SAE International

SURFACE VEHICLE STANDARD

SAE J2970 JUL2012

Issued 2012-07

Minimum Performance Requirements for Non-Refrigerant Tracer Gasses and Electronic Tracer Gas Leak Detectors

RATIONALE

Loss of refrigerant from leaking systems occurs when a system is charged to enable use of an electronic refrigerant leak detector or trace dye. Although a system can be checked with an electronic detector with as little as 10-15% of the specified charge installed in the system, trace dyes if not previously installed require a full refrigerant charge. As a result, use of any refrigerant as a fluid medium for leak detection is subject to regulation and an environmentally benign alternative may be required. Some manufacturers have proposed using a nitrogen/hydrogen blend as a trace gas for use in leak detection of mobile air conditioning systems. This standard is meant to define the minimum requirements for safety and performance of all non-refrigerant leak-tracer gasses.

1. SCOPE

This standard provides the testing and functional requirements guidance necessary for a leak detection device that uses any non-A/C refrigerant tracer gas, such as helium or a nitrogen-hydrogen blend, to provide functional performance equivalent to a refrigerant electronic leak detector. It explains how a non-refrigerant leak detector's calibration can be established to provide levels of detection equal to electronic leak detectors that meet SAE J2791 for R-134a and SAE J2913 for R-1234yf.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

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

SAE J2197 Hfc-134a (R-134a) Service Hose Fittings for Automotive Air-Conditioning Service Equipment

SAE J2888 R-1234yf Service Hose, Fittings and Couplers for Mobile Refrigerant Systems Service Equipment

SAE J2791 HFC-134a Refrigerant Electronic Leak Detectors, Minimum Performance Criteria

SAE J2913 R-1234yf [HFO-1234yf] Refrigerant Electronic Leak Detectors, Minimum Performance Criteria

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
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SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/J2970_201207

SAE J2670 Stability and Compatibility Criteria for Additives and Flushing Materials Intended for Aftermarket Use in R-134a (HFC-134a) and R-1234yf (HFO-1234yf) Vehicle Air-Conditioning Systems

SAE J2911 Procedure for Certification that Requirements for Mobile Air Conditioning System Components, Service Equipment and Service Technician Training Meet SAE J Standards

3. GENERAL DESCRIPTION AND OPERATING INSTRUCTIONS

3.1 The tracer gas detector shall be suitable for use in safely detecting the tracer gas following recovery of refrigerant from the system with equipment that meets SAE J2788 (R-134a) or SAE J2801 (R-134a), SAE J2843 (R-1234yf) or SAE J2851 (R-1234yf).

3.2 The tracer gas shall be suitable for use at temperatures of 15-49 °C. (59 to 120 °F.) and have the following characteristics:

3.2.1 It shall meet the commodity specifications of the Compressed Gas Association.

3.2.2 It shall be non-flammable.

3.2.3 It shall be removable from the mobile air conditioning system with ordinary A/C shop equipment, and/or self-release from the system, leaving no residue, in less than 30 minutes. (Note: the tracer gas should not be recovered into the tank of SAE J2788 or SAE J2843 Recovery/Recycling/Recharging equipment. When releasing, care should be taken so the background level of the tracer gas is not increased which may impact further leak detection.)

3.2.4 The pressure required for proper leak detection shall be less than 1.1 MPa (160 psig).

3.2.5 The safety and chemical compatibility of the tracer gas must cover the possibility of a mixture of up to 20% of the system refrigerant from incomplete recovery. Reference SAE J2670 for example test methods. The method of demonstrating compatibility with R-1234yf and R-134a is left to the discretion of the manufacturer/marketer or the test lab.

3.3 The tracer gas detector shall be tested to meet the performance specifications of this standard by an independent testing facility as defined in SAE J2911, and in accordance with the procedures set forth in SAE J2911. The independent testing facility shall maintain all documentation related to its testing, including calibration and maintenance data for its equipment, for a period of five years following the final production test of the specific detector.

3.3.1 The manufacturer may state certification of compliance with this Standard (including use of any labeling) only after meeting the requirements in SAE J2911 “Procedure for Certification That Requirements for Mobile Air Conditioning System Components, Service Equipment and Service Technicians Meet SAE J Standards”. See Appendix B.

