shape has a pointed end, which should be pointing at the 2H marker on the transfer case. The following describes work on the motor only:

NOTE: Before you begin, use a marker to make alignment marks on the motor cylinder cover, end caps, actuator housing covers, and everywhere something separates from the assembly. Also, mark where the triangular "socket" is pointing. This is located on the backside of actuator and is the female portion that fits on the shaft sticking out of the transfer case. These marks will greatly simplify reassembly.

1. Carefully remove the two long screws holding the bracket to the back of the motor. These also hold the motor assembly together.
2. With some effort, you need to overcome the magnetic pull on the armature. Pull the cylinder cover from the motor.

NOTE: Do this carefully, as the brushes and springs will pop out of position as you pull apart the motor. Don't lose the springs!!! As the cover separates about an eighth of an inch, look inside and you will see the brushes and how they ride on the armature contacts (commutator).

3. With the cover off, use emery or crocus cloth (or fine sandpaper) to clean the contacts where the brushes ride. These contacts will likely be very black. Restore the contacts back to their shiny copper color. Blow off any residue with low-pressure air, or by mouth.
4. After cleaning, a second pair of hands will make reassembly much easier. Have a helper hold the brushes retracted against the springs in their slots while you slide the armature back into position. As you get close to position, rotate the armature to the left to engage

the worm gear. (I was able to do this alone, but it took some effort and a few tries to get it right).

5. With the armature and brushes in position, rotate the armature until the female socket points to the mark you made earlier on the back of the actuator. Reinstall the cylinder cover, bracket and long screws.

The following describes work on the actuator:

1. The cover for the actuator is held on with three proprietary (tamperproof) torx screws, size 20T. I was able to remove mine with a small pair of vise grips. Others have described using a Dermal to cut a slot for a straight blade screwdriver, or purchasing the proper bit (who wants to do that?). The screws can be replaced with standard 8x32 screws of the proper length. These screws don't positively lock the cover in place. They only provide pressure, through the washers, to hold the cap down in place. Make sure you make alignment marks on the cover before removal.
2. Remove the cap, and the gear inside. With the gear out you will likely see a small post on the backside with what looks like hardened grease on it, and similar pieces floating around inside the case. This is what's left of a translucent colored plastic stop bumper that was mounted on the post. Clean this out and replace with some 5/16 fuel hose or vacuum tubing. Make sure you carefully trim this replacement bumper to the same height as the post. I used a razor blade.
3. Clean the contact fingers and the printed circuit with a pencil eraser and wash clean with contact cleaner.
4. Reassemble using your alignment marks.

At this point your motor and actuator should be fully assembled. Take the unit back to your vehicle and reinstall using the reverse procedures as shown in the first section. This is where a picture would have been useful for the wire routing. Fortunately for me, I had a second Explorer in the driveway that I could use as a guide. Line up the triangular shaft in the transfer case with the socket in the actuator. You may have to wiggle the whole unit to get the mount holes to line up once the shaft is engaged. Make sure you have the speed sensor and retaining bracket lined up properly. The bracket is held in place by two of the actuator mount bolts.

Issue number four, as described at the top of this article, says that the limit switch plate may have rotated, since the bolts only provide pressure to the cap. I have no experience with this and will quote from the article I have, written by drbob: "T

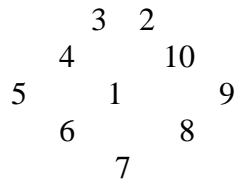
he first task is to get the shift motor to some known position. The easiest is probably to the 2WD position. The manual then gives a matrix of switch positions vs. motor positions to go through. Using the ohmmeter on the terminals of the eight-pin harness connector at the shift motor, look for the following conditions. Do this testing on the connector terminals of the transfer case with the harness disconnected.

In 2WD position, pin 10(yel/wht) should show continuity with pin 6 (violet) and continuity with pin 8 (brn/wht) and should show no continuity with pin 7 (white) and no continuity with pin 9 (org/wht).

In the 4WD/Low position, pin 10 (yel/wht) should show continuity with pin 6 (violet) and continuity with pin 7 (wht) and show no continuity with pin 8 (brn/wht) and no continuity with pin 9 (org/wht)

These cover the two extreme positions in the rotation of the transfer case shift motor. To move the transfer case motor, apply 12V to the following terminals: +12V to pin 3 (yel) with -12V (ground) to pin 2 (org). Reverse polarity of these connections to rotate the motor to the 4WD/Low position. Again, make these connections with the harness disconnected. It is extremely important that you make exactly the correct connections when you do this. Accidentally shorting through one of the switch contacts or the speed sensor with 12 volts will destroy them.

The color codes on the harness wires provide the best identification of the correct circuits. This connector is a square plastic outside shell with a round barrel inside, and a circular ten-pin array. Pin one is in the center. Looking at the motor connector from the control wiring harness end, the pins are numbered as follows:



(very bad html version of ASCII art)

It appears from the manual drawing that those two key shots in the motor connector are opposed at the bottom as shown in the above diagram; you should still confirm the harness color codes before applying any voltage to shift the motor. Also remember that the transmission needs to be in neutral when you do the shift. Keep the 12V power attached only for the time needed to shift the case...maybe 5 seconds max.

Once you've forced the motor to the extremes of it's travel, you can install the cover and position sensor assembly in whatever position you need to get the switch logic detailed above. This may take a bit of time and patience, but is still cheaper than a few hundred bucks spent replacing the whole motor/sensor assembly. If the controller is confused, disconnect the battery for a minute or two so the controller can "forget" that it doesn't know where the motor is."