Borås 2014-01-26

This is a do it yourself (DIY) instruction on how to install a Kufatec High-Line VAG original back-up camera kit in a VW Passat CC (3C) my 2011. Though the instruction is long the installation is quite straightforward and by no means complicated. The end result is awesome both technically cool with the overlaid image based on the current steering angle and the back-up camera is very handy when reversing into narrow parking lots – I'm delighted (installation was really fun to!).

/ per@ddm.se

This instruction assumes you are installing the Kufatec.de "*Rear View Camera - Retrofit - VW Passat C*" Article Nbr.: 36784

1. What's in the package

1.1. Cables

Those are the three cables in the delivery.

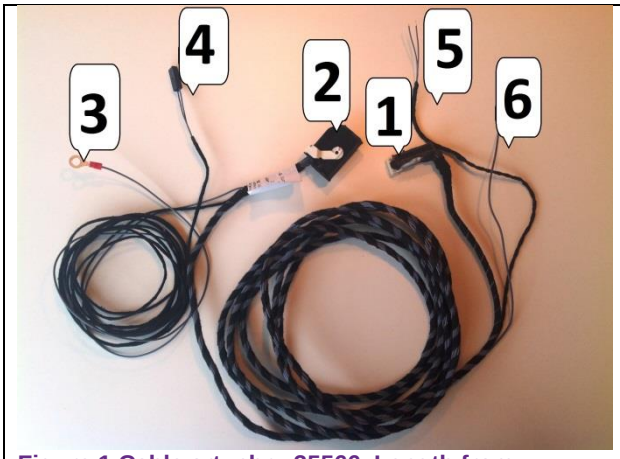


Figure 1 Cable art. nbr.: 35566. Length from connector 1 to connector 2 = 4,9m; additional 3,15 m to connector 4.

1. 26 p connector to plug in to the Radio unit.
2. 54 p connector to plug into the control unit J722 (part of delivery).
3. Connect to earth point close to the control unit.
4. Connect to the corresponding socket on the combined camera-VW-emblem unit (part of delivery).
5. CAN high/low cables to crimp to cables in Quadlock socket connecting the radio unit (pin 9 and 10 respectively).
6. Steady plus to connect either to the cable of pin 15 of the Quadlock connector connecting to the radio or to fuse 37 of the main fuse box.

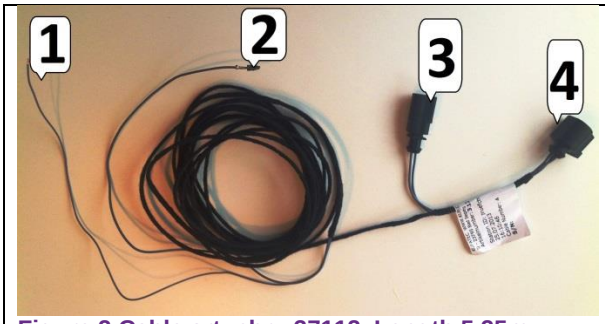


Figure 2 Cable art. nbr.: 37112. Length 5,25m.

1. Cable is labelled “J519 terminal 31” (*J519 is the relay carrier placed in the drivers foot well*) but should be connected to the left reversing light bulb cable in the luggage compartment lid.
2. Constant plus to connect to *S51- Fuse, Relay carrier on left under dash panel or for a simpler installation to the cable of pin 15 of the Quadlock connector connecting to the radio*.
   This cable is .5 to 1.5 meters too short (depending on whether connecting to the back of the radio or to the fuse carrier) – have to be extended!
3. Connect this lead to the plug originally connected to the VW emblem (connector T2f).
4. Connect to the new VW emblem (part of delivery) (connector T4av).

Note *It seems where reversing camera is factory fitted on a VW Passat CC my 2011 the lead labelled “1” in the above picture connects the left reversing light bulb cable in the trunk lid via the “Q158 connection – (RL) rear lid wiring harness”. That reversing light bulb in turn is connected to the J519 unit on terminal “T12k/12”, i.e., not the connector C pin 28 as outlined in the Kufatec mounting instruction and neither to terminal 31 of the J519 unit as indicated on the fine print on the cable!*

Figure 3 Cable/coax Art nbr: RG174. Length 3,1 m.

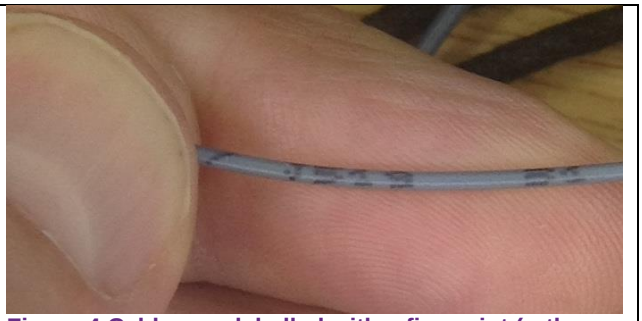


Figure 4 Cables are labelled with a fine print (rather than colour coded).

1.2. Combined swivel badge and camera unit

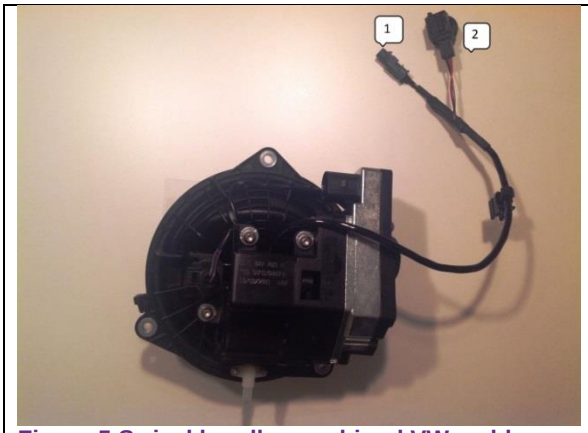


Figure 5 Swivel handle, combined VW emblem camera unit.

Figure 6 Water drain pipe.

1.3. J772 control unit and mounting bracket

Figure 7 J722 control unit.

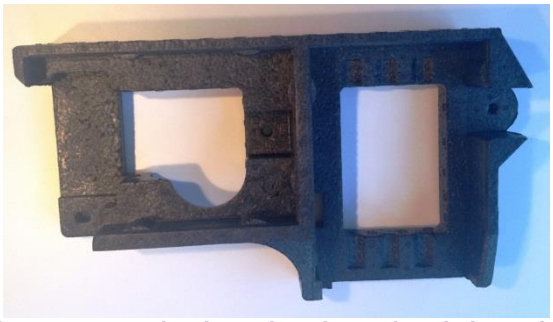


Figure 8 Control unit retainer (*you already have this if you have a shock absorber regulator J250 controller – which most Passat CC probably have*).

