WORK PROCEDURE

for distributors and service points

WP1250D

ADDRESSEES	: ABC Customer Care and Parts Source
VEHICLE MODEL	: CX45 MY2020 vehicles
MANUAL SECTION	: 11.04 Control systems – Vehicle safety systems
DOCUMENT TYPE	**: Addendum to service bulletin SB1789**
DATE	: December 07th, 2022
SUBJECT	**: To retrofit with Collision Mitigation System (CMS) and Adaptive Cruise Control (ACC)**

This work procedure should be read together with Service bulletin SB1789.

DESCRIPTION:

Van Hool has released Collision Mitigation System (CMS) in combination with Adaptive Cruise Control (ACC) as an option for above mentioned vehicles.

This work procedure gives step-by-step instructions how to retrofit CX45 MY2020 vehicles with Collision Mitigation System (CMS) and Adaptive Cruise Control (ACC).

PARTS AND PRODUCTS:

Retrofit kit VH11746138

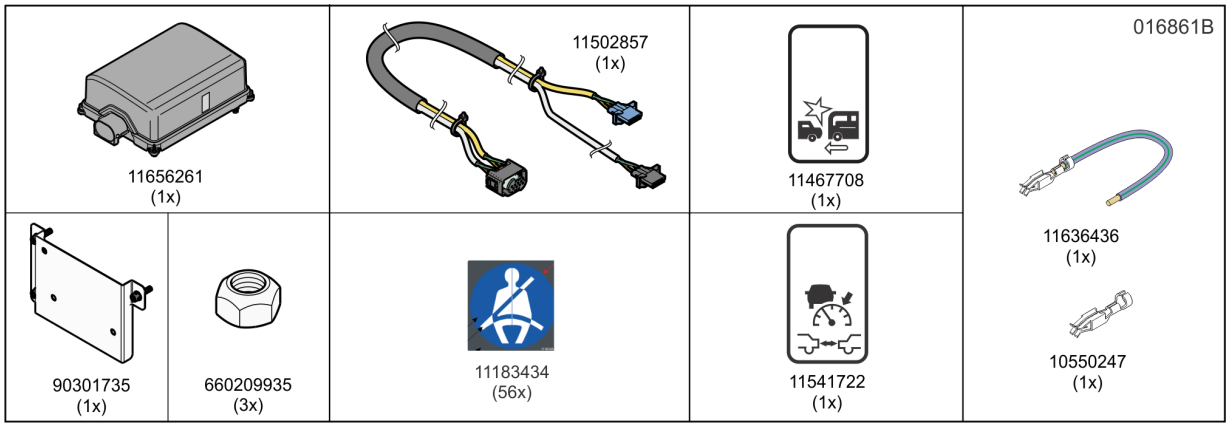


Figure 1

VH reference	Description	Quantity
11656261	CMS/ACC radar	1
90301735	Bracket	1
660209935	M6 nuts	3
11502857	Connecting cable (radar to vehicle wiring)	1
11467708	Dashswitch to switch off CMS	1
11541722	Dashswitch to set following distance of ACC	1
11636436	Electrical wire (violet/green; 1mm²; length 4 inch), with terminal crimped	1
10550247	Cable terminal	1
11183434	Seat belt adhesive	56

Continued on next page.

PREPARATIONS:

- Park the coach on a level-surfaced service pit.
- Apply the parking brake and shut down the engine.
- Switch off all systems and turn off the battery master switch.
- Turn off the mechanical battery switch.
- Put a “DO NOT OPERATE” tag on the instrument panel.
- **Read the entire procedure before beginning to work.**



WARNING!

Observe safe shop practices at all times.

AVAILABILITY OF NEW SOFTWARE

A vehicle with CMS/ACC requires other software/parameters for some electronic devices (multiplex system, gateway, radar, …). Van Hool will provide the new software/parameters after we received an “CMS/ACC retrofit request” e-mail for a specific vehicle. Send the mail to aftersalesbc@vanhool.be with the text “**VIN… ready to be retrofitted with CMS/ACC**”. You will be informed by mail as soon as new software/ parameters are available on the customer portal for that vehicle.

PROCEDURE

Step	Action
1	Lower the front bumper.
2	Remove the three screws from the bottom securing the front grill and remove the front grill.
3	Install the CMS/ACC radar as explained further on under “STEP 3 IN DETAIL”.
4	Remove the brown wires at nodes 2 and 6 of the multiplex system as explained under “STEP 4 IN DETAIL”.
5	Install the dashboard switches from the kit as explained under “STEP 5 IN DETAIL”.
6	Load new parameters in the ABS control unit as explained in WP1008. Parameters are available on the customer portal under the heading “Software”.
7	**For vehicles with Cummins engine + calibration needed:** a. Make a Cummins authorized workshop install new engine software b. Make a Cummins authorized workshop change following parameter in engine control unit: • Adaptive cruise: **enable**
8	**For vehicles with Detroit Diesel MY2017 engine (max Vspeed: 71 mph):** a. Make a Detroit Diesel authorized workshop install new engine software. b. Make a Detroit Diesel authorized workshop change following parameters in engine control unit. • Min_Cruise_set_Speed_low: **40** • Min_Cruise_set_Speed_high: **40** • Adaptive_Cruise_Control_enable: **2**
9	**For vehicles with Detroit Diesel MY2017 engine (max Vspeed: 68 mph):** c. Make a Detroit Diesel authorized workshop install new engine software. d. Make a Detroit Diesel authorized workshop change following parameters in engine control unit. • Min_Cruise_set_Speed_low: **32** • Min_Cruise_set_Speed_high: **32** • Adaptive_Cruise_Control_enable: **2**

Continued on next page.

