ESP Retrofit in a 2002 VW Golf TDI (Mk4)

By

Jonathan Babbitt (KD7IWP)

Special thanks to many members at TDIClub including (but not limited to)
tongsli
Steve99
blizzard60
graeme86

I AM NOT RESPONSIBLE for anything you do to your car, do this at your own risk, as I did. Brakes are important, so don't cheap out. This project is very extensive and not too cheap either. Even if you find used parts for a good price VW tends to nickel and dime you on wires and such.

Parts Needed

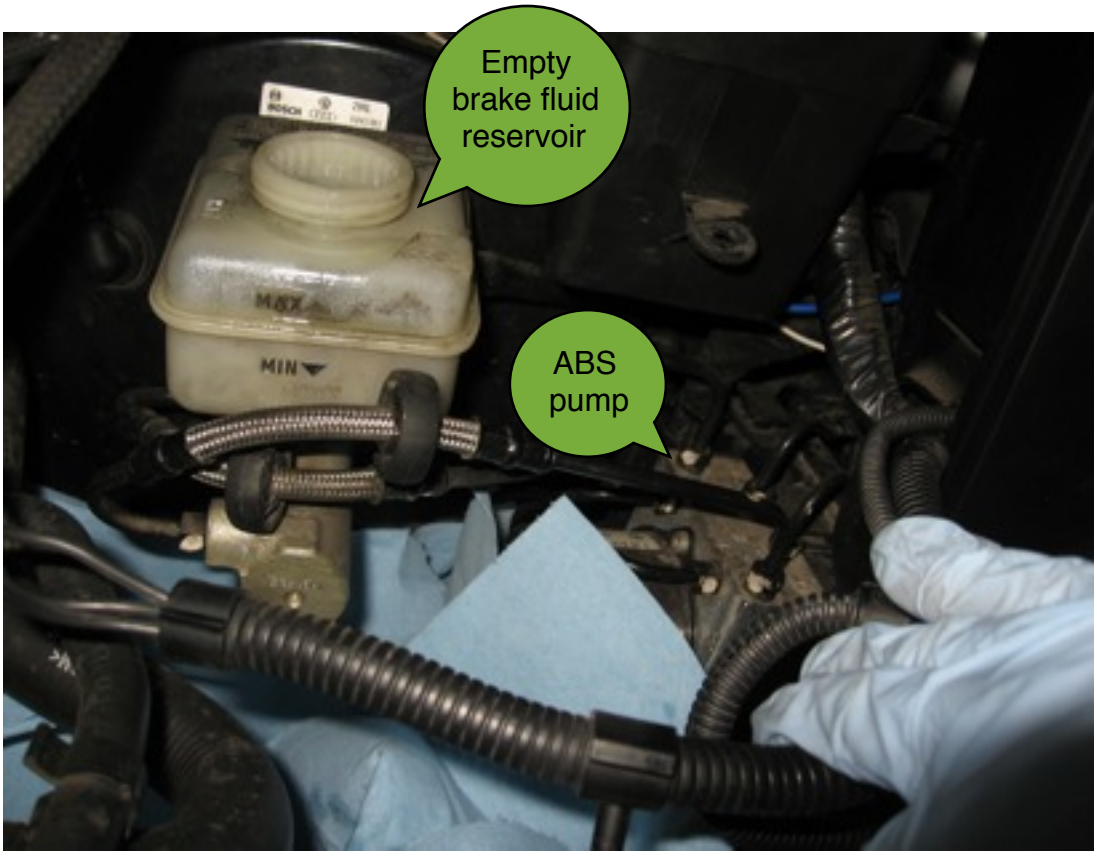
Name	Qty	Part Number	Where used
ABS Pump and Control unit	1	1C0 907 379 M	Replaces old ABS pump (under relay panel and airbox)
Brake Master Cylinder	1	1J1 614 019 C	Replaces old master cylinder (has a hole in it for a pressure sensor)
Brake Booster	1	1J1 614 106 J	Replaces old booster and has hole pattern to match new master cylinder
Clock spring/Steering angle sensor (G85)	1	1J0 959 654 AG	Goes on steering wheel under airbag
Combination (lateral, yaw) sensor	1	1J0 907 637 D	Mounts to right hand side of steering column under dash
ESP switch	1	1J0 927 134 A	Sits in dash to disable ESP
Connector (harness) for ESP switch	1	8L0 971 972	Hook wires into this and then plug onto back of ESP switch
Wires w/pins for ESP harness (2 pins are on each wire)	2	000 979 227	All you need is the pins and this particular part number has thicker wire than you want, find smaller wires if possible
Brake pressure sensor	1		Used master cylinders sometimes have this sensor in them. Screws into base of cylinder
Wiring seals	10	3B0 972 742 B	You can buy these or try to take the plugs out of your 47 pin connector and punch small holes in them (but still need 3 for brake pressure sensor)
Seals for ABS unit holes	1	1H0 698 311 A	**Optional**: these seals plug the holes on your old ABS unit
Connector for brake pressure sensor	1	1J0 972 483 A	The pins go into this housing to connect to sensor
Wires w/pins for brake pressure sensor	2	000 979 009	2 repair wires (but only 3 pins are used)
Wires w/pins for 47 pin connector T47	6	000 979 131	6 wires with 12 pins. 4 pins go to combination sensor, the rest in T47 connector
Connector for Steering angle sensor	1	4B0 971 636	Plugs into steering angle sensor beneath steering wheel
Connector for Combination sensor	1	4B0 973 712	Plugs into combination sensor

