DomiWorks Engineering DCT Gearbox Wiring Modification Kit Installation guidelines

Version 1.0 2021-06-24

The information in this document is guidelines for the installation of our Wiring Modification kit to your DCT gearbox. Failing to follow these guidelines may result in permanent damage to the either the gearbox or this kit included parts, which DomiWorks Engineering cannot be held responsible. Always work calm and methodical and always wear appropriate safety equipment. If you are unsure, please contact us and we will guide you in the best way possible. Thank you!

Included in this kit

The following parts are included in DomiWorks Gearbox modification kit for HTG GCU.

- Our own developed PCB
- Internal gearbox harness including aluminum gearbox connector adapter
- External flying lead
- 22 AWG wires for internal PCB
- 24 AWG wires for internal PCB
- Bolt M6x25

DCT Wiring Kit
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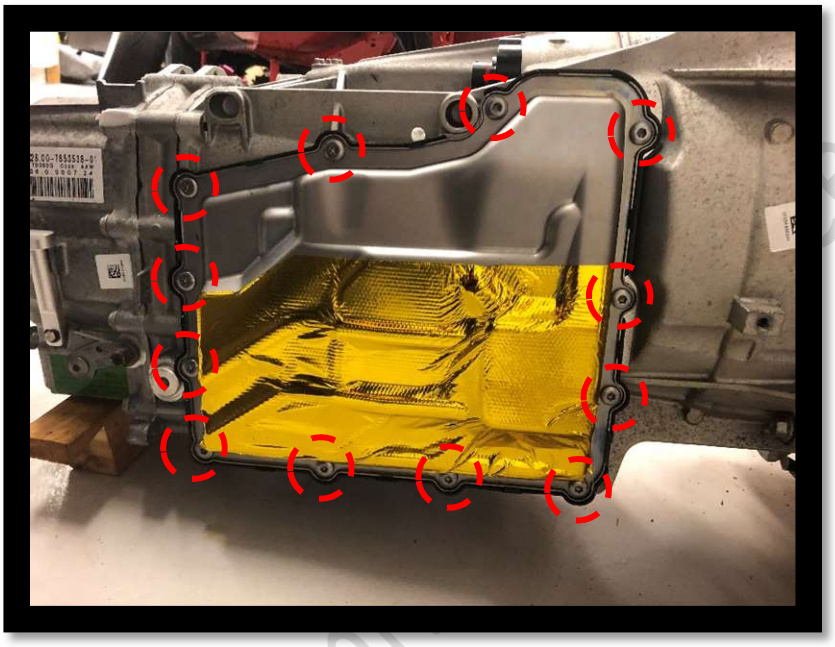
Required tools

- Wire cutter
- Wire stripper for AWG16, AWG 22 and AWG 24 wires
- Small flatheaded screwdriver
- Terminal extraction tool
- Soldering iron with accessories (soldering wire, soldering grease etc.)
- High temperature silicone sealant (i.e Loctite 5910)
- Multimeter to measure resistance, voltage and continuity

Removal and preparations

Removal of mechatronic unit

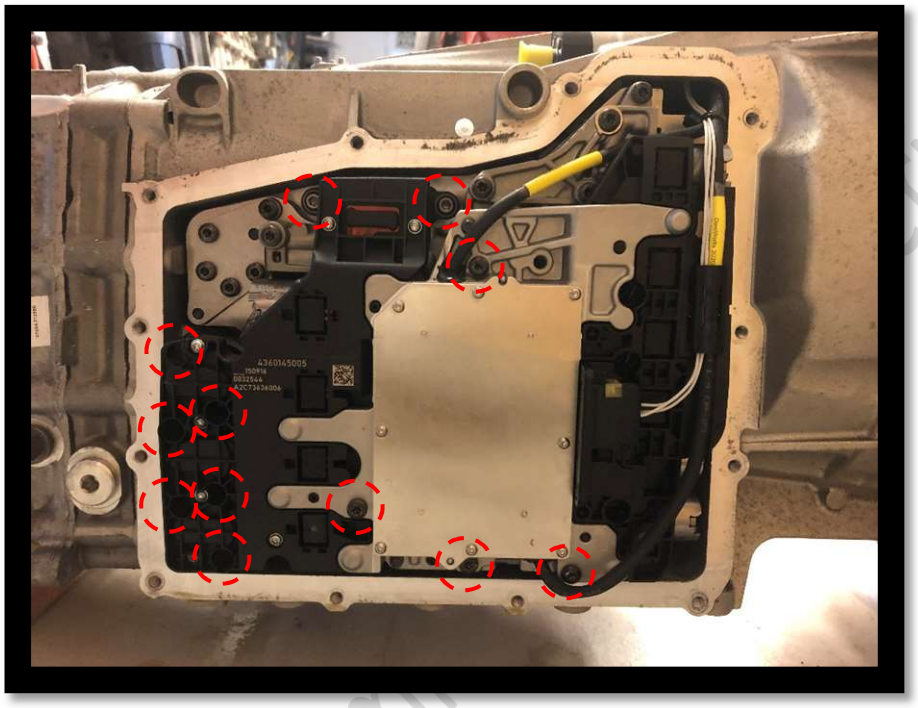
Remove the outer cover by removing the bolts with a Torx T25 insert bit. There are 12 bolts in total. Please be aware that remaining transmission fluid will leak when removing the cover, have some oil cleaning rags prepared.



Disconnect the main connector from the mechatronic unit, push the plastic lock down while pulling connector out.

