

AOR Black Tank Gauge Calibration Process¹

Warning: This process requires the Black tank to be filled and emptied. Appropriate personal protective equipment (PPE) must be worn when undertaking any work on the black water system as the fluids and parts could be contaminated by human waste products.

1. The AOR vans fitted with the marine macerator units are fitted with a SCAD Technologies LLC Solo Tank Monitor and External Foil Sensor Tank Display as per Figure 1 below.

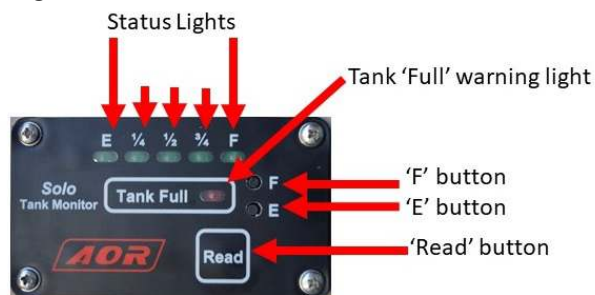


Fig.1 - Black Tank Gauge

2. There are two distinct steps in this calibration process:
 - a. software setup, and
 - b. calibration

The process for each follows below from paragraph 4.

3. This process also covers:
 - a. Error Checking;
 - b. System Wiring, and
 - c. Fault Finding.

Software Setup

4. *Setting the Sensor Type*
 - a. Press and hold the “Read” button. You should see the status lights (i.e.: ‘E’; 1/4; 1/2; 3/4, and ‘F’) turn on. Release the button and the status lights will go out.
 - b. Within 5 seconds after the lights go out, press the “E” button to set the sensor type as follows:
 - i. Each time you press the “E” button, the status lights turn on and moves consecutively from left to right. Select the “E” (Empty) light: this corresponds to sensor type 1 - external foil sensor.

¹ This document is based upon SCAD Technologies LLC publication Solo 1-Tank Monitoring / Display & External Sensor Installation Manual, Version 2.2 dated 28 July 2009. Sighted 14 Mar 2019 at <http://www.scadtech.com/>

Note: the other status lights relate to different sensor types not used by AOR and their selection will lead to incorrect readings.

- c. Release the button, and the light(s) will go out after 5 seconds indicating that the sensor type has been set.

5. *Setting the Tank Shape*

- a. Press and hold down the “Read” button, and you should see the status lights turn on. Release the button and the lights will go out.
- b. Within 5 seconds after the lights go out, press the “F” button to set the tank shape as follows:
 - i. Each time you press the “F” button, the status lights turn on and move consecutively from left to right. Select the “E” (Empty) light: this corresponds to tank shape 1 - a square tank.

Note: the other status lights relate to different tank shapes not used by AOR and their selection will lead to incorrect readings

- c. Release the button and the status light(s) will go out after 5 seconds indicating that the tank type has been set.

Calibration

Note: This section must be read concurrently with paragraphs 8 through 10 below.

6. *Empty Calibration*

- a. Calibrate the empty point to the “pumped out empty” level. This is the level at which the tank has been drained and any remaining fluid in the plumbing has drained back into the tank. Ensure there is some fluid in the tank (≈ 10 lts) before starting the process below. Calibrate the empty point by:
 - i. press and hold both the “Read” and “E” buttons simultaneously for at least 4 seconds, then
 - ii. Release both buttons and wait at least 5 seconds before pressing any further buttons.

7. *Full Calibration*

- a. Fill the black tank with water (via the flush line) until the level in the external visual gauge (clear tube located under the van near the compliance plate) shows the level of the tank as ‘full’. Then drop 9 – 10 lts of the fluid (a bucket) out of the tank.

Caution: Care is needed when filling the black tank with water from a mains outlet. It is recommended that the tank be filled **slowly** to negate the risk of overflowing or over pressurising the tank which will increase the risk of the tank deforming and potentially rupturing.

Warning: This water could be contaminated by human waste products and appropriate personal protective equipment (PPE) should be worn. The fluid must be handled with care and treated as untreated black water/effluent.

- b. Calibrate the full point:
 - i. press and hold both the “Read” button and “F” buttons simultaneously for at least 4 seconds, then
 - ii. Release both buttons and wait at least 5 seconds before pressing any further buttons.
- c. After the ‘Full’ point has been set, you must test the ‘Tank Full’ warning light. Do this by:
 - i. Flush the toilet a few times, and press the ‘Read’ button after each flush to read the display. The ‘Tank Full’ warning light should then come on.

