

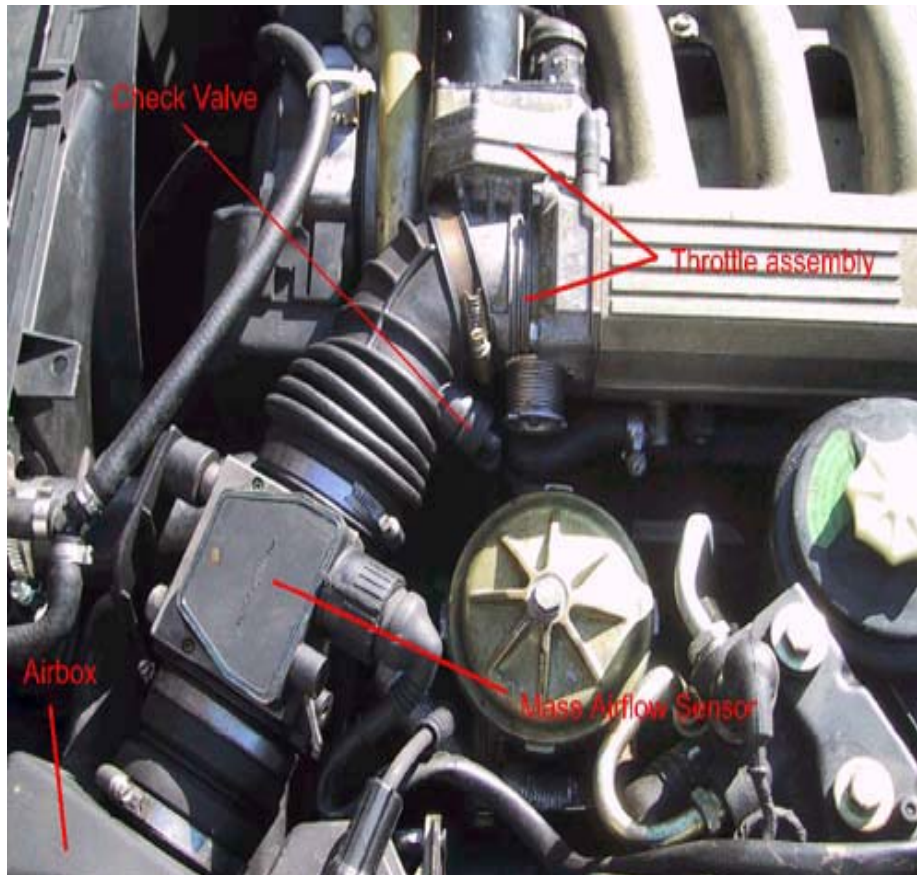
Reconditioning BMW 750il throttle assemblies./

My 1990 BMW 750il was not idling well, and I was starting to get "EML" errors on startup. The "EML" light would stay on when I started the car, and the engine would run in "limp home" mode. If I turned off the ignition, the subsequent start would usually be ok. My penske reader would not return a fault code, but the more sophisticated one at my mechanic would return an error code for the throttle.

Great. These little babies cost \$900 new, and are supposed to be un-maintainable. But I found some used throttle assemblies on E-Bay cheap, and since I naturally have to take things apart on my own anyway, I dove in.

The bottom line is that the throttles are easy to take apart, and very easy to recondition. The results were dramatic -- my engine now idles like a sewing machine, and runs smoother across the whole rev range. And NO "EML" errors! The following details my exploration into the secrets of the BMW throttle.

The first Photo is of the throttle location in the engine compartment. The left side of the engine is shown, but there are two of these guys on the V-12 engine. By the way, even though this is a picture of what I call the LEFT side of the engine, the intake shown is the RIGHT intake assembly, this being because the intake to the RIGHT side heads cross over the middle of the engine.