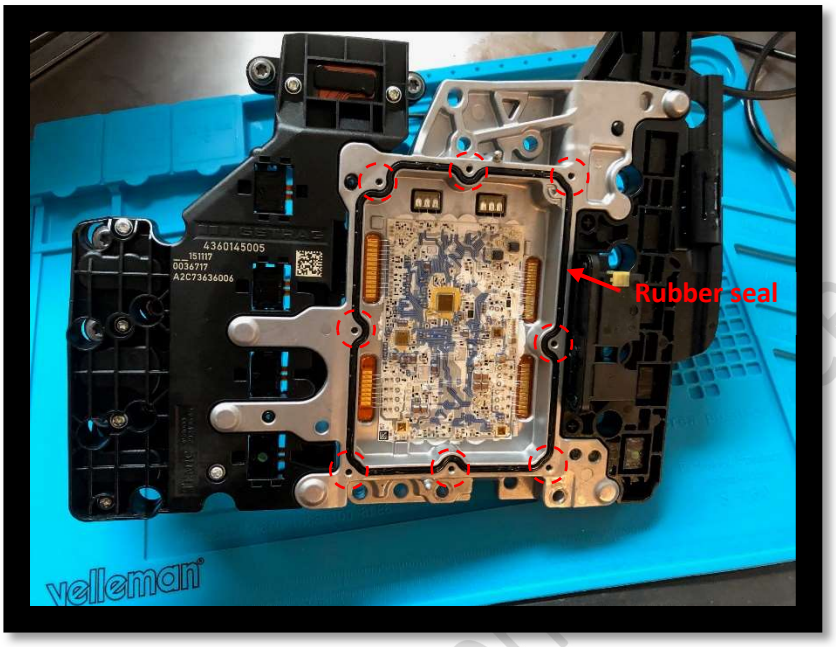
To be able to remove the mechatronic unit completely from the gearbox, 12 bolts need to be unscrewed. Four of them can be removed completely, make note of where they sit as the length of the bolts differs. The remaining eight can be unscrewed but will still be hold by the mechatronic unit.

The mechatronic unit can still sit quite hard, wiggle it gently and it will come loose.



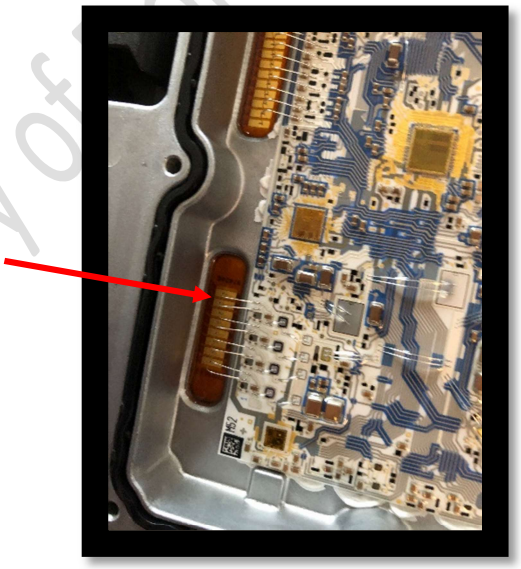
Removal of TCM PCB

Remove the center cover by removing 8 Torx T10 screws.



Remove the rubber seal to prevent any damage of this in the future.

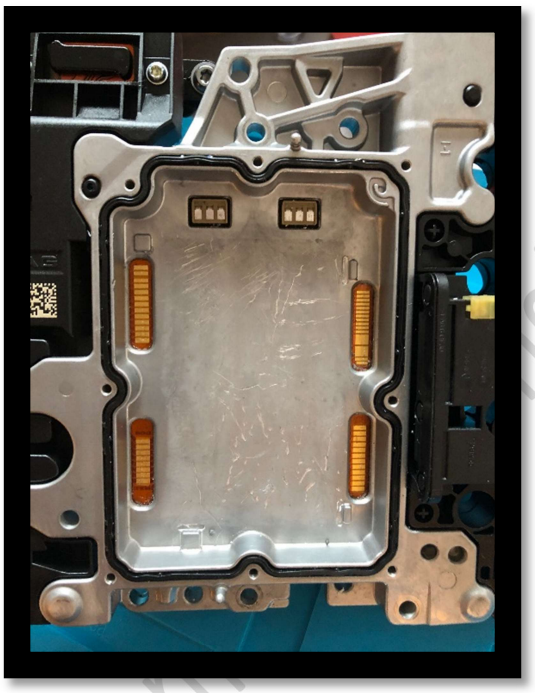
Use a set of pliers and gently remove all the thin wires going to the soldering pads, try to grad it by the bottom to remove as much as possible of the wire.



Caution! In area PC between pad 2 and 3 there is a thin trace. Be very careful when removing the wires to not damage this thread.

The original PCB is quite difficult to remove, it is made of a ceramic like board and is very brittle, therefore almost impossible to remove in one piece. The easiest way we found so far is to remove it piece by piece.

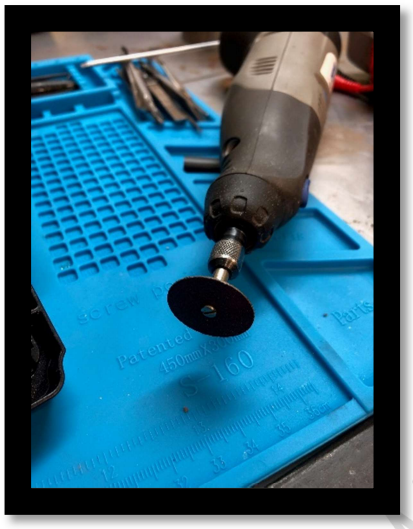
Clean the base from any remaining residuals or debris. The unit should look like this when you have removed the TCM PCB.

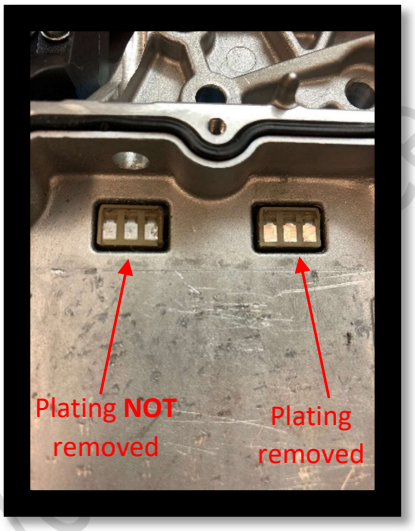


Preparation of soldering pads

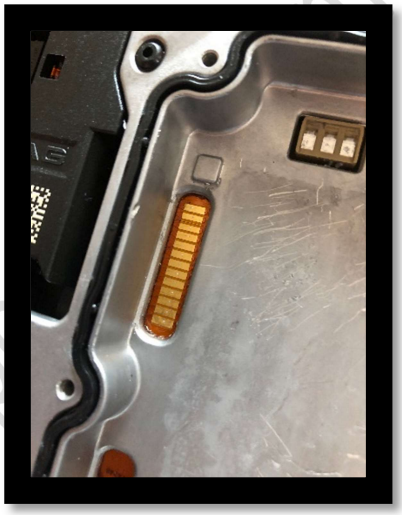
When the PCB has been removed, clean all soldering pads mechanically as alcohol solvent is not very efficient on the protecting gel.

