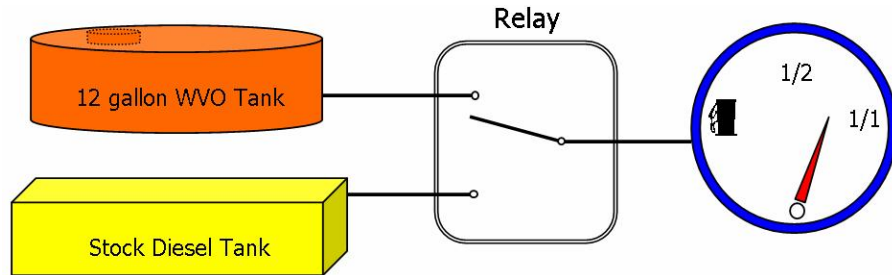


Greasecar – VW TDI – Fuel Gauge Modification and Integration

Notes by: Jamie Braman – jamie.braman@gmail.com

Objective:

To integrate the fuel gauges from a Greasecar WVO tank with that from the stock diesel tank so that the both fuel levels are displayed in the gauge that is integrated into the instrument cluster. Here is the concept –



Please read this whole procedure before you start cutting, pulling or crimping anything! Also, fully disconnect the battery before attempting to make any of these modifications.

Disclaimer:

These instructions were made for personal distribution. They represent the process that I used when modifying my 99.5 Golf TDI. Actual conditions will vary, and I am in no way responsible for any of the possible outcomes from the modification. Work carefully and methodically... but undertake this modification at your own risk!

This modification also requires a basic understanding of electricity and sensor/circuit design.

Total Project Time: 2.5 hours

Total Cost: less than \$15.00

Parts list:

- SPDT 30a./12v.-dc relay (Bosch makes a weatherproof one for less than \$5, that can be found on-line at Parts Express)
- 10' signal wire (14-18 AWG is fine)
- several small zip ties
- 1a. in-line fuse holder with fuse
- 10 - insulated spade terminal wire crimps
- 10 - insulated butt splice wire crimps
- Several small pieces of heat shrink tubing to keep connections clean
- 1 small roll electrical tape for keeping things tidy
- 1 - 33ohm resistor (available at Parts Express or Radio Shack)

Tools necessary:

- Wire clippers
- Phillips head screwdriver
- Small flat head screwdriver
- Small set crescent wrenches
- Electrical Crimp tool
- Multimeter with Ohms scale as well as dc ranges
- Heat gun

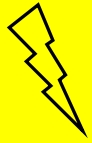
VW Golf TDI Stock Setup:

Fuel level sensor kit, measures 50 – 240 (when empty 50 , when full 240) VW Stock part 1J0 919 183H

Greasecar Fuel Gauge Sender:

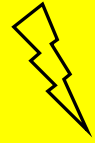
Installed in tank, as part of Greasecar Deluxe kit measures 30 - 240 (when empty 240 , when full 30) ***Yes, this is the opposite of the Volkswagen stock set up!***

Instructions:



Caution:

Always disconnect the battery before doing any electrical work on the car.



1. Run the control wire:

You will need to cut into your wiring for the Greasecar electrical system. Locate the wire that you ran from the main fuel selector switch to the 6-port valve. These wires should be under the dash.

Take your meter and be sure to ground the black lead to any piece of exposed metal on the car and with the red probe see which wire (of the ones that go to terminals D and E on the 6-port valve – upon second thought, I think this goes to E...) goes to 12v. when the WVO kit is activated.

The relay is set up to switch between two signals when is supplied with 12v. power. So you want to use the red probe to find the wire that has 12v. when the kit is engaged... the relay is essentially going to switch the signal from one tank sender unit to the other; sending the proper signal back to the dash. We will also wire this relay so that it will default to the diesel fuel sender gauge, in the unlikely event of electrical problems.