3.4 If it complies, the detector shall carry a label that states “Design certified by (name of testing laboratory) to meet SAE J2970 with (type of tracer gas, such as 95% nitrogen/5% hydrogen) at (tracer gas test pressure)" with lettering in bold face type at least 3 mm high.

3.5 If it fails to comply, the detector may be retested subject to the limits of Section 11. If a detector fails beyond the retest limits of Section 11, it shall be retested only after the manufacturer/marketer has documented design or process changes made to correct the failure and provided this data to the testing laboratory. A detector must pass the procedures in Sections 7, 8. A failure in either or both of those sections requires a complete retest. The detector also must meet the requirements of Section 10, passing the no-false-triggering requirement for transmission oil and engine oil (Nos. 13 and 14) and clearing within 20 s after a permitted false-trigger.

3.6 The tracer gas detector shall be suitable for use in an automotive service garage and operate in ambient temperatures of 15 to 49 °C (59 to 120 °F).

3.7 The tracer gas detector shall be capable of indentifying leak rates equivalent to 4 g/year (0.15 oz/year) and 7 g/year (0.25 oz/year) of refrigerant R-134a or R-1234yf when tested using calibrated leak standards certified for both the refrigerant and the tracer gas. At the discretion of the manufacturer, the tracer gas detector may be capable of identifying a leak rate equivalent to 14 g/year (0.5 oz/year). The equivalent leak rates shall be determined at the refrigerant vapor pressure at 20 to 22 °C (68 to 72 °F) and the specified test pressure for proper leak detection for the tracer gas. The selection of the base refrigerant, R-134a or R-1234yf, is at the discretion of the manufacturer/marketer or the test lab. When a numeric leak rate is indicated it shall be displayed in g/yr of refrigerant equivalent.

3.8 Other equipment requirements (if included with the detector)

3.8.1 All couplings for attachment to MAC systems with R-134a shall meet SAE Standard J2197.

3.8.2 All couplings for attachment to MAC systems with R-1234yf shall meet SAE Standard J2888.

4. WHAT SHALL ACCOMPANY THE DETECTOR

4.1 The manufacturer/marketing company shall provide operating instructions for the detector that cover tracer gas specification and pressure needed for proper leak detection, tracer gas installation and removal, detector calibration, normal usage, trouble shooting, and maintenance, including replacement of any sensors, filters or power supply.

4.2 Tools, adapters and needed adjustment and calibration devices (including calibration and/or reference bottles) for the detector must be included with the detector.

4.3 The manufacturer/marketing company shall provide all needed safety information and labeling.

4.4 The manufacturer/marketing company shall provide the Section 10 list of all common under hood chemicals that may affect the operation of an electronic leak detector and indicate by Y, if their detectors will false-trigger from exposure to each of the chemicals on the list, or N if it will not indicate a false-trigger.

4.5 The resistance to false triggering shall be based on the test procedures described in Section 10. False triggering is defined as the detector making the same or similar indication (sound and/or light) as if it detected a tracer gas leak.

5. REQUIRED BASIC FUNCTIONS

5.1 The detector may self-calibrate or require manual calibration, but once calibrated for an operation, it must hold that calibration for a time sufficient to perform the operations described in Sections 7 and 8 (including 8.1 to 8.6). This does not preclude automatic recalibration for a probe that has been inserted into a contaminated atmosphere (as per Section 8), readjustment of sensitivity by operator selection, or an audible-and-or-visual warning of a condition beyond the operating scope of its design. The latter must be obviously different from the indication of a leak, although the same functional trigger may be used. Example: a steady indicator light vs. a flashing indicator light.

5.2 The detector shall have two sensitivity positions, designated “high” and “normal” equivalent to the 4, and 7 g/yr leakage rates of refrigerant (SAE J2791 or SAE J2913). At the discretion of the manufacturer, the detector may have an additional sensitivity setting designated "low" equivalent to the 14 g/yr leakage rate of refrigerant (SAE J2791 or SAE J2913).

5.3 The detector must demonstrate automotive garage durability by continuing to function normally after being dropped 1.2 m (4.0 ft) to a hard surface, such as a concrete floor, four times. This test may be performed with the detector in a protective caddy, provided the caddy is a standard part of the basic detector kit, and does not affect in-shop use of the detector, or testing of the detector under all procedures in Sections 7, 8, 9 and 10.