Removing Old Parts

1. Disconnect your battery with a 10mm socket or wrench.
2. Press the brake pedal a few times to remove all vacuum.
3. Remove engine cover and the flexible intake hose coming out of the airbox. I use spring clamp pliers that I got from Sears.

4. Remove the airbox. There is a little braided line that goes into it you need to remove, along with the plug for your MAF sensor. You'll need a 10mm wrench and a 10mm socket with a few extensions. I put a paper towel over the intake pipe to the turbo inlet and held it in place with a spring clamp.

5. Put plenty of paper towels under your master cylinder to absorb the fluid. Remove the connector to the brake fluid level sensor on the reservoir and empty out the reservoir of fluid. I used a syringe that I got from an inkjet refill kit years ago. A siphon hose would work also. Note that there is a strainer inside the reservoir that can be difficult to pull out, I used needle-nose pliers. Remove



that and you can get your fluid level even lower.

6. Remove the two brake lines from the master cylinder (11mm wrench) that go to the ABS pump and plug the master cylinder holes if you would like. I used some plastic seals from kit 1H0 698 311 A.

7. Remove the hose from the brake fluid reservoir that goes to the clutch master cylinder. I found it helped to put a small wrench over the plastic nipple and use that as a lever to push the rubber

hose off.

8. Remove the master cylinder by taking off the two 13mm nuts that hold it onto the brake booster.

9. Remove the vacuum line going into the booster. It took me quite a while to get it off but I just kept pulling and twisting it a bit.
10. Remove the lines going into the ABS pump with an 11mm wrench. It's good to take a picture, write down where they go, or refer to a Bentley manual. Although it's pretty obvious where they go since they are all shaped to fit in a particular spot. Plug the holes in the ABS unit with the plastic seals in kit 1H0 698 311 A.

11. Remove the 2 bolts under the ABS unit mounting bracket to remove it, they are 10mm and you

may want to do this with a wrench since space is limited. Here you can see the brake lines after the ABS pump is removed. Behind the brake lines is the black plastic housing of the T47 connector.