Now put 2 pieces of electrical tape on this wire close together, and cut the wire in between them. Strip both ends of the wire that you just cut and insert one side into a butt splice. Crimp on the butt splice on one side. Strip back one of the wires on your fuse holder and twist it together with the original piece that is still dangling. Insert this twisted wire into the other side of the butt splice and crimp together. Crimp carefully and ensure that there is a good mechanical connection here. Now strip back a piece of your signal wire, and crimp a butt splice onto the other side of the fuse holder. Again, check for a good mechanical connection and if your butt splices are not insulated you should cover these connections with heat shrink tubing and shrink into place.

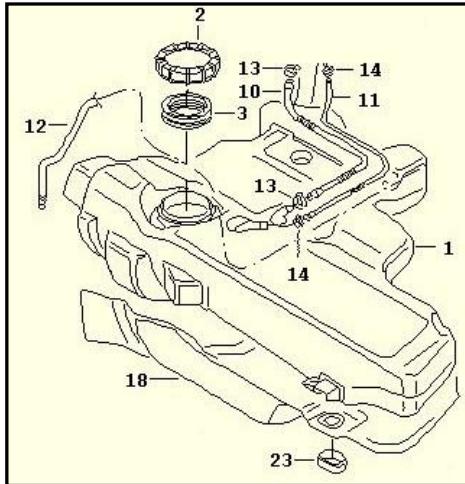
This fuse holder can also be placed on the other end of the control wire, under the rear seat. This location may make it easier to change than under the dash.

2. Access to the top of the tank and the sender:

You can access the top of the fuel tank under the rear seats. You will see a 10" square of carpet, pull back the carpet and you will see a triangular access panel with 3 screws. Remove these screws and gently pry the panel open.



At this point you will be looking directly at the top of the diesel tank and the fuel sender unit as well as the top of the fuel sensor.



The fuel tank looks like this, but you should only see the a little bit of the top of the ring labeled #2:

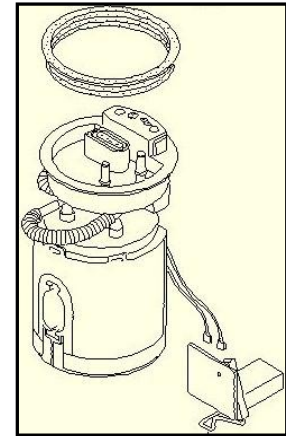
On top of the tank, you will notice both the fuel supply and return lines from the engine. Next to those you will see a 2 wire electrical connection.

You should be looking at 2 wires that go into a 2-pole black connector. You are in the right place if:

One of the wires is brown/white (21 AWG) and the other should be lilac/brown (22 AWG). These wires are small and delicate, so take care not to crimp or cut them unnecessarily. This is the top of the fuel delivery unit (see drawings), and although you will only see a small part of it you should not remove this piece. If you remove the sender unit, you are exposing your diesel tank to contaminates...

Gently press down on this connection and activate the latch release to remove the connector. Do not use a screwdriver here, save the guerilla mechanics for someone else's car...

Now, cut both wires half way between the connector and where they go back into the conduit molding and run it front of the car. Carefully strip each side and crimp on electrical connectors and set aside.



3. Pulling wires from the WVO tank to the Relay:

You will need to pull 2 wires from the WVO tank back to the relay. One for the ground (since this signal ultimately is connected to the instrument panel, having a strong ground is essential to accurate measurement) and one for the signal. I ran these wires under the carpet and back seat for protection.

On the tank end, attach ring terminals for easy connection/disconnection and terminate the wires on top of the diesel tank access hatch. Although it is not shown in my photos you should also be sure to insert the 33ohm resistor on the signal wire from the WVO tank sensor before it gets to the relay. This resistor is essential to ensure that the dash gauge reads the proper level of oil in the tank.