5.4 The detector must demonstrate automotive garage durability by continuing to function normally after:

- the probe tip has been submerged to a depth of six mm (0.25 in) in a pan of water and drawn through the water at a rate of 75 mm (3 in) per s for two s and

- then, after wiping clean and performing any other cleaning/maintenance prescribed by the manufacturer in its operating instructions manual, including but not limited to a sensor replacement or filter change.

6. LEAK DETECTION TEST EQUIPMENT

6.1 The testing shall be performed with the probe in a 610 mm (2 ft) cube clear sealed chamber as described in the appendix, figures A1 and A2. A chamber built to conform to SAE J2791/SAE J2913 is suitable.

6.1.1 Illustrations and details of the chamber are described in the Appendix A. A vertical wall of the chamber shall have a horizontal slot 200 mm (8 in) or wider, and large enough for a probe from an externally-mounted detector to go through. The slot opening shall be sealed with:

6.1.1.1 Overlapping strips of a rubber material that conforms sufficiently around the probe to maintain the specified level of contaminated atmosphere, or

6.1.1.2 A butt-joint of conforming rubber seals with additional sealing from face seals on the detector probe neck that are in contact with the butt joint.

6.1.1.3 Any other slot sealing method that provides the chamber sealing required for Section 8.

The rubber strips and face seals may be lubricated to provide smooth movement of the probe and any surrounding brace as described in 6.2.

6.1.2 The chamber shall have an access door large enough to insert a calibrated leak standard, a cylindrical sleeve or round-hole access point for a gas-tight syringe and a built-in mixing fan (120 V, approximately 40 cfm) to circulate an injection of a designated contaminated atmosphere gas to produce uniform distribution of injected gas for the contaminated atmosphere test. The chamber should have a provision for attaching a vacuum source (such as a small household vacuum motor) to permit rapid clearing of the chamber following a contaminated atmosphere test. The cylindrical sleeve or round-hole access shall include a sealing plug or other provision for sealing following use of the gas-tight syringe.

6.1.2.1 The designated contaminated atmosphere gas shall be the tracer gas.

6.1.3 The three (optionally four) calibrated leak standards used for the tests shall be calibrated per methods and instruments per the National Institute of Standards and Technology, Washington, DC 20234, and the standards shall be rated accurate (have measurement uncertainty) to within ±20%. The leak rates shall be in common units for R-134a or R-1234yf of 7 g/yr (0.25 oz/yr), 4 g/yr (0.15 oz/yr), 2.0 g/yr (0.0625 oz/yr) and optionally 14 g/yr (0.5 oz/yr), at the refrigerant vapor pressure at 20 to 22 °C (68 to 72 °F) and certified (calibrated with a certificate of calibration) for use with both the refrigerant and the tracer gas. The leak standards shall be designed for connection to a supply of 100% of the tracer gas or if a blend, 100% of the specified blend. If the tracer gas is heavier than air, the standards or their mounting locations in the chamber shall ensure the base of the standard is 75 mm (3 in) or more from the floor of the chamber. This is to provide a sufficient drop for the tracer gas coming from the leak standard orifice, to minimize puddling around the orifice and/or orifice shroud if used. To mitigate testing inconsistency from possible air turbulence caused by the moving probe, the leak standards may be equipped (as a certification test option) with a shroud around the orifice port. The shroud protrusion from the orifice port shall be no more than 6 mm +0/-0.2 mm (0.236 in +0/-0.01 in). A view of a sample configuration, with dimensions within those ranges is shown in the Appendix, as Figure A3. If a shroud is used with any leak standard, this shroud also must be used with all other leak standards for certification of a detector.

6.1.3.1 The calibrated leak standards shall be three (optionally four) individual units. For a tracer gas an adjustable standard, as commonly used for refrigerant gas leak detector testing, is not permitted. The standards must be made so they are calibrated for refrigerant R-134a or R-1234yf, but engineered to accept the tracer gas supply.