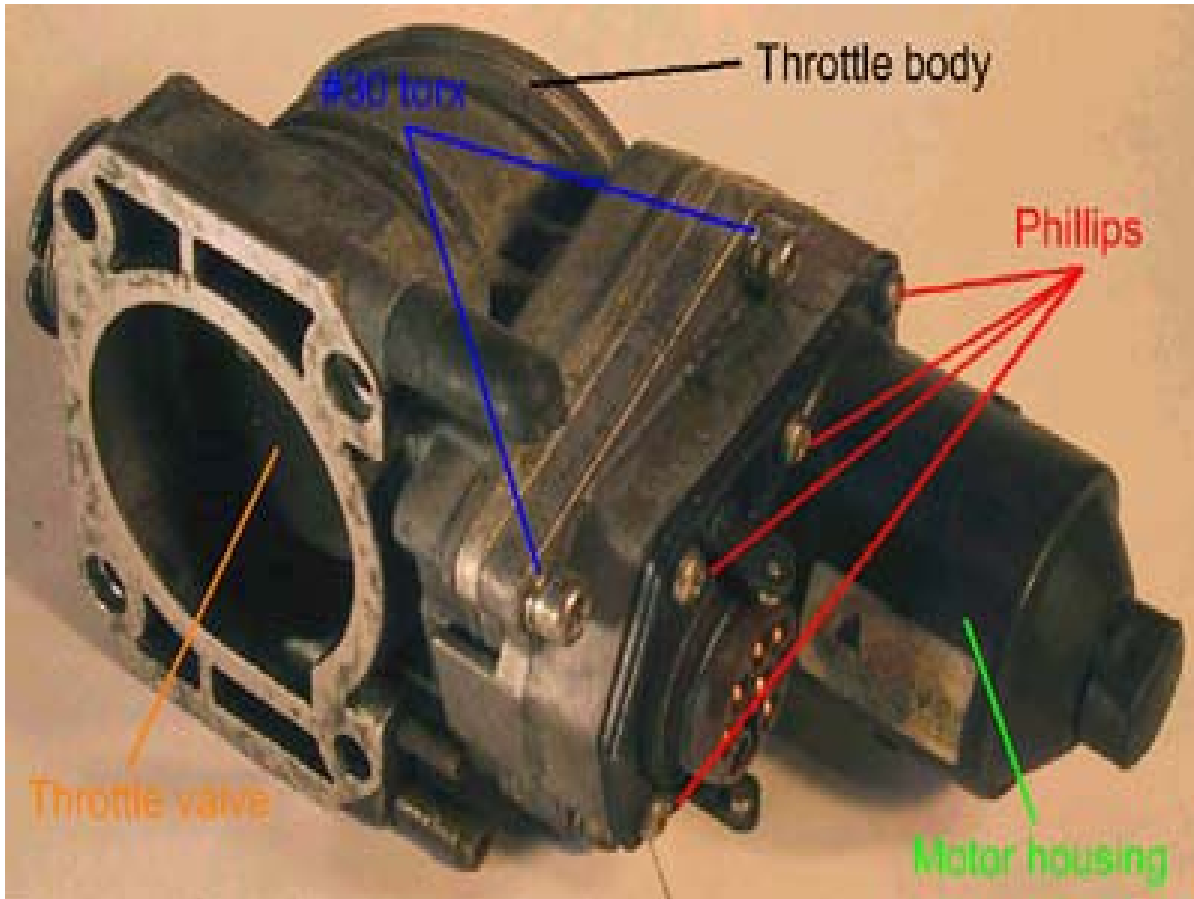
The removal of the throttle assembly is very easy. Remove the airbox cover and the connecting hose to the MAF (mass airflow sensor). Disconnect the MAF and remove it and the hose to the Throttle assembly, making sure to remove the check valve from the hose.

There are four 6mm (10mm wrench size) bolts holding the throttle assembly on, with the bottom two being easier to remove with a universal joint on your socket set.

You may want to test the throttle before you take it apart. The electrical connector has the pins labeled, and to make the throttle valve fully open, you need about four volts across pins 3 and 5 at 2.5 amperes.