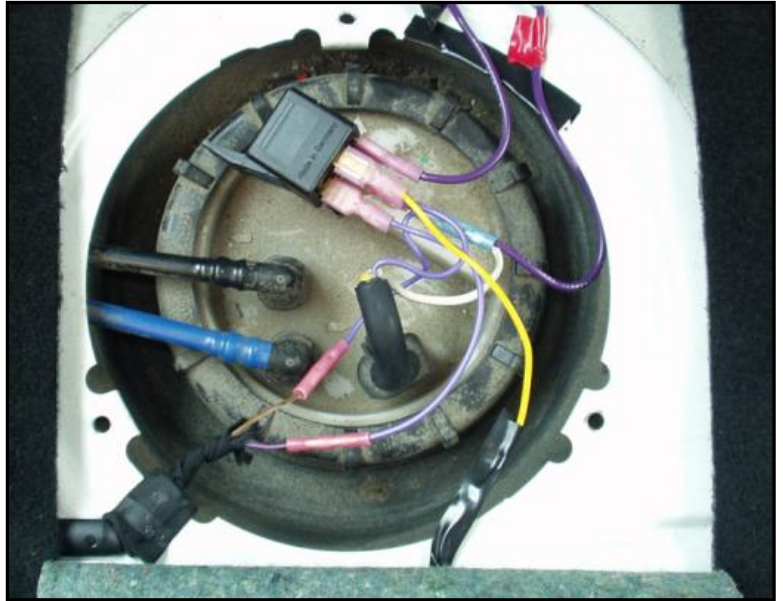
4. Wiring the Relay:

We will also wire this relay so that it will default to the diesel fuel sender gauge, in the unlikely event of electrical problems.

Here is what my relay set up looked like:

Wires (in this photo):

- Yellow: switching wire
- Purple#1: from the WVO tank
- Purple#2: ground
- Purple#3: from the Diesel tank
- White/grey: ground



Lower left corner: You will also note the two wires going back to the dash, in the molded conduit.

Lower right corner: is a yellow wire, going back to the dash. This is the control wire for the relay.

Center of photo: you will also notice the black and blue diesel fuel lines.

It is important to tie all of the ground wires together so that there is one ground reference point that all of the sensors share. You should have ground wires from: the WVO tank, the diesel sensor (tank), and the ground that goes back to the dash.

Relay Pin-Out Inputs:

If you are using a Bosch 12v./20a. relay the numbers in () refer to the terminal labels on the relay. You don't need to use a Bosch relay, any 12v. relay will work following the pin-out.

- NO (87): WVO sensor signal, this should include the 33 ohm resistor in-line
- NC (87a): diesel sensor signal
- COM (30): to dash signal – connect to the lavender/white wire to dash
- 12v. (86): from the WVO switch, this signal switches the relay
- Ground (85): This should pick up the brown/black wire to the dash as well as both ground wires from the diesel (brown/white) and WVO tanks. All of these should be tied together and connected to the relay.

When the WVO system is activated the control wire should go from floating to 12v. when measured against ground. Having a solid connection to the vehicle ground is essential to accurate measurement of the sending unit.

For a complete schematic see the last page-

5. Calibration process, of the Greasecar sender inside the tank:

Open the Greasecar tank access hatch by removing all the screws.