6.1.4 The detector shall be mounted on a table with a moving platform, designed to produce a horizontal reciprocating motion of at least 150 mm (6 in), and a motor drive adjusted to move the platform so the probe tip passes the specified calibrated leak at a rate of 75 mm (3 in) per s, from a distance of 9.5 mm (3/8 in) per 7.2 All moving probe tests in this standard shall be performed at that rate as the probe passes the orifice of the calibrated leak standard. The platform shall stop at each end of its travel for no less than eight, no more than 10 s. The stop may be manually controlled by a test operator or performed automatically with a switch at each end-of-travel and a timer. A table that was built to conform to requirements for SAE J2791 or SAE J2913 is suitable.

6.2 It is necessary to hold steady the detector's flexible neck and probe, as the detector probe moves side to side through the sealed slot in the vertical wall of the chamber. If the design of the flex neck requires, this may be done by adding to the platform a brace (may be C or U channel) sized to hold the flex neck and probe securely, and long enough to protrude through the slot to within a distance conveniently short of the 9.5 mm (3/8 in) from the orifice of the calibrated leak.

6.3 The detector probe may be aimed so that the tip is horizontal or up to 45 degrees above or below horizontal, the latter two positions to compensate for a tracer gas that is lighter or heavier than air

7. DETECTOR REQUIRED PERFORMANCE AND TEST PROCEDURE

7.1 Begin all testing for a single detector with a chamber cleared of tracer gas from any previous testing. Give the calibrated leak standards any maintenance/cleaning prescribed by the manufacturer making sure they are properly charged with the tracer gas. Perform the leakage rate tests separately, with the specific calibrated leak standard in the same position within the chamber. Position the calibrated leak standard so its orifice is at the exact midpoint of the moving platform's travel.

7.2 Adjust the detector and probe position for all tests so detector and probe are at one extreme end of the test table sweep. The probe shall sense two or three leakage rates: of 4 g/year (0.15 oz/year), 7 g/year (0.25 oz/year) and optionally 14 g/year (0.5 oz/year) when moved at a rate of 75 mm/s (3 in/s) past a calibrated leak standard, coming no closer than 9.5 mm (3/8 in) from the orifice of the calibrated leak. The 9.5 mm (3/8 in) distance from the orifice of the calibrated leak standard shall be horizontal or up to 45 degrees downward offset. Under these same operating conditions, the detector also shall not indicate a leak of 2 g/year (0.0725 oz/year) leak with the detector sensitivity selector in the 4 g/year (0.15 oz/year) position, a 4 g/year (0.15 oz/year) leak with the sensitivity selector in the 7 g/year (0.25 oz/year) position, and a 7 g/year (0.25 oz/year) leak with the sensitivity selector in the 14 g/year (0.5 oz/year) position if available.

7.2.1 Begin with the calibrated leak standard for 2 g/year (0.0725 oz/year) in position. Warm up the detector, select 4 g/year (0.15 oz/year) and operate the moving table so the probe sweeps past the calibrated leak standard a total of 10 times (five side to side and back again movements at the specified rate and distance from the orifice). The probe shall indicate no leak nine of 10 times or the leak detector fails.

7.2.2 Replace the 2 g/year (0.0725 oz/year) calibrated leak standard with the 4 g/year (0.15 oz/year) calibrated leak standard. Operate the moving table so the probe sweeps past the calibrated leak standard orifice a total of 10 times (five side to side and back again movements). The probe shall sense the leak within 2 s and clear within 2 s of passing the orifice, at least nine of the 10 times. "Clear" is defined as a clearly audible reduction in sound and/or substantial decrease in indicator lighting from the indication of a leak. If after an apparent "Clear" the detector sounds in the stop period at each end of travel, following any one of the 10 sweeps past the calibrated leak standard, the leak detector fails.

7.2.3 Immediately following the 4 g/year (0.15 oz/year) test, move the detector sensitivity selector to the 7 g/year (0.25 oz/year) position and perform a 10-sweep test with the 4 g/year-calibrated leak standard still in position. The detector shall indicate no leak at least nine of 10 times or it fails.

7.3 Replace the 4 g/year (0.15 oz/year) calibrated leak standard with the 7 g/year (0.25 oz/year) calibrated leak standard and leave the detector sensitivity selector in the 7 g/year (0.25 oz/year) position. Perform a 10-sweep test and the detector shall indicate a leak within 2 s of passing the calibrated leak standard orifice, then clear within 2 s, at least nine of the 10 times, or it fails.

