

FREON AIR CONDITIONING - SERVICING

1. General

A. Airplane may be equipped with Freon air conditioning system. This servicing procedure provides instructions for system discharging, evacuating, charging, leak testing and checking compressor oil level with compressor installed on airplane.

2. Tools, Equipment and Materials

NOTE: Equivalent substitutes may be used for the following listed items:

NAME	NUMBER	MANUFACTURER	USE
Charging Manifold and Hose Assembly	CMN-4-3	Superior Supply Company 215 Laura Wichita, KS 67211	To charge system.
Refrigerant Can Adapter	CT-3	Superior Supply Co.	To charge system.
Halogen Leak Detector	RLD-G19G-1	Superior Supply Co.	To detect Freon leaks.
Vacuum Pump (Capable of 28 to 29 inches of Mercury)		Commercially Available	To evacuate system.
Two (2) Dial-Type Thermometers (2.0 inch diameter. Dial range 0° to 120°F)	C668507-0101, -0103 or -0104	Cessna Aircraft Cessna Parts Distribution Department 701, CPD 25800 East Pawnee Road Wichita, KS 67218- 5590	To check temperature differential.
Refrigerant	R-12	Commercially Available	To charge system.
Dry Nitrogen		Commercially Available	To check for leaks in system.
Refrigerant Oil (500 viscosity minimum)	Capella WF 100	Texaco Oil Company Box 7483 White Plains, NY 10650	To lubricate compressor, fittings and O-rings.
Refrigerant Oil (500 viscosity minimum)	Suniso 5GS	Sun Oil Company 1801 Market Street Philadelphia, PA 19103	To lubricate compressor, fittings and O-rings.
Suds Spray Leak Detector	Type F	Winton Products Co. P. O. Box 36332 Charlotte, NC 28236	To check for leaks in charged system.
Teflon Tape	0.50 inch wide	Commercially Available	To wrap lines.
Compressor Oil Dipstick	32447	Commercially Available	To check compressor oil level.
Machinists Universal Level		Commercially Available	To check mounting angle of compressor on airplane.
Robin Air Charging Station	13105	Robinair Mfg. Corp. 1224 Robinair Way Montpelier, OH 43543-1933	To charge system.
Freon Recovery System		Commercially Available	To capture Freon from system.

3. General Precautions

A. Freon Handling.

NOTE: Effect of Montreal Protocol and U. S. Environmental Protection Agency's Clean Air Act of 1990 is to ban unnecessary release of CFC-12 refrigerant, also known as R12 into the atmosphere. In compliance with the preceding, Cessna Aircraft recommends refrigerant be captured and recycled. For additional information, refer to Federal Clean Air Act, EPA 40 CFR Part 82.

WARNING: Liquid R12 at normal atmospheric pressure and temperature, will freeze anything it contacts. Eyes are especially susceptible to damage. Safety glasses are absolute minimum protection and shall be worn at all times when servicing Freon system.

WARNING: Do not attempt to treat yourself should any liquid refrigerant get into eyes. Follow these instructions: do not rub eye. Splash large quantities of cool water into eye to raise temperature. Apply a few drops of mineral oil to eye to wash it, followed by a weak solution of boric acid to flush out all of the oil. Seek aid of a doctor immediately.

- (1) Observe safety precautions when handling refrigerant or servicing and performing maintenance on air conditioning system.
- (2) Use of protective clothing, gloves and goggles will protect the skin and eyes.

B. General System Notes.

NOTE: Cleanliness is of utmost importance to avoid system contamination and useless wear to compressor and other equipment items. All plumbing and hoses shall be cleaned and capped after fabrication and shall remain capped during storage and installation until hooked up to their mating components. All valves shall also be capped with clean caps or plugs. During time components are open, extreme care shall be exercised to assure that no contaminating matter enters parts or system. Receiver/dryer is easily contaminated with moisture from atmosphere. All care shall be exercised to prevent moisture from entering receiver/dryer.

C. Removing Hoses Under Pressure.

WARNING: Do not remove hoses under pressure. This procedure will result in the release of refrigerant into the atmosphere. Removing hoses under pressure may also result in personal injury if hose ends are not restrained.

D. Use of Intense Heat.

WARNING: To avoid explosion, never weld, use a blow torch, steam clean, bake aircraft finish or use excess amounts of heat on or in immediate area of any part of the air conditioning system or refrigerant supply tank, while they are closed to atmosphere, charged or not. Although R12 gas, under normal conditions, is nonpoisonous, discharge of refrigerant gas near a flame can produce a very poisonous gas (Phosgene). This gas will also attack all bright metal surfaces.

WARNING: Do not use a flame-type leak detector because of fire hazard on airplanes and production of minor amounts of phosgene gas.

