

**R134A AIR CONDITIONING - SERVICING**  
**(Airplanes 20800274 and On and 208B0655 and On)**

**1. General**

A. The airplane may be equipped with R134a 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
Continuity Tester	VOM	Commercially Available	To troubleshoot electrical system.
Ester Refrigerant Oil	Mobile EAL Arctic Series 22	Mobile Oil Corp. Interstate 10 Beaumont, TX 77704	To lubricate compressor, fittings and O-rings.
Leak Detector, Electronic	16500	Robinair Mfg. Corp. 1224 Robinair Way Montpelier, OH 43543-1933	Used to detect refrigerant leaks.
Leak Detector, Suds Spray	Type F	Winton Products Box 36332 Charlotte, NC	Used to detect refrigerant leaks.
Thermometer, Digital Type, 0 to 150 degrees		Commercially Available	Used to check temperature differential.
Dry Nitrogen Regulated, Dry		Commercially Available	Used to check for leaks in system.
Refrigerant	R134a	Commercially Available	Used to charge system.
Robinair Recovery and Recycling Cart	P/N 34700 P/N 34560 with Flushing Kit	Robinair Mfg. Corp. 1224 Robinair Way Montpelier, OH 43543-1933	Used to recover, recycle, recharge and flush with optional flushing kit.
Teflon Tape	0.50 inch wide	Commercially Available	Used to wrap lines.
Tension Gauge	Kent-Moore BT-33-73F	Commercially Available	Used to check belt tension.
Tensiometer	Gates 150 (17599H)	Gates Rubber Co. 2707 W. Douglas Wichita, KS 67213	Used to check belt tension.
Compressor Oil Dipstick	32447	Sanden International 10710 Sanden Drive Dallas, TX 75328	Used to check compressor oil level.
Acme Union, 1/4 inch		Commercially Available	Used to connect regulated nitrogen.
Machinists Universal Level		Commercially Available	Used to check mounting angle of compressor on airplane.
Power Supply 28 VDC, 200 Amp minimum.		Commercially Available	Used to provide power.

**3. General Precautions**

A. R134a Refrigerant Handling

**WARNING: Observe safety precautions when handling refrigerant or servicing and performing maintenance**

on air conditioning system. Care must be taken to minimize release of refrigerant into the atmosphere. The Environmental Protection Agency (EPA) requires recycling/recovery of 134A as of 11/15/95. All reclamation and recovery equipment must be EPA and UL listed. Use R134A reclamation system per manufacturers instructions, whenever evacuating system.

**WARNING:** Liquid refrigerants, at normal atmospheric pressure and temperature, will expand and absorb heat. As a result, it will freeze anything it contacts. Use of protective clothing, gloves, and goggles will protect skin and eyes. Eyes are especially susceptible to damage, so safety glasses are an absolute minimum protection. Goggles are the preferred method of protection and should be worn at all times when servicing system.

**WARNING:** Should any liquid 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. Do not attempt to treat yourself.

- (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 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, or use excessive amounts of heat on or in immediate area of any part of the air conditioning system or a refrigerant supply tank, while they are close to atmosphere, charged or not.

E. Use of Nitrogen.

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

4. Compressor Lubrication

**NOTE:** Compressors are shipped from factory with the PAG oil. The original oil must be drained from the compressor and then replaced with the ester based refrigerant oil.

**NOTE:** Do not, at any time, leave oil container standing open. Keep cap on tight, as exposed refrigerant oil absorbs moisture rapidly.

**NOTE:** Oil is needed to lubricate the seals, gaskets and other parts of the compressor. A small amount of oil is circulated through the system with the refrigerant and is necessary to keep the expansion valve functioning properly. The 208 airplane system requires 11 fluid ounces of oil.

5. System Evacuating

A. Evacuation of 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 service 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) Remove cap from service valve on high pressure side of system and connect high pressure hose (red) of the charging manifold.

- (3) Remove cap from the service valve on low pressure side of system and connect the low pressure hose (blue) of the charging manifold.
- (4) Connect vacuum hose (yellow) to center of charging manifold.
- (5) Open high and low pressure valves on charging manifold and valve to the vacuum pump.
- (6) Start vacuum pump to begin evacuation of system.
- (7) Observe low pressure gage needle. It should pull down into a slight vacuum. After about five minutes, low pressure gage should be below 20.00 inches of mercury and the high pressure gage should be slightly below the zero index on the gage.

**NOTE:** If high pressure does not drop below zero, a blocked line is indicated. If blocked, then stop evacuation and repair or remove obstruction.

- (8) Operate vacuum pump for 15 minutes and observe gage. Gage should be down to 27 inches of mercury. Hold vacuum for at least 30 minutes and observe gage. If the gage rises it indicates a leak that will need repair.
- (9) If no leak is indicated, charge the system Refer to step 6.B.