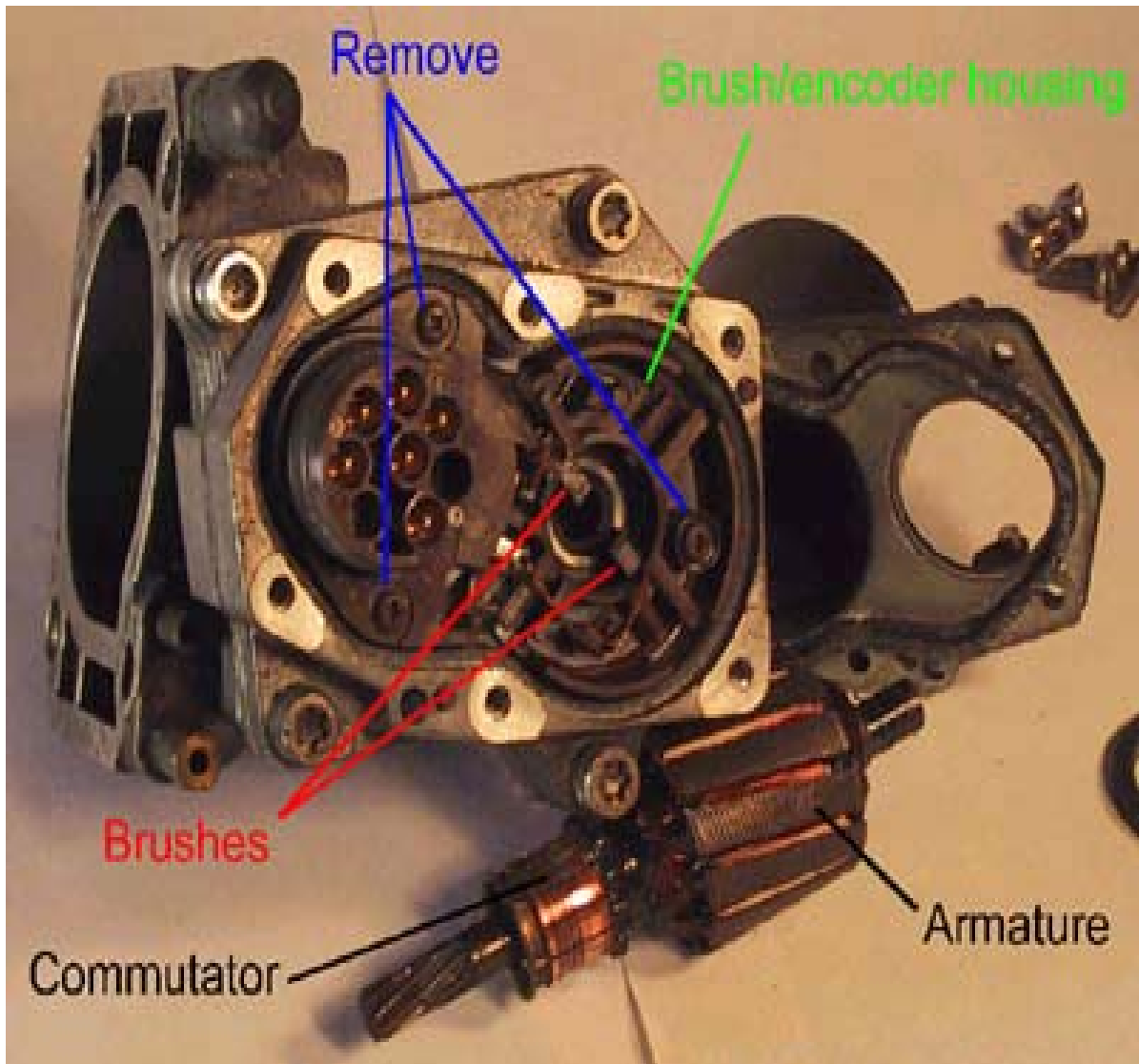
I happen to have a bench power supply that will let me run the throttle, but if you don't have such an animal, don't despair. Just run to radio shack and get a 2.4 ohm, 25watt wirewound resistor, part number 900-1284. Now you can use your car battery to run the throttle. Connect the negative terminal of the battery to pin 5 of the throttle connector, and the positive terminal of the battery to pin 3 of the connector THROUGH the 2.4 ohm resistor. CAREFUL -- the resistor will get very hot!! I would not recommend leaving the battery hooked up for very long. But you should see the throttle valve rotate slowly to full open when you attach the power. Remove the battery connection and the valve should slowly rotate back to fully closed. On all four throttles that I looked at, before cleaning, the throttle valve would stick at some point in the closing process. I'm sure this is the root of most of the throttle problems, and is a good reason in my mind to clean the throttles. I should mention that the 1988 throttles I opened were reported to have 88K miles on them, and the 1990 throttles had 105K miles.

You might also at this point want to measure the output of the throttle position encoder, to see if you need to work on that. Appendix A gives my measurements for the encoder output on my four throttles. I don't know what the absolute BMW spec is on the encoder, but I'm sure that these values are in the ballpark.



Take the throttle back to your bench, and remove the six phillips head screws holding the motor housing to the throttle body. On both the 1988 and 1990 throttles I worked on these screws are normal phillips head screws; I have heard that some have "tamper proof" screws here. If so, you could file a slot in them to remove, or you could check with the McMaster- Carr company, WWW.mcmaster.com, for a screwdriver to fit the head.