WARNING: Do not smoke in vicinity of refrigerant discharge. Inhaling refrigerant through burning tobacco will produce a poisonous gas like an open flame.

E. Use of Nitrogen.

NOTE: All nitrogen pressure checks are to be made only with regulated nitrogen.

4. System Evacuating

A. Evacuation of System (Refer to Figure 301 and Figure 302).

NOTE: Understand and follow all safety precautions prior to evacuating system.

NOTE: Charging manifold and hoses must be free of contamination.

- (1) Gain access to servicing valves, located between pilot and copilot seat, by removing access panel 232AC. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.
- (2) Connect charging manifold hoses to low and high pressure servicing valves.
- (3) Connect center hose from charging manifold to vacuum pump.
- (4) Open valve on vacuum pump and both hand valves on charging manifold.
- (5) Turn on vacuum pump to begin evacuation of system.
- (6) Continue evacuation a minimum of 30 minutes after compound (suction) gage has reached 27.0 to 29.0 inches of mercury vacuum.

NOTE: 27.0 to 29.0 inches of mercury vacuum value is for sea level condition. For each 1,000 feet increase in field elevation, decrease value 1.0 inch of mercury.

- (7) Close both hand valves.

- (8) Turn vacuum pump off.

5. System Discharging/Charging

- A. Discharging System (Refer to Figure 301 and Figure 302).

NOTE: Understand and follow all safety precautions prior to discharging system.

NOTE: Charging manifold and hoses must be free of contamination.

- (1) Gain access to servicing valves, located between pilot and copilot seat, by removing access panel 232AC. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.
- (2) Connect charging manifold hoses to low and high pressure servicing valves.
- (3) Connect Freon reclaimer in accordance with manufacturer's reclaimer instructions.
- (4) Capture Freon in accordance with manufacturer's reclaimer instructions.
- (5) Close hand valves when Freon has been reclaimed.
- (6) Install access panel 232AC.

- B. Charging System (Refer to Figure 301, Figure 302 and Figure 304).

- (1) Gain access to servicing valves, between pilot and copilot seat, by removing access panel 232AC. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.
- (2) Connect charging manifold hoses to low and high pressure servicing valves. Refer to Figure 301 and Figure 302.
- (3) Evacuate system. Refer to System Evacuation procedures.
- (4) Open valve on R12 container.
- (5) Open center hose at manifold gage set for five seconds to purge hose of air. The system is now purged and under a vacuum.

CAUTION: Do not start engine at this time. Do not turn air conditioner on.

- (6) Open high side manifold hand valve; observe low side gage. Close high side hand valve.
 - (a) If low side gage does not change from a vacuum condition to a pressure condition. System blockage is indicated. Re-evacuate system and proceed with following steps.
- (7) If blocked, correct blockage,
- (8) Ensure both high and low side manifold hand valves are closed.
- (9) Using a qualified assistant, start engine and adjust to ground idle.
- (10) Adjust air conditioning controls for maximum cooling, and blower on high speed.
- (11) Keep refrigerant cylinder in upright position.

CAUTION: If container is turned upside down, refrigerant will become liquid. Liquid refrigerant entering compressor may cause serious damage.

- (12) Open low side manifold hand valve and allow a 7.5 pound R12 refrigerant charge in the gaseous state to enter the system.

NOTE: A fully charged system will take between 7.5 and 8.5 pounds of R12 refrigerant.

- (a) Continue charging until sight glass is clear and free of frothing or bubbles.
- (13) Verify gages display approximately 40.0 PSI on low pressure gage and 170.0 to 210.0 PSI on high pressure gage. Higher readings indicate overcharged or blocked system.
 - (a) For pressure at various temperatures, refer to Figure 304.
 - (b) If high surges of pressure on high and low gages are indicated during charging, receiver/dryer may be contaminated or expansion valve blocked. Refer to Chapter 21, Freon Air Conditioning - Troubleshooting.
- (14) Bubbles in sight glass of stabilized system (five minutes minimum operation) constituting a foam or frothing action indicate an undercharge.

NOTE: Occasional individual bubbles passing through sight glass should be considered a clear sight glass and full charge.

- (a) If frothing continues, open suction valve on charging manifold to allow approximately two ounces of refrigerant into system. Wait two minutes and recheck sight glass. Clear glass indicates full charge, frothy glass indicates low charge. Repeat two ounce charge and two minute wait until sight glass is clear.