7.4 For detectors that have a "low", 14 g/year (0.5 oz/year), sensitivity position (This is optional):

7.4.1 Immediately following the 7 g/year (0.25 oz/year) test, leave the 7 g/year (0.25 oz/year) calibrated leak standard in position and move the detector sensitivity selector to the 14 g/year (0.5 oz/year) position. Perform a 10-sweep test and the detector shall indicate no leak at least nine of the 10 times, or it fails.

7.4.2 With the detector sensitivity selector remaining in the 14 g/year (0.5 oz/year) position, replace the 7 g/year (0.25 oz/year) calibrated leak standard with a 14 g/year (0.5 oz/year) calibrated leak standard. Perform a 10-sweep test and the detector shall indicate a leak within 2 s of passing the calibrated leak standard orifice, then clear within 2 s, at least nine of the 10 times, or it fails.

8. DETECTOR REQUIRED PERFORMANCE IN A CONTAMINATED ATMOSPHERE

Test for detector clearing in a contaminated atmosphere and then sensing a 4 g/year (0.15 oz/year) leak. This test shall be performed with the 4 g/year (0.15 oz/year) calibrated leak standard in the chamber.

8.1 The probe of a self-clearing detector (turned off) shall remain in the chamber, to test its ability to clear in a contaminated atmosphere. Inject a volume of tracer gas (amount sufficient to produce 500 ppm in the chamber) with a gas-tight syringe through the cylindrical access into the chamber, seal the cylindrical access and mix the tracer gas with the air in the chamber by operation of the mixing fan for 4 to 5 min. Monitor the tracer gas contamination in the chamber, using a tracer gas monitor with accuracy of within ±10% as rated by the manufacturer. Accuracy shall ensure the laboratory will be able to determine the chamber atmosphere is within the required contaminated atmosphere ranges of this section during the testing. The contaminated atmosphere shall be in the range of 450 to 550 ppm at the start (60 s after the mixing fan is turned off) and shall remain above 50% of that initial level at the conclusion of the sweep test. The tracer gas monitor shall be of verified accuracy, tested by the certifying laboratory prior to use, so its accuracy for the test procedure is assured.

8.2 Turn on the self-clearing detector, set to 4 g/year (0.15 oz/year) sensitivity and allow it to warm up. Once the detector is warmed up, shut off the mixing fan for the contaminated atmosphere test. The detector shall clear in the contaminated atmosphere within 60 s after the mixing fan has stopped, or it fails.

8.3 If the detector is not a self-clearing type, but can be cleared within the chamber by manual adjustment, turn on the detector, set to 4 g/year sensitivity and allow to warm-up. Shut off the mixing fan and immediately perform the manual clearing adjustment. The detector shall clear in the contaminated atmosphere within 60 s after the mixing fan has stopped, or it fails.

8.4 If the detector is designed to clear only with a calibration bottle, perform that procedure, inject the tracer gas into the chamber and mix with the mixing fan for 4 to 5 min. Shut off the fan. Wait 60 s and insert the detector probe into the chamber. The detector shall not indicate any leak. If it does, it fails.

8.5 Follow the contaminated atmosphere test immediately with a 10-sweep moving probe test (minimum gap of 9.5 mm or 3/8 in, at a rate of 75 mm/s or 3 in/s) with the 4 g/year calibrated leak standard.

8.6 The probe shall indicate the leak within 2 s of passing the calibrated leak standard orifice from the 9.5 mm (3/8 in) distance and clear within 2 s, at least nine of 10 times, or it fails.

9. TESTING FOR CERTIFICATION OF A SERIAL PRODUCTION UNIT FROM BLIND PURCHASE ACQUISITION

When testing a serial production unit per SAE J2911, the detector shall be permitted to pass with the following tolerances allowed from the detection/alarm and detection/no alarm tests in Sections 7 and 8: The readjustments for these tolerances shall be made by the laboratory technician from the specified setting on the same calibrated leak standards, for which the independent testing laboratory has obtained accuracy assurance per SAE J2911.

On the highest-sensitivity setting (4 g/year), the detector shall pass if it detects at as high as 4.4 g/year, including for the contaminated atmosphere test. On the normal sensitivity setting (7 g/year), the detector shall pass if it detects at 7.5 g/year. On the lowest sensitivity setting (14 g/year), if equipped, the detector shall pass if it detects at 14.5 g/year. For the no-detect testing, it may pass on the highest-sensitivity setting with the calibrated leak standard reset from 2 g/year to 1.8 g/year. Other tests carry no tolerance.