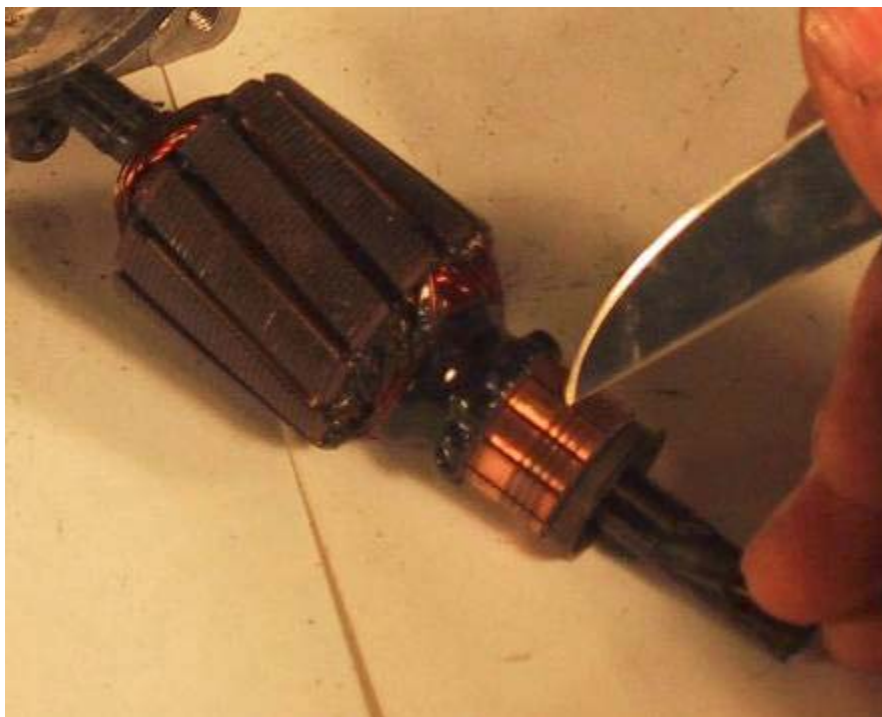
Removing the motor housing will take a little pulling, because the magnets on the motor housing will pull on the motor armature. If at all possible leave the motor armature in the throttle as you pull off the housing; this will prevent possible damage to the motor brushes as you remove the armature. Push back the brushes from the commutator before you remove the motor armature.



Once you get the housing off, you will see the guts of the motor and encoder assembly. You can now remove the motor brush and encoder wheel housing by removing the three phillips head screws shown.

Let's spruce up the motor armature first. The main cleaning job here is to clean the commutator, the copper area where the armature windings get their electricity from the motor brushes. Using some #0000 steel wool, polish the commutator AROUND parallel to the brush marks already there. You could also GENTLY clamp the armature in a vise (use a rag or other soft material to pad the vise jaws) and use #600 or #1500 sandpaper to clean the contacts.