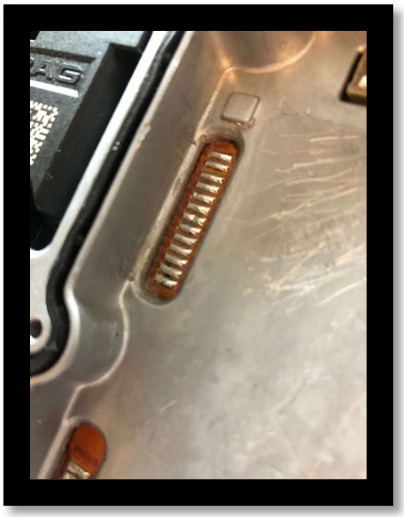
The two pads on top needs to be cleaned with a Dremel with an abrasive disc, this is because solder doesn't stick to the plating of the connector pads. Gently go over the pads with the abrasive disc, when you see copper you are all good. Clean any residuals and pre solder the pads.





Pre solder all connector pads, it is only necessary to pre solder pad 3, 6 and 7 on the top right pad.

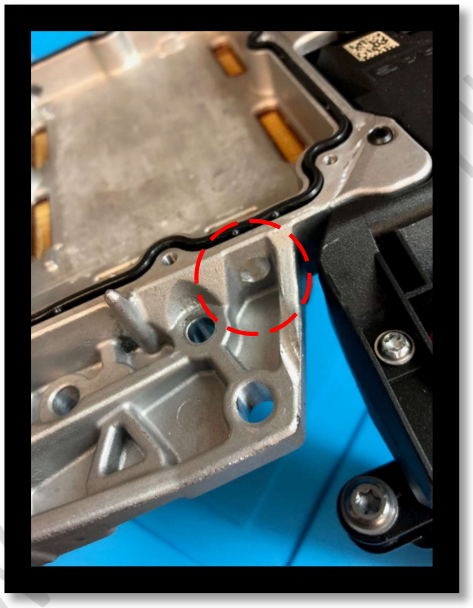




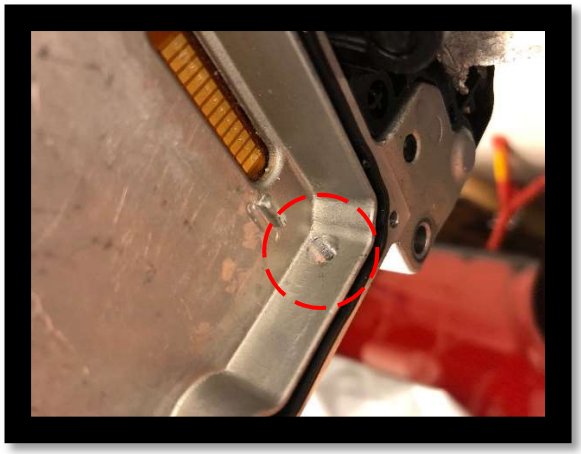
Drill holes preparation

It is required to drill two holes to get access to the center location of the mechatronic unit. One on top of the unit and one in the bottom

On the top side, use a 6mm drill, make sure to put the hole as close as possible to the base to avoid interference with the rubber sealing surface.



On the bottom side, use a 6.5-7.0mm drill, the diameter of the harness can differ a little bit between individuals so please always measure the diameter of your harness before choosing appropriate hole diameter. Make sure to put the hole as close as possible to the base to avoid interference with the rubber sealing surface.



Remove any sharp edges or debris.

Preparation of the new PCB

Pre solder all pads on the new included PCB.

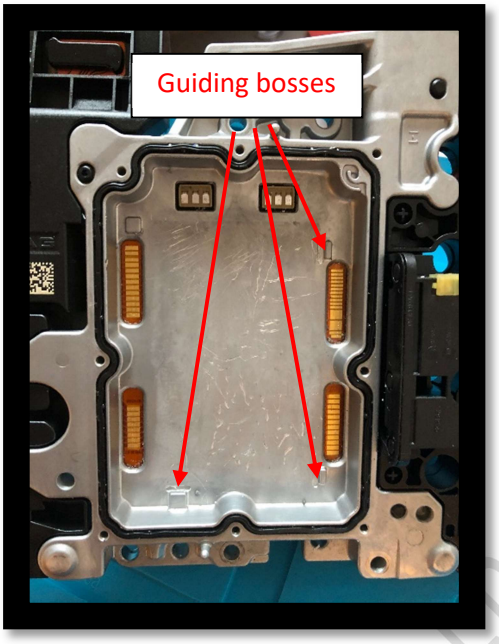
Preparation of short wires

Strip 5mm on each end of the included wires that are 20mm long, both the -22 and -24 AWG. Pre-solder both ends.

Install the new PCB

Apply high temperature silicone sealant to the back of the new PCB, see example below.

Place it where the old PCB used to sit, use oscillating movement while applying pressure to evenly distribute the compound, use the bosses to properly align the PCB. It should sit tight to the right and downward bosses in the picture below. Let it sit for at least 12 hours to fully cure before proceeding with any soldering.



Soldering

Use the supplied short wires in this kit, please keep in mind that there are both -22 and -24 AWG wires included. They come in two different bags, labeled with the corresponding size.

The -22 AWG are for the solenoid pads which are pads PE and PF.

The -24 AWG wires are for the gearbox internal sensors which are pads PA, PB, PC and PD.

There are different colors supplied in this kit, the intention of the color is as follow:

Orange: 5V (24AWG)