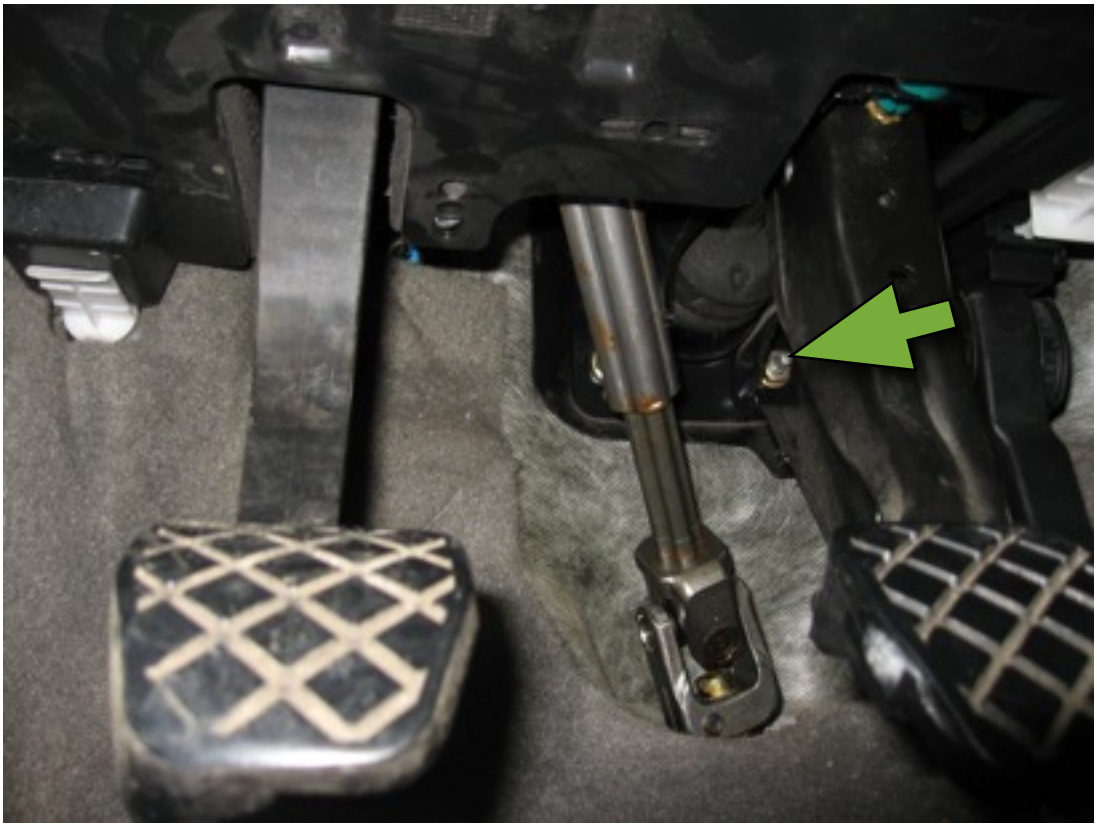
12. Remove the lower dashboard panels on the drivers side so that you can get to the 4 nuts (13mm)

that hold the brake booster on.

13. There is a plastic panel behind the brake pedal and accelerator pedal. It has 2 screws that come

out with a flat-head screwdriver.

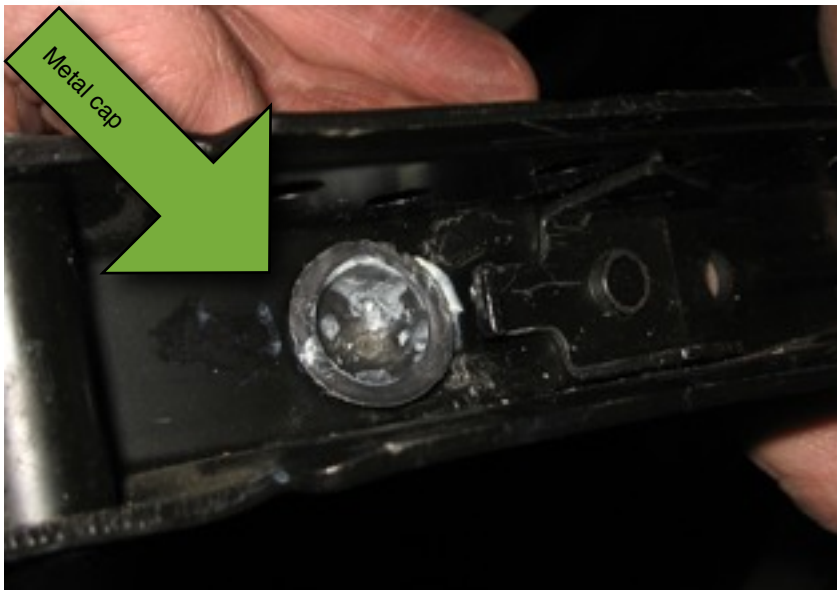
14. Now you can see the 4 bolts holding the brake booster. You can remove them with a 13mm



socket and a number of extensions. You can see the bolts behind the steering shaft there.