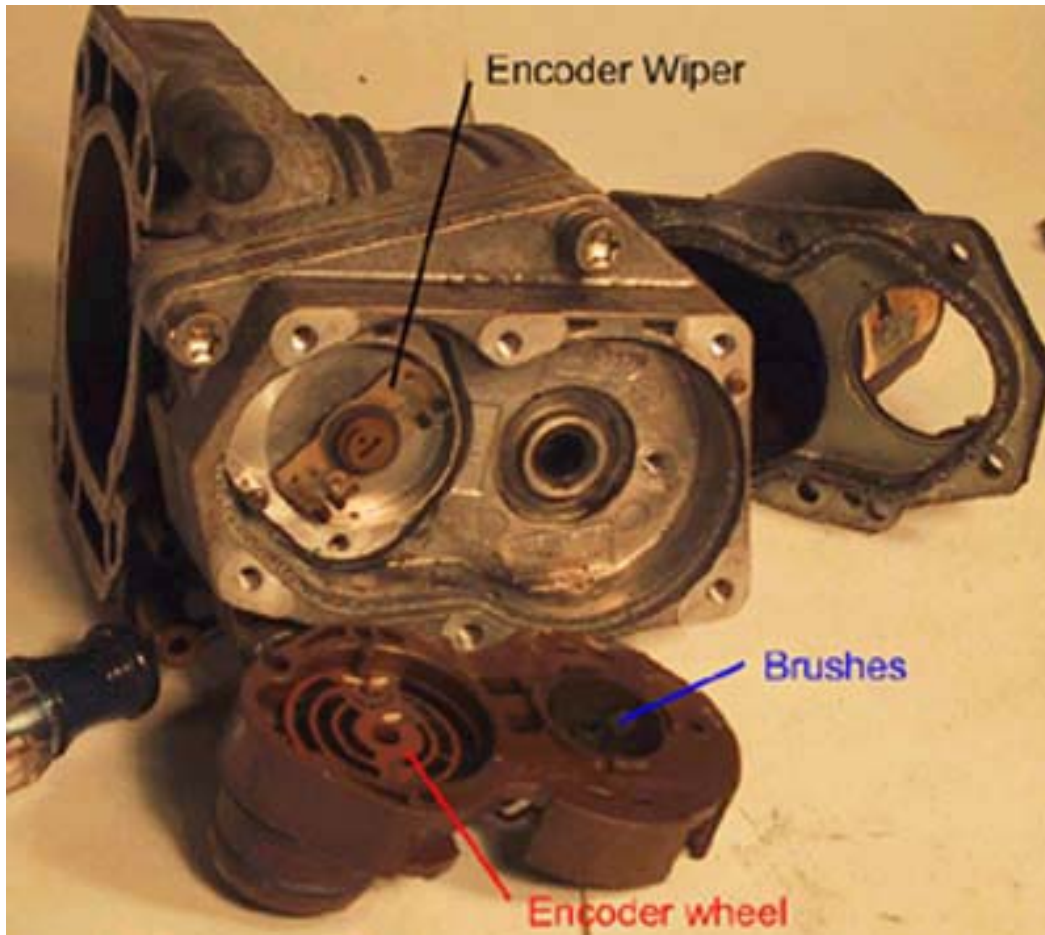
Remove the brush dust that has collected between the commutator contacts with the back side of knife blade.



Make sure that you leave no steel wool bits on the commutator or in the armature!

Set the armature aside for now. The next step is to clean the motor brushes and brush/encoder housing. Wipe it down with a clean rag, and run the brushes back and forth in their grooves. If the faces of the brush contacts have worn to the point that there are no grooves left, you might want to remove the brushes entirely and carefully re-groove them with three parallel grooves, matching the pattern that has worn into the commutator. Frankly, this is probably not needed, however; it is so easy to remove the throttle and take it apart that you could just leave them and repeat the cleaning more often.

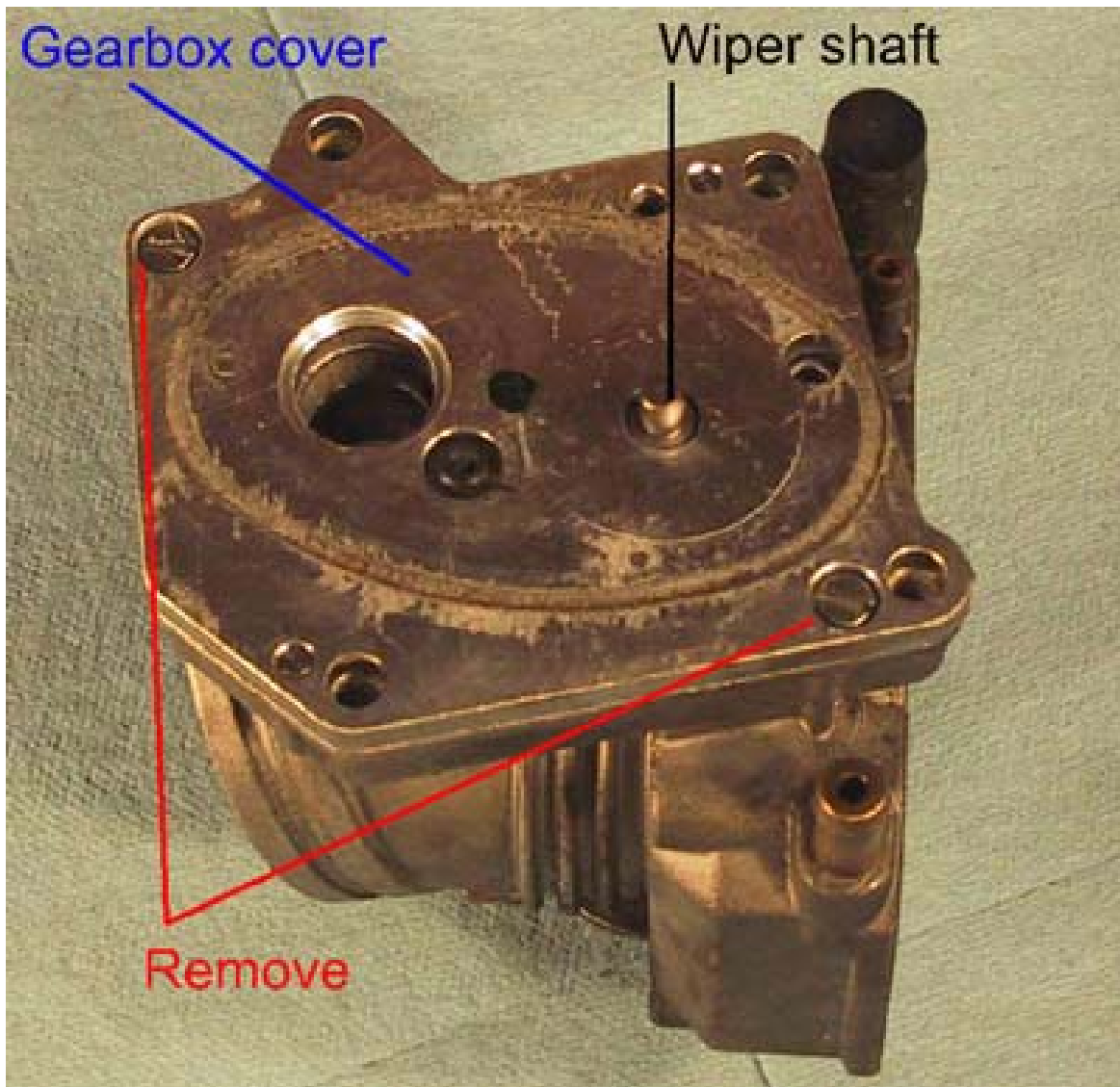
The back side of the brush/encoder housing has the throttle position encoding wheel on it. The wiper assembly is connected to the end of the throttle valve shaft, and as the shaft turns the wipers slide along the encoder wheel. The wheel stripes are made of a material that varies in resistance per length; the whole thing produces a "volume control" that tells the main computer what the throttle opening is.