10. FALSE-TRIGGERING OF THE DETECTOR

It is recognized that an electronic leak detector may falsely indicate a leak in the presence of certain under hood chemicals. Therefore the detector shall be tested against the following substances, using the procedures described or equivalent. If substances other than specified are used, the laboratory shall ensure they are chemically equivalent and maintain records of the substitution in the SAE J2970 certification documentation.

Although false triggering is allowed by this standard for many chemicals, it is not allowed for mineral engine oil or transmission oil. The marketer of the leak detector shall list all the chemicals and by a Y or N in an adjacent box, indicate if the detector will or will not false-trigger from each chemical. That list shall be included with the leak detector, such as in the instruction manual.

If a detector's probe false-triggers from a permitted chemical, it shall immediately be removed, and to pass the test, the detector shall clear in no more than 20 s. The detector shall be fully warmed up and set for 4 g/year (0.15 oz/year) sensitivity prior to a false-triggering test. In all cases the detector probe shall be brought gradually to the surface of the chemical until/if it false-triggers, but no closer than within 3/8 in (9.5 mm), and held there for a minimum of 5 s. If it false-triggers, it shall immediately be pulled out of the beaker, or a short distance (approximately 75 mm or 3 in or more) away from the chemical if on a brush or dish. It shall clear within 20 s after being pulled away, or it fails the test. All tests shall be performed at 15 to 27 °C (60 to 80 °F) with chemicals in this temperature range except as noted, and in still air.

Each false-trigger test shall be performed four times and the detector shall not false-trigger any of the four times to be listed as an N (no false-trigger).

If the detector is of a design that requires movement to generate a voltage change in order to alarm, the probe shall be moved across the chemical sample at a rate of 25 mm (1 in) per s from a distance of 9.5 mm (3/8-in). The independent testing laboratory may use the moving table platform for this purpose.

The manufacturer of the detector shall explain in the operating instructions that if the detector takes longer than 2 s to clear as a result of exposure to one of the chemicals in this section (up to the test limit of 20 s), this indicates the probe apparently has encountered a large sample of contaminant, not necessarily a refrigerant leak. The instructions should add that the test area should be inspected for one of the permitted chemicals on the false-trigger list.

1. Windshield washer solvent (methanol base). Pour into a beaker or Petri dish.

2. Ford spot and stain remover (F3AZ-19521-WA). Pour into a beaker or Petri dish.

3. Ford rust penetrant and inhibitor (F2AZ-19A501-A). Spray from aerosol onto a dish surface, until there is a liquid accumulation.

4. Ford gasket and trim adhesive (F3AZ-1 9B508-AA). Unthread and remove cap with brush holding a thick film of the liquid for test.

5. Permatex Natural Blue cleaner and degreaser (biodegradable, non-caustic, with no chlorinated solvent, no petroleum solvent, no phosphate). Pour into a beaker or Petri dish.

6. Ford brake parts cleaner (F6AZ-2C410-AB). Spray from aerosol onto a dish surface, until there is a liquid accumulation. Ford clear silicone rubber (F7AZ-19554-CA). Extrude bead 50 mm (2 in) or longer onto a dish surface.

7. Motorcraft G-05 anti-freeze/coolant. Pour into a beaker or petri dish. Heat the coolant to 66 to 82 °C (150 to 180 °F).

8. Gunk Liquid Wrench. Pour into a beaker or petri dish.

9. Ford Pumice/Lotion hand cleaner (petroleum distillate, alcohol). Extrude from container onto a dish.

10. Ford Motorcraft DOT3 brake fluid. Pour fluid into beaker or petri dish.

11. Ford Spray Carburetor Tune-Up Cleaner (D9AZ-19579-AA). Spray from aerosol onto a dish surface, until there is a liquid accumulation.

12. Ford silicone lubricant (COAZ-19553-AA). Extrude bead 50 mm (2 in) or longer onto dish surface.

13. Dexron automatic transmission fluid heated to 66 to 82 °C (150 to 180 °F). Pour into a beaker or Petri dish.

14. Mineral engine oil heated to 66 to 82 °C (150 to 180 °F). Pour into a beaker or Petri dish.

11. REPEATING A TEST PROCEDURE AFTER A FAILURE

If a detector fails only one 10-sweep test against a calibrated leak standard, but passes all the other sweep tests, that one procedure may be repeated once. However, if it fails a second time, the entire series of certification tests to this standard shall be repeated, but not until the marketer has provided documentation to the test facility of changes made to the detector.

