The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1658

REAF. FEB1999

Issued 1993-06
Reaffirmed 1999-02

Superseding J1658 JUN93

Submitted for recognition as an American National Standard

Alternate Refrigerant Consistency Criteria for Use in Mobile Air-Conditioning Systems

1. Scope

1.1 This SAE Recommended Practice applies to refrigerant blends (multicomponent refrigerants) intended for use as retrofit refrigerants to replace CFC-12 (R-12) in mobile air-conditioning (A/C) systems. Since the composition of non-azeotropic refrigerant mixtures changes as refrigerant is lost, either through the vapor phase or the liquid phase, the method of charging A/C systems is important. The purpose of this document is to determine the proper refrigerant phase, liquid or vapor, for system charging by relating system performance changes to the charging method.

This document is complete only when combined with the requirements of SAE J1657.

2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE 1657—Selection Criteria for Retrofit Refrigerants to Replace CFC-12 (R-12) in Mobile Air-Conditioning Systems

SAE J1659—Vehicle Testing Requirements for Replacement Refrigerants for CFC-12 (R-12) Mobile Air-Conditioning Systems

3. Sample Testing

3.1 Two 13.5 kg containers which meet the appropriate safety requirements (e.g., DOT and/or UL requirements), identified as "A1 and A2," shall be filled, to 80% maximum capacity, containing the specified refrigerant mixture and shall be maintained at a 24 °C ambient ± 1 °C for 24 h.

3.2 Container A1 shall be used to transfer and sample refrigerant in the liquid state. Container A2 shall be used to transfer and sample refrigerant in the vapor state.

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3.2.1 Prior to start of testing, a small amount of refrigerant from both containers "A1" and "A2" shall be taken in the liquid and vapor phase, respectively, and analyzed using a gas chromatograph to determine original composition of liquid and vapor.

3.3 The containers shall be connected, with the appropriate valves and hoses, so that the contents of containers A1 and A2 can be transferred to empty containers, identified as "B1" and "B2," respectively, and also with the ability to withdraw a 1 kg sample at various container weights into a third set of containers generally identified as "S" (Figure 1).