Note: *Wait 2 – 3 minutes between flushing and reading the gauge as there is a slight delay before the warning light displays.*

Error Checking

8. The calibration software has inbuilt error checking capabilities.
9. If after you set a calibration point you see the “1/2” light blinking, it means that a full point is being set which is equal to or less than the empty point, or an empty point which is equal to or greater than the full point.
10. When this error occurs, the calibration routine sets default empty and full values. This return to default values clears possible bad calibration data, which might make the sensor channel difficult to properly calibrate (i.e.: an empty calibration value erroneously set with a full tank would otherwise prevent the setting of a proper full value until the empty point is set back to an appropriate empty value). If you continue to see this error after re-attempting calibration and re-checking the tank level, you may actually be experiencing a problem with the wiring between the sensor and panel (e.g.: a disconnected power, sensor return, or ground wire to the sensor) or a bad sensor. If you suspect this may be the case, check the troubleshooting section below and call AOR Service for guidance.

System Wiring

11. The wiring diagram below is for a generic gauge and foil sensor installation and is only include to help provide an overview of the entire system configuration.

Note: *Depending on when your van was built, there are variation in the wiring: guidance from AOR Service should be sought.*
12. AORs “...AOR Waste tank Test and Fault Check “ process should be referenced if a wiring or sensor failure issue is suspected. A copy is included at Annex 1 to this process.

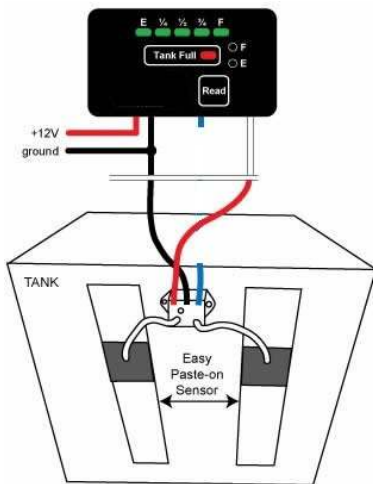



Fig. 2 – Foil and gauge wiring

Note: Past the obvious loose wire(s) and physical damage, it is strongly recommended that prior to undertaking fault finding with respect to the wiring loom or sensor that you contact the AOR Service Department for advice and guidance.

Note: AOR carry the full range of spares required to effect repair to this system.

Troubleshooting

Problem	Possible Causes	Test / Remedy
<p>Panel lights do not come on when pressing “Read” button.</p> <p>Note: <i>The gauge will not work unless the main isolation switch (marked ACC) on the Power Control panel is switched on.</i></p>	<p>Blown fuse or disconnected power or ground wires.</p>	<p>Check/replace fuse on power wire as needed. Check/repair poorly attached power and ground wires.</p> <p>Note: <i>The gauge is protected by a 3 Amp blade fuse located in the 12 blade fuse holder located with the house batteries.</i></p> <p>Note: <i>If your van’s Power Control Panel is a “Connex 6 Way Fused & Backlit Switch Panel” (as per the photo below) there is also a 3 Amp blade fuse behind the Main Isolation Switch (marked “ACC”) that should be checked.</i></p> 
<p>The gauge always reads full, empty or never changes regardless of fluid level.</p>	<p>Improperly calibrated tank.</p>	<p>Recalibrate tank for empty and full and recheck.</p>
	<p>Damaged wiring between the display and sensor module.</p> <p>Note: <i>The sensor foil is located on the driver side of the Black Water Tank and is external to the tank. The Black Water Tank is the most forward fitted tank.</i></p>	<p>Check the wire connecting the sensor module to the display panel. Check that all wires are attached securely and that there is no damage along the wire run.</p> <p>Note: <i>If damage is found or suspected, you should contact the AOR Service Department for advice and guidance.</i></p> <p>Recalibrate, and recheck.</p>

Problem	Possible Causes	Test / Remedy
	Damaged or improperly installed sensor foil.	<p>Check that the sensor foil is installed according to the instructions. Check that there is nothing “shorting out” the sensor foils (i.e.: metal object touching both foils; that a large metal object is too close to the foils, or a foil has been damaged by a rock etc.).</p> <p>Note: <i>If damage is found or suspected, you should contact the AOR Service Department for advice and guidance.</i></p>
The gauge always reads full, empty or never changes regardless of fluid level (cont.)	Damaged sensor module.	<p>Check that the white wires attached to the sensor modules have not become disconnected from the copper patches or that the copper patches have not come loose from the aluminium sensor foil.</p> <p>Note: <i>If damage is found or suspected, you should contact the AOR Service Department for advice and guidance.</i></p>

Annex:

- 1 AOR Waste tank Test and Fault Check.