If a detector passes all the sweep tests, but fails a not permitted false-triggering test (either by false-triggering on engine or transmission oil, or by failing to clear from another chemical false trigger within 20 s), it may be retested against that chemical again, only at the conclusion of all other tests. If it fails a second time, it may not be retested until the marketer has provided documentation to the test facility of changes made to the detector, and in that case, the entire series of certification tests to this standard shall be repeated.

12. NOTES

12.1 Marginal Indicia

A change bar (I) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

PREPARED BY THE SAE INTERIOR CLIMATE CONTROL SERVICE COMMITTEE

APPENDIX A - TEST CHAMBER DESIGN

The sealed chamber shall be built to the dimensions shown – a 610 mm (2 ft) cube, with an access sleeve on or near the top for injecting the tracer gas with a gas-tight syringe, an access door on a vertical wall, large enough to insert a calibrated leak standard and with a sealing surface when closed. It shall have a mixing fan (120 V, approximately 40 cfm) installed on the base, and a vacuum motor mount on the top (so with the access door opened the chamber can be quickly purged of contaminated atmosphere). The slot through which the detector probe passes and sweeps back and forth shall have an overlapping double-strip arrangement of conformable rubber material to seal the chamber around the pass-through of the probe, or the butt joint with face sealing as described in 6.1.1. See illustrations.

The table with the reciprocating platform for the detector testing shall be as described in 6.1.4.

A.1 HOW TO USE A DETECTOR THAT MEETS THIS STANDARD

The marketer shall provide a prominent warning, accompanying the chart of false triggers, to caution the technician against using cleaning agents or solvents on or near refrigerant lines, and to wipe away both dirt or potential false-triggering chemicals, using a dry shop towel or shop air. The marketer also shall explain that a detector may false-trigger in a contaminated atmosphere, and what steps to take (if any), and/or what time to allow for the detector to clear.

A.1.1 Other instructions that accompany the detector shall include the following:

Leak test with the engine off.

a. Charge the system with sufficient tracer gas to reach the gauge pressure indicated in the detector instructions with the system off.

b. Visually trace the entire refrigerant system, and look for signs of air conditioning lubricant leakage, damage and corrosion on all lines, hoses and components. Check each questionable area with the detector probe, as well as all fittings, hose-to-line couplings, refrigerant controls, service valves with caps in place, brazed or welded areas, and areas around attachment points and hold-downs on lines and components. If looking for an apparently larger leak, check first at the 7 g/year or 14 g/year position (normal and low-sensitivity settings).