15. Now comes the nasty part; you need to separate the brake booster from the brake pedal. If you search online you will find a few posts that give recommendations and VW also makes a tool to

help with removal, I did not use this, but only because I had a spare piece. This plastic part that you see mounts inside the brake pedal and that ball is the end of the shaft coming from the brake booster. Some people have had luck putting a block of wood under the pedal to hold it in place and then pull really hard on the brake booster from the engine compartment. I had no luck with that method, and since my new booster had a spare white plastic piece, I simply ripped the old piece apart with pliers. If you do the method I did, make sure you first mount the plastic piece into the brake pedal. Then after that it was pretty easy to shove the new brake booster into the plastic

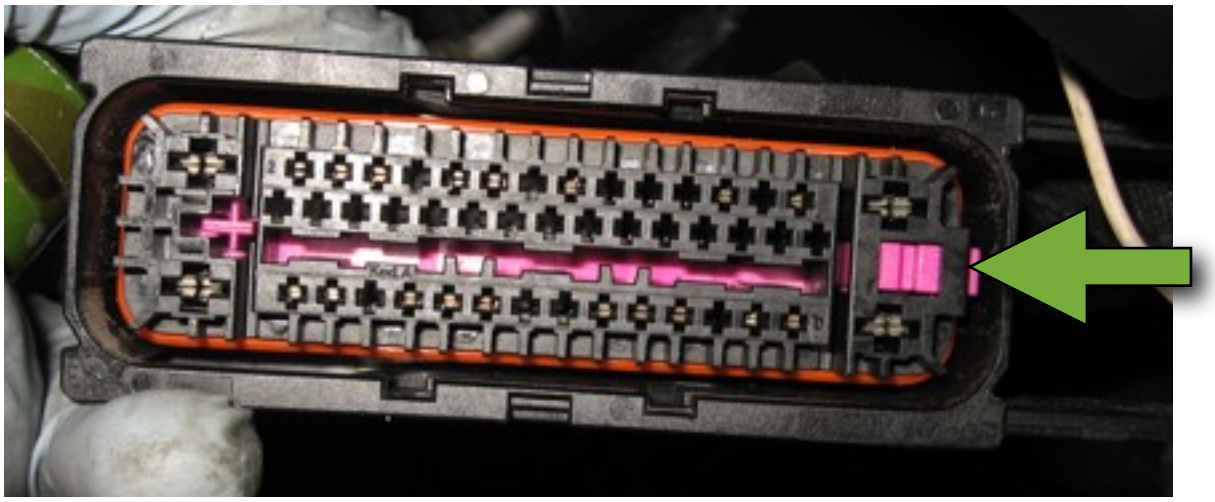


piece after putting grease on the ball at the end of the shaft. Note that there is a little thin (delicate) metal cap that the end of that ball rubs on, make sure you don't lose it.