Step 1.

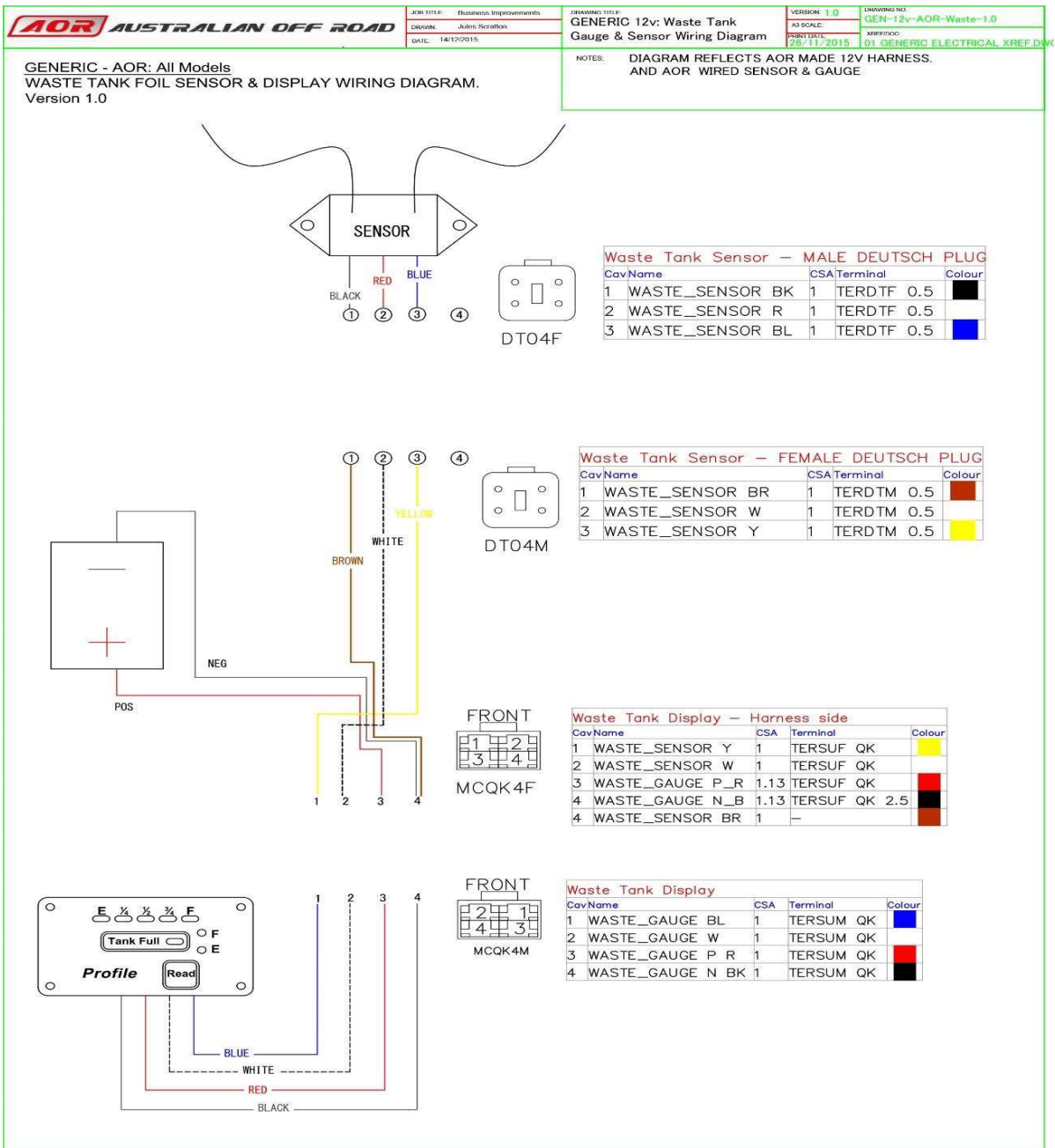
Check for 12V power supply to the sensor by pushing the read button on gauge and hold it 'on'. While doing this, check the Green LED located on the gauge is lit. If the Green LED comes on, there is 12V system power at the sensor.