2. Stuff you need to source separately

In addition to what's included in the scope of delivery from Kufatec you also need:

- VAG 3C8971616A Cable guide attached to the right luggage compartment lid strut.
- And possibly crimp receptacles Conrad article number 56C751

You actually can do without those but then you need to find an alternative arrangement – suggestions for installing also without those above items further down in the instruction.

Prerequisites

- A radio unit with a 26 pin contact for the back-up camera signal, e.g., 3C8035190C. Note that not any RCD510 or RNS510 unit will not do, for example, a unit with part number 3C8035195 will not work while a 3C8035190C will – this even they both look the same on the front and they are both called RCD510.
- A set of tools can be handy (the installation actually is quite straight forward and do not require much special tools), including
    - VCDS (or VAS 5051 or a VAS 5052) tool.

- Some cardboard to make the calibration device.
- Contact removal tool *Conrad article number 743092* (a contact removal too is quite essential!)
- Crimp tool

3. Installation

3.1 Overview

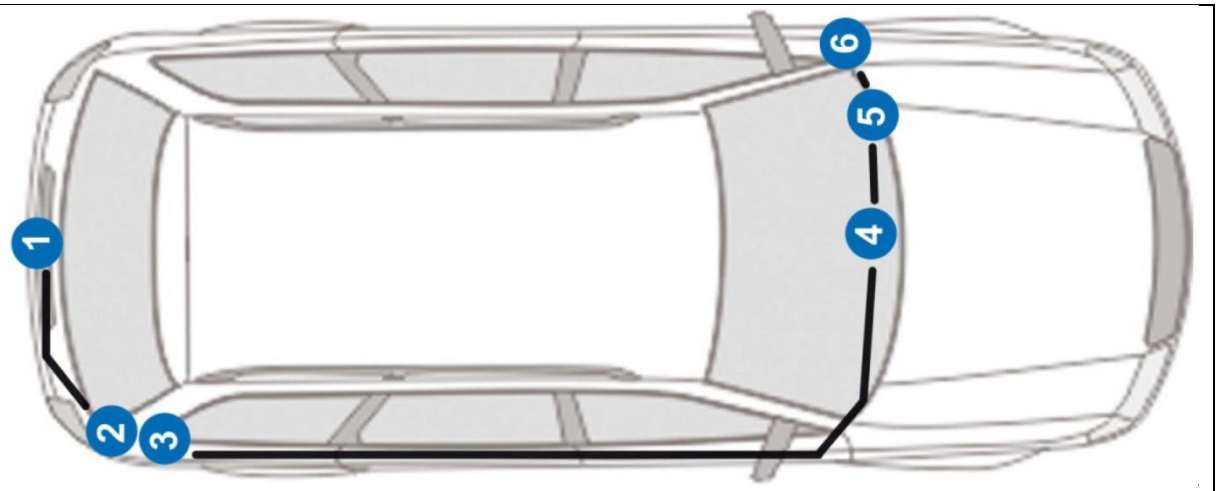


Figure 9 Overview.

1. Combined VW emblem and camera. (emblem motor V432)
2. Reversing camera control unit (J772)
3. Earth point
4. Radio (constant plus, CanHigh, CanLow and cable harness from J772)
5. not used for back-up camera installation
6. Fuse panels (constant plus 12 V for a close to original installation)

3.2. Installing the reversing camera and control unit

Start in the luggage compartment, remove the hazard warning triangle holder, depending on vehicle model you may have or to pry the two hatches in the lower part of the hazard warning triangle holder or to unscrew the bolt. On some vehicles remove caps (the outer arrows in Figure 10) on some you don't have to. Remove the cap over the locking mechanism (Figure 10 centre arrow). Pull out the rear lid trim, start from the lower/fore side.

Loosen the lock mechanism (two nuts).

Detach the cable connected to the VW emblem. Unfasten the screws holding the combined VW emblem (Figure 11).

Note. Although the Kufatec instruction indicates the signal to the swivel badge is to be taken from a connector C pin 28 (which will eventually mean the right reversing light bulb), instead source swivel badge signal from the left reversing light in the luggage compartment lid. Doing so makes much sense since it will be closer to the original fitting arrangement and it is a much less intrusive to crimp new connectors here? The

reversing light is connected to pin 3 of the four-pin connector attached to the left lamp unit in the trunk lid.

Mount the new emblem, excreting care to align the unit such that the o-ring/sealing makes tight to the luggage compartment lid. Also make sure the drain pipe is not twisted all to counter the danger of leakage. Insert the VW emblem/camera (also known as swivel badge) into the rear lid. Lock the VW emblem by turning it counter-clockwise (there are small hooks on the emblem that engages into the lid when turning the emblem a few degrees counter-clockwise (seen from inside)). Screw in the 3 screws for securing the swivel badge without tightening them completely. Thread a long thin screwdriver or metal rod through the drain pipe and then through the small hole just above the lock mechanism (Figure 14) in the lid and then to the drain pipe nipple of the emblem unit. Then thread the drain pipe onto the drain pipe nipple of the newly mounted VW emblem. Align the VW emblem centrally in the mounting hole (looking from outside). Tighten the three bolts to 4 Nm.

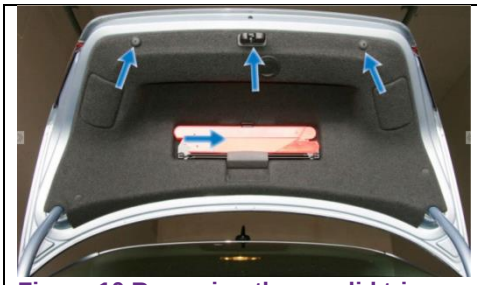


Figure 10 Removing the rear lid trim.

Figure 11 VW emblem/camera unit mounted, new cables routed.

Figure 12 Swivel emblem drain pipe nipple.