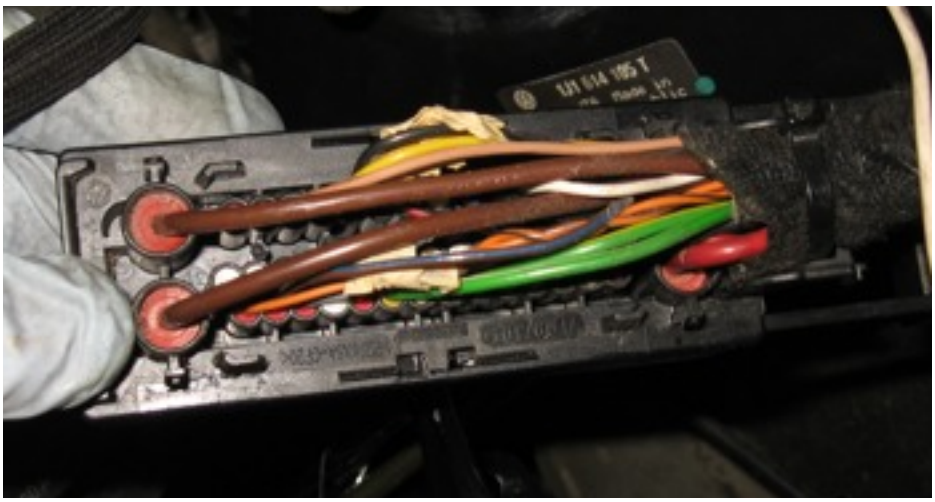
16. Now you can pull the brake booster out through the engine compartment.

Installing The New Parts

1. Install your new brake booster by inserting it through the engine compartment. Push the ball on the end of its shaft into the plastic housing inside the brake pedal, then replace the nuts that mount the brake booster. Bentley says to replace the nuts.
2. Now I recommend that you take your T47 electrical connector for the ABS unit and move a jumper. You can do this at any time, but right now you still have room in the area to do it. If you have a 2-wheel drive car move pin 14 to 12. First make sure you slide the pink slider inside the



connector to the “open” position. I had no luck removing the pin to relocate it, so I simply snipped the existing jumper wire and put a new pin in at 12 and soldered that to the jumper wire coming from 38. **Remember to move this jumper!!!** I didn’t do this at first and when I turned the key my FIS cluster kept beeping non-stop and flashed the ABS, ESP, and e-brake lights at me. Plus



VCDS wouldn’t let me bleed the ABS pump. If you look on the side of the connector where the wires come out you will see the pin numbers.

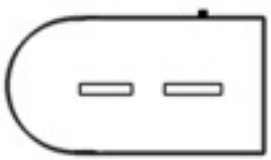
3. Now you can mount your new ABS pump. This should be straightforward, slide it in and reinsert the two 10mm bolts at the base.
4. Next you can attach the 4 brake lines into the ABS pump. Make sure you put them in the right holes, though this was obvious for me since they are custom fitted and they all wanted to go in a particular spot. Use an 11mm wrench.
5. Install the new master cylinder. Make sure when you attach it to the booster that the rod in the booster goes into the sheath on the end of the master cylinder. Tighten on its 13mm nuts.

6. Next you can attach the two flexible brake lines to the master cylinder and ABS pump. You can see in the photo where each line goes.
7. Now you have installed all the parts, so it's good to check that these mechanical parts work.
8. Bleed your brakes. I won't go through the official details, look in your Bentley for that, but here's what I did. I pressed the brakes a few times to get some fluid moving and then put my pressure bleeder on and bled all 4 brake cylinders. Then I used VCDS to prime the ABS pump. I did that procedure a few times, then I manually bled each of the 4 cylinders a second time.

Electrical Setup

The electrical setup requires installing a number of wires from various sensors and hooking them up either directly to the ABS unit in its 47 (T47) pin connector, or to the CAN-BUS.

1. The first thing I installed was the connector for the brake pressure sensor. I found it very tricky to get this harness working and unfortunately, I forgot to take photos of this step. The base of the harness has a black clip that you can lift with a small screwdriver and then the center of the housing slides out. Then you can clip in all 3 of the 000 979 009 wires into place, be sure you have seals on them. Next slide the inner part of the housing back into the outer part and you can slide it onto the sensor of the Brake pressure sensor. **PLEASE NOTE:** the harness that I got from VW would not slide onto the sensor. The inner part of the harness has a plastic strip on it that's designed as a key to guide it onto the sensor. Well, mine had the key (little black dot on the top of



the image) on the wrong side, so I had to use an exact-o knife to carve it off. My guess is that the harness was designed for the MK20 brake systems that used 2 pressure sensors instead of one, and most likely both harnesses have the key on opposite sides so that you do not connect the harness to the incorrect sensor.