- (15) Close low and high pressure valves or charging manifold.
- (16) Close valve at charging cylinder.
- (17) Shut down engine.
- (18) After system has stabilized for five minutes, remove hose fittings from high and low pressure service valves. Use a clean cloth wrapped around knurled fitting to prevent refrigerant from getting on skin and to catch excess oil.
- (19) Replace caps on service valves.
- (20) Reinstall access panel 232AC. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

6. Check Compressor Oil Level With Compressor on Airplane

A. Checking Compressor Oil Level (Refer to Figure 303).

- (1) Discharge system. Refer to System Discharging/Charging.
- (2) Remove oil filler plug. Look through oil filler hole and rotate clutch front plate to position internal components.
NOTE: This step is necessary to clear dipstick of internal parts, allowing insertion to full depth.
- (3) Center parts as they are moving to rear of compressor (discharge stroke).
- (4) Determine mounting angle of compressor from horizontal. Position a machinists universal level, across flat surfaces of compressor's two front mounting ears, center bubble, and read angle to closest degree.
- (5) Insert dipstick to STOP position. Fabricate dipstick using fabrication instructions in Figure 303.
 - (a) Ensure point of angle is to right if mounting angle of compressor is to the left.
 - (b) Ensure bottom surface of angle is flush with surface of oil filler hole.
- (6) Remove dipstick and count increments of oil. Each mark equals one fluid ounce with compressor in level position.
- (7) Determine correct oil level for mounting angle of compressor. If increments on dipstick do not match table, add or subtract oil to midrange value. For example, if mounting angle of compressor is ten degrees and dipstick is three degrees, add oil in one fluid ounce increments until 7 is read on dipstick. Refer to Table 301.

NOTE: Too much oil in system will greatly reduce the efficiency of system.

Table 301. Oil Level for Mounting Angle.

MOUNTING ANGLE (IN DEGREES)	ACCEPTABLE OIL LEVEL (IN INCREMENTS)
0	3 to 5
10	4 to 6
20	5 to 7
30	6 to 8
40	7 to 9
50	8 to 10
60	8 to 10
90	8 to 10

- (8) Install oil filler plug. Ensure sealing O-ring is not twisted. Torque from 6.0 to 9.0 foot-pounds.

CAUTION: Do not overtighten oil plug to stop a leak. Remove plug and install a new O-ring.

7. Functional Leak Check

A. Air Conditioning System Leak Check. (Refer to Figure 305).

WARNING: Use halogen tester in a well ventilated area to prevent any concentration of poisonous gas being produced. Do not breathe fumes.

NOTE: This test assumes system is not charged. If system is charged, it must be discharged before proceeding.

- (1) Gain access to servicing valves, between pilot and copilot seat, by removing access panel 232AC. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.
- (2) Connect charging manifold to high pressure and low pressure service valves.

- (3) Connect vacuum pump to center charging manifold.
- (4) Turn on vacuum pump and open both hand valves (high and low pressure) on charging manifold.
- (5) Allow pump to run for 15 minutes.
- (6) Shut off both hand valves on charging manifold. Open valve on R12 container. Open both hand valves on charging manifold and allow one pound of Freon into system.
- (7) Shut off both hand valves on charging manifold and disconnect vacuum pump. Connect a dry, high-pressure regulated dry nitrogen source at center connection on charging manifold.
- (8) Slowly open hand valve (low pressure) on charging manifold, while watching high pressure gage. service system from 175 to 200 PSIG. Close hand valve (low pressure) on charging manifold and hose, and disconnect nitrogen supply.
- (9) Record pressure reading from gage and ambient temperature only after airplane has been in hanger a minimum of two hours to allow temperature to stabilize.
- (10) After a minimum of 24 hours, record system pressure and temperature.
 - (a) Depending on final temperature being above or below initial temperature, Refer to charts from Figure 305, add or subtract the delta P to initial pressure reading.
 - (b) Compare adjusted initial pressure with final pressure. If system loss is greater than 10 PSI, a system leak is present and must be corrected.
 - (c) Locate leak using halogen.
 - (d) Repair leak and rerun pressure check with Suds Spray.

NOTE: All instructions for Suds Spray Leak Check are identical to preceding instructions except all fittings shall be sprayed with suds instead of using Halogen leak detector. Refer to steps 7.A.(10) (a) thru 7.A.(10) (c).

B. Install Access Panel.

- (1) Install access panel 232AC between pilot and copilot seat, Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