Figure 13 Drain pipe

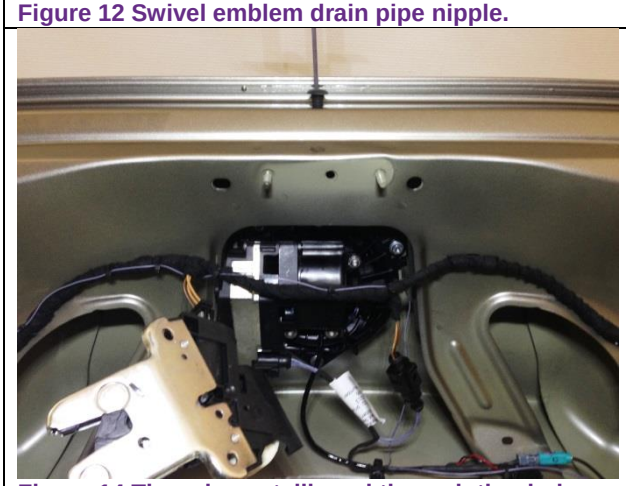


Figure 14 Thread a metallic rod through the drain pipe into the nipple on the swivel badge and thread in the pipe in place.

Remove the luggage compartment right side trim. Position the rear view camera control unit (J772) and control unit retainer if not already there. Split the Kufatec 37112 cable harness such that the “J519 31” lead stays in the rear lid and the “dauerplus” runs through the strut. Feed the cables through the right rear lid strut. Obviously feed cable with Kufatec article number 37112 from top and the cable with Kufatec article number 35566 from bottom up. The RG174 coax any way you like.

Figure 15 Hidden screws in the lashing eye to untighten when removing the right side trim of the luggage compartment.

Figure 16 Remove the lock carrier trim by just lifting it straight up.

Figure 17 Right side trim fasteners.

Cables are routed through the rear lid strut and need some guidance to make sure they do not get entangled. Where back-up camera is factory fitted a 3C8-971-616A bracket is used – best is to buy that bracket (approx. EUR 5). If you have access to a 3D printer there's a "thing" you can use as bracket, see http://www.thingiverse.com/thing:229869 . Acquire, build or print a cable guide to attached to the rear lid strut (Figure 18, Figure 19).

Figure 18 Rear lid strut cable guide VAG 3C8971616A.

Figure 19 Rear lid strut cable guide (3D printed/homemade).

Figure 20 Cables routed through rear lid strut and through the VAG 3C8-971-616-A cable guide (picture taken from inside luggage compartment looking up).

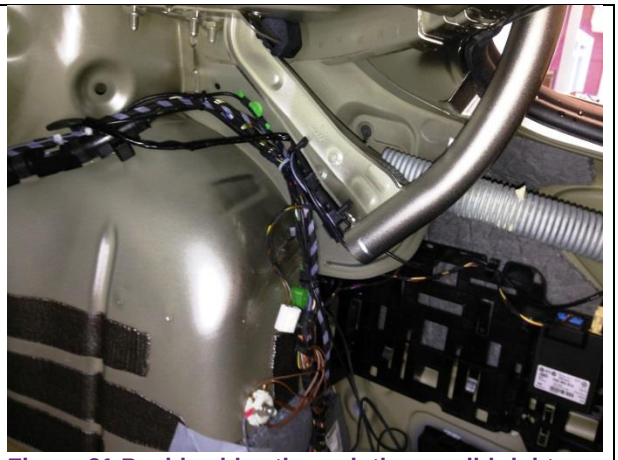


Figure 21 Pushi cables through the rear lid right strut.

Connect cables to the combined VW emblem – camera unit (Figure 22, Figure 23, Figure 24). Arrange cables to run smooth to the right rear lid strut, fasten cables using cable ties. Connect the earth lead of cable 35566 to the earth point (Figure 25). Connect the art. no. 35566 cable 54-pin connector to the control unit (J772).

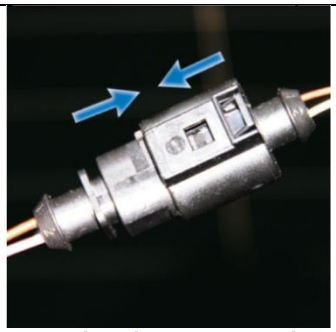


Figure 22 Connecting the 37112 2 pol connector to the cable originally connected to the old VW emblem.

Figure 23 The art no. 37112 cable connects to the four pin connector on the VW emblem/camera unit.

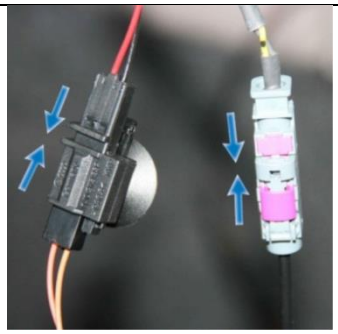


Figure 24 The two pin connector of the art- no. 37112 cable and the optical fibre (art. no. RG174) connects to the camera unit.

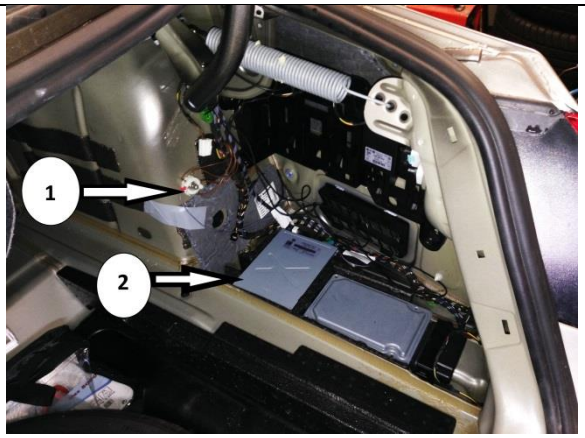


Figure 25 Placement of earth point (1) and the control unit (2).

Note. Don't be alarmed if the trunk lid do not open when you push the camera/VW-emblem; until you have provided constant plus to the swivel motor the push-button function will not work. (you could be misled to think the switch-function of the camera/VW-emblem would work once the two connectors in the trunk lid are connected)

3.3. Cable routing

Continue with routing the wiring to the front of the vehicle. Run cables together with existing cables under the sill.

Note. Exert care if your rear seat side padding is equipped with airbag.

Figure 26 Cables are routed over the rear lid strutt.

Figure 27 Rear seat padding removal bolt.

Figure 28 opening sill.

Figure 29 Open sill front.