10 **On the engine parameter setting chart located in junction box EKA**, change the parameters settings by using a felt-tipped pen. Also change the identification number of the parameter setting chart with a felt-tipped pen as indicated below:

Engine	Chart identification number without ACC/CMS	Chart identification number with ACC/CMS
Detroit Diesel MY2017 (Max Vspeed: 71 mph)	11568847	11599210
Detroit Diesel MY2017 (Max Vspeed: 68 mph)	11643033	11660929
Cummins X12 MY2018	11690452	11683698
Cummins X12 (Max Vspeed: 68 mph)	11692656	11769945
Cummins X12 (Max Vspeed: 71 mph)	11734052	11769946

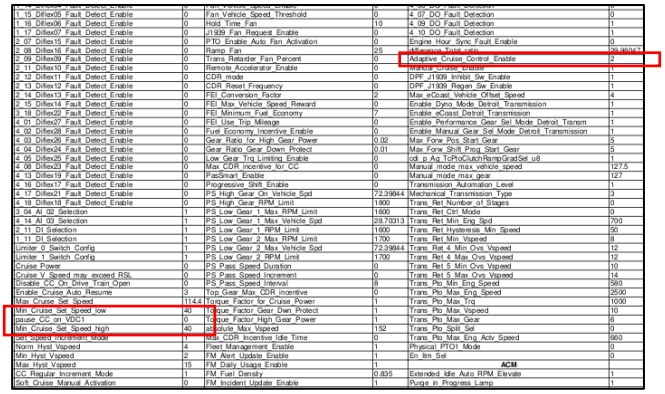


Figure 2: Detail of parameter setting chart 11599210 (changed settings framed)

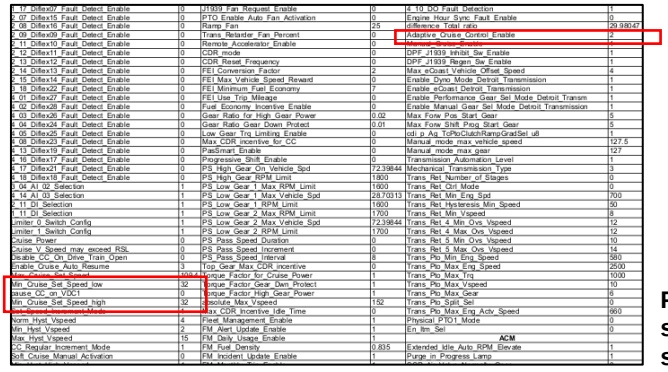
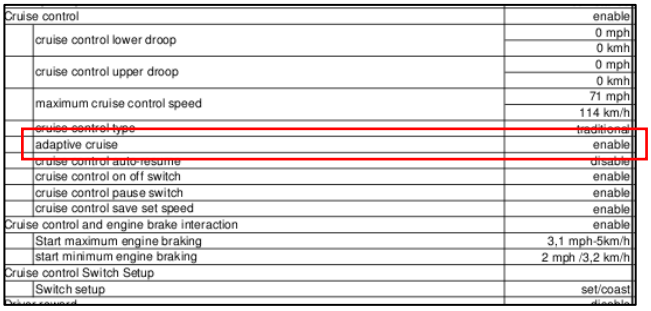


Figure 3: Detail of parameter setting chart 11660929 (changed settings framed)



Cruise control	enable
cruise control lower droop	0 mph
	0 kmh
cruise control upper droop	0 mph
	0 kmh
maximum cruise control speed	71 mph
	114 km/h
cruise control type	traditional
adaptive cruise	enable
cruise control auto resume	disable
cruise control on off switch	enable
cruise control pause switch	enable
cruise control save set speed	enable
Cruise control and engine brake interaction	enable
Start maximum engine braking	3,1 mph-5km/h
start minimum engine braking	2 mph /3,2 km/h
Cruise control Switch Setup	
Switch setup	set/coast

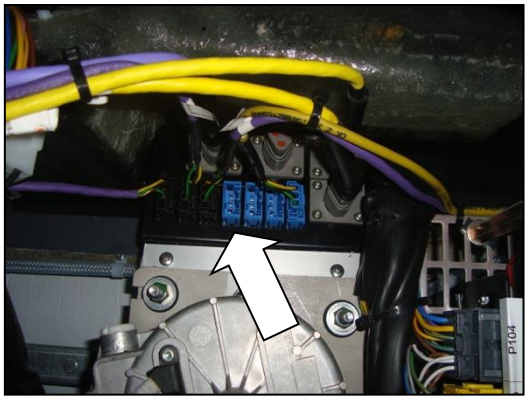
Figure 4: Detail of parameter setting chart 11683698 (changed setting framed)

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11	Load a new program in computer module of multiplex system as explained in chapter 11.1 of the maintenance manual.
12	Load a new program and parameters into digital instrument panel (MVP) as explained in work procedure WP1151. Program is available on the customer portal under the heading “Software”.
13	Load new parameters in the CAN-bus gateway as explained in work procedure WP873. Parameters are available on the customer portal under the heading “Software”.
14	Load new parameters in the CMS/ACC radar as explained in work procedure WP1005. Parameters are available on the customer portal under the heading “Software”.
15	Perform an CMS/ACC radar service alignment as explained in work procedure WP1006.
16	Perform an “End-Of-Line” test according to the instructions mentioned in the separate document at the end of this Work Procedure.
17	Test the Adaptive Cruise Control operation as explained under “STEP 17 IN DETAIL”.
18	Register the works through the registration button located behind the work procedure on the Van Hool customer portal. Write the text “WP1250B completed on VIN…” in the “Remark” field.
19	Affix a seat belt adhesive on every passenger seat.

End of procedure.

STEP 3 IN DETAIL: To install CMS/ACC radar

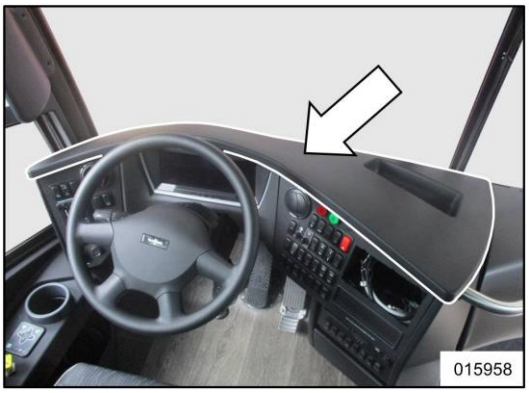
Step	Action
3.1	Secure the CMS/ACC radar to its bracket with the three M6 nuts from the kit. Tighten the M6 nuts to a torque of 7 ± 1 Nm (5 ± 1 ft.lbf).
3.2	Secure the CMS/ACC radar bracket to the chassis with the three adjusting screws. Make sure that the radar connector is at the driver’s side when the radar is installed.
3.3	Verify the CMS/ACC radar is level vertically (plumb) and horizontally. Adjust by using the three adjusting screws.
3.4	Connect the CMS/ACC radar to the vehicle wiring as follows: a. Connect the black 8-pin connector socket of the connecting cable to the CMS/ACC radar. b. Route the blue 3-pin connector socket of the connecting cable to junction box EKF and connect it to one of the free blue CAN splitter connector plugs.  **Figure 5** c. Route the black 3-pin connector socket of the connecting cable to junction box EKV and connect it to black connector plug P309.
3.5	Re-install the front grill (with CMS/ACC radar window).

