

	<b>SURFACE VEHICLE RECOMMENDED PRACTICE</b>	<b>J2790</b>	<b>ISSUED JUN2007</b>
		Issued 2007-06	
Test Method for Evaluating the Electrical Resistance of Coolant System Hose Covers			

## RATIONALE

Not applicable.

### 1. SCOPE

This test method provides a standardized procedure for evaluating the electrical resistance of automotive coolant hose covers. It is known that an electrical potential exists between the engine and the radiator. Coolant hose cover conductivity has been determined to be a factor to reduce hose clamp life when vehicle build variations allow possible contact of the hose or the clamp to metal components on the radiator and engine thus completing an electrical circuit. The ensuing electrical current can undercut the clamp protective coating, leaving it vulnerable to the corrosive effects of road salts, moisture, and other environmental contaminants. SAE Recommended Practice J1684 addresses the electrochemical resistance of the tube portion of the coolant hose.

### 2. REFERENCES

#### 2.1 Applicable Publications

##### 2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), [www.sae.org](http://www.sae.org).

SAE J1684 Test Method for Evaluating the Electrochemical Resistance of Coolant System Hose and Materials

##### 2.1.2 ISO Publications

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, [www.ansi.org](http://www.ansi.org).

ISO 17025 General Requirements for the Competence of Testing and Calibration Laboratories

##### 2.1.3 Unified Numbering System (UNS)

Information on UNS S4300 can be found on website <http://www.ssina.com/publications/primer.html>.

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### 3. TERMINOLOGY AND ACRONYMS

DC	Direct Current
ISO	International Standards Organization
UNS	Unified Numbering System
Voltage Sense	Measurement of a voltage drop between two electrodes
Current Source	A power supply that provides constant current to the test set-up
Source/Measurement Device	A combination power source and measurement device (In this document it relates to sourcing current and measuring a voltage drop across a designated distance)

### 4. SAFETY

The foregoing test procedure involves use of potentially dangerous DC electrical voltage. The user of this procedure shall consult the manual for the test equipment being used, its manufacturer, and/or other pertinent documents as to the safe handling of electrical equipment used to conduct this test procedure. The user of this test procedure shall be solely responsible for understanding and following all safety guidelines of this test procedure and those of the manufacturers of the electrical equipment.

It is recommended the users of this test procedure electrically insulate the test hose set-up such as by constructing a clear plastic box to house the test hose set-up. This box should have grounded interlocks in the event that access doors/panels are opened for any reason.

SAE, and members of the Non-Hydraulic Hose Committee shall not be held liable for any accidents causing injuries or death due to inappropriate or improper manipulation of electrical generating/discharge equipment, failure to follow the procedures set forth in this test method and the safety guidelines of the equipment manufactures whose equipment was used.

### 5. METHOD

#### 5.1 Materials and Equipment

- 5.1.1 Source/measurement device<sup>1</sup> with following capabilities: Voltage range 200 mV to 200 V DC; Current range 1  $\mu$ A to 1 A; and resistance measurement of 0.2  $\Omega$  to 200 M $\Omega$ . Tolerance ranges shall be as specified by the literature of the equipment referenced in footnote 1.
- 5.1.2 Two (2) 9 mm wide non-perforated stainless steel screw clamps<sup>2</sup> and two (2) 0.57 mm copper or brass blades for contact sensing with a weight (pressure)
- 5.1.3 Two (2) sets (2 wires per set) of leads with shrouded banana jacks on each end, and four (4) alligator clips.
- 5.1.4 Hand torque wrench suitable for the torque being applied to the clamps in Procedure 5.3.
- 5.1.5 Plugs per SAE J1684, sized to fit snug in ends of test hose.
- 5.1.6 130 mm straight hose sample(s).
- 5.1.7 Non-conductive test surface large enough to support the test sample, plastic containment box, and the source/measuring device.

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<sup>1</sup> Keithley Model 2400 SourceMeter, Yojogawa GS610 Source measure Unit, or equivalent.

<sup>2</sup> Stainless steel per UNS S43000.

## 5.2 Hose Pre-Conditioning

### 5.2.1 Sample Cleaning

Samples shall be cleaned by rubbing with aluminum magnesium silicate ("Fuller's earth") and water. The surface shall be flushed thoroughly with distilled/deionized water. The surfaces should not be abraded or buffed.

### 5.2.2 Drying and Equilibration

Sample shall be placed in a hot air oven at 70 °C for 2 hours, then allowed to equilibrate at  $23 \pm 2$  °C and  $50 \pm 10$  relative humidity for at least 16 hours.