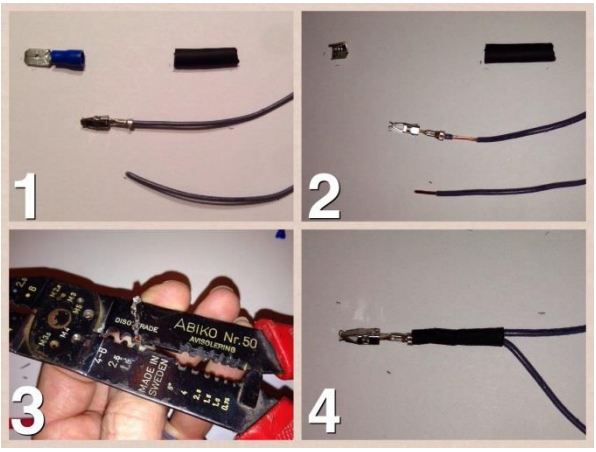
Figure 30 Remove glove compartment by unscrewing screws and releasing hatch.

Figure 31 Glove compartment release hatch.

3.4. Connecting to the radio unit

Note. CAN buss wires must be twisted, i.e., CAN-High and CAN-Low must be twisted around each other, this to avoid electrical interference. Thus the two vires must not run parallel for more than 50 millimetres. Twisting shall be such that each complete twist is not more than 20 millimetres apart. There are three CAN busses in the vehicle one for Powertrain (Orange/black), Convenience (orange/green), Infotainment (orange/violet) and CAN low for all three busses is collared orange/brown.

Note. Cables should be crimped, not soldered. (Soldering is advised against in this extensive post)



One way to clamp on new leads to existing ones without having to cut the original cables, and thereby don't have to source new crimp receptacles, is to take an ordinary flat connector remove the insulation and cut of the tongue. Then remove a short segment of the insulation from the original cable, e.g., the can-high connected to the Quadlock connector. Crimp on the new lead to the original lead. Add a short piece of heat shrink tube.

Remove the radio/CD/navigation unit (J503) by levering out the (polished aluminium) centre console. Unscrew the four torx screws hidden by the centre console. Carefully pull out the radio unit and disengage the connectors from the back of the radio unit.

Figure 32 Pull out the centre console.

Connect the steady-PLUS, CAN-high and CAN-low cables of the Kufatec art. no. 35566 cable harness to the corresponding pins in the quadlock plug.

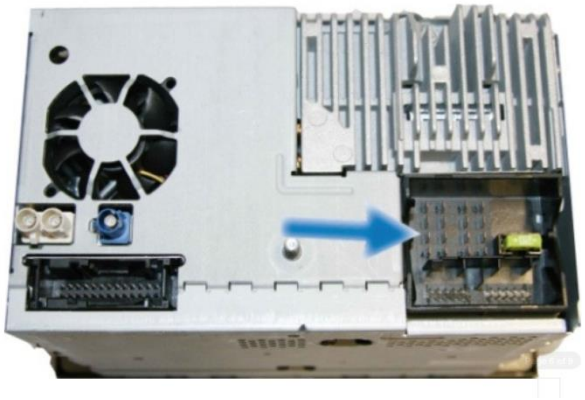


Figure 33 Rear view of the radio unit.

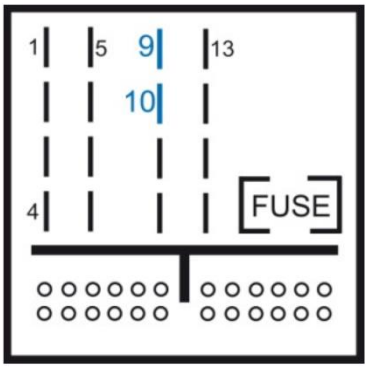


Figure 34 Quadlock connector pin-out of the radio unit connector.

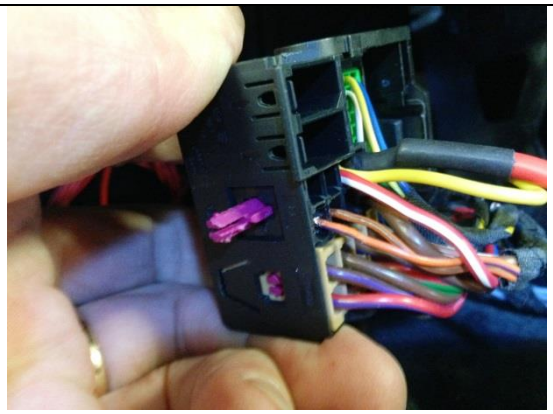


Figure 35 First pull out the pink locking pin from the quadlock connector.

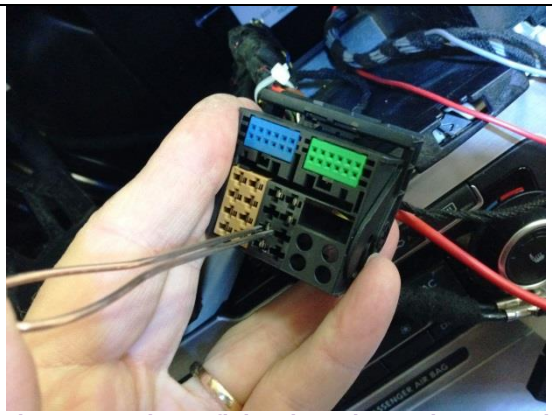


Figure 36 Release flukes by using a pin removal tool (here homemade).

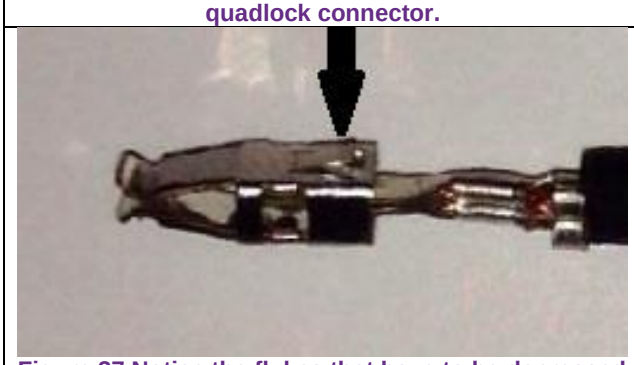


Figure 37 Notice the flukes that have to be depressed by a pin removal tool.

9 - CAN bus, high
10 - CAN bus, low
15 - Positive connection (since this lead is supplied by a 30 A fuse; you should add a 10 A inline fuse here)

3.5 Constant power to swivel badge motor (V432)

The “correct” way of doing this is to connect

- The steady plus (labeled “dauerplus / siehuypi” *(or possibly “siewuypl” – neither makes sense!)* of the Kufatec 37112 cable harness to the S51 fuse, in relay carrier on the left under dash panel, and
- The “steady plus” lead of the 35566 cable harness to fuse 37 in the main fuse carrier.