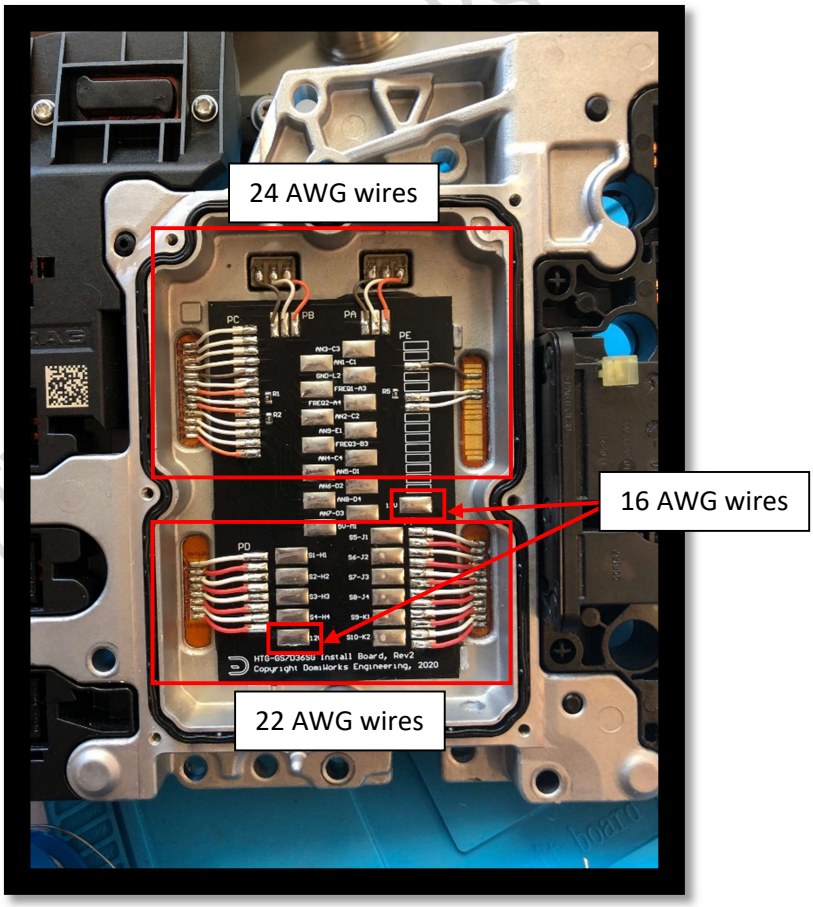
Brown: Signal Ground (24AWG)

Red: Solenoid feeds +12V (16AWG)

White -24: Sensors (Pads PA, PB, PC and PD)

White -22: Solenoid signal (Pads PE and PF)

In the end it should look like this.



Reference for soldering pads

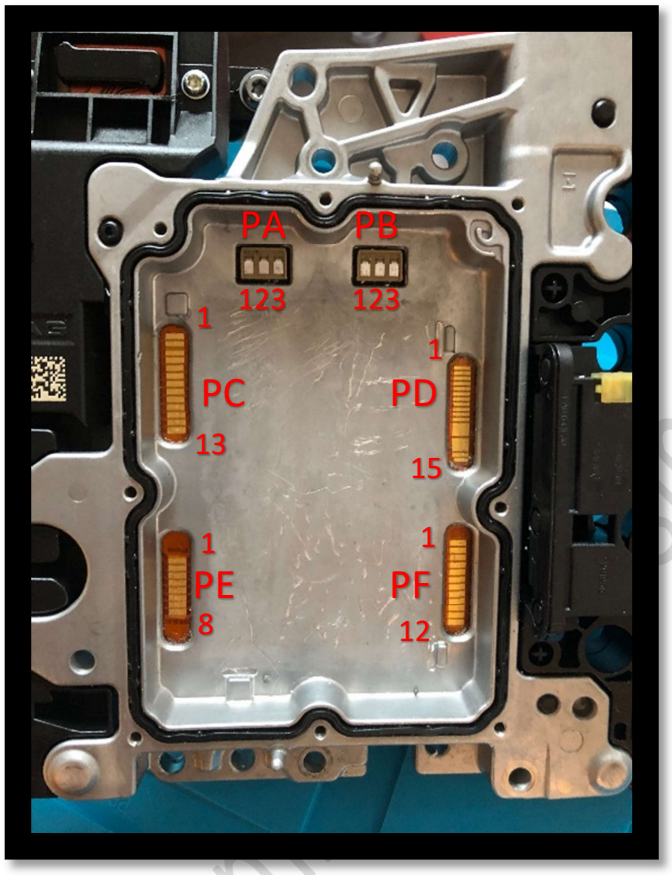


***Table 1**. Color and size reference to the soldering pads above*

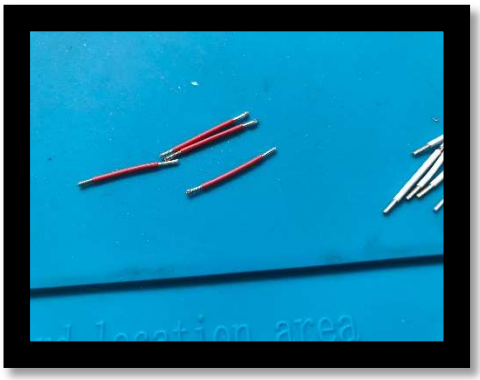
PA	Color size	PB	Color size	PC	Color size	PD	Color size	PE	Color size	PF	Color size
1	Brown-24	1	Brown-24	1	White-24	1	N/A	1	White-22	1	White-22
2	White-24	2	White-24	2	White-24	2	N/A	2	Red-22	2	Red-22
3	Orange-24	3	Orange-24	3	White-24	3	Brown-24	3	White-22	3	White-22
				4	White-24	4	N/A	4	Red-22	4	Red-22
				5	Brown-24	5	N/A	5	White-22	5	White-22
				6	White-24	6	White-24	6	Red-22	6	Red-22
				7	Orange-24	7	White-24	7	White-22	7	White-22
				8	White-24	8	N/A	8	Red-22	8	Red-22
				9	Orange-24	9	N/A			9	White-22
				10	White-24	10	N/A			10	Red-22
				11	White-24	11	N/A			11	White-22
				12	White-24	12	N/A			12	Red-22
				13	Orange-24	13	N/A				
						14	N/A				
						15	N/A				

Soldering technique tips

This is informational tips which we have found to be the easiest and fastest way to solder the wires. We have found it easiest to solder the wire to the mechatronic pad first before soldering to the PCB.

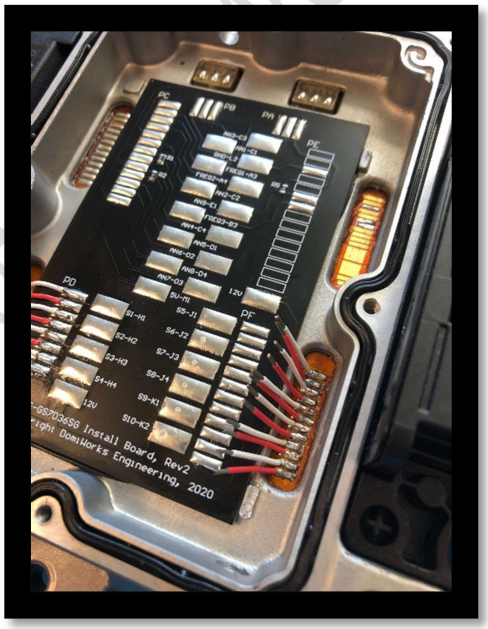
Pre solder the wires in both ends.

