

04/24/25

Subject: Revision 1 to Change Letter #1 to SAE/USCAR-2 (Revision 9)

This letter describes a change to the USCAR-2 specification. Comments and questions can be sent to EWCAP@uscar.org.

Situation:

In USCAR-2 Section 5.6.6.3 Procedure, Step 4 does not provide a robust means to detect water intrusion when the harness is biased/ bent as seen when assembled in the vehicle. The connector validation test does not represent how the harness assemblies apply tape to the bundles, then are routed in various directions on the vehicle. The taping and bending of the wire harness assembly applies side loads to the wires where the cable or mat seals are located potentially leading to water ingress.

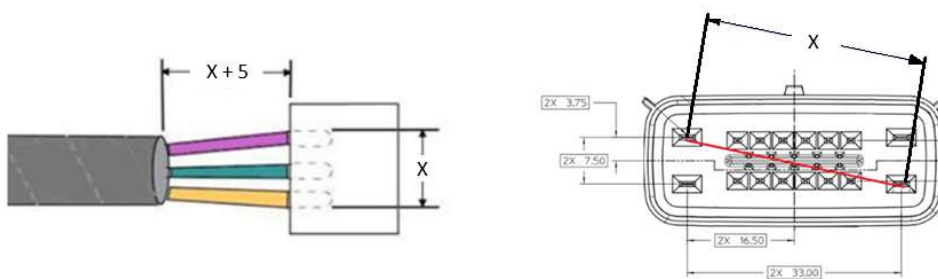
Resolution

Changes to 5.6.6.3 to include taping and bending instructions when conducting pressure/ vacuum conditioning.

5.6.6.3 Procedure

This test is intended for test sequences S, RSAA, U, and TUAB (see 5.9.7) for full validations. For pressure vacuum leak standalone, use test sequence W (see 5.9.9).

1. Ensure CUT consists of a mated connector pair that includes all applicable parts. Number each CUT. Seal all loose conductor ends to eliminate possible leakage through the conductor strands, if not already done. Tape each wire bundle as specified in Figure 5.6.6.3.a. To maintain bundle rigidity, the tape must cover a minimum of 150mm of cable bundle.



X is the maximum centerline distance from the outermost terminals exiting out the back of the connector.

Figure 5.6.6.3a –Taping Dimension

2. **Either** replace two terminated cables in the connector with two tubes of sufficient diameter and wall strength to ensure that there is no possible leak path between the outer tube surface and the conductor seal into the open cavities in each connector pair, **or use** the actual wire leads ~~instead of using tubes is acceptable~~ if the cable composition is such that sufficient air can pass in a reasonable time to complete the test.

NOTE: It may take several tries to create a system that allows sufficient airflow. The length and inner diameter of the pressure/vacuum supply tubing (or stranded cable if used) as well as the volume within a mated connector influences the time required to reach the pressure/vacuum values within the CUT. Alternative methods of adding pressure/vacuum ports are acceptable as long as the integrity of the part is not compromised.

3. Prepare enough saltwater solution to completely submerge the samples. Use tap water and 15 to 16 g of table salt and 10 mL of liquid dish washing soap per liter. Mix well before adding to test apparatus. It is recommended that an appropriate ultraviolet dye be added to assist in visual inspection for any ingress of solution into the test samples.
4. Connect the free end of one of the tubes (or wires, if using) to a regulated pressure source and the other to the pressure/vacuum gauge. Completely submerge all samples into a container of the room temperature bath prepared in step 3.
5. Slowly increase the air pressure of the regulated pressure source supplying the tube (wire) in each sample until the monitored pressure within the CUT reads 48 kPa (7 psig). Upon the CUT reaching the specified pressure, observe samples for a minimum of 15 seconds and verify that there are no air bubbles. Note the monitoring requirements outlined in Step 2.
6. **Holding the wire bundle approximately 50mm behind the tape, bend the bundle 90 degrees up and hold for 15 seconds.** All samples must remain under water during the bending process. The bend must occur **between the back of the connector where the tape is not applied.** ~~Bend, do not apply a load, and secure all conductors in the same direction, 90 degrees to the back of each sample connector half and secure them in this position using actual conductor dress shields if available.~~ This is to simulate routing of the conductors as they exit the connector and is intended to stress the conductor seal(s) as in actual vehicle applications. ~~If actual production dress shields are not available, simulate allowable worst-case production application intent as closely as possible.~~ If a tube is used, ensure that the tube is not kinked, squeezed shut, or otherwise obstructed. If a tube is used, it should be left out of the 90-degree bend if feasible.

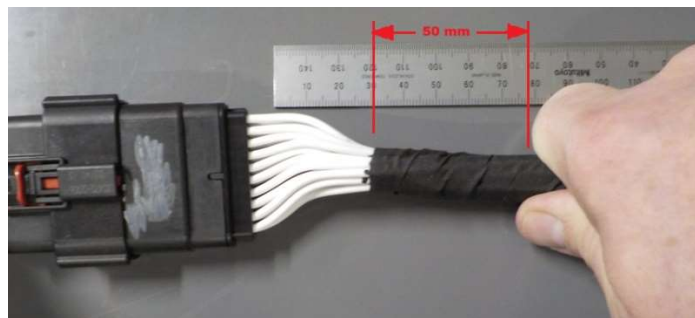


Figure 5.6.6.3.b Wire Holding Distance

Note: This process may not be applicable for specialty cables or connectors with larger cables. Discuss any potential changes to this process with the appropriate OEM connector representative for approval.



Figure 5.6.3.3.c 90° Bending Process

~~Note: Connection systems that have a required, integrated wire dress cover that provides harness retention features (zip ties provisions, tape tabs, etc.) which are used to secure the wires directly to the cover will not require this bending process. If the wire dress cover is not required, then the bending operation must be completed without the wire dress cover present.~~

7. Repeat Step 6, bending the wire bundle in the other three directions: down, left and right to meet the required bending radius. Samples must stay submersed during testing and held for 15 seconds after each bending operation.
8. Switch the regulated source from pressure to vacuum. Decrease the air pressure until the monitored pressure within the CUT reads negative 48 kPa (7 psig) and hold for a minimum of 15 seconds. Note the monitoring requirements outlined in step 2. No bending is required for this portion of the test.
9. Remove the samples from the water, shake off excess fluid and then carefully dry all exterior surfaces of the sample. Immediately perform insulation resistance per 5.5.1.
10. For test sequences S, RSAA, U, or TUAB (see 5.9.7), see sequence for appropriate conditioning then proceed to step 12. For sequence W (see 5.9.9), proceed to the next step.
11. Place the samples in a temperature chamber stabilized at the maximum ambient temperature for the temperature class selected from Table 5.1.4.1 for the CUT. Heat soak all samples for 70 hours. After the heat soak, remove the samples from the chamber and allow the samples to cool to room temperature.
12. Repeat steps 4 to 9 except limit pressure in step 5 and the vacuum in step 7 to 28 kPa (4 psig).
12. At the conclusion of the test, measure the CUT/TUT as required per appropriate test sequencing table.

5.6.6.4 Acceptance Criteria

1. Upon reaching the specified positive internal pressure including the bending operations, there shall be no bubbles visible exiting any test sample.
2. Verify conformance of CUT/TUT per corresponding measurement section as identified in 5.9.