Those fuse boxes are however quite tedious to work with – you may thus connect both above “steady plus” leads to pin 15 or 16 of the quadlock connector connecting to the radio unit (using an inline fuse (10 A)).

4. Coding and adaptation

This section will take you through coding, adaption and calibration using the VCDS tool. If you have a VAS 5051 or a VAS 5052 tool you will get guiding through the process there instead.

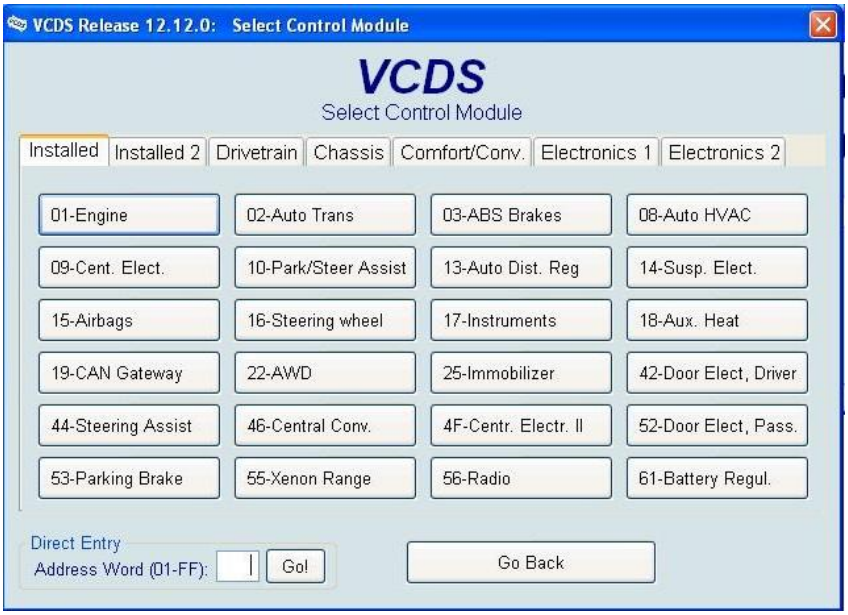
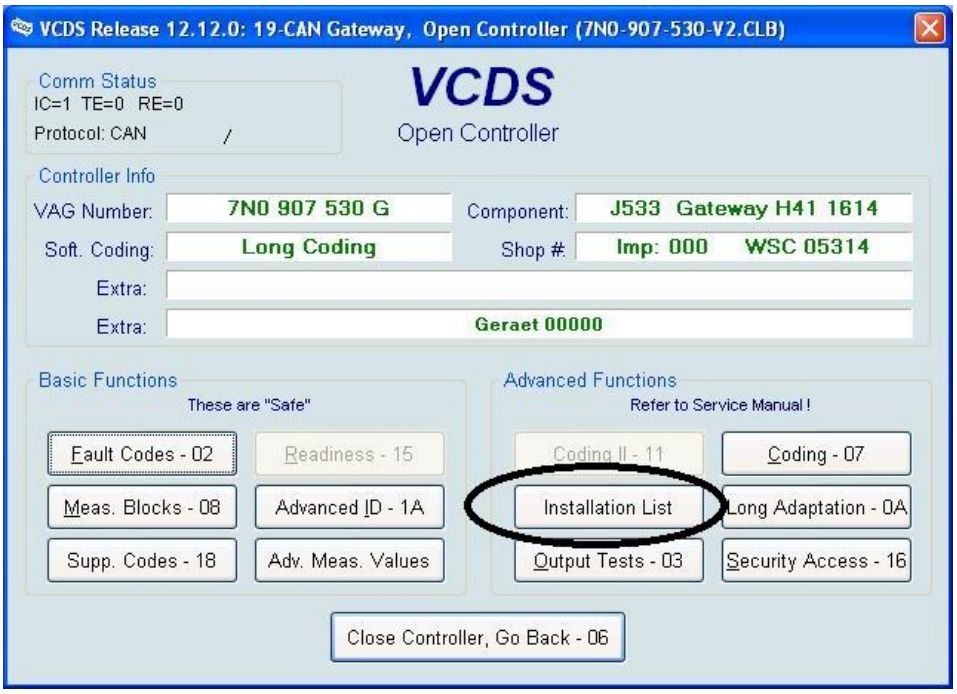


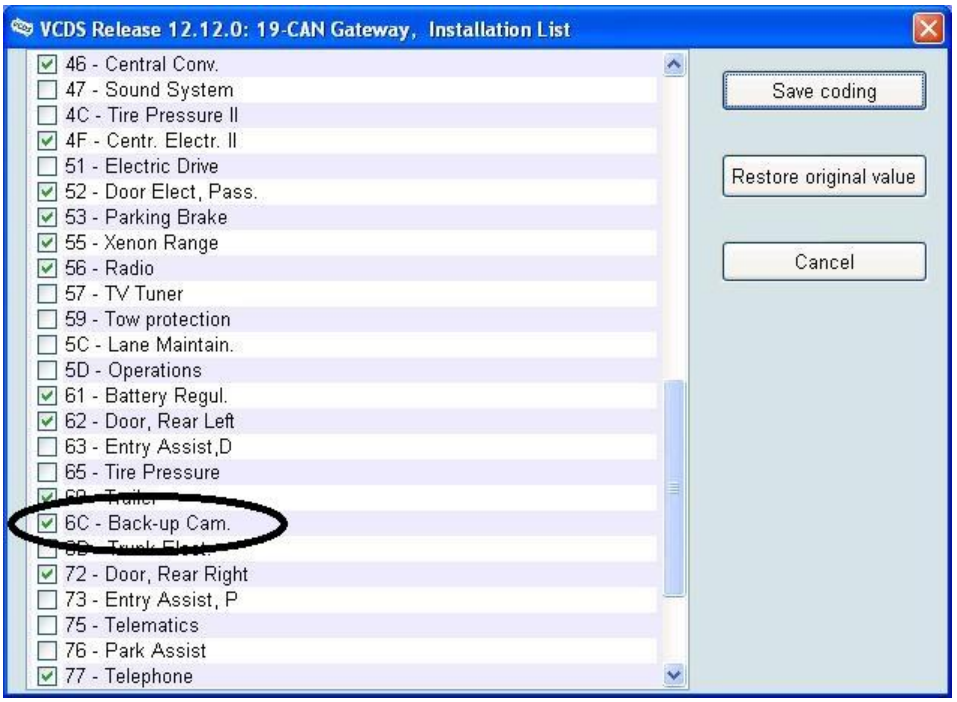
Figure 38 VCDS control module selection screen.