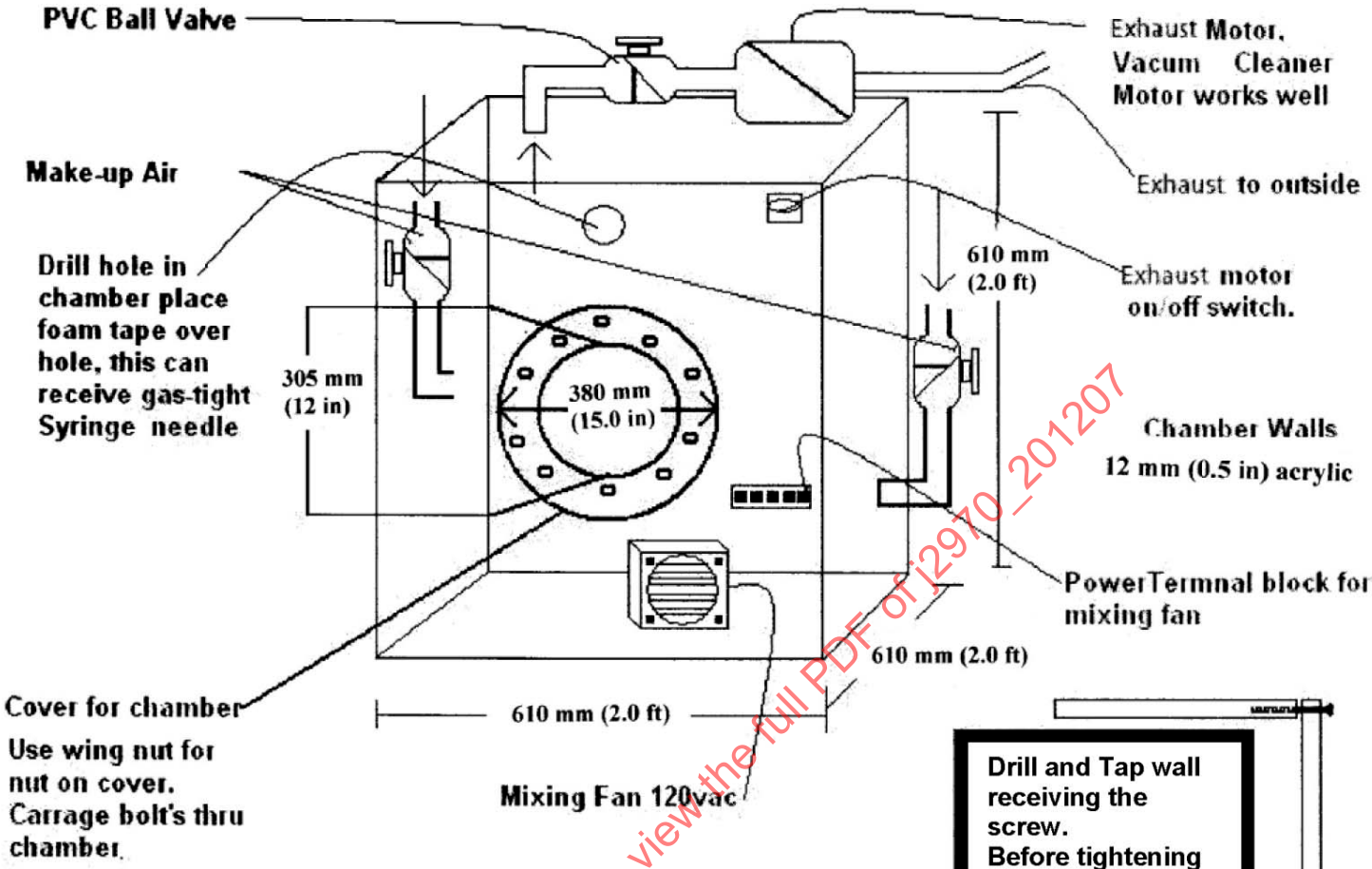
c. Always follow the refrigerant system around in a continuous path so that no areas of potential leaks are missed. If a leak is found, always continue to test the remainder of the system.

d. Recheck service valves with caps removed. Blow shop air over service valve to clear immediate area, and then check with detector on 7 g/year setting (normal sensitivity).

e. Move the detector at a rate of no more than 75 mm/s (3 in/s) and as close as possible to 9.5 mm (3/8 in) from the surface, completely encircling each test position (switch, sensor, refrigerant tubing connection, etc).

f. Slower movement and closer approach of the probe normally improves the likelihood of finding a leak. However, detectors made to meet this standard are based on air sampling from the 9.5 mm (3/8 in) distance. So retest is advisable when a leak appears to be found at the most sensitive settings, particularly if the probe was in a static position on a joint, or making physical contact with a joint, as it was moving. Repeat with a moving probe test at that location, taking care to maintain the small gap (9.5 mm or 3/8 in) to confirm that the leak is of repairable size. Use of the 7 g/year (0.25 oz/year) - normal sensitivity - position of the detector, after finding an apparent leak with the 4 g/year (0.15 oz/year) - high sensitivity - setting, also may be helpful.

g. Prior to making any repairs or final evacuation and charging remove the tracer gas from the system per instructions. (NOTE: The tracer gas should not be recovered into the tank of SAE J2788 or SAE J2843 Recovery/Recycling/Recharging equipment.)



Chamber size is per standard. Other features, including vacuum cleaner motor, material and thickness of chamber walls, use of ball valve, shape and size of door, etc. are suggestions based on a sample chamber constructed.

When you evacuate the chamber, be sure exhaust make-up air valves are open. Otherwise, chamber structure might be affected. After evacuating, close all valves.

FIGURE A1 - CHAMBER DESIGN