All the throttles that I opened had no problem in this area; I could see some problems arising if the encoder wheel had cracked, or if the wiper contacts had worn away the encoder wheel stripes. Appendix A has my measurements of the encoder output.

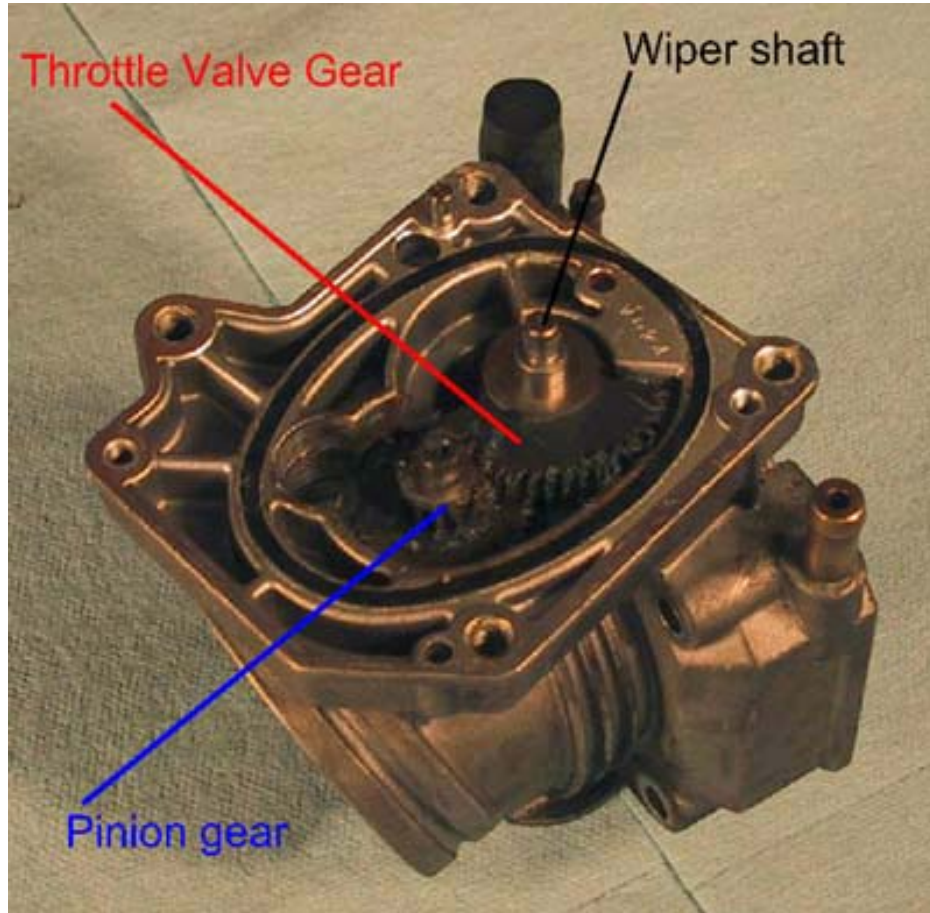
At this point it is a good idea to clean the throttle valve and surrounding area with carburetor cleaner. DON'T use cleaner on the brushes, encoder wheel or wiper area. Just clean the throttle butterfly valve and venturi.