Bend one of end about 70 degrees.



Use a tweezers to grab the wire and put it in position of the pad you are about to solder.

Use your soldering iron and give it a quick touch to let the solder flow.



Release the wire from the tweezer and gently bend it towards the corresponding pad on the PCB.

Gently push the wire against the soldering pad while applying heat with your soldering iron until the solder flows bonding the wire to the PCB.

It is recommended to use solder grease to have a better flow of the solder.

Use high quality solder with a high content of tin, 97-98%. Use a soldering temperature of 380-390° C.

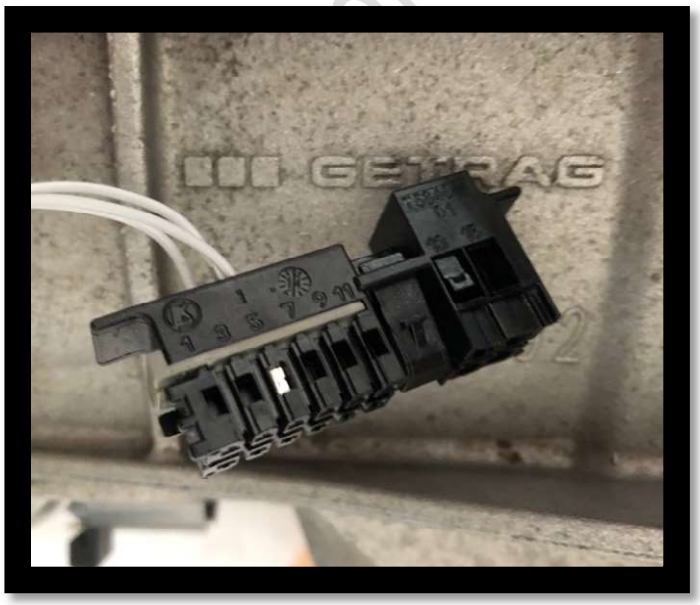
Removal of external connector

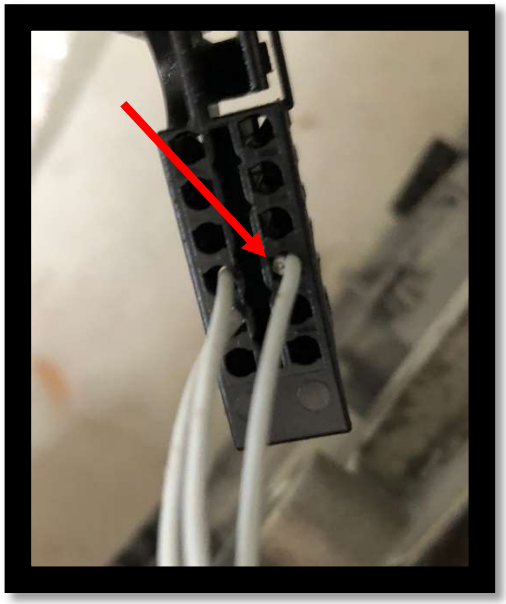
Remove the screw that holds the outer connector in place.

Disconnect the internal connector from the mechatronic unit. Only three wires are required from this harness. Either cut or remove the terminal from all locations except pin 4, 5 and 6. See marking on side of connector. It is recommended to remove the terminal instead of cutting as it can be refitted in the future.

The terminals are removed by first removing the grey locking pad. When the locking pad has been removed the terminal lock needs to be pressed down and then the terminal can be pulled out. The small terminals can easily be removed be a small screwdriver while the larger terminals need a fork looking tool to be removed, see example tool below.

There are two wires going from pin 5, one to the external connector and one to an internal sensor inside the gearbox. Cut the wire that goes to the external connector, see red arrow below where wire have been cut. **Always doublecheck which wire to cut before you actually make the cut.**





There is one larger wire going from the internal connector to a ground point inside the gearbox. Cut this wire as close as possible to this ground point as it is no longer needed.

After these steps has been performed it should now be possible to fully remove the outer connector and wires. In the end there should only be three wires going from the internal connector to an internal sensor.

Installation of mechatronic unit.

Install the modified mechatronic unit by position it by the internal guides and solenoid connectors. Reinstall all bolts and tighten them to their corresponding torque.