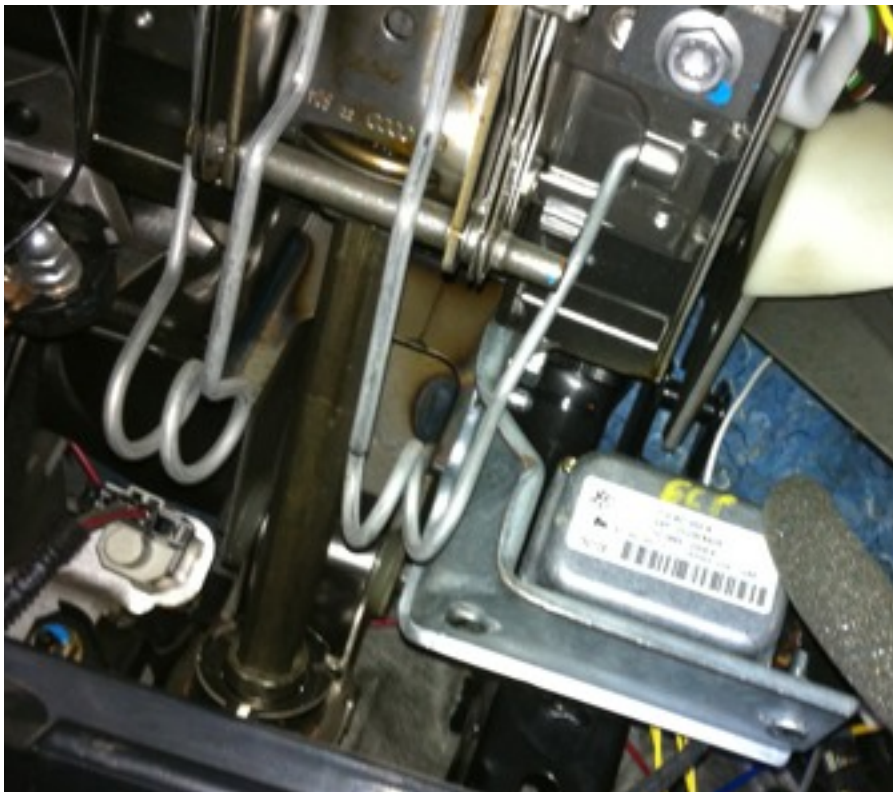
2. On the other end of the 3 wires from the brake pressure sensor you can attach wires 000 979 131. These pins will go directly into the 47 pin connector. Get the wires to be a length you are happy with and insert them.