4.1. CAN gateway

The CAN gateway (on address 19) functions like a bridge between the three CAN busses in the vehicle. The CAN gateway holds a list of devices to talk to – that list must be updated to reflect the installation of the new control module. Until you have updated this list the back-up camera control unit is functional but the CAN gateway will store a fault code (“01044 Control module incorrectly coded”) (that cannot be cleared unless the installation-list is updated).



Tick the checkbox for "*6C: Back-up Cam.*" in the Installation list.

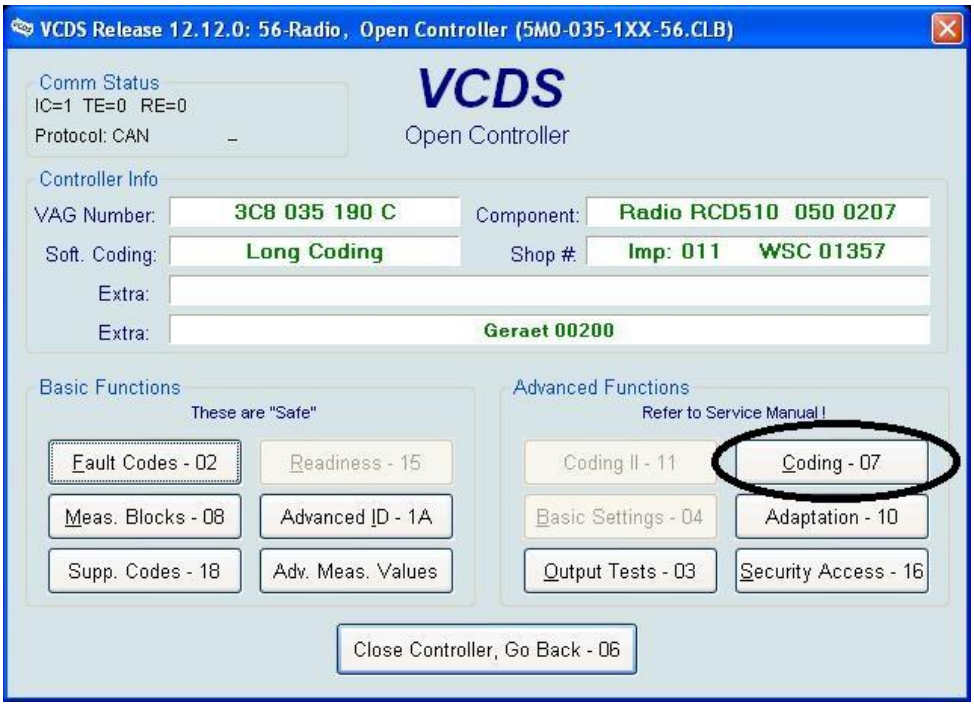


Save coding and close controller.

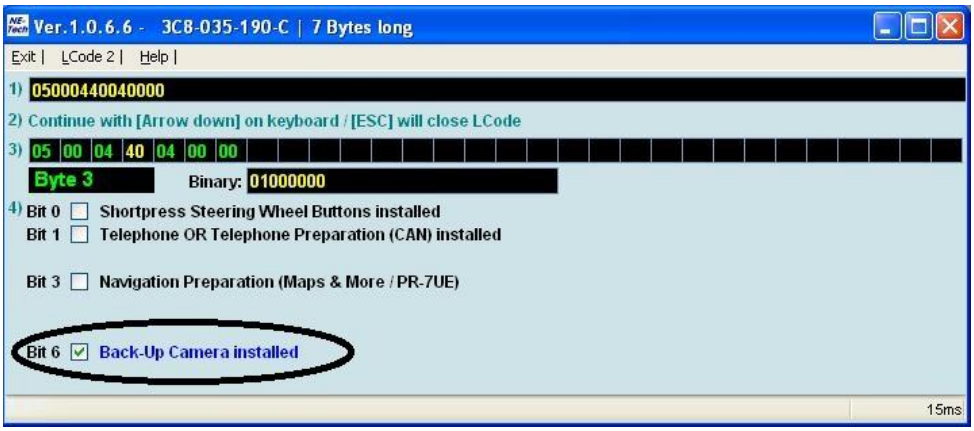
4.2. Coding radio unit

You need to tell the radio unit it now has a back-up camera. Once you have done this the radio unit will add a (on-screen) button for bringing up the back-up camera image if not shown automatically when the reverse gear is engaged.

Select "*Coding -07*".



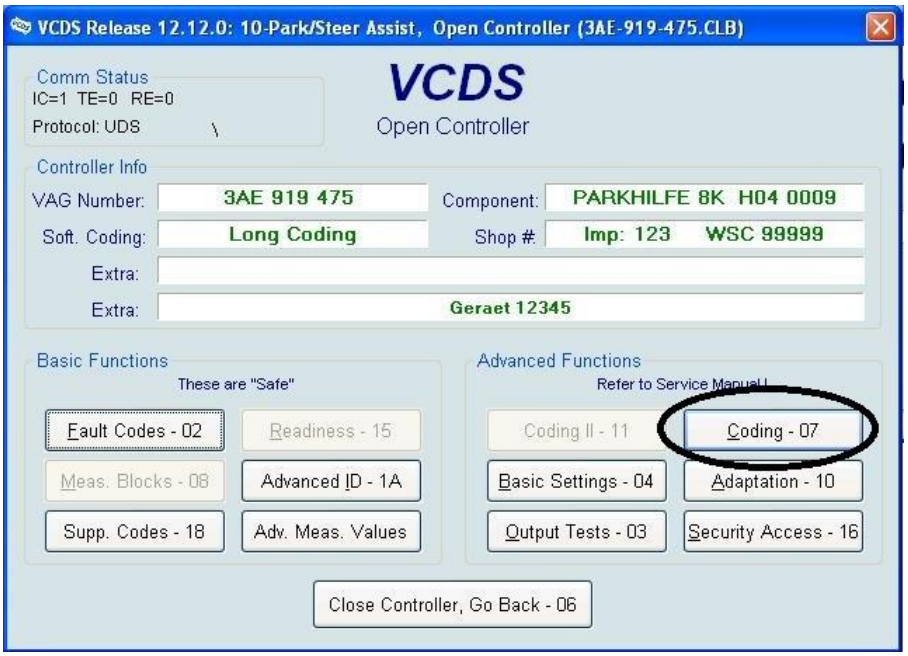
Tick the checkbox for Back-up camera installed.