Figure 301 : Sheet 1 : Typical Air Conditioning Servicing Ports

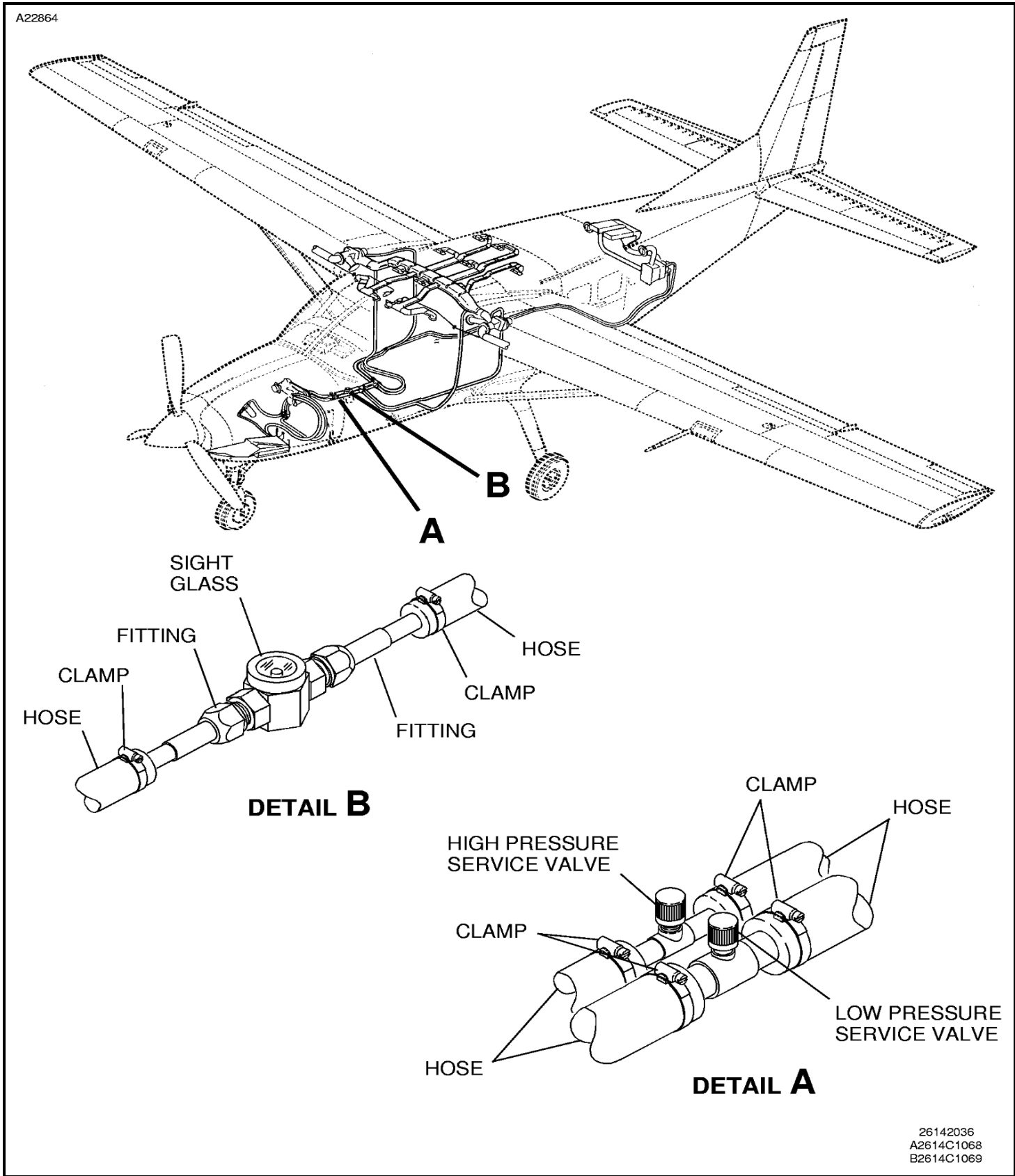
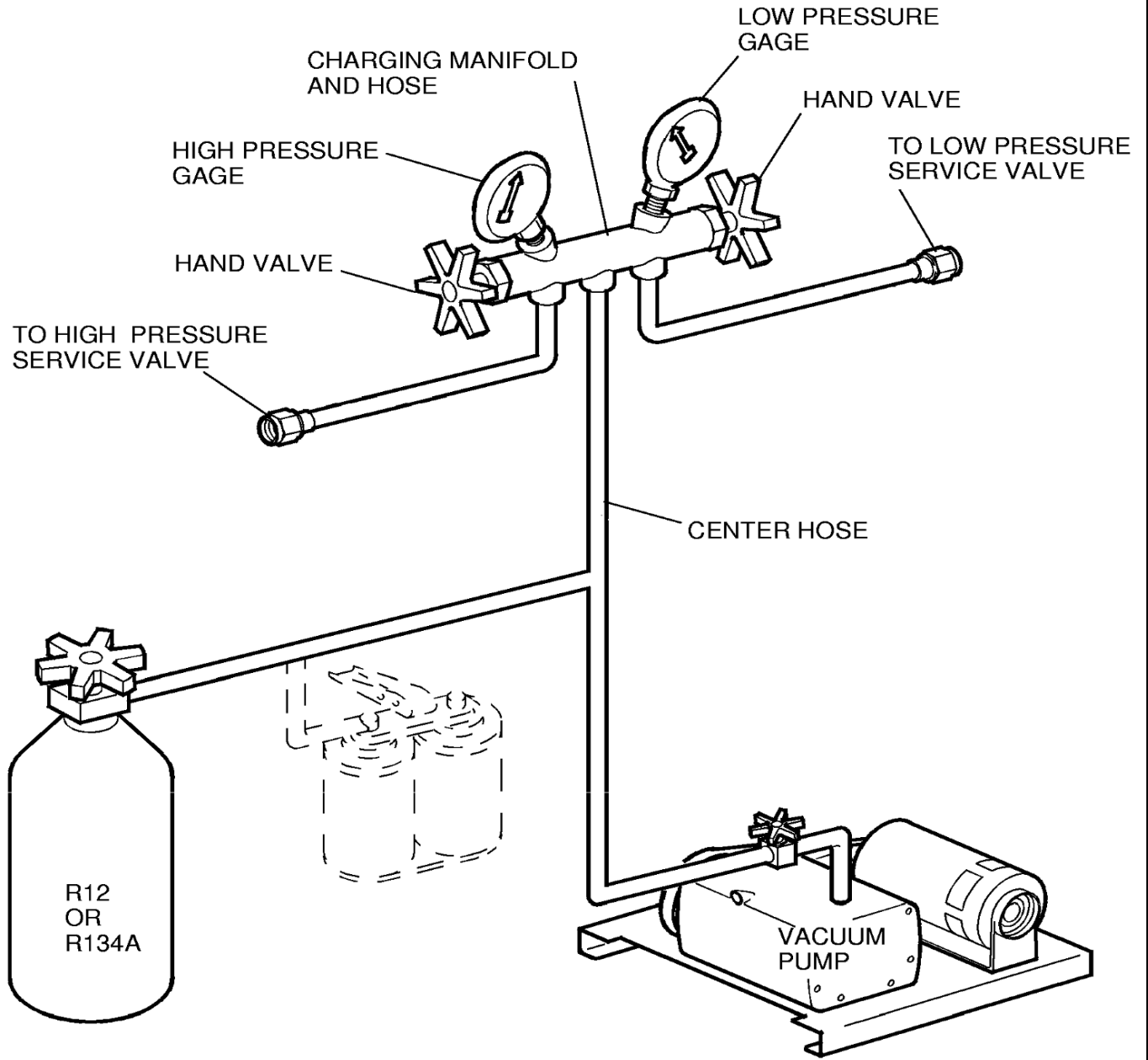