Pin on Pressure Sensor harness	Pin in 47 pin ABS pump harness
1	19
2	20
3	18

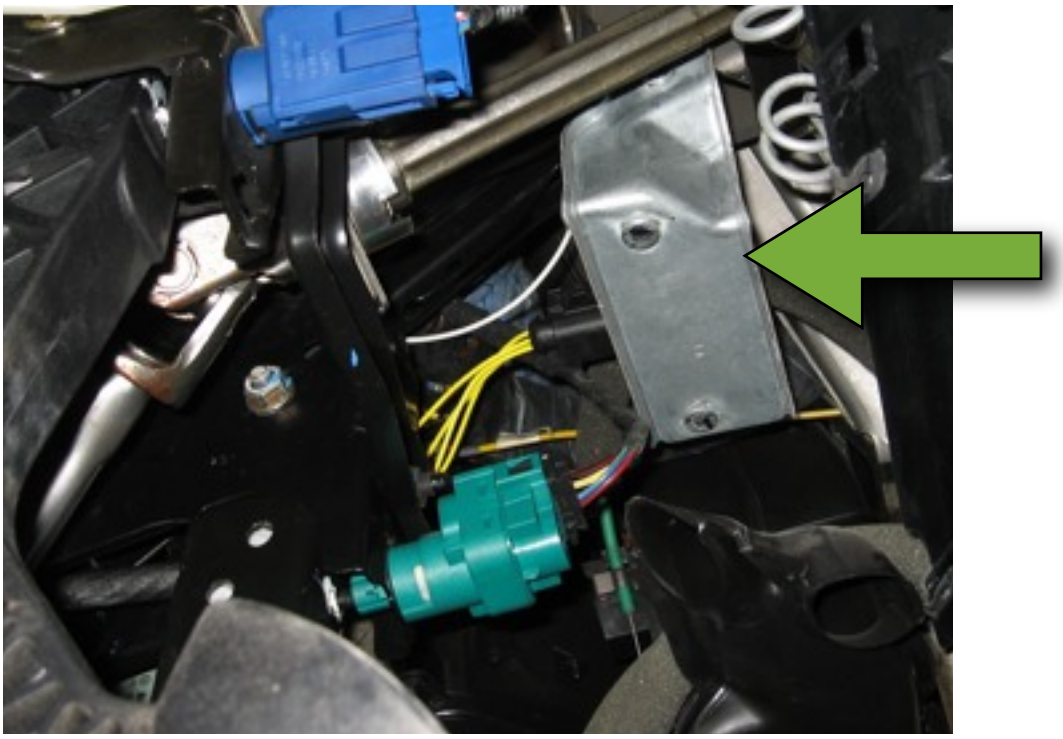
3. Next you can prepare the wires for the combination sensor. You will need 4 wires of 000 979 131. Make sure you have enough length to go from the 47 pin connector through the firewall and under the dash. Remember that the harness won't go through the little hole in the firewall, so I recommend that you attach all 4 wires to the harness, then tape them together and pass them through the firewall. Then in the engine compartment you can attach them to the other 4 pins and put them in the 47 pin connector.

Pin on combination sensor harness	Pin in 47 pin ABS pump harness
1	6
2	25
3	24
4	29

4. This sensor is going to mount onto the steel shield that goes over the steering column. Get an M8



bolt (I got one, and a washer, from Home Depot). The sensor bracket has a hole with 2 pins on either side of it. The steel shield over the steering column has 3 holes in it and you will put the bolt through the center while the two pins go through holes to stabilize the unit and keep it level. In the photo above you can see the sensor sitting on its bracket, just behind the springs for the tilt steering column. This other photo is taken from the dummy foot pedal looking up diagonally at the



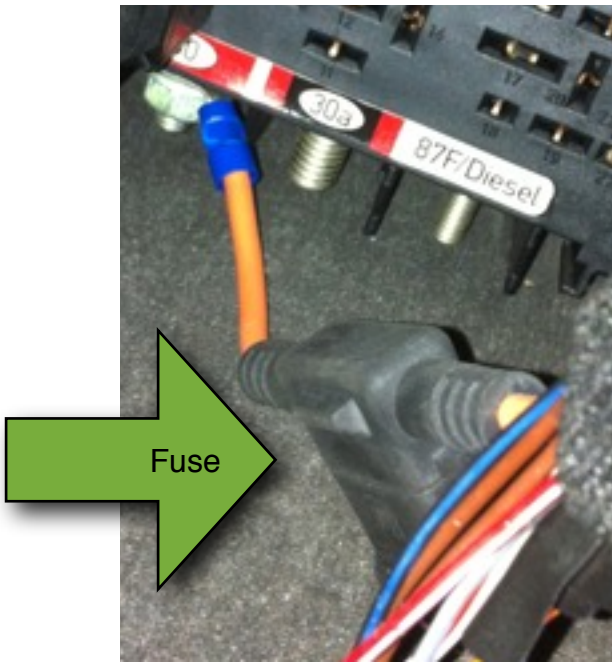
sensor bracket. You can see my 4 yellow VW repair wires coming from the sensor, they go through a hole in the firewall, just above the accelerator pedal.

5. Next you can remove the steering wheel to prepare the Steering Angle sensor
    1. Remove the airbag (be sure your battery negative cable is disconnected). Bentley explains this best, but you want to start with the wheel centered and then turn it a quarter turn in either direction. You will see a hole on the rear of the steering wheel that is above the steering column. Insert a small flat screwdriver in there and fool around for a bit. Your goal is to push down (by pulling up on the screwdriver handle) on a spring inside there and one half of the airbag should pop out. Next turn the steering wheel half a turn and do the same on the opposite side.
    2. The airbag should then pop off and you can pull hard on the yellow connector on the back of it to disconnect. Store the airbag with the plastic side pointing up.
    3. There is a 12 point socket you need to remove the nut in the center of the steering wheel. Remove that nut and take off the wheel.
    4. Now remove the top and bottom trim pieces of the steering column by removing a few screws underneath and in the front.