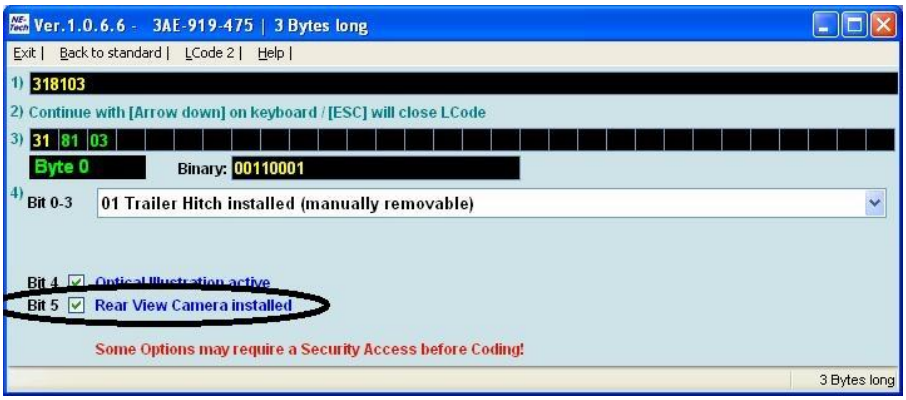


Save the new coding and close controller.

4.3. Park / Steer assist control module

Though the coding of the park/steer assist control module is not strictly necessary for using the camera it seems, unless you do this coding you will have to switch to rear view camera by pressing an on-screen button each time you are reversing – with this coding the rear-view camera picture will show automatically.





4.4. Back-up camera control unit (J772)

4.4.1. Coding

Next you need to *code* the J722 control module, i.e., telling it what car it is in etc. The coding is a decimal number expressing a bit-pattern according to the VCDS long coding or help balloon that shows when you position the cursor in the code input field.

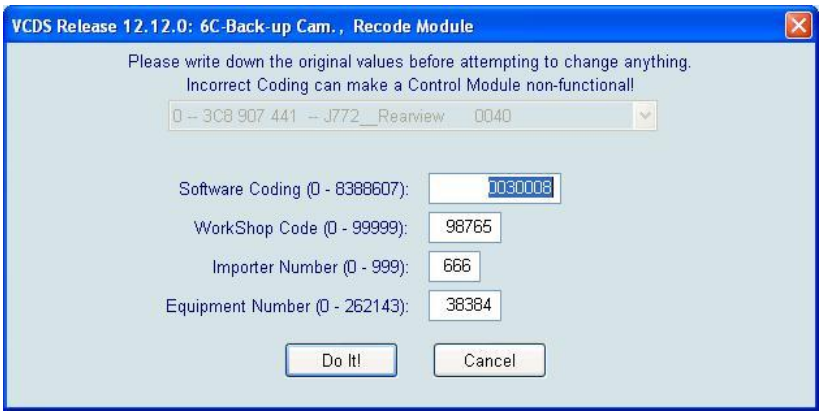


Figure 39 Back-up camera coding dialog (note the software coding shown is an example (the "3" denoting both tow bar and OPS installed), you have to tailor the coding to your market, make, camera height and vehicle model).

```
?xx0xxx: Manufacturer
0 = Volkswagen
2 = Bentley
x?x0xxx: Market
0 = Rest of the world
1 = North America Region
xx?0xxx:Trailer hitch and OPS
+1 = Trailer hitch installed
+2 = Optical parking system installed
xxx0?xx: Camera height
0 = height-1 (970 mm); 1 = height-2 (985 mm);
2 = height-3 (1000 mm); 3 = height-4 (1015 mm);
4 = height-5 (1030); 5 = height-6 (1045 mm);
6 = height-7 (1060); 7 = height-8 (1075 mm)
x0x0x??: Model
01 = VW Touareg (7L)
02 = Bentley continental flying spur (3W3)
07 = VW Passat (3C)
08 = VW Passat CC (35)
10 = VW Tiguan (5N)
11 = Seat Alhambra (71) / VW Sharan (7N)
15 = VW Transporter Multivan (7E/7F)
```

Table 1 Coding crib sheet from VCDS.

4.4.2. Adaptation

There is a Wikipage on calibrating back-up camera on the VCDS wiki. The same page is linked to from multiple vehicle models since the process is quite general (that's why you end up on a Touareg page even though you asked for a Passat page).

http://wiki.ross-tech.com/wiki/index.php/VW_Touareg_(7L)_Back-Up_Camera

Below some information that may be useful in addition to the above linked to Wiki article.

The VAS 6350 is a kit including some special tools and then particularly a reference image. You can create your own reference image based on the sketch below (thanks to whoever posted this information to the Internet first). The rest of the VAS6350 kit can be replaced by standard tools (some string, measuring tape, spirit level and a set square).

Position the reference image something between 1200 and 1700 mm behind the rear axle. Ensure the reference image is centred to the car, at level (check with a spirit level) and at an absolute right angle.

G85 steering angle

The Wiki page referred to above say you must position front wheels straight, Steering Angle Sensor (G85) close to 0.0 °. The current steering angle measurement from the G85 sensor is available in measurement block 004 of the J772 control module.

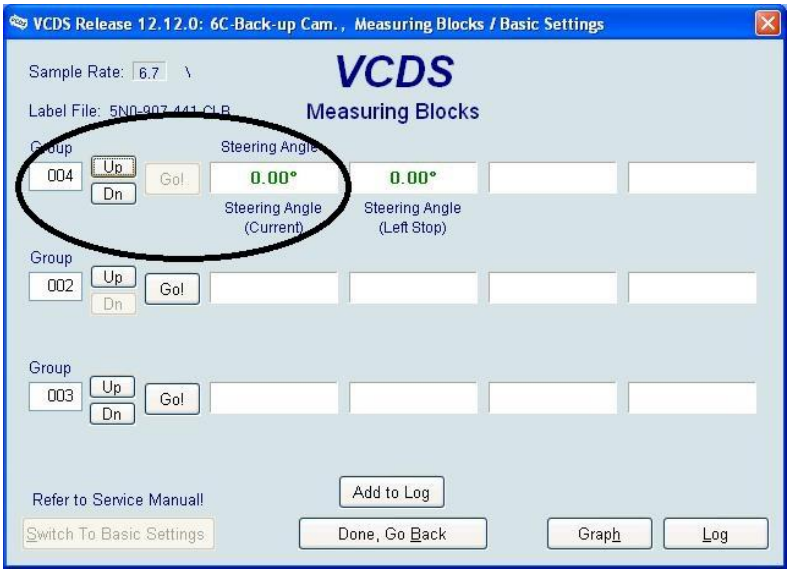


Figure 40 Reference image behind car for calibration.