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STEP 4 IN DETAIL: To remove brown wires at nodes 2 and 6 of multiplex system

Step	Action
4.1	**In junction box EKV:** locate 22-pin connector socket “A” from node 2 of the multiplex system. The connector reference (A, B, C …) has been stamped into the node housing. Cut off the brown wire connected to contact number 1 and insulate the ends of the wire with a piece of heat shrink tubing.
4.2	**In junction box EKA:** locate 22-pin connector socket “A” from node 6 of the multiplex system. The connector reference (A, B, C …) has been stamped into the node housing. Cut off the brown wire connected to contact number 11 and insulate the ends of the wire with a piece of heat shrink tubing.

STEP 5 IN DETAIL: To install CMS/ACC dashboard switches

Step	Action
5.1	Remove the dashboard cover panel.  **Figure 6**
5.2	Undo and remove the Torx screws securing the LH dash panel indicated. Tilt the panel forwards so gain access to the rear of the panel. Compress the locking tangs of the dummy switches firmly and push them out of their mounting holes.  **Figure 7**
5.3	Install dashboard switch 11467708 supplied with the kit as follows: a. Insert the switch into the LH mounting hole and push firmly home until a click is heard. b. Locate the free plug S600 in the vehicle wiring. c. Attach plug S600 to the switch.

Continued on next page

5.4	Install dashboard switch 11541722 supplied with the kit as follows: a. Insert the switch into the RH mounting hole and push firmly home until a click is heard. b. Locate the free plug S592.1 in the vehicle wiring. c. At the back of plug S592.1: remove the violet/green wire from location #7 by using terminal removal tool VH10541368 and cut off the terminal. d. At the back of plug S592.1: install the terminal of violet/green wire 11636436 supplied with the kit into location #4. e. At the back of plug S592.1: splice the violet/green wires from step “c” and “d” using terminal 10550247 supplied with the kit. Install the terminal in location #7. f. Attach plug S592.1 to the switch.
5.5	Re-install the dash panel holding the switches. Secure hand-tight in place using the screws covered during removal.

STEP 16 IN DETAIL: To test Adaptive Cruise Control operation

Test drive the vehicle in a safe, non-congested area. Do not test the system on unsuspecting traffic! The target vehicle must be driven by someone knowing the test procedure. Driver of host vehicle must be ready to apply brakes and maintain safe control of the vehicle in event the ACC does not interfere!

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>16.1</td><td>NOTE: Make sure that the engine, “Jake Brake” or retarder, and service brakes are activated in the proper sequence.

Check the different phases of braking:

<table>
<tr><th>Phase</th><th>Target vehicle</th><th>Host vehicle</th></tr>
<tr><td>1</td><td>Driver of target vehicle reduces vehicle speed by releasing the accelerator pedal.</td><td>Vehicle speed of host vehicle must be reduced automatically by the Engine Control Unit (ECU).</td></tr>
<tr><td>2</td><td>Driver of target vehicle brakes slowly by using the “Jake Brake” or retarder.</td><td>Vehicle speed of host vehicle must be reduced automatically by intervention of the “Jake Brake”. Toggling the Jake brake dash switch between 0%, 50% and 100% should not have any effect on the intervention.</td></tr>
<tr><td>3</td><td>Driver of target vehicle brakes by applying the service brakes.</td><td>NOTE: Make sure that the host vehicle has a speed of at least 10 km/h (6 mph) higher than the target vehicle.

Vehicle speed of host vehicle must be reduced automatically by applying the service brakes.</td></tr>
</table>
</td></tr>
</table>

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16.2	Check if Adaptive Cruise Control switches off when: • you depress the brake pedal; • vehicle speed drops below cruise control off speed (25 mph for Cummins; 22 mph for Detroit Diesel); • you put the transmission in neutral.
16.3	Check the different following distances: a) Put ACC in the fifth and longest following distance. b) If the speed and distance between the target vehicle become constant, change the following distance to the first and shortest one. Make sure that the cruise control set speed is higher than the target vehicle speed. c) Check if the following distance gets smaller. d) Repeat this for all the other following distances and vice versa.

DISCLAIMER:

The procedures contained herein are not exclusive. Van Hool cannot possibly know, evaluate, or advise the transportation industry of all conceivable ways in which a procedure may be undertaken or of the possible consequences of each such procedure. Other procedures may be as good, or better, depending upon the particular circumstances involved. Each carrier who uses the procedures herein must first satisfy itself thoroughly that neither the safety of its employees or agents, nor the safety or usefulness of any products, will be jeopardized by any procedure selected.

VAN HOOL CUSTOMER PORTAL:

Consult the customer portal regularly for the latest service documentation. In addition to the maintenance manual, you will also find the operating manual and the spare parts catalogue of your vehicle on the customer portal. The customer portal is accessible through www.vanhool.be, and only with a code (password) from Van Hool. If you do not have a password yet, request it by using the link on the Van Hool website.

EOL Test – CMS / ACC Retrofit

About this document

This document aims to provide information on several aspects of the CMS / ACC retrofit procedure. All of which related to the EOL Test tool and the execution of the tests or checks done via this tool.

The main subjects of this document are:

- The required software
- The required hardware
- Initiating an EOL test
- The EOL Help feature
- The execution of the EOL test related to the retrofit Work Procedure (WP) document
- The execution of the EOL tests related to the MVP full digital dashboard functionality
- How to connect the P-CAN GW Cable: VH ref. 11691776
- How to connect the P-CAN DIAG Cable: VH ref. 11694789

Required software

Following software needs to be installed on the computer which is going to be used to execute the EOL tests:

- EOL Test
- PEAK PCAN-USB Interface device drivers

Please refer to INSTR-109 for detailed instructions on where to download and how to install the software.

Required hardware

2 x PEAK PCAN-USB Interface: VH ref. 11294549

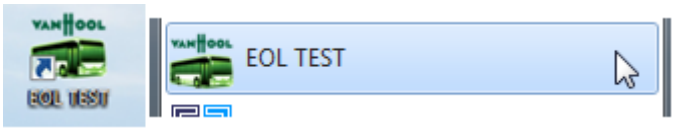
1 x P-CAN DIAG Cable: VH ref. 11694789

1 x P-CAN GW Cable: VH ref. 11691776

Initiating an EOL test

Step 1

Open the EOL Test tool by double clicking the provided hyperlink on your desktop or via the start menu.