6. Get your connector for the steering angle sensor (G85) and put 5 generic wires into it (you wont

be using pin 6). **Please note**: I had originally plugged the CAN-BUS lines to the 2 CAN-BUS wires that are in the OBDII plug. However, the ABS unit could not connect to my G85 sensor. I guess that the CAN-BUS wires in the OBDII plug are on a separate network.

Pin on sensor	Location of other end of the wire
1	This just has to be grounded. There is a nice ground spot on the left side of the steering column that you can use if you attach a ring terminal to your wire coming from pin 1.
2	This wire connects to the CAN-BUS. I pulled back the tape covering the wires going to the T47 connector at the ABS unit and soldered into the orange/brown wire. Since this is on the CAN-BUS you should twist this wire along with the wire from pin 3 as a twisted pair.
3	This wire connects to the CAN-BUS. I pulled back the tape covering the wires going to the T47 connector at the ABS unit and soldered into the orange/black wire. Since this is on the CAN-BUS you should twist this wire along with the wire from pin 2 as a twisted pair.
4	This wire needs a constant 12v. There is a connection at the base of the relay panel, I believe it is called A52 (The relay panel says 30 below it). We only want a small amount of current, so I soldered a 5 amp fuse holder in between the positive 12v connection and the pin 4 in the harness. You can see a picture below.
5	This wire needs to be switched 12v. When the sensor is first hooked up it is in “sleep” mode. Once the ignition is turned on for the first time it will wake up the sensor. From then on it will always be turned on (it needs to monitor steering movement even when the car is off so that it stays aligned). You can connect this to fuse 9. There is already a wire at fuse S9 that goes to the ABS unit, so tap into that, you will also be adding a wire to this switch for the ESP button (see below).



7. Next we need to wire up the ESP switch.

Pin in ESP switch	
1	Hooks into a positive wire from your dimmer switch. I found the wires from my rear window defroster switch and hooked into it.
2	This is the ground wire for illumination, I also soldered this into an illumination wire from the rear window defroster switch
5	I soldered this into the wire that was already at pin 13 of the 47 pin connector on the ABS unit. It was easiest to pass a wire through the firewall and solder onto the wire right where it comes out of the 47 pin housing.
6	This wire gets soldered to fuse 9 along with ping 5 of the Steering angle sensor (G85).

8. Now that everything is wired up you should just have to do VCDS tasks from here.

VCDS Setup

1. First you will need to get the appropriate software coding for your ABS unit. For my 2002 Golf TDI I used 19458 as my coding. Ross-Tech has info about picking your coding.
2. Next you need to scan the CAN-BUS to find the steering angle sensor. To do this, just go to your CAN Gateway in VCDS and recode it. Simply hit the Coding button and then hit Do It. Don't change any values, simply re-coding tells the Gateway to scan the bus for any new devices.
3. Follow Ross-Tech's instructions on how to calibrate all of your sensors.
4. Do the road test. In VCDS you you select ABS Brakes and log in (I think the button is called coding II) and us 40168. Then hit the Basic Settings button. Here you can select the option to Initiate the ESP drive test.
5. At this point your ABS light will come on and stay on. You will also have a DTC stating that the test is started. You can only perform the test while your ESP light in the cluster is flashing. Stomping on the brakes pretty hard will start it. Then just drive in a figure 8. For me, both lights went off after 1 figure 8 going about 20km/h in 2nd gear.
6. Hopefully you are done.

Closing

If you see any errors in this document please send me a note at jonbabbitt@gmail.com, or send me a PM on TDIClub and I'll edit it. If you have questions you can contact me as well as this was a fun project for me that spanned over 8 months and I want others to be able to do this also.