While at the gauge, remove the control panel bracket to access the wiring behind. Check waste tank gauge plugs are connected, and all terminals are tight in their connector. See the wiring diagrams below.

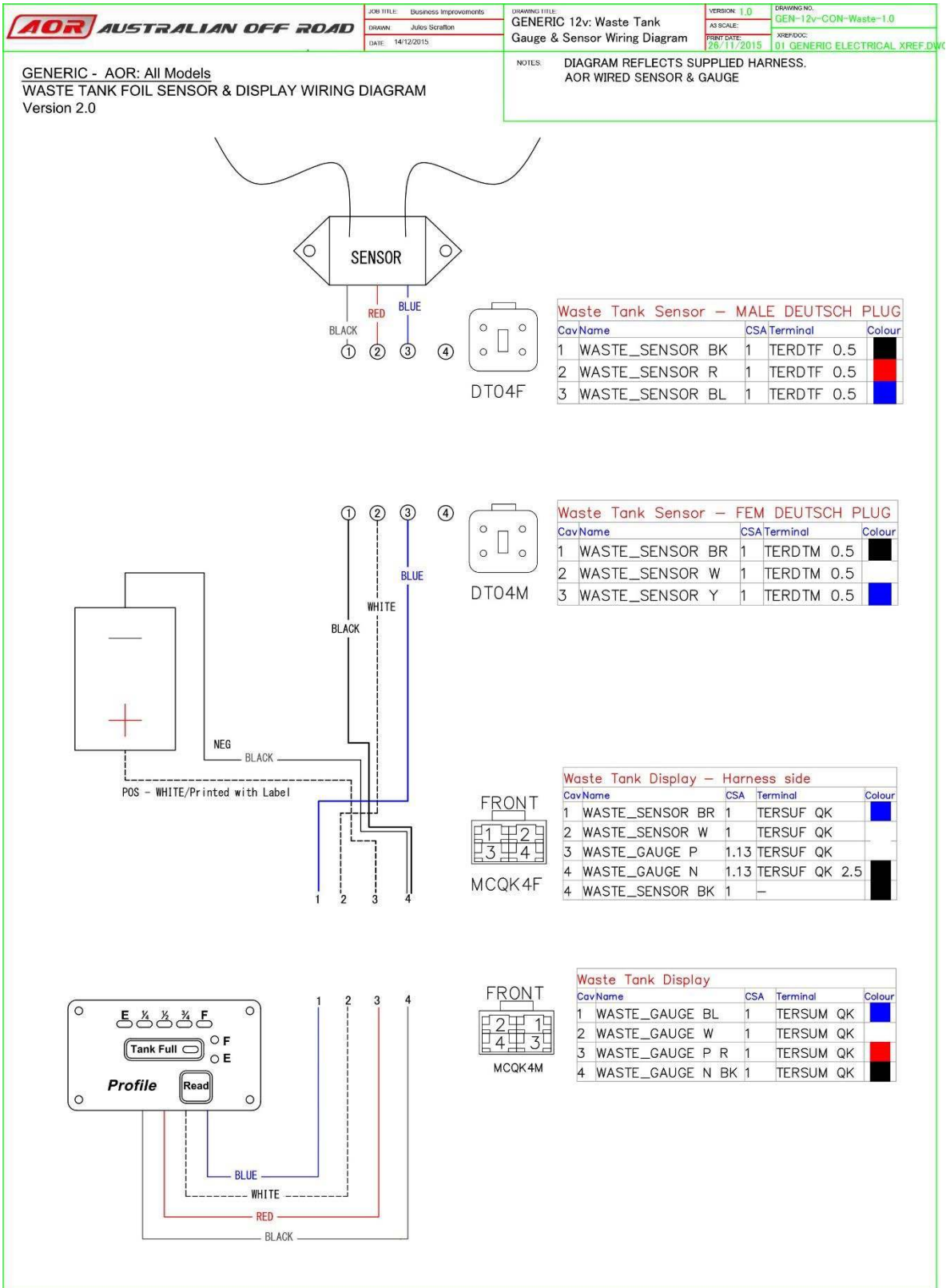
Depending when your van was built, there will be variation in wiring colours: the test procedure however is the same. Read below for the test instructions.