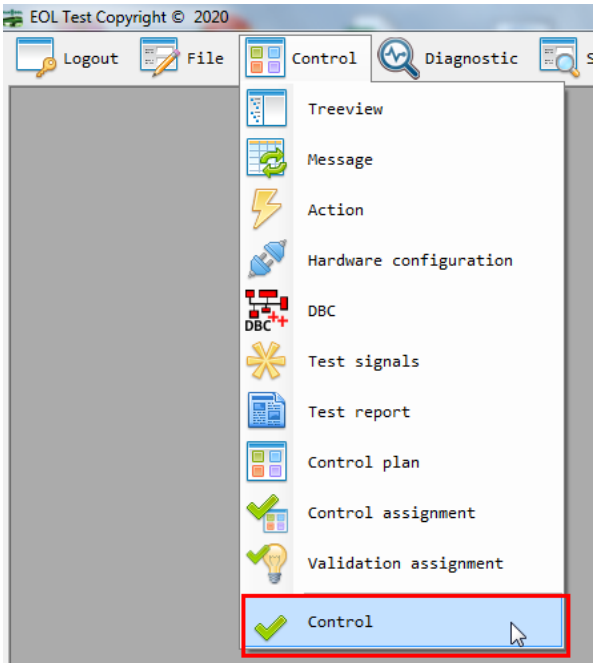
Picture 1:EOL Shortcuts

Step 2

Log in using your povided credentials if necessary.

Step 3

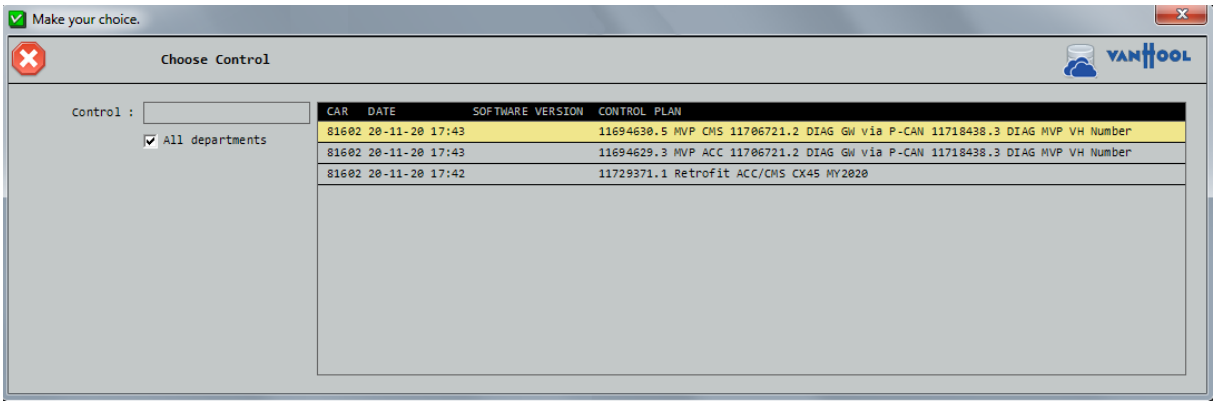
To navigate to the menu where we can select which test we want to execute, select the *"Control"* menu in the top navigation bar and select *"Control"* again in the drop-down menu that opens up.



Picture 2: The Control menu

Step 4

After opening the control menu you will be presented with something similar to what is shown in picture 3. In the box on the right hand side you will be presented with all the EOL tests that are currently available to the user that is signed in. You may need to tick the checkbox "All departments" on the left hand side of the menu.



Picture 3: The Control menu with all the EOL Tests available to the current user.

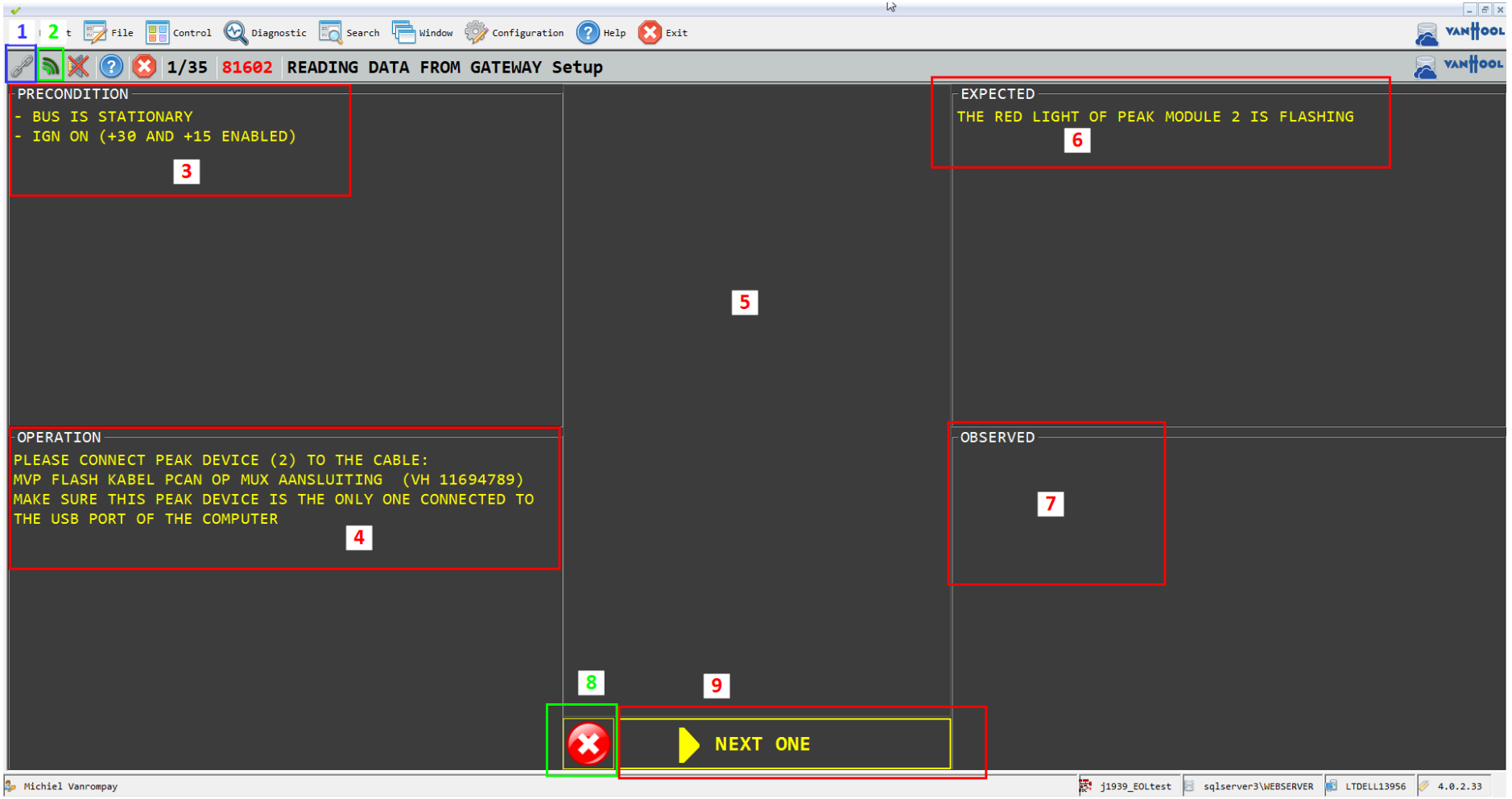
Select the test you wish you execute, double click it and the test will commence.