Figure 302 : Sheet 1 : Charging Manifold Connections

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TYPICAL HOOKUP

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Figure 303 : Sheet 1 : Checking Compressor Oil Level

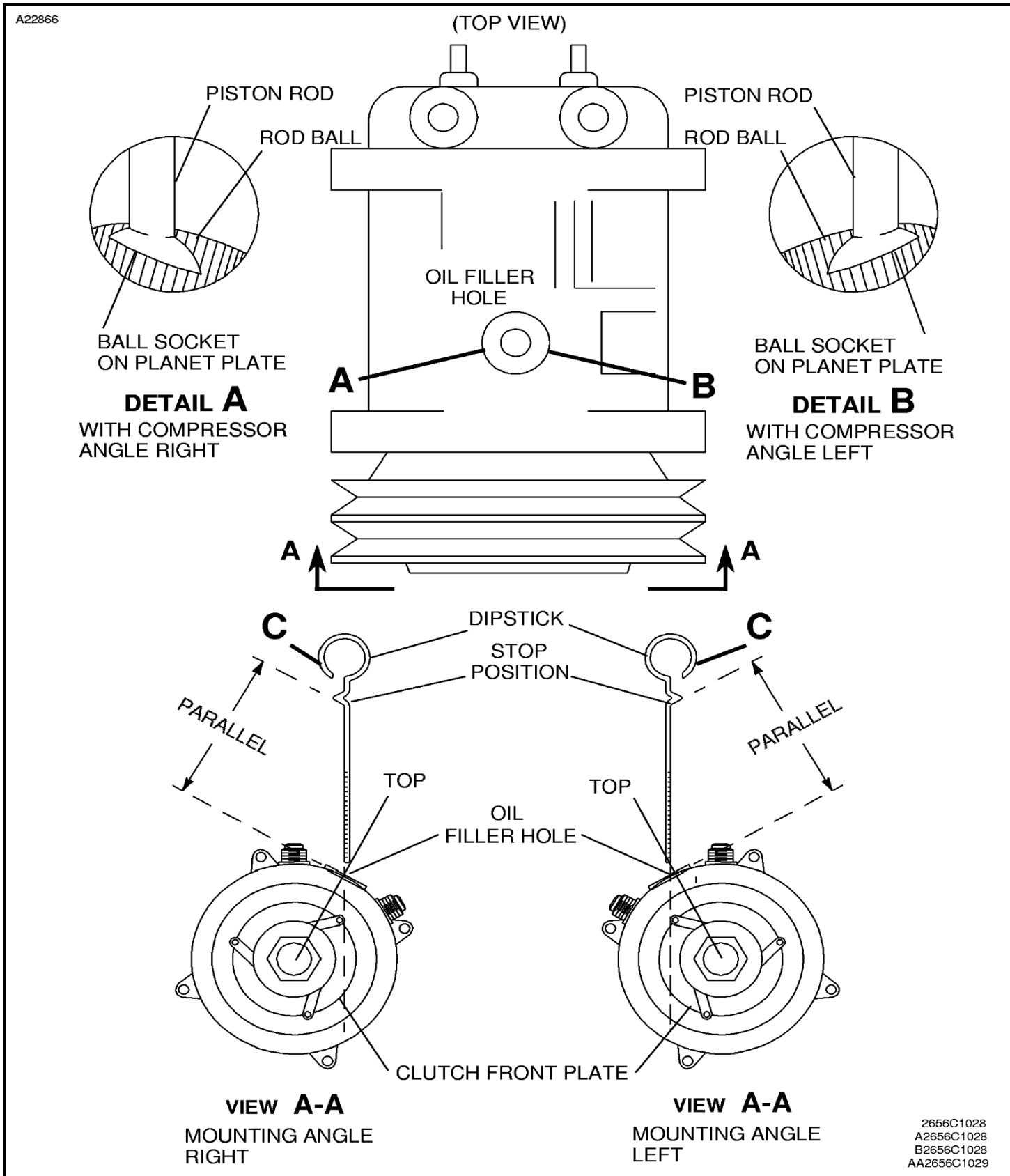
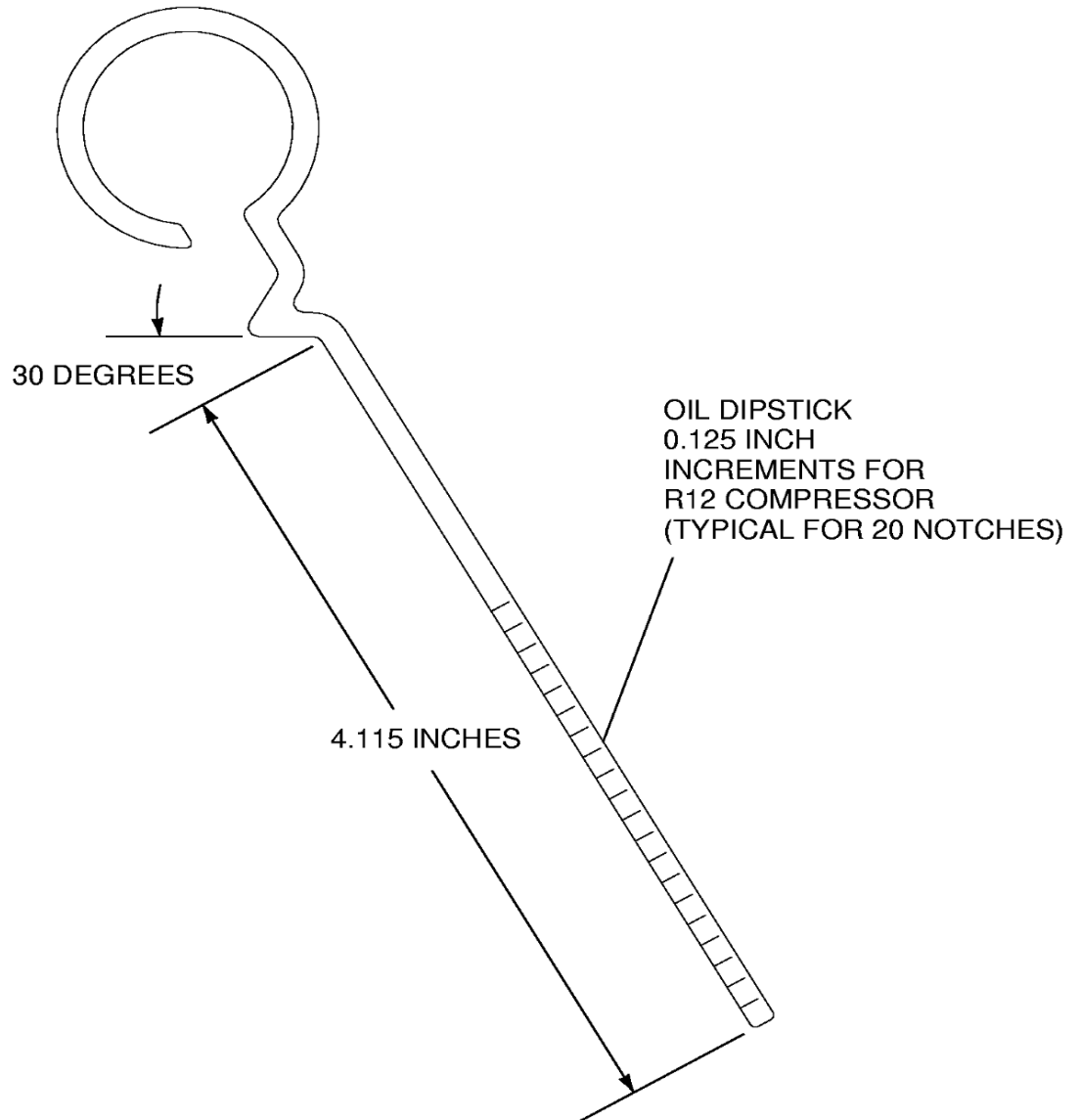