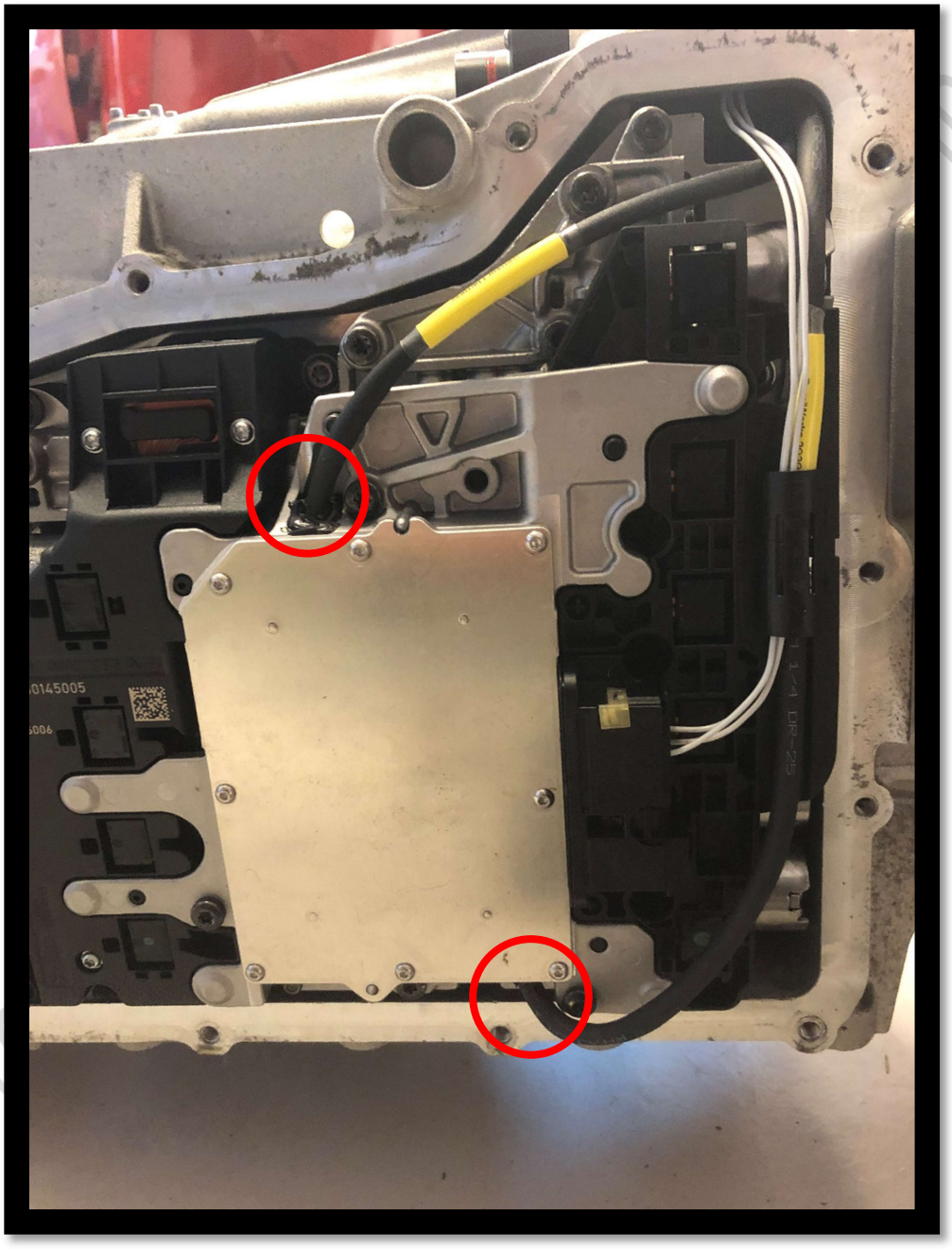
Install the new external connector

Put some lubricant on the O-rings and on the walls of the large outer hole. Install the new external connector by leading the solenoid and sensor harness through the large external hole the same way as the original harness did. Push the new connector into the hole, when the new connector is in place, use a countersunk allen M6 bolt and tighten.

Note that the external connector adapter might look a little bit different on early versions of our wiring kit.

Route the new harnesses

There are two harnesses coming from the new external connector. Route them as proposed below, the sensor harness shall go through the hole on top and the solenoid harness through the lower hole (the harness is marked with a yellow label). Route the solenoid harness through the standard harness locator clip.



Cut the wires to appropriate length so they reach their corresponding soldering pad and then strip the wire about 5mm and pre-solder the wire. Each wire is labeled with a yellow marker to see where it shall be connected. Note! Be gentle with the markers as they do not always stick to the wire low friction surface, resulting in that they can fall if not handled by care. If the marking is lost, use a multimeter with summer functionality and connect the flying lead harness to easier find out which wire goes where.

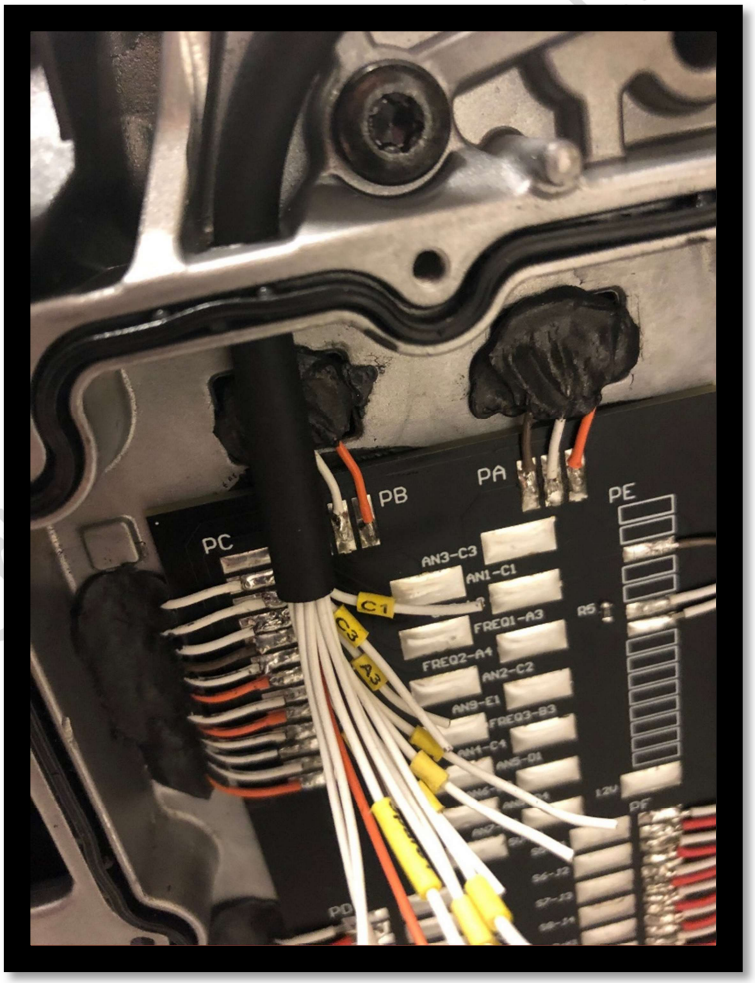
There are four wires which has been colored. There is one orange, one brown and two red wires.

The orange wire shall be connected to +5V marked 5V-M1 on PCB.