Step 5

Now you are ready to start executing the test. A window similar to that of picture 4 will show up, and can be a bit overwhelming initially. A Brief explanation on the different aspects of this window are given below. (The numbers of the list correspond to those indicated on picture 4).

1. This is the “Connect” button. This can be used to reconnect yourself to your PEAK device if you are having connection problems. Note that the PEAK device is only used in some segments of the tests to simulate or check certain CAN signals.
2. This is the “Send / Receive” button. If your current test step is supposed to simulate or check one or more CAN signals via a PEAK device, this button can be used to (re) send or (re) check the relevant CAN signals.
3. The PRECONDITIONS window describes all the conditions which need to be fulfilled before the actions described in OPERATION are executed.
4. The OPERATION window declares all the actions the tester needs to execute to perform the test.
5. The center space is used to show reference images or animated GIFS to, for example, visually indicate to the tester what the desired result is or to show where specific buttons can be found which need to be pressed. In this example there was no reference image present.
6. The EXPECTED window tells the tester which result is expected after the actions declared in the OPERATION window are executed.
7. In the OBSERVED window the tester can write remarks about the observed result.
8. This button states if the test has PASSED or FAILED. Click it to change its status. In some test steps where CAN signals are checked this button will be configured automatically based on the signal values that are read. You can always retry by using button number 2.
9. When the test has been performed the tester can move to the next test case by clicking button number 9.

PS: If you would like to change the font size of the text shown in the test execution window, then click the OBSERVED window to highlight is and press CTRL + (NUM) + or CTRL + (NUM) -. Or press CTRL and scroll your mouse wheel up or down.



Picture 4: The EOL Test Execution window

The EOL test related to the retrofit Work Procedure

Each vehicle type eligible for an ACC / CMS retrofit has a specific Work Procedure which describes how the retrofit is to be executed. Each of these Work Procedures also has an accompanying EOL test plan. This has to be executed as extra verification that no required steps are accidentally skipped or missed when performing the retrofit.

The VH references for the EOL test related to the retrofit Work Procedure for each vehicle type are;

Vehicle type	**VH Ref. number**	**Related Work Procedure**
CX35 2020	11733768	
CX45 2020	11729371	WP1250
TX40/45 2020	11733769	
TDX25 2020	11733770	

These EOL tests will be automatically linked to the vehicles belonging to each vehicle type in the EOL Test tool. The EOL tests contain the same information as their related Work Procedures and should be executed in parallel with the ACC / CMS radar retrofit as described in those Work Procedures.

EOL tests related to the MVP full digital dashboard functionality

Both the CX35 2020 and the CX45 2020 vehicles types come equipped with an MVP full digital dashboard. There are two extra EOL tests that need to be performed for each of these vehicle types.

- 11694630 MVP CMS
- 11694629 MVP ACC

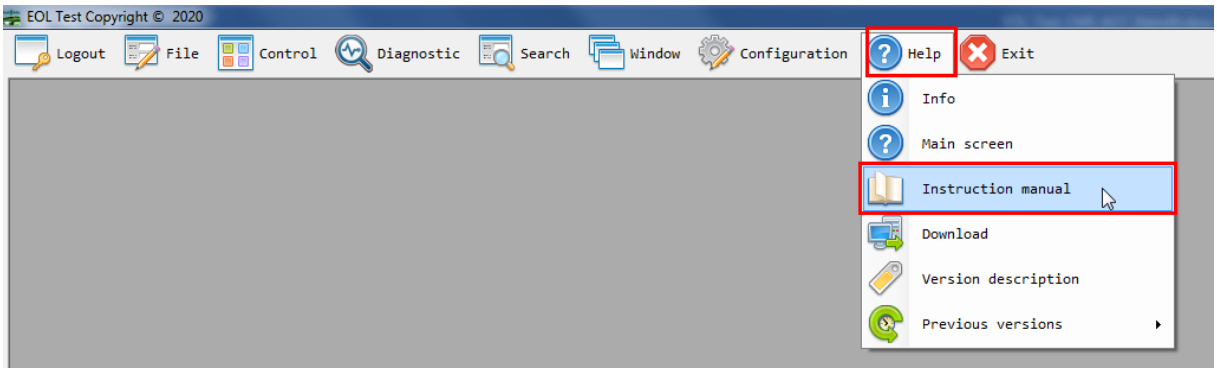
Completing both tests successfully confirms the correct integration of the ACC / CMS hardware with the rest of the system. These EOL tests will also be automatically linked to the vehicles belonging to the CX35 and CX45 vehicle types in the EOL Test tool.

Both tests include detailed descriptions on the actions that are expected from the tester. On certain occasions the two tests listed above will require the tester to connect one of both P-CAN Cables to the vehicle and the computer in some way. These two specific actions are described in detail in this document to provide some more insight.