Figure 303 : Sheet 2 : Checking Compressor Oil Level

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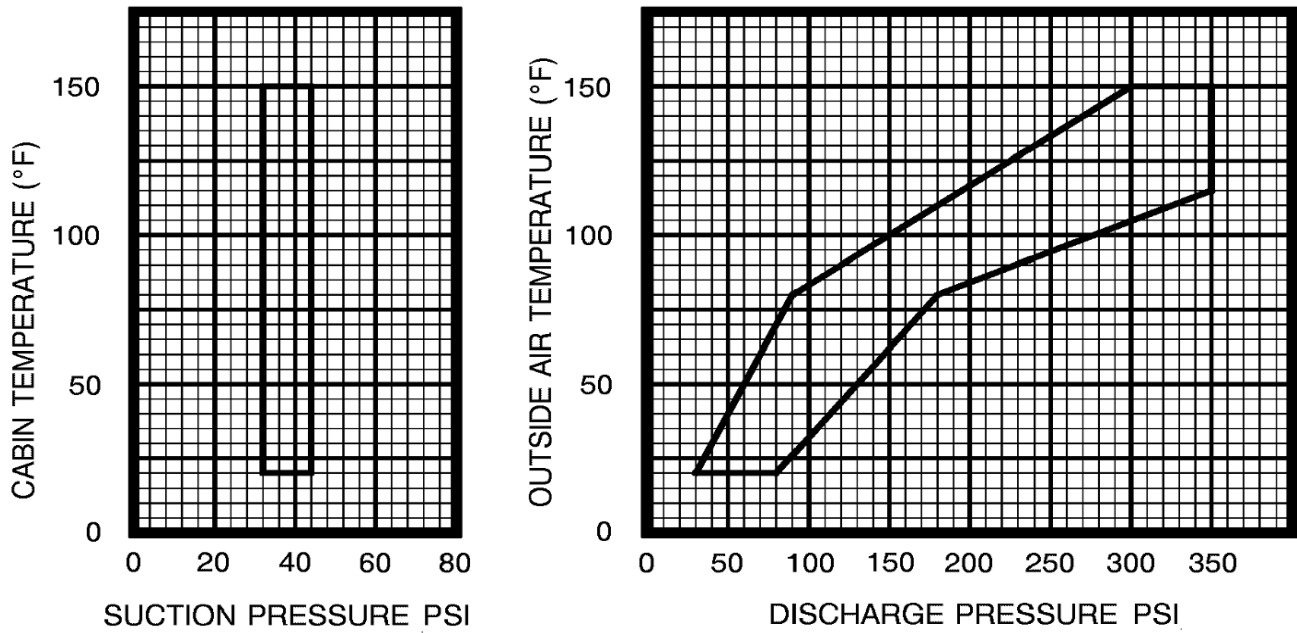
DETAIL C

NOTE: DIPSTICK MAY BE FABRICATED USING DIMENSIONS AS A GUIDE

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Figure 304 : Sheet 1 : Pressure Versus Temperature Chart