² **Note:** The procedure “ AOR Waste Tank Test and Fault Check “, is an AOR proprietary document and must not be copied or disseminated without explicit approval from AOR. It has been transcribed as provided other than for minor grammatical fixes.

Annex 1 - AOR Waste tank Test and Fault Check



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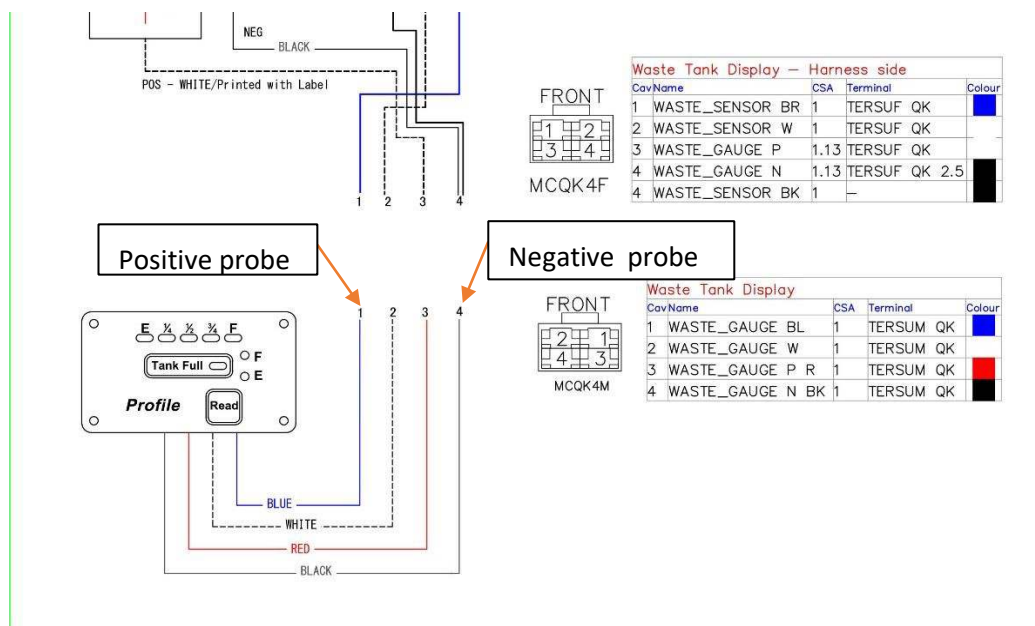
Step 2.

Check for bad connections at the sensor plugs.

Check all terminations at the 4 pin grey Deutsch. Clean away any corrosion or dirt, and spray with contact clear.

Step 3.

Check Calibration voltage reference at the gauge. You will need a multimeter, set to DC (---).



With everything plugged in, push the positive probe into the back of the gauge plug, on the Blue wire, and the negative probe onto the Black wire. Push the READ button.

Tank empty: 0V

Tank Full: approximately 0.5V or above.

If your readings are not correct or close to these voltages, then calibration maybe out. When the Empty and Full points are set to close, calibration is wrong. See Waste Tank Calibration instruction AFTER testing the sensor.

Step 4.

Test Sensor

First unplug the wires going from the sensor to van harness wiring. This is the 4 pin grey Deutsch plug.

You will need a 12V battery for this test.

Put the positive of the 12 volt test battery to the red wire going to the sensor.

Put the black wire to negative.

The green light on top of the sensor should now be illuminated.

Annex 1 - AOR Waste tank Test and Fault Check

Hooked up this way, the light is on all the time.

Put the blue wire to the positive probe of your meter.

Put the meter negative probe on the battery negative along with the sensor black wire.

Now put your hands across the foils so they are shorted out by your hand touching both foils: you should get some movement on the meter, maybe of 0.1- 0.2V or so.

Next put a wire across the foil to short them out. If you had 12.5V at the battery, going to the sensor, you should have around 10V or so with the foils shorted out by the wire.

If you get these readings, then the sensor is working correctly. See calibration instructions.

For more information, please call the AOR Service Dept.