## 5.3 Procedure – Source Current

5.3.1 Insert plug in each end of the test hose.

5.3.2 Attach the two outboard clamps  $12 \pm 6$  mm (approx) from each end of the hose. Torque outboard clamps to 3 Nm.

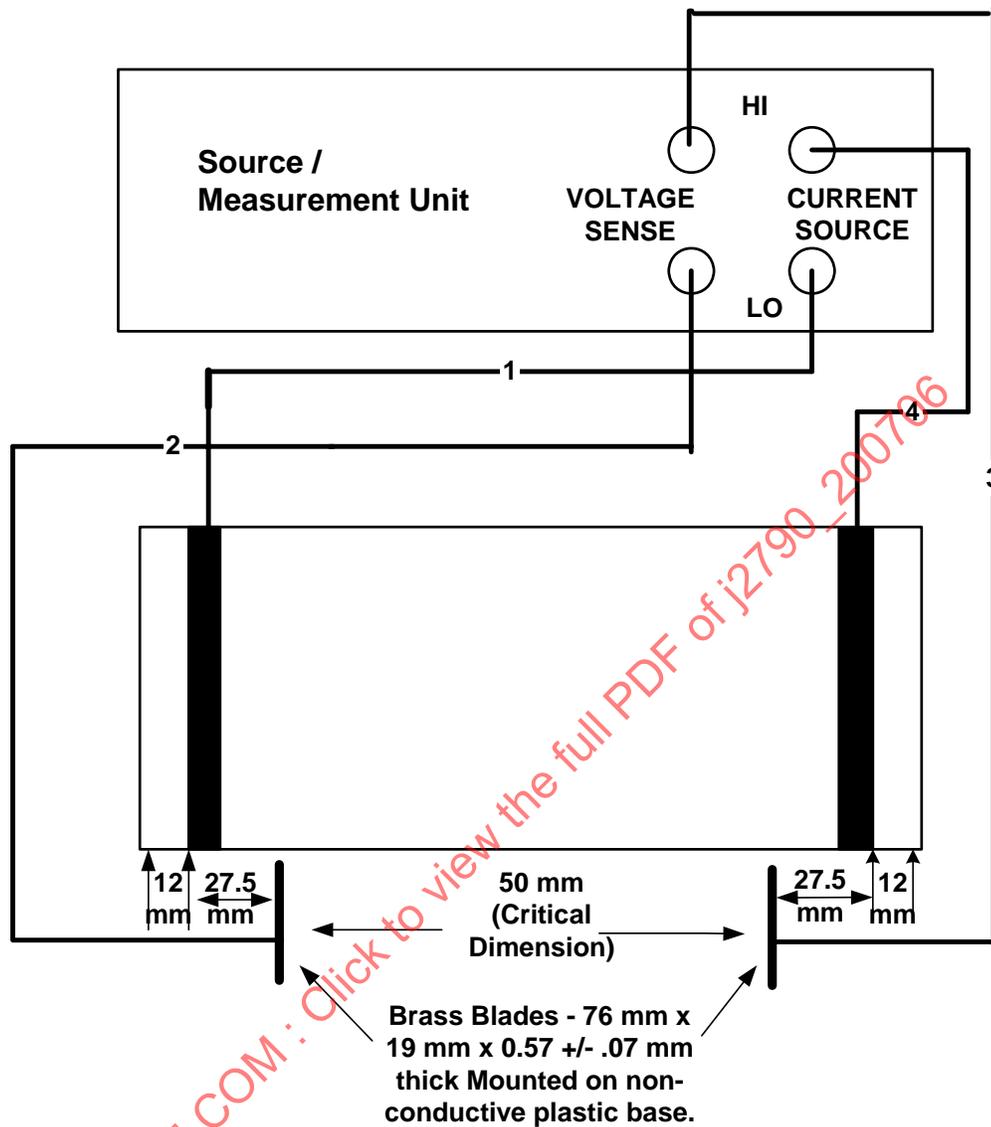
5.3.3 Locate source blades  $27.5 \pm 6$  mm from the outboard edge of each clamp and 50 mm from each other (The 50 mm between the blades is a critical dimension and it is recommended to mount blades on non-conductive plastic base to maintain this spacing). Place a 600 gram weight on hose to provide a consistent firm contact with the hose. Weight shall not come in contact with clamps or brass electrodes.

5.3.4 Place hose/clamp assembly into plastic interlock box.

5.3.5 Set the source/measurement device to read ohms.

5.3.6 *Note: Refer to Figure 1 to verify proper attachments.* For clarity, Figure 1 has generic labels. Current Source HI and Current Source LO in the figure represent Input/Output HI and Input/Output LO labels for the instrument referenced in footnote 1. For clarity, Figure 1 is also labeled Voltage Sense HI and Voltage Sense LO which represent Sense HI and Sense LO labels for the instruments referenced in footnote 1.

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Source current to electrodes 1 and 4; measure voltage between electrodes 2 and 3.

FIGURE 1 - FOUR-WIRE COOLANT HOSE COVER RESISTANCE SET-UP

All wires used in the following subsections have shrouded banana jacks as referenced in Section 5.1.3.

- 5.3.6.1 Attach a wire (Lead 4) from the Current Source HI port to the tail portion of one outboard screw clamp using an alligator clip, and another wire (Lead 1) from the Current Source "Input/Output LO" power supply port to the tail portion of the other outboard screw clamp using an alligator clip.
- 5.3.6.2 Attach a wire (Lead 3) from the Voltage Sense HI port of the ammeter to the blade inboard of Lead 4 with an alligator clip, and a wire (Lead 2) from the "Sense LO" port of the ammeter to the blade inboard of Lead 1 using an alligator clip.
- 5.3.7 Securely close access panels to interlock box.
- 5.3.8 Set the source/measurement device to covert the data from voltage to resistance.