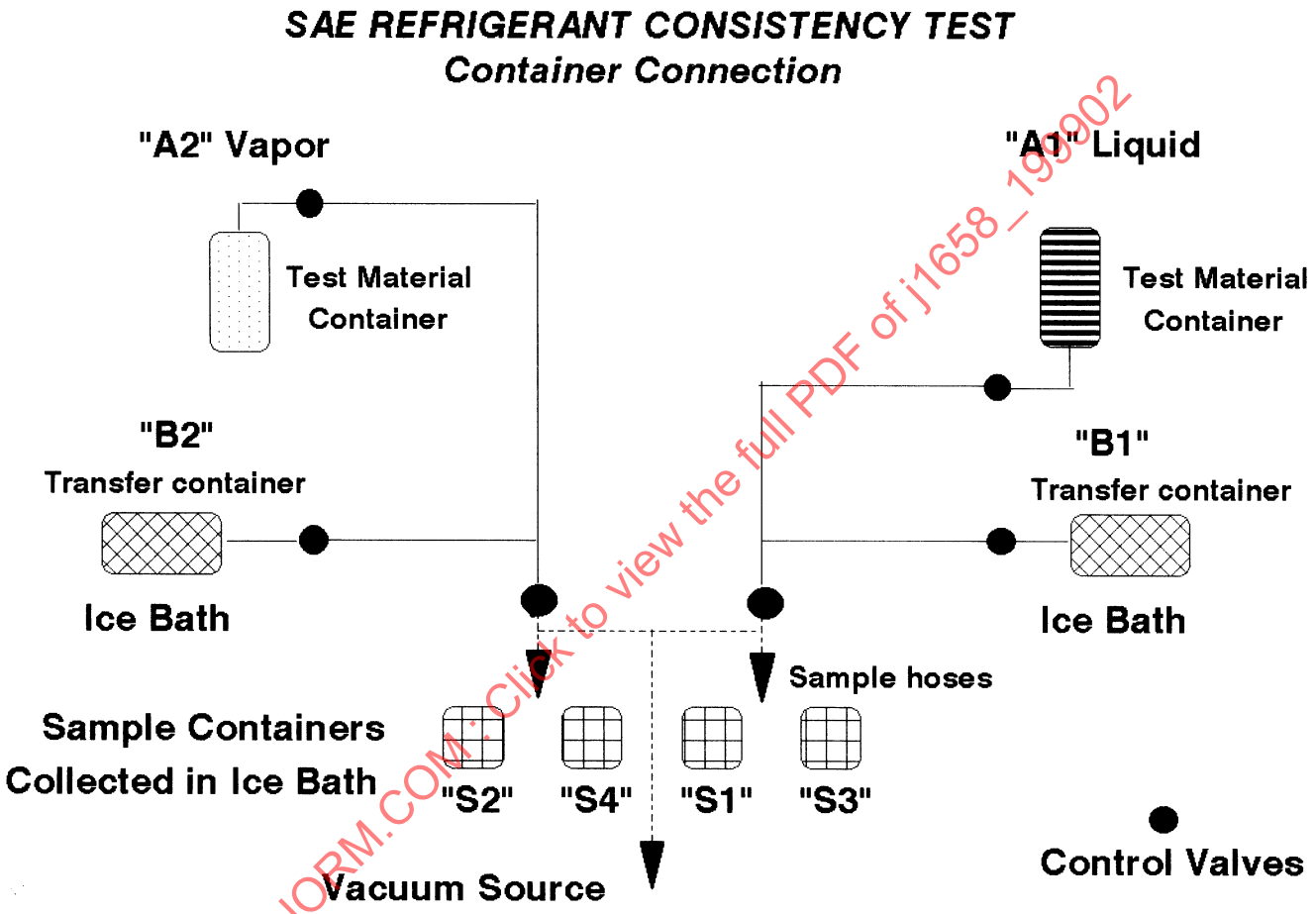

FIGURE 1—SAE REFRIGERANT CONSISTENCY TEST

3.3.1 The "B1" and "B2" containers, at least 13.5 kg (meeting appropriate DOT or UL requirements), shall be initially evacuated to a minimum of 2.7 kPa below atmospheric adjusted for altitude (29.2 mm of mercury), and placed in a container and covered with dry ice.

3.3.2 The sample container "S," shall not be less than a capacity of 2.5 kg mass in size (total of 4), and will contain the 1 kg test samples. The container and connection hoses shall be initially evacuated to a minimum of 2.7 kPa below atmospheric adjusted for altitude (29.2 mm of mercury), and placed in a container and covered with dry ice prior to collecting the sample.

3.3.3 The total test system including hoses and connections shall be reduced to 2.7 kPa below atmospheric adjusted for altitude (29.2 mm of mercury), prior to transfer of the refrigerant from valved off containers "A1" and "A2."

3.3.4 After each refrigerant transfer, the containers shall be weighed to identify the amount of refrigerant transferred.

3.3.4.1 The weight of the various containers shall be compared to determine the relationship and location of the transferred refrigerant samples under test.

4. Transfer of Samples

4.1 With both containers "A1" and "A2" in the original filled condition after the sample defined in 3.2.1 has been obtained, a 1 kg liquid sample labeled "S1" shall be taken from the bottom of container "A1" and a 1 kg vapor sample labeled "S2" shall be taken from the top of container "A2." To represent charging a mobile A/C system, the refrigerant shall be removed over a 3 min period. (Use of a small needle valve will help control flow.)

4.1.1 After the samples "S1" and "S2" have been taken from the full containers in 3.1, refrigerant from containers "A1" and "A2" shall be transferred in 1 kg increments once every 24 h to containers "B1" and "B2" until containers "A1" and "A2" have been reduced to approximately 12% (net weight) of the original refrigerant. Immediately after sampling from containers "A1" and "A2," shake each container prior to the 24 h storage period. This should require the transfer of 11 samples.

4.1.2 After containers "A1" and "A2" have been reduced to 15% of the original refrigerant weight in 4.1.1 and after an additional 24 h wait, the second 1 kg liquid sample from the bottom of container "A1" to container "S3" is removed. Similarly, a 1 kg sample labeled "S4" from the top in vapor form is removed from "A2."

5. Test Analysis

5.1 The four 1 kg refrigerant samples, "S1 through "S4," shall be analyzed using a gas chromatograph to analyze the liquid and vapor composition for deviation from the original refrigerant formulation.

5.2 Based upon the results in 5.1, the change in chemical composition due to fractionation shall be identified.

5.3 The reduction of cooling capability of the refrigerant mixture under these conditions shall not exceed more than 5% loss compared to the original formulation. The refrigerant cooling capability comparisons shall be confirmed by system testing (SAE J1659).

6. Those compositions meeting the requirements of 5.3 shall be vehicle tested per SAE J1659. The results identified in 4.1, indicating refrigerant composition of the four end member compositions, shall be vehicle tested and compared as required in SAE J1659 to the original system refrigerant.

6.1 The proper charging method, liquid phase and/or vapor phase, required to assure refrigerant of sufficient quality to meet the requirements of this document shall be noted on the exterior of the refrigerant container in bold type at least 3 mm in height.

7. All containers and test material shall meet appropriate SAE, DOT, and other applicable emission and safety requirements.

PREPARED BY THE SAE INTERIOR CLIMATE CONTROL STANDARDS COMMITTEE