- P-CAN DIAG Cable: VH ref. 11694789
- P-CAN GW Cable: VH ref. 11691776

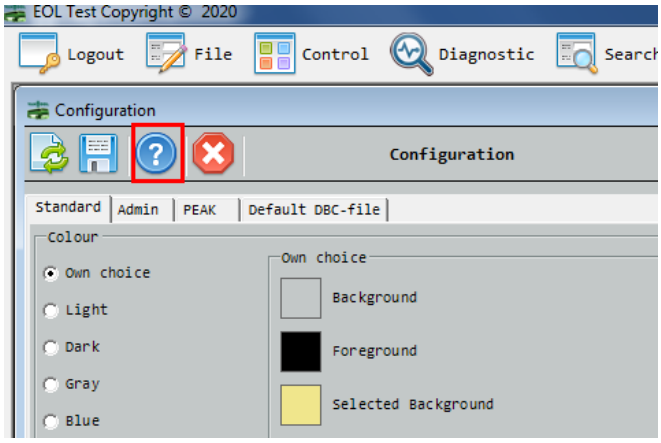
The EOL Help feature

The EOL tool has a fairly extensive Help menu available to the users. Each menu has a help icon which can be clicked to enter the help page relevant to that specific menu. There is also a general help icon which can be used to access the global menu.



Picture 5: The global help button available on the top navigation bar. Acces to the instruction manual highlighted.

Picture 6 has the menu specific help button shown, in this case for the Configuration menu. Every menu should have a help button like this that will take you to this menu's specific help page with information on every button or setting present on the menu.



Picture 6: The menu specific help button.

How to connect P-CAN GW Cable (VH: 11691776)

During the execution of EOL tests **11694629 MVP ACC** & **11694630 MVP CMS** you will be asked to connect the *"P-CAN GW Cable"*. This section aims to help the tester to correctly connect this cable and to verify the connection between the CAN line and the computer via both PEAK devices.

The tester will need to branch off the PCAN connection right after the ZR32-B. This will force all the CAN signals to pass through the EOL tool on the tester's computer via both PEAK devices (one for reading and one for writing).

P.S.: This will already be stated in the EOL test itself, but be sure to completely power down the vehicle before executing this procedure.

Step 1

Roll-out the cable through the driver's window to the EKV in the trunk. The ZR32-B is located here. We Leave the end with the SUB-D9 connectors somewhere in the vehicle cockpit.

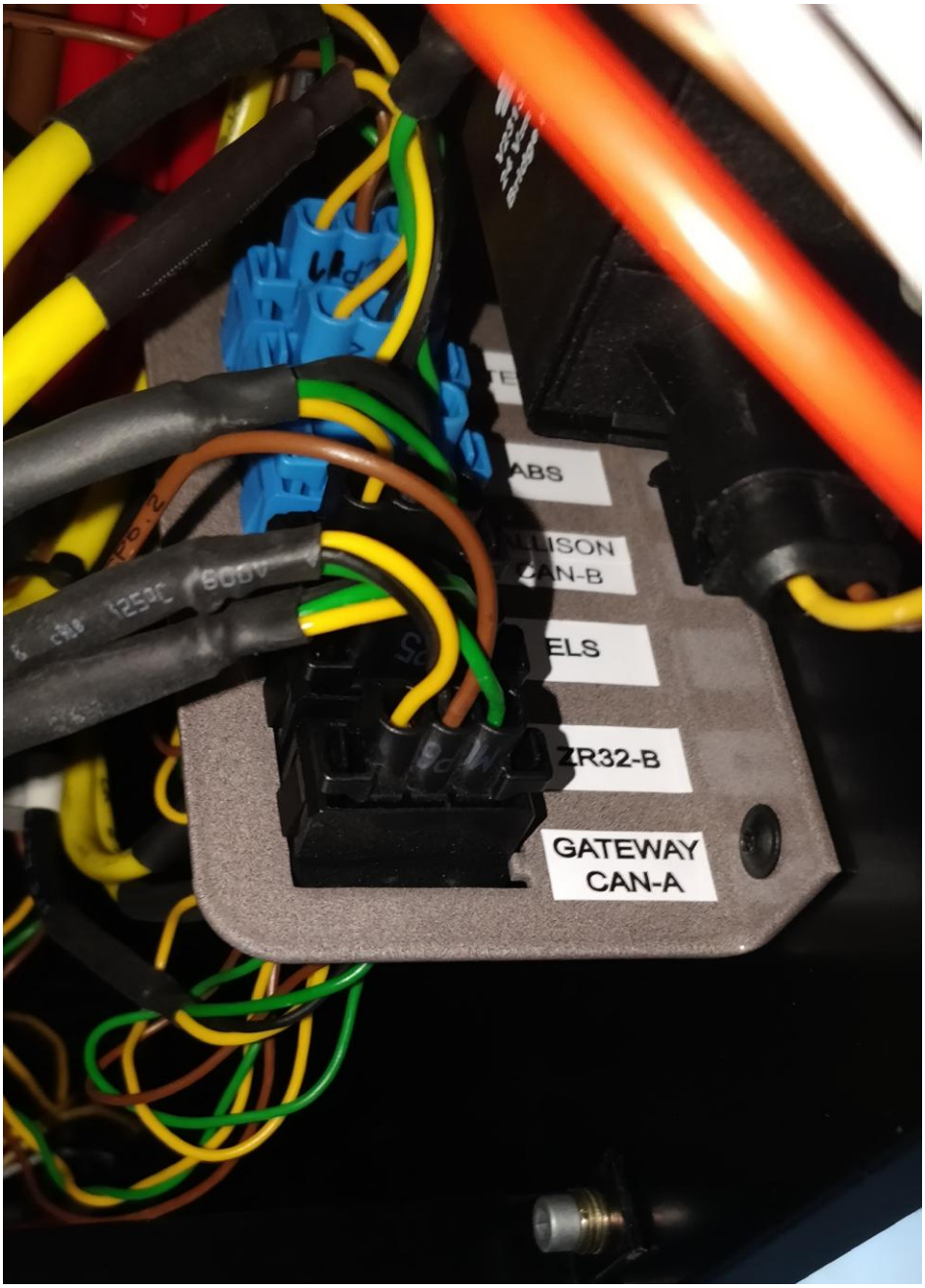
Step 2

Open up the panel covering the EKV in the trunk so you can access the electrical wiring. There are two screws you need to remove before you can slide the panel out. Pay attention to a relatively short power cable that is attached between the EKV and the interior of the cover panel for the LED lighting that is attached to the exterior of the cover panel.

Step 3

Look for the CAN connection panel in the EKV. It can be found on the right side of the EKV when laying on your back in the trunk right under the EKV, facing the outside.

We are interested in the second connector from the bottom up, labelled *"ZR32-B"*. See picture 1 for reference.