For the first couple of throttles I looked at this was as far as I went. For one of my throttles, however, I continued on because it still was sticky after cleaning just the top.



To remove the brush/encoder housing carrier, take off the four #30 Torx screws. You will need to GENTLY pry off the wiper contacts from the throttle valve shaft - this is a press fit NOTE -- mark the position of the wiper contacts on the shaft carefully -- you will have to reposition it to the same place when you re-assembly it.

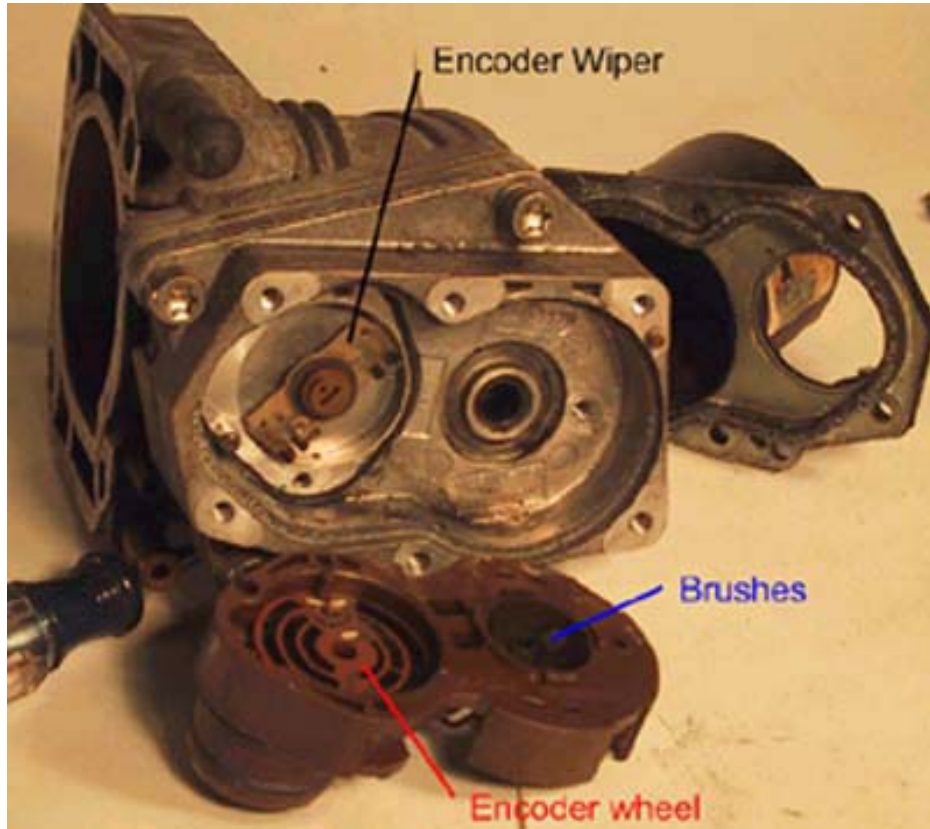
Remove the two slotted-head screws shown to remove the gearbox cover and gently pry the cover off.



You have now exposed the lower geartrain, which transmits the rotation of the motor armature to the throttle valve. On the throttle in question, there was an area of rust where the pinion gear touched the throttle valve gear at rest -- this was the cause of my sticking.