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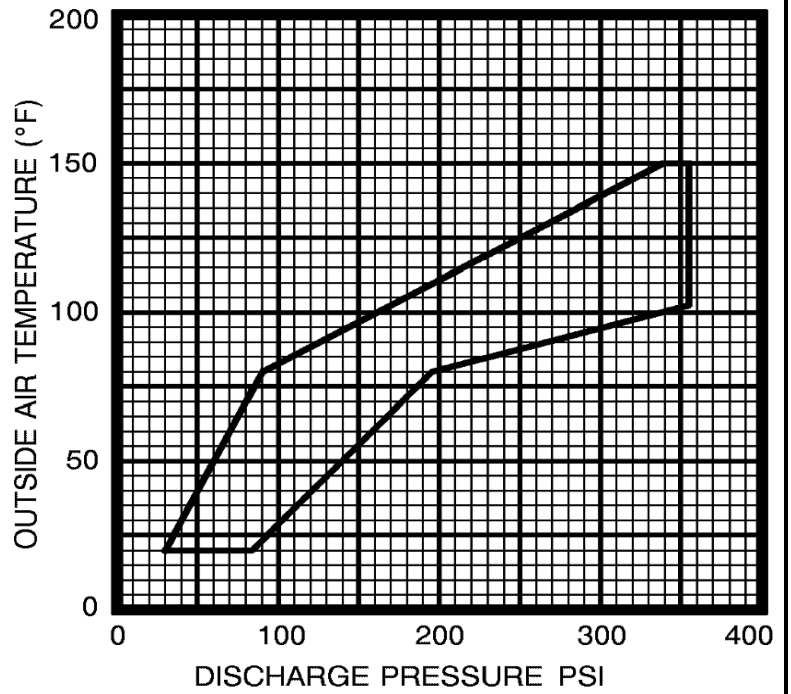
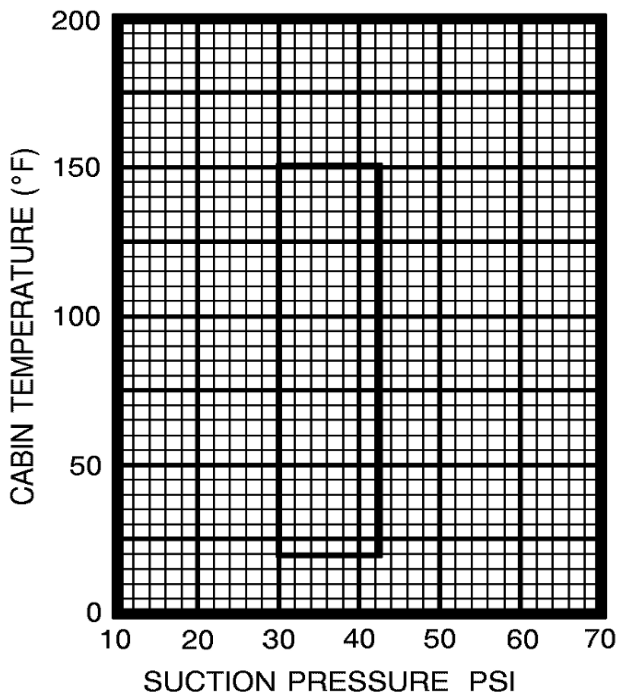


R12 SYSTEM OPERATING PRESSURES

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Figure 304 : Sheet 2 : Pressure Versus Temperature Chart

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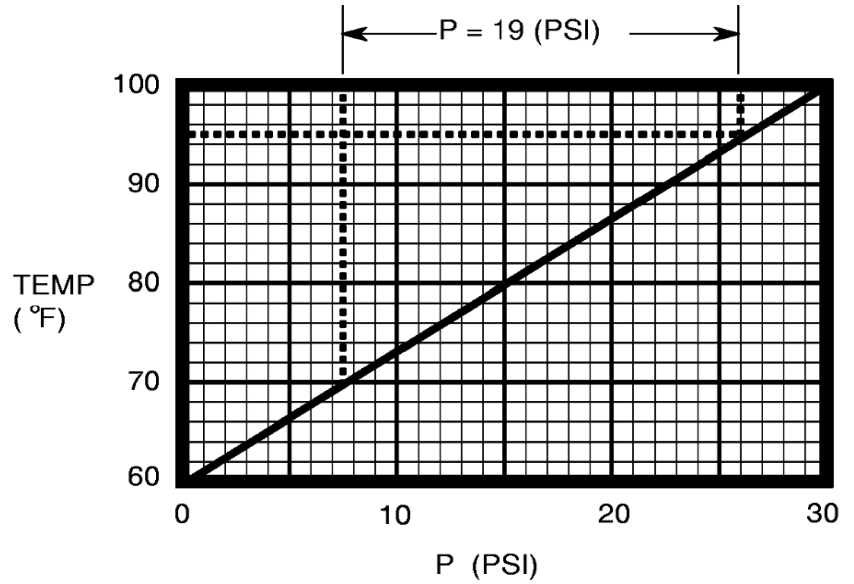


R134A SYSTEM OPERATING PRESSURES

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Figure 305 : Sheet 1 : Temperature and Pressure Chart

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LEGEND

- T₁ = TEMPERATURE AT CHARGE
- T₂ = TEMPERATURE AT CHECK
- P₁ = PRESSURE AT CHARGE
- P₂ = PRESSURE AT CHECK

EXAMPLE:

T₁ = 70 °F
 T₂ = 95 °F
 P₁ = 300 PSI
 P₂ = 305 PSI

P+P₁ = 319 PSI
 319 PSI - P₂ = 14 PSI (INDICATES A LEAK)
 WHERE VALUE OF 0 = NO LEAK

P CAUSED BY TEMPERATURE RISE AFTER CHARGING

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Figure 2 : Sheet 1 : Model 208 Floorboard Access Plates/Panels Identification