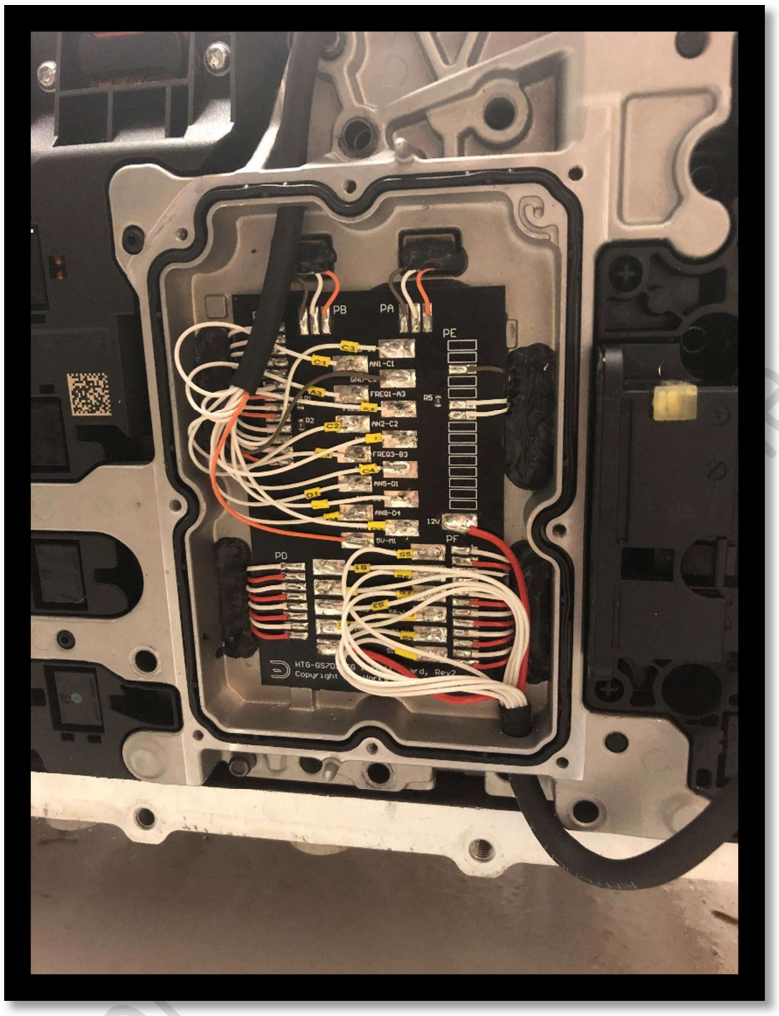
The brown shall be connected to Sensor Ground marked GND-L2 on PCB.

The red wires shall be connected to +12V, marked 12V on PCB. Note that there are two +12V pads on the PCB and both are must be connected.

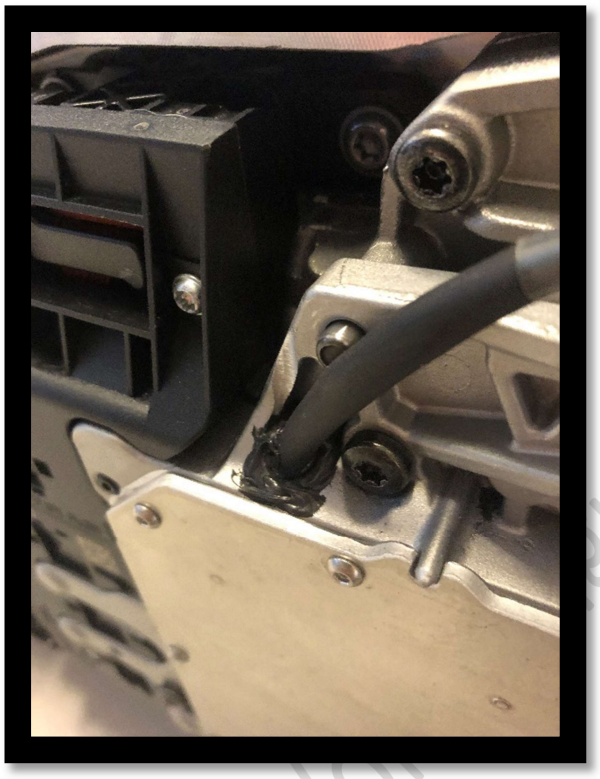
Solder each marked wire to their corresponding place on the PCB. In the picture below, connect C1 to soldering pad C1 which is the second pad from the top. Note that the marking for the soldering pad is located either left or right of the soldering pad, never on top or below.



When everything is finished it should look like this.



When all wires have been soldered to their corresponding soldering pad the two passthrough holes need to be sealed. Use a high temperature silicone sealant compound, recommended to use one that sustain +200°C (i.e Loctite 5910). Make sure to fill up the gap properly and a little bit on the inside and outside of the hole. Let it sit for at least 24h before adding any oil to gearbox.



Even if the internal and external harnesses are cross-checked before delivery and the markers on both ends indicate that they are connected, it is **ALWAYS** recommended to make a final check to see that correct pad is connected to the right terminal in the GCU connector.

When finished with the soldering, mount the mechatronic lid and tighten the M3 bolts to their corresponding torque. If found necessary, add additional zip ties to secure the harness even further.

External GCU harness

It is up to the end customer to make the final manufacturing of the external harness to suit the application requirements.

When constructing your external GCU harness to be used with HTG-Tunings GCU we strongly recommend looking into HTG-Tuning Installation document which can be found on their website. The cross-references in our kit should be the same as HTG, with the same name convention for the solenoids etc. It is always recommended to measure between the PCB and the GCU connector to see that there are no mismatches before installation into the vehicle.

The label on each wire corresponds to the position in the GCU connector it shall be connected to. For example wire A3 shall be connected to position A3 in the connector.

On some versions of our wiring kit there is a different solenoid name convention. See table below where to connect.

Solenoids	GCU Connector position
Solenoid 1, S1	H1
Solenoid 2, S2	H2
Solenoid 3, S3	H3
Solenoid 4, S4	H4
Solenoid 5, S5	J1
Solenoid 6, S6	J2
Solenoid 7, S7	J3
Solenoid 8, S8	J4
Solenoid 9, S9	K1
Solenoid 10, S10	K2

NOTE! The two red 16 AWG wires shall be connected to fused 25A +12V ignition source, this is the +12V feed for the gearbox solenoids. Do **NOT** connect to "+12_out" position M2, the M2 purpose is to feed low power auxiliary equipment like gearbox selector.