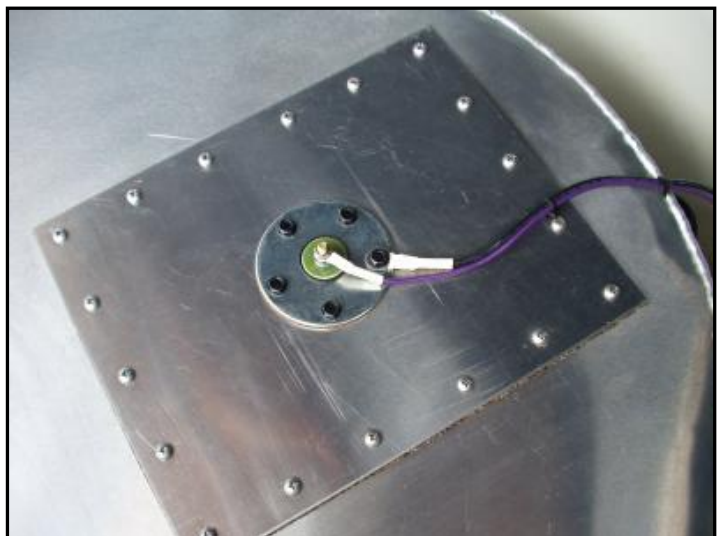
If you are doing this modification before ever putting oil in your grease tank: Bore out your access hatch screw-holes first before you pour oil into the tank. Greasecar does not fully tap these screw holes, and this process can generate metal filings that can be dropped into your oil, if this is done after the tank is filled with oil.

You will need to disassemble the fuel level sender arm mechanism and invert the white plastic piece. Take this piece apart slowly – since there are many movable parts here. Just invert the whole potentiometer and re-attach it to the L bracket that is bolted to the hatch: You want to flip the tank level signal sender inside the WVO tank so that on an empty tank the sensor will measure 30 – 60 roughly and with a full tank the measurement will be closer to 240 roughly. Once you verify that the sensor is re-assembled and functioning properly, it is time to adjust its throw -

This is a process of trial and error, and is **best done before you put oil in the tank or with a very empty tank**. This can be a very messy process, since you are constantly lifting open the access hatch to the tank. The float itself rides very low in the vegetable oil, barely floating above the surface at all.

You will need to reconnect the battery and turn on the key, to power up the instruments but don't start the car. Turn on your WVO kit, so that the relay is energized and switches to the WVO fuel level reading. You will need to watch the fuel gauge on the instrument cluster as you perform the next few steps to calibrate the gauge.

Using a Multimeter, adjust the throw arm (using the set screw) on the level sender unit so that when the tank is empty the measured resistance is 30 – 60 roughly. You will need to adjust this arm through trial and error get the sender to read this value. It is important that you calibrate the lower end of the sensor range, so that you accurately know when you are approaching an empty tank. Calibration on the upper end of the range is less important. This



calibration also allows the low fuel light to work properly with both diesel and WVO.

It is also important in this calibration process to be sure that the sensor float rests on the bottom of the WVO tank and not on the coolant heating coils or your WVO pick up hose. This can lead to false readings. Once this is calibrated you can close the tank and re-attach the wires. In the photo below, I used a black wire for my ground and a purple wire for my signal measurement.

6. Usage Notes:

a.) Often the gauge doesn't change immediately when you switch fuels. The VW ECM module only looks at this level once every few minutes. Since change in the tank level is slow, this sample rate is acceptable. The gauge often reads better (quicker) when parked or on the highway. I have found that it can be hard to read an accurate fuel (WVO) level while in traffic due to the fuel sloshing around the tank causing the reading to be inaccurate.

