

SURFACE VEHICLE RECOMMENDED PRACTICE

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Recommended Service Procedure for the Containment of CFC-12 (R-12)

1. **Scope**—During service of mobile air-conditioning (A/C) systems, containment of the refrigerant is important. This procedure provides service guidelines for technicians when repairing vehicles and operating equipment defined in SAE J1990.

2. References

2.1 **Applicable Publications**—The following publication forms a part of this specification to the extent specified herein. Unless otherwise indicated, the latest version of SAE Publications shall apply.

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

SAE J639—Safety and Containment of Refrigerant for Mechanical Vapor Compression Systems Used for Mobile Air-Conditioning Systems

SAE J1771—Criteria for Refrigerant Identification Equipment for Use with Mobile Air-Conditioning Systems

SAE J1990—Extraction and Recycle Equipment for Mobile Automotive Air-Conditioning Systems

SAE J2296—Retest of Refrigerant Containers

3. Refrigerant Recovery Procedure

3.1 Since the A/C system may contain another refrigerant, a combination of refrigerants or excess noncondensables (NCG'S), the system's contents should be identified before removing the refrigerant. Not identifying the refrigerant type prior to removal can result in contamination of recovery/recycle (R/R) equipment. Use of refrigerant identification equipment certified to SAE J1771 should be used to determine what refrigerant is in the mobile A/C system about to be recovered.

3.2 Connect the recovery unit service hoses, which shall have shut-off valves within 30 cm of the service ends, to the vehicle air-conditioning system service ports.

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3.3 Operate the recovery equipment as covered by the equipment manufacturers recommended procedure.

3.3.1 Start the recovery process and remove the refrigerant from the vehicle A/C system. Operate the recovery unit until the vehicle system has been reduced from a pressure to a vacuum. Continue the process until the system pressure has been reduced to a minimum of 102 mm of Mercury below atmospheric pressure (vacuum). With the recovery unit shut off for at least 5 min, unless there is a device that identifies the refrigerant has been removed, determine that there is no refrigerant remaining in the vehicle A/C system. If the vehicle system has risen above a vacuum (0 kPa), additional recovery operation is required to remove the remaining refrigerant. Repeat the operation until the vehicle A/C system vacuum level remains stable for 2 min.

3.3.2 Caution shall be taken to assure that the seals on all service hose connections are in good condition. Cut seals and leaking service hoses will cause the recovery equipment to draw air into the unit. These leaks, as well as a leak in the mobile A/C system being serviced, may result in the automatic shut off device in the recovery unit not to function properly. By allowing the recovery equipment to draw air from these leaks will result in excess air, noncondensable (NCG) being mixed with the recovered refrigerant. The excess noncondensables (NCG's) are difficult to remove from the refrigerant and will result in pressures higher than normal in the recovery/recycle equipment.

3.4 Close the valves in the service lines and then remove the service lines from the vehicle system. Proceed with the repair/service. If the recovery equipment has automatic closing valves, be sure they are properly operating.

4. Service with Manifold Gage Set

4.1 Service hoses shall have shutoff valves in the high, low, and center service hoses within 30 cm of the service ends. Valves must be closed prior to hose removal from the A/C system. This will reduce the volume of refrigerant contained in the service hose that would otherwise be vented to atmosphere.

4.2 During all service operations, the valves should be closed until connected to the vehicle A/C system or the charging source to avoid introduction of air and to contain the refrigerant rather than venting to the atmosphere.

4.3 When the manifold gage set is disconnected from the air-conditioning system or when the center hose is moved to another device which cannot accept refrigerant pressure, the gage set hoses should first be attached to the reclaim equipment to recover the refrigerant from the hoses.

5. Supplemental Refrigerant Checking Procedure for Stored Portable Containers

5.1 Certified recycling equipment and the accompanying recycling procedure, when properly followed, will deliver use-ready refrigerant. In the event that the full recycling procedure was not followed or the technician is unsure about the noncondensable gas content of a given tank of refrigerant, this procedure can be used to determine whether the recycled refrigerant container meets the specification for noncondensable gases (air).

5.1.1 Since refrigerant contamination can occur from many sources, it is important that the recycled CFC-12 (R-12) refrigerant not be contaminated. CFC-12 (R-12) refrigerant with a contamination amount of more than 2 to 3% by weight (7 to 8% by volume) can cause many different problems if used in the mobile A/C system. Depending upon the type and amount of contamination, mobile A/C system operation can be affected including, reduced cooling performance, improper refrigerant control calibration, higher operating pressures, and chemical reactions.

5.1.2 To determine if a container of CFC-12 (R-12) refrigerant is contaminated, it should be checked by using a SAE J1771 certified refrigerant identifier.

- 5.1.3 If refrigerant identification equipment is not available, than the use of a pressure gauge with readable divisions of 7 kPa can provide some guidance if the container of refrigerant is contaminated. This procedure cannot be used on a mobile A/C system since it is very difficult to be assured that all the A/C system refrigerant parts are at the same temperature. If the container pressure exceeds the recommended pressure/temperature indicated on the table, it may not only contain excess air but may contain a mixture of other refrigerants. Since identification of contaminated refrigerant by the pressure/temperature relationship procedure is not reliable, this procedure should be used with caution.