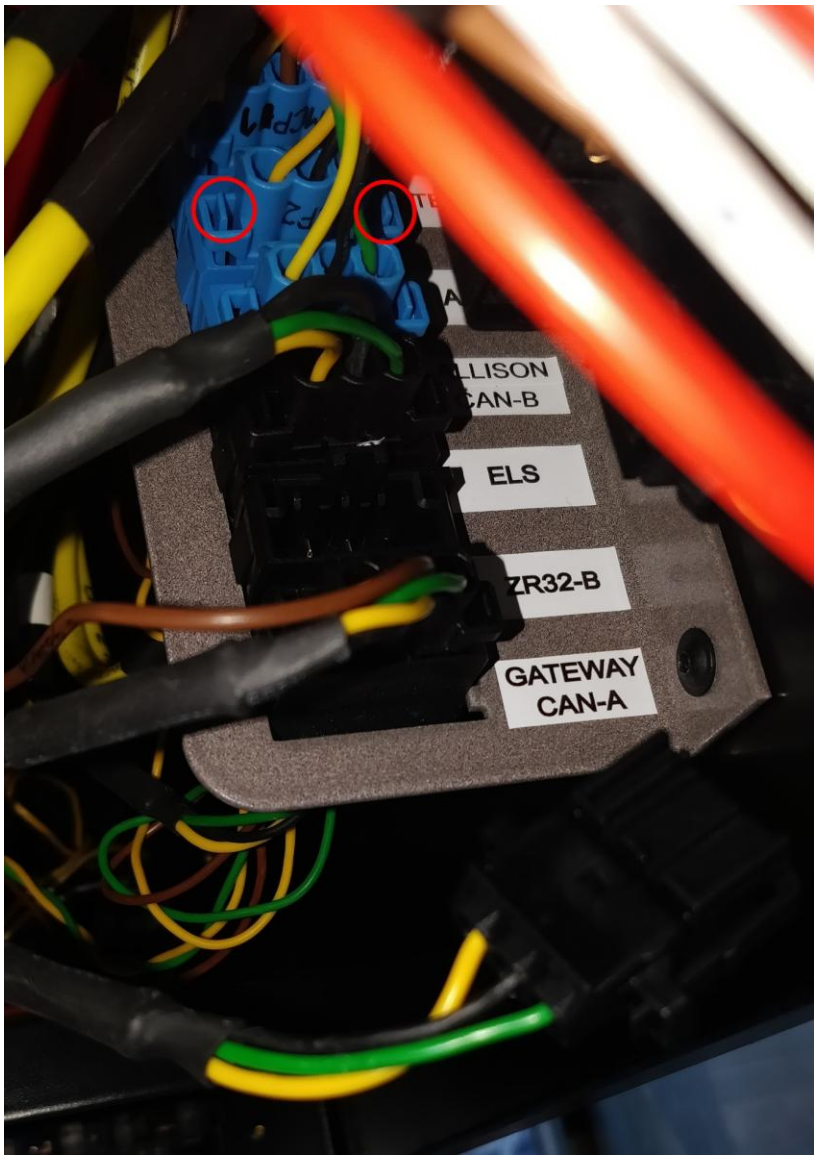


Picture 7: The CAN connection panel in the EKV.

Step 4

We will now need to unplug the ZR32-B connector.

This is done by pinching the two small tabs on each side of the connector and then pulling the connector out. Picture 8 shows two highlighted tabs (red circles) on a blue connector (for improved visibility). You can find the same tabs on the black connector in the ZR32-B slot.

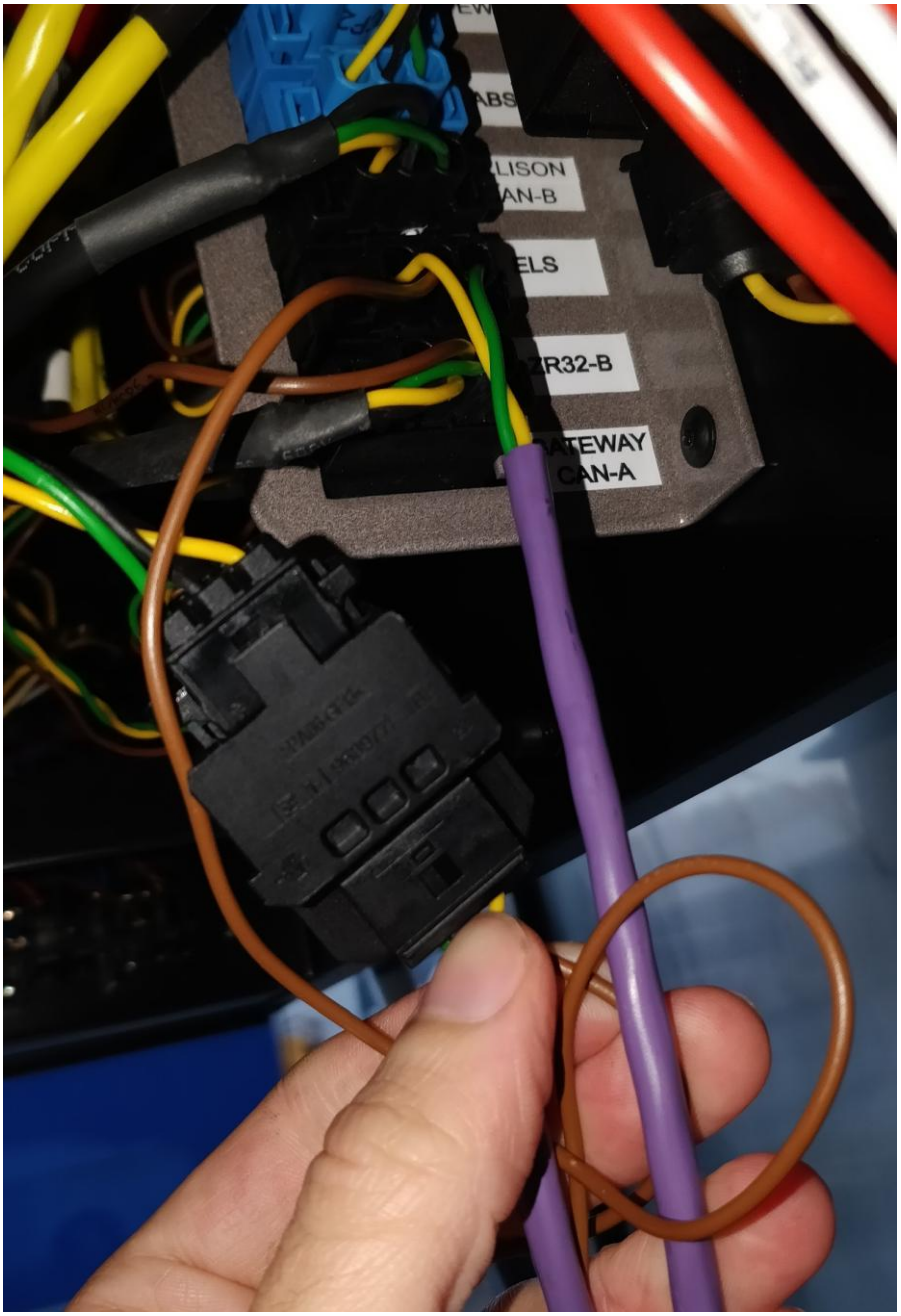


Picture 8: The CAN connection panel in the EKV with the ZR32-B connector removed.