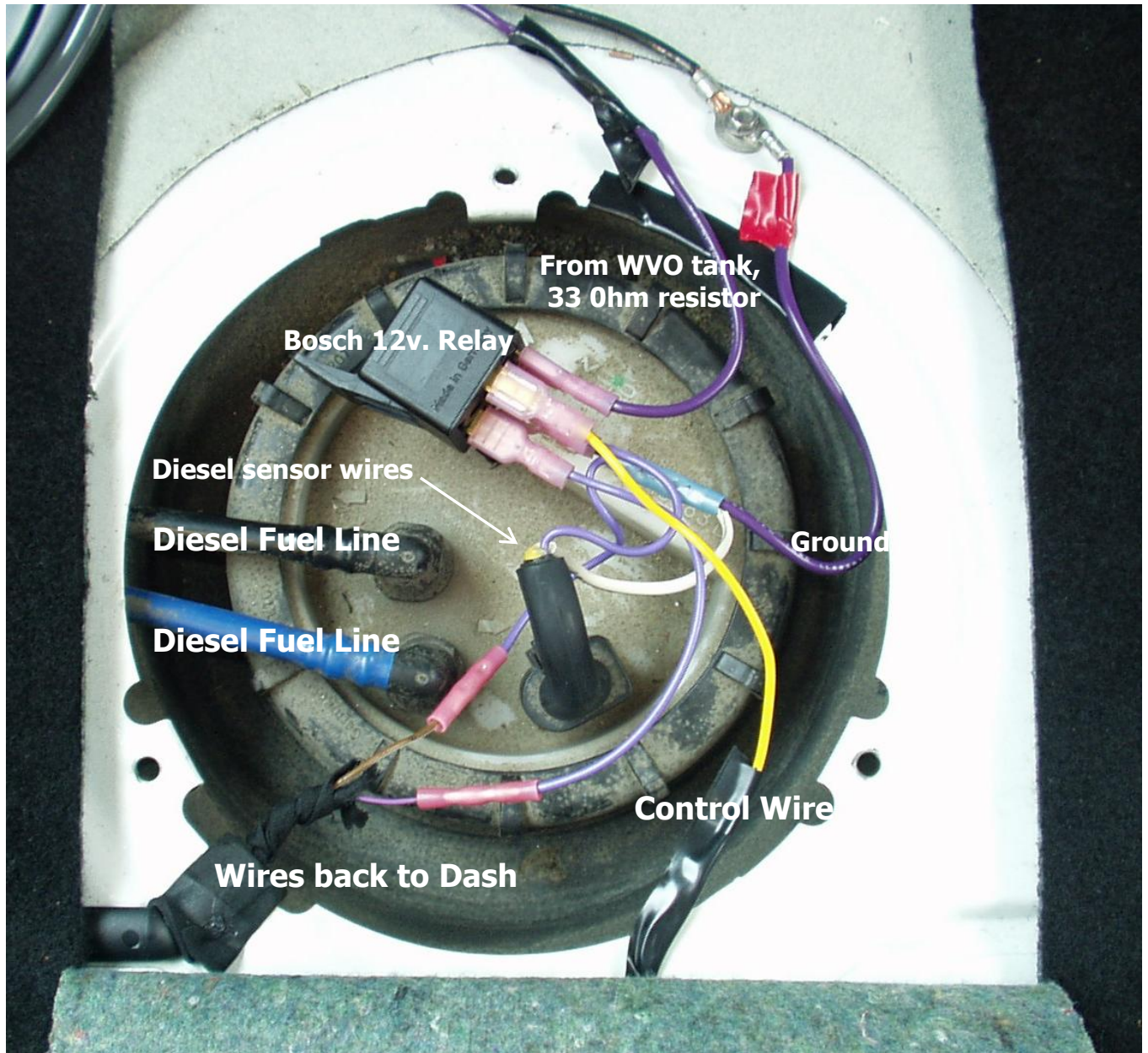
b.) When my low fuel light comes on – I typically have 2 gallons of WVO left in the tank (between 1-2" of oil). It is just an early warning to pick up some more WVO or switch to diesel!

c.) The relay is wired in such a way that if there is an electrical failure the gauge level will default to the diesel tank.

d.) It is important to add the 33 ohm resistor to the circuit on the WVO signal wire. If you leave this out you will get incorrect readings. The potentiometer will only send a signal that shows at $\frac{3}{4}$ on the gauge when the tank is full. With the round tank the level potentiometer can never reach a full signal (240 Ω) so the needle never gets to full.

Many thanks to all that contributed to this document, the GreaseCar message board, Fred's TDI page and especially Brian McLaughlin (<http://vw.ourwebstop.com>).

View inside panel under rear seat, with relay –



Relay Electrical Schematic – One line