NOTE—The use of refrigerant with excess air will result in higher system operating pressures and may cause A/C system damage.

- 5.1.4 If the container of refrigerant is contaminated, it should be sent off-site for the appropriate processing.
- 5.2 If this procedure is used, the container must be stored at a temperature of 18 °C or above for at least 12 h, protected from direct sunlight.
- 5.3 Install a calibrated pressure gage, with 7 kPa divisions, on the container and read container pressure.
- 5.4 Attach a temperature-measuring device to the lower one-half of the refrigerant container surface so that an indication of the temperature inside can be identified. Insulate the temperature-measuring device so that it provides a good indication of the container surface temperature. The use of only the air temperature surrounding the refrigerant container can result in incorrect refrigerant temperature information. For example, a container located on a concrete or other surface, the refrigerant can be colder than the air temperature, which will result in an incorrect reading.
- 5.5 Compare the observed container pressure and container surface temperature to the values given in Tables 1 (Metric) or 2 (English) to determine whether the container pressure is below the pressure limit. For example, in Table 1 at a container surface temperature of 21 °C, the container pressure must not exceed 562 kPa.
- 5.6 If the refrigerant in the container has been recycled and the container pressure is less than the limit in Tables 1 and 2, the refrigerant may be used.

TABLE 1—CFC-12 (R-12) REFRIGERANT—MAXIMUM ALLOWABLE CONTAINER PRESSURE/TEMPERATURE FOR NONCONDENSABLE (NCG)—METRIC

Temp °C	kPa	Temp °C	kPa	Temp °C	kPa	Temp °C	kPa	Temp °C	kPa
18	520	24	611	29	717	35	829	40	956
19	527	24	618	30	724	35	843	41	970
19	534	25	632	31	738	36	857	42	984
20	548	26	646	31	752	37	871	42	998
20	555	26	660	32	759	37	878	43	1012
21	562	27	674	32	773	38	892	43	1026
21	576	27	688	33	780	38	906	44	1040
22	583	28	695	33	794	39	913	44	1054
23	590	28	703	34	808	39	927	45	1068
23	604	29	710	34	815	40	942	46	1082

TABLE 2—CFC-12 (R-12) REFRIGERANT—MAXIMUM ALLOWABLE CONTAINER PRESSURE/TEMPERATURE FOR NONCONDENSABLE (NCG)—ENGLISH

Temp °F	psig	Temp °F	psig	Temp °F	psig	Temp °F	psig	Temp °F	psig
65	74	75	87	85	102	95	118	105	136
66	75	76	88	86	103	96	120	106	138
67	76	77	90	87	105	97	122	107	140
68	78	78	92	88	107	98	124	108	142
69	79	79	94	89	108	99	125	109	144
70	80	80	96	90	110	100	127	110	146
71	82	81	98	91	111	101	129	111	148
72	83	82	99	92	113	102	130	112	150
73	84	83	100	93	115	103	132	113	152
74	86	84	101	94	116	104	134	114	154

- 5.7** If the refrigerant in the container has been recycled and the container pressure exceeds the limit in Tables 1 or 2, there may be a possibility that the refrigerant is contaminated and unusable.
- 5.8** The pressure/temperature relationships in Table 3 only compare CFC-12 (R-12) refrigerant contaminated with air and different mixtures of HFC-134a (R-134a). Contaminated CFC-12 (R-12) mixed with other refrigerants will result in different pressure/temperature readings.

**TABLE 3—(ENGLISH) WITH HFC-134a (R-134a) CONTAMINATION %
PERCENT BY WEIGHT
ESTIMATED CONTAMINATED PRESSURE $\pm 2\%$**

Temp °F	Pure R12 psig	Max NCG psig	2% R134a psig	5% R134a psig	10% R134a psig	25% R134a psig	50% R134a psig
65	64	74	67	71	74	83	84
70	70	80	74	79	82	90	91
75	77	87	81	85	91	99	101
80	84	96	88	93	99	107	110
85	92	102	96	101	108	116	120
90	100	110	105	111	116	125	129
95	108	118	114	119	126	135	139
100	117	127	123	127	135	145	151
105	127	136	132	138	146	158	163
110	136	146	142	147	156	170	175
115	147	156	152	159	166	183	190
120	158	167	164	170	177	195	205

- 5.8.1** If it has been determined that the container only contains R12 refrigerant and excess air (NCG), slowly vent the air with the container upright into the recovery/recycle equipment until the pressure is less than the pressure shown in Tables 1 or 2.
- 5.8.1.1** Caution should be taken to not vent the container too rapidly since the refrigerant in the container will become cooler during the venting process. This temperature change can be noted by observing the container surface temperatures as required in 5.4.
- 5.9** If, after shaking the container and letting it stand for a few minutes, the container pressure still exceeds the pressure/temperature limits in Tables 1 or 2, the entire content of the container shall be recycled or sent off-site to be reclaimed.