Step 5

Now it is time to connect the *P-CAN GW Cable (VH: 11691776).* Plug the male connector into the ZR32-B plug from which you just removed the connector. Plug the connector you just removed into the female plug of the cable. You should hear a “click” when the connectors are inserted as confirmation of a good connection. See picture 9 for reference.

This is your work in the EKV done. Return to the vehicle cockpit for step 6.

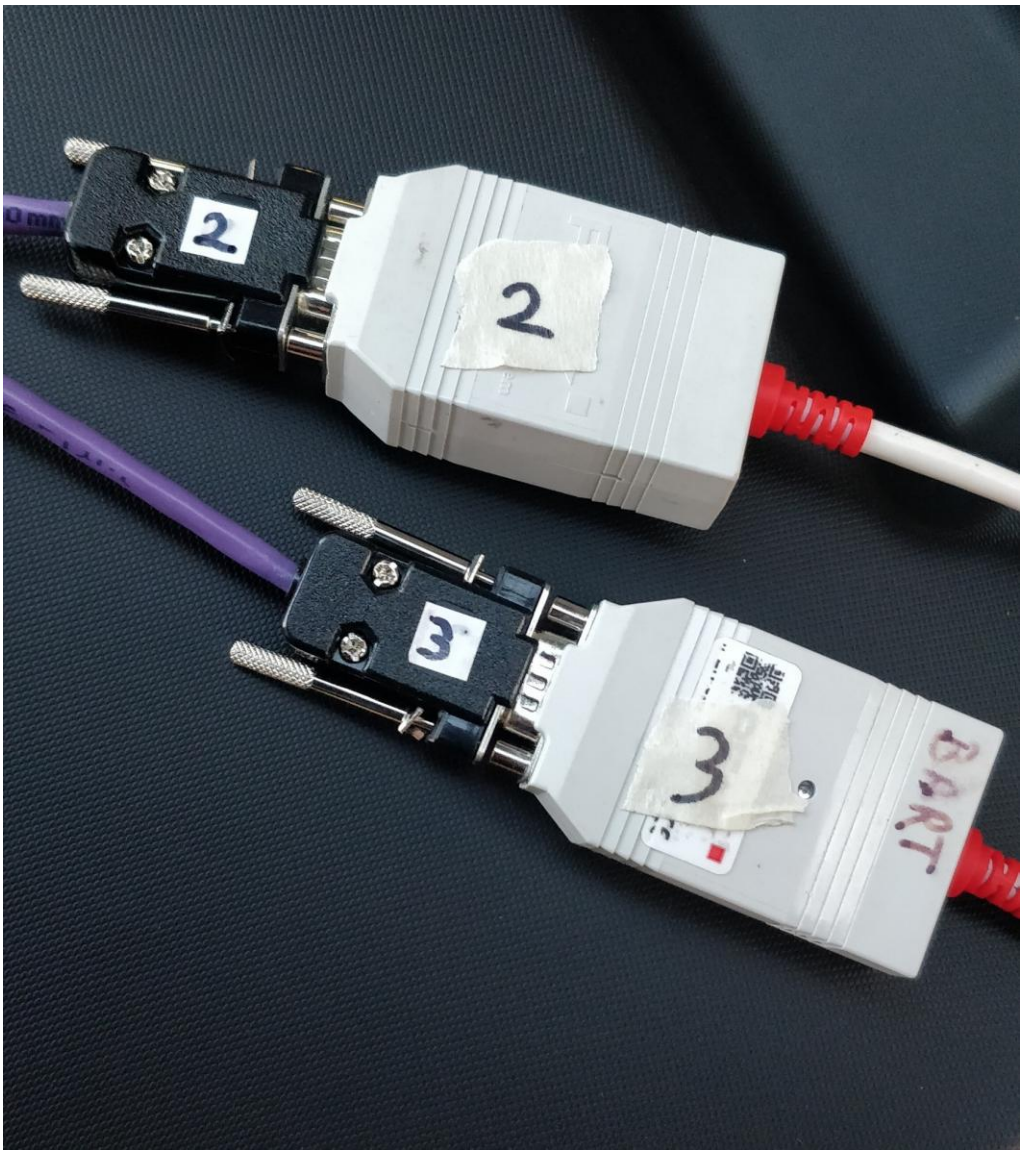


Picture 9: The P-CAN GW Cable connected.

Step 6

Connect both SUB-D9 connectors into your two PEAK devices. Both peak devices should already have an ID assigned to them after executing INSTR-109. Make sure that the numbers on the SUB-D9 connectors match the ID's of the PEAK devices. We've labeled our PEAK devices with their hardcoded ID for easy reference. See picture 10 for reference.

Connect your PEAK devices to your computer if you haven't already.



Picture 10: Both PEAK devices connected to the correct SUB-D9 connectors.

Step 7

You are now ready to proceed to the next step of the EOL test. In the next few steps, your connection to the CAN line will be verified by making the red LED on the PEAK devices flash. One test step is present for testing each individual device.

How to connect P-CAN DIAG Cable: VH ref. 11694789

The P-CAN DIAG Cable may look more familiar than the P-CAN GW Cable. On one end we have Sub D9 connector just like we have on the P-CAN GW Cable and on the other hand we have a round MUX connector.

Step 1

Connect the MUX connector into the MUX Diag port in the same way that you would connect your ZR32B diagnose cable into the MUX Diag port. This is illustrated in picture 11.



Picture 11: The P-CAN DIAG cable plugged into the MUX Diag port.

Step 2

Connect the SUB-D9 connector into the PEAK device with ID 2, in the same way as illustrated in picture 4. Except that we are now only using one PEAK device instead of two PEAK devices.

Step 3

You are now connected. Your connection will be checked with a flashing red LED in the same way as with the P-CAN GW Cable.