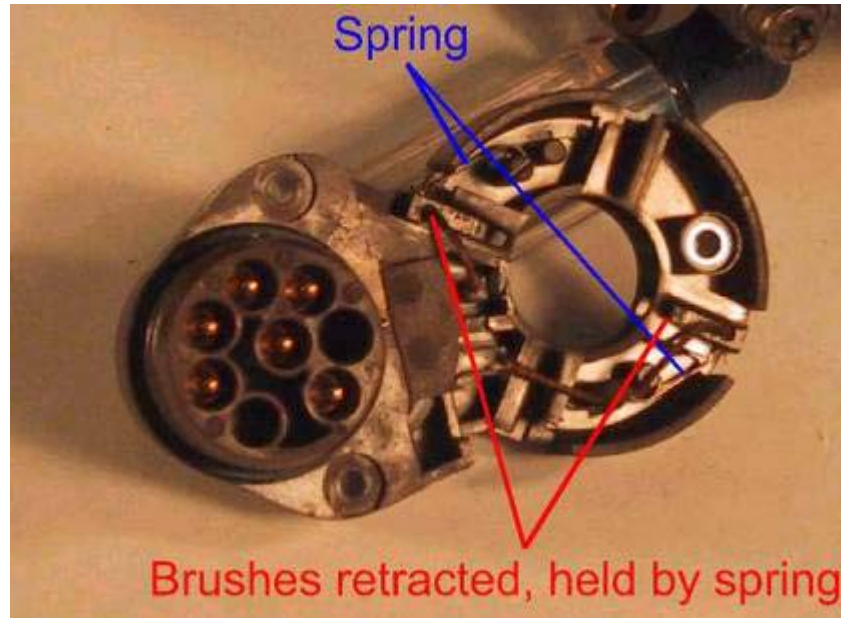
I cleaned the area with solvent and re-greased the gears.

Re-assemble the throttle unit back to the following stage:



Note the position of the encoder wiper.

Before re-attaching the brush/encoder housing, gently push the motor brushes back in their slots until the springs are running on the side of the brushes, instead of the backs:



Now re-attach the brush/encoder housing to the main unit. We retracted the brushes so that re-installing the motor armature would be easier, and won't break the motor brushes.

SPARINGLY grease the motor armature shaft. It is VERY IMPORTANT that no grease gets on the motor commutator. Use as little grease on both shaft bearing areas as possible, leaving just enough to do the job but not so much as to run all over and contaminate the comutator.

Re-install the motor armature, and push the motor brushes toward the commutator until they touch the commutator and the springs engage the rear of the brush.

Re-install the motor housing, keeping in mind that the magnets on the housing will try to pull the motor armature out of the throttle body.

Now we can re-test the throttle operation as before. If you have succeeded, the operation of the throttle valve will be noticeably smoother, and the throttle valve should not stick open when power is removed.

Note that after re-installation on the car, you will have to re-initialize the throttles. Remove the negative battery cable from the battery of your car for at least one hour. This will clear the memory of your main computer. Then re-connect the battery, and start the car without touching the throttle. Allow to warm to normal operating temperature. Now, with the car in first gear, accelerate until at least 5000 rpm is reached. Allow the car to slow to idle, and then repeat two more times. Let the car idle for 5 minutes. All Done!.

Source: <http://www.users.qwest.net/~gbower/bmw/BMWThrottles.htm/>

APPENDIX A

Throttle Encoder Measurements

Throttle Resistance between pin numbers: 6 and 8

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1988 Left: @ idle (closed) : 2093 ohms @ full (open): 1193 ohms

1988 Right @ idle (closed) : 2133 ohms @ full (open): 1168 ohms

1990 Left @ idle (closed) : 2017 ohms @ full (open): 1063 ohms

1990 Right: @ idle (closed) : 2065 ohms @ full (open): 1087 ohms

Message Title: **More on DK recon**

Posted by: [rick8637](#) on 2002-03-27 at 09:02:47
(posted from: Host: termq25.greennet.net IP: 208.192.5.29)

Message:

Great post on the complete reconditioning of the DK motor assembly. This does lend credence to the earlier post from the mechanic who discovered the procedure of sliding the motor back 1/4 and spraying the comutator and encoder assembly with contact cleaner was successful in returning proper operation. This procedure is non invasive and fast. I'm wondering if anyone has tried this and what cleaner they would recommend.

Altho the procedure does not recommend cleaners on the brushes I have used cleaners liberally on elec motors with no adverse effects.Regardless, if anyone is facing replacement of these units (\$\$) this is a major savings and definitely worth a shot.

Rick...91 850

Posted by: [Steve Cohen](#) on 2002-03-25 at 21:41:42
(posted from: Host: spider-ntc-tc034.proxy.aol.com IP: 198.81.17.34)

Message:

using emory cloth. less residue and no chance of leaving strands of steel wool in the commutator.

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