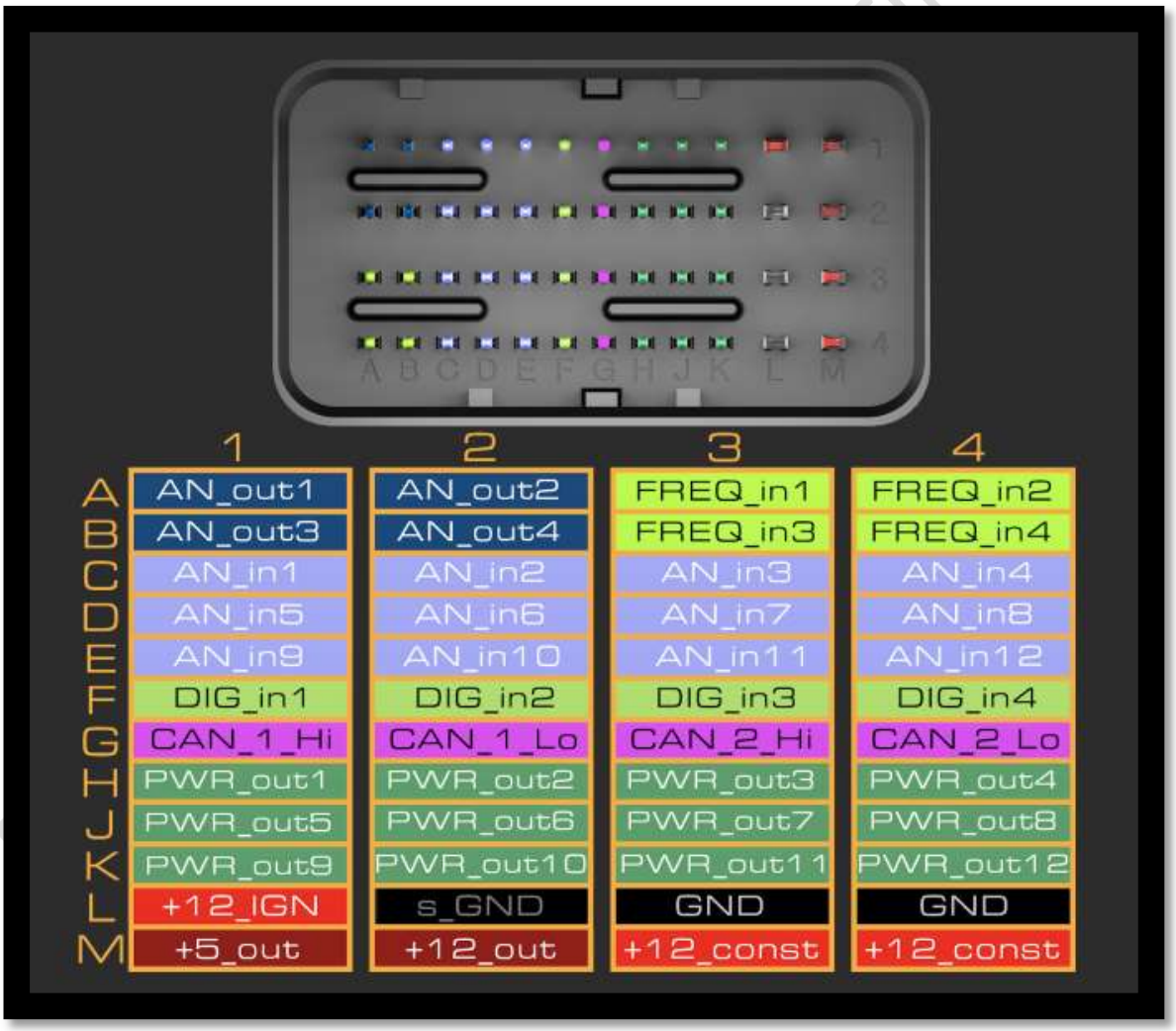
Minimum wire sizes for +12V feed (M3, M4), ground (L3, L4) and 12V (L1) ignition is 16AWG wire on each position to ensure proper functionality. Keep the wires as short as possible to reduce any source of voltage drop. Its essential to have sufficient power supply feed to the GCU and the gearbox solenoids, if there is a large voltage drop it can cause crossfeed of the valves leading to incorrect behaviour.

Recommendations and tips when finalizing the external harness

When manufacturing the external harness for the GCU, please consider the following things

- **Reverse light**, can be controlled by PWR_out11 or PWR_out12. This can be setup in the software to light up the reverse light when reverse gear has been engaged.
- **Paddle shift and gear shifter**, can either be connected to analogue inputs AN_in10, AN_in11 or AN_in12 or digital inputs DIG_in1, DIG_in2, DIG_in3, DIG_in4 or by using CANBUS input messages.

While crimping the bigger terminals with thin wire, especially the 5V and signal ground which is 24 AWG wire size. Strip the wire double in length and fold it once before crimping the terminal, this will result in a better crimp.



Setting up the GCU and testing solenoid valves

When the wiring is finished its possible to test the valves with the valve tester firmware available from HTG Tuning.

Make sure all drivers are installed on your computer, otherwise it's not possible to connect or change firmware. http://update.htg-tuning.com/htg-driver.zip

Download "HTG Tuning Loader" from the https://update.htg-tuning.com/loader-latest.zip

Download "DataLogger"

Connect your GCU to your computer and open the Loader software. You should see your GCU serial number in the drop down menu, select it and click connect. There will now be more options in the second drop down menu, select valve-tester and press flash.

Connect your GCU to the gearbox, connect 12V, ground and +12V ignition.

You should now hear clicking from the valves, you should hear 10 consequent clicks and a pause. This will repeat infinite times.

Open the DataLogger application, press Refresh and then connect. You should now see different colored lines which represents the current draw to each solenoid.

The maximum level should be fairly the same and only one line should go high at the time. Minimum current should also be the same for all solenoids.

Correct behavior is that you should see 10 independent lines with individual actuation.

When this is done you need to reflash your firmware with the latest one available in the Loader software. Repeat the same steps as for the valve tester firmware above but select the latest (or the FW you prefer) and flash.

Calibration guidelines

Take-up map

Way of driving off. Start in neutral, engage gear, clutch pressure is low and clutch is slipping. When TPS load and/or RPM increases the clutch pressure increases and propulsion is generated.

Fall time – For how long time to turn off the clutch

Rise time – For how long time the clutch is engaging

Spread time – Delay between start of fall and start of rise

Prefill pressure – Prefill pressure of inactive clutch before shift

Prefill time – How long time before the shift the clutch is prefilled

Shift pressure – Pressure to which inactive clutch is engaged after the shift

Shift time – How long after the shift the pressure is reduced

Time maps are quite ok from the start

Adjust prefill pressure and shift pressure

Pressure unit is in %, 30 means 30% of max pressure

Rate of success if calibration is good enough

If you have a loose drive and then a bang, this means prefill pressure and/or shift pressure is too low

If you feel, just after requesting shift you have a lock, the prefill is too high.

For further information please visit HTG-Tuning wiki page at:

https://wiki.htg-tuning.com/

Need help or assitance?

Don’t hesitate to contact us via social media or send a mail to sales@domieng.com

Thank you!