Figure 41 Measuring distance from rear axle (centre) to calibration board (not shown in this picture).

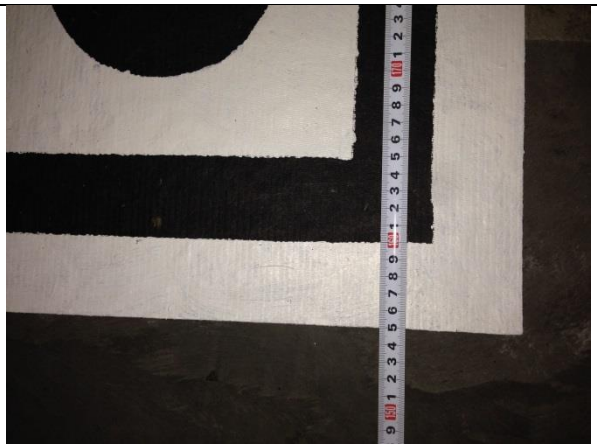


Figure 42 Measure distance from the rear axle to the black border (closest to the car). Here distance is 1600 mm.

Wheelbase of VW Passat CC (3C) is 2708 mm

Note. A successful calibration is indicated by the value "1" in the second field (labelled calibration status) of measurement channel 130. (that is the Wiki is not entirely correct there) (it seems the calibration takes place when you hit "Test" for the value "1" in adaption channel 001, saving the "1" don't do much – possibly throwing the calibration status 0x00FE of measuring block 130).

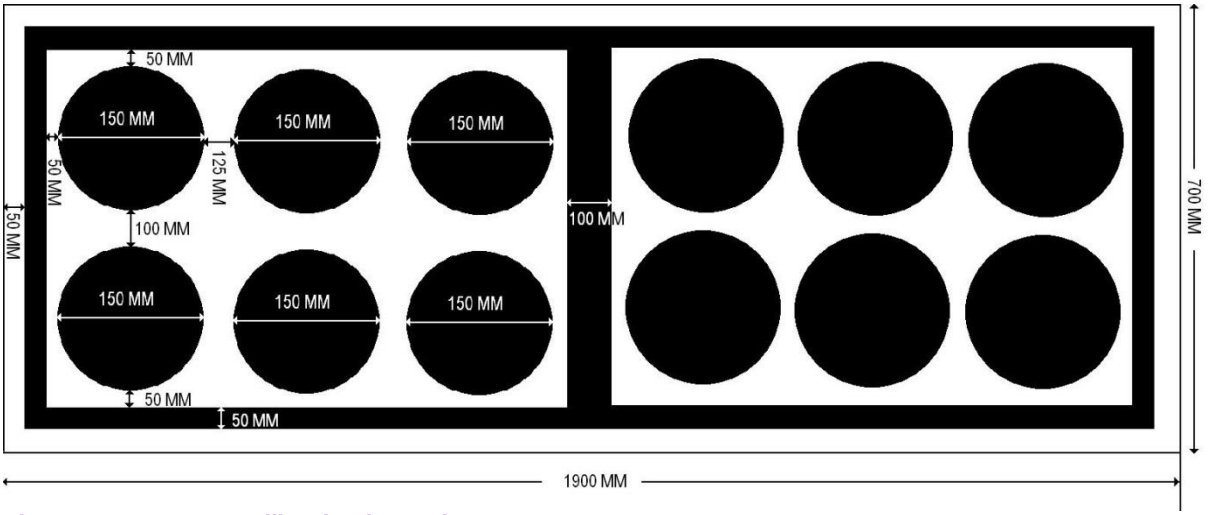


Figure 43 VAS 6350 Calibration image layout.

Below are shown typical coding, calibration values and statuses from two cars.

	Coding	004	005	Measuring block 130			
VW Passat 3C with factory fitted back-up camera	0030007	15410	565	Calibration mode	Calibration status[1]	Calibration status	No units
				Deactivated	1.0	0x0000	1.0

```
-------------------------------------------------------------------
Address 6C: Back-up Cam.         Labels: 5N0-907-441.clb
   Part No SW: 3C9 907 441     HW: 3C9 907 441
   Component: J772__Rearview      0020
   Revision: 00H09000    Serial number: 525PA8-J120739
   Coding: 0030007
   Shop #: WSC 05311 000 00000
   VCID: E8DB0461DBA6865EBC3-80BD
```

Table 2 Scan from VW Passat variant 3C where the back-up camera system was factory installed (and to my knowledge have newer since been calibrated or touched).

	Coding	004	005	Measuring block 130			
VW Passat CC 3C with retrofitted camera.	0030008	15692	510	Calibration mode	Calibration status	Calibration status	No units
				Deactivated	1.0	0x00FE	1.0

```
-------------------------------------------------------------------
Address 6C: Back-up Cam. Labels: 5N0-907-441.clb
Part No SW: 3C8 907 441 HW: 3C8 907 441
Component: J772__Rearview 0040
Revision: 00H11000 Serial number: 525PA8-J2Z5461
Coding: 0030008
Shop #: WSC 98765 666 38384
VCID: E7D9075DD6B88926B59-80B2
```

Table 3 Scan from the VW Passat CC in that the back-up camera kit have been retrofitted in.

[1] The interpretation of the fields is shown if you hover the pointer over the respective fields, so is the second field in measurement block 130 ”Calibration status” interpreted as, 0=Not calibrated; 1=Calibrated; 2=Calibration failed.

5. Finishing: A note in the service schema booklet

VAG keep a note on what controllers and settings was installed at factory. Should a workshop encounter problems with the car they probably would reset everything to factory default, i.e., deregistering the back-up camera. To save you from re-coding you may want to make a note of your modification in the services schedule booklet; thereby allowing any technician and the next owner too for that sake to understand what modification you made.

A back-up camera has been retrofitted to this car, i.e., the VW emblem in the rear lid have been replaced with “5K0 827 469 AP UMP“ and a “3C8 980 551 A” camera unit, further a J722 “3C8 907 441” control unit have been added, cables have been routed mostly as an original install with the exception the swivel badge and the J772 control module is powered from an inline fuse behind the radio unit and the CAN bus from the J772 unit is clamped on to the Infotainment CAN bus in the Quadlock connector behind the radio. Also coding for the *CAN gateway* and the *Park / Steer assist* control modules has been updated. For further information contact: <contact details>