## 6. 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.

**WARNING:** Extreme care must be taken when discharging refrigerant from system. Discharging must be done very slowly. Gloves and goggles should be worn for protection.

- (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 service valves.
- (3) Use hose from center port of charging manifold to discharge refrigerant into a container to catch oil.
- (4) Open high pressure manifold valve slowly to bleed off refrigerant and oil into container without splattering.
- (5) As pressure drops, valve may be opened for faster discharge.
- (6) Close valve when pressure drops below 5-10 psi so no air enters system, unless a component must be replaced which necessitates complete bleed down.
- (7) Observe amount of oil caught in container. If amount is approximately a tablespoon or less, disregard loss. If it is more than one tablespoon, add like amount in compressor at fill nut.
- (8) Install access panel 232AC.

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

**NOTE:** Refer to paragraphs on handling refrigerant and removing hoses under pressure for safety precautions. Charging manifold and hoses must be free of contamination.

- (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.

**NOTE:** Ensure system has been evacuated per step 5.A, attaining 25-27 in. Hg within 15 minutes and maintaining vacuum for 30 minutes after vacuum pump is shut off. If either criteria is not met, a leak is indicated and system must be leak checked per step 8.A. before being re-evacuated.

- (2) Following the servicing instructions, replace any oil that was vented during the leak test procedure.

**NOTE:** Do not add more oil than was vented. Too much oil in the system can deteriorate cooling performance of evaporators. If compressor was drained, refer to Chapter 21, R134a Air Conditioning - Maintenance Practices, for compressor lubrication.

**WARNING:** Do not allow a slug of liquid into system by tilting refrigerant container on its side, because it could damage the system

- (3) Connect charging manifold hoses to low and high pressure servicing valves. Refer to Figure 301 and Figure 302.
- (4) Place refrigerant container on scales. Connect R134a container to center of manifold and open valve on R134a container.
- (5) Open center hose at manifold gage set for five seconds to purge hose of air. System is now purged and under a

vacuum.

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

- (6) Ensure both high and low side manifold hand valves are closed.
- (7) Using a qualified assistant, start engine and adjust to ground idle.
- (8) Adjust air conditioning controls for maximum cooling, and blower on HIGH setting.
- (9) With refrigerant in an upright position, open low side manifold and allow 5.5 pounds of R134a gas to enter system. A normal fully charged system will require a charge between 5.5 and 7 pounds of refrigerant.

**WARNING: Do not overcharge system or component or system damage may occur.**

- (10) With system fully charged and operating, observe the suction and discharge pressure. Pressure will vary with air temperature. Refer to Figure 304.
- (11) Allow system to operate for 10 minutes and then shut down.

**NOTE: After shutdown, both suction and discharge pressures will immediately start equalizing. Pressures should be equal after a maximum of six minutes.**

- (12) Turn off system and replace caps on service valves.
- (13) Reinstall access 232AC. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation.

## 7. 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 machinists universal level, across flat surfaces of compressors 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.**

## 8. Functional Leak Check

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

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

**NOTE:** The refrigeration system must be checked after assembly and prior to charging the system if vacuum cannot be held during evacuation. Due to installation of the aircraft interior, it may be necessary to leak test the refrigerant lines aft of the firewall before the entire system is checked. Refrigerant lines penetrating the firewall must be securely plugged or capped to leak test aft portion of aircraft.

- (1) If a leak is indicated during evacuation, relieve the vacuum in system and disconnect the service cart. If desired, allow approximately 1/4 lb. of R134a to enter system per the service cart instructions before relieving the vacuum from the system in order to enable the use of an electronic leak detector during the leak check.

**CAUTION:** Service cart must be disconnected before the system is pressurized with nitrogen. If it is not disconnected, service cart could be damaged.

**CAUTION:** Do not use any leak dye in the system, or damage to expansion valves or compressor may result.

- (2) 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.
- (3) Connect regulated dry nitrogen to the high pressure side of the system.
- (4) Open valve at service coupling end of hose and slowly regulate nitrogen into system to pressure of 350-400 psig maximum. Allow the high and low sides to stabilize to the same pressure.

**CAUTION:** Regulate nitrogen into system slowly to maintain control of pressure. With high pressures obtainable from nitrogen bottles, over pressurizing system is possible which would result in system damage.

- (5) Apply suds leak detector to all system connections. An electronic leak detector can be used if 1/4 lb. of R134a was introduced into the system per step 8.A.(1).

**NOTE:** The electronic leak detector is very sensitive to refrigerant leaks. Residual refrigerant vapors in the area may set off the instrument prematurely. Therefore, be sure the area is clear of all vapors. A high pressure air purge (blow gun) usually clears an area of residual vapors.

- (6) Repair leaks and rerun leak test. The high pressure gage may also be monitored for continuing drop in system pressure indicating a leak still existed. Note slight variations in pressure may be caused by temperature changes.

**NOTE:** Do not over tighten plumbing connections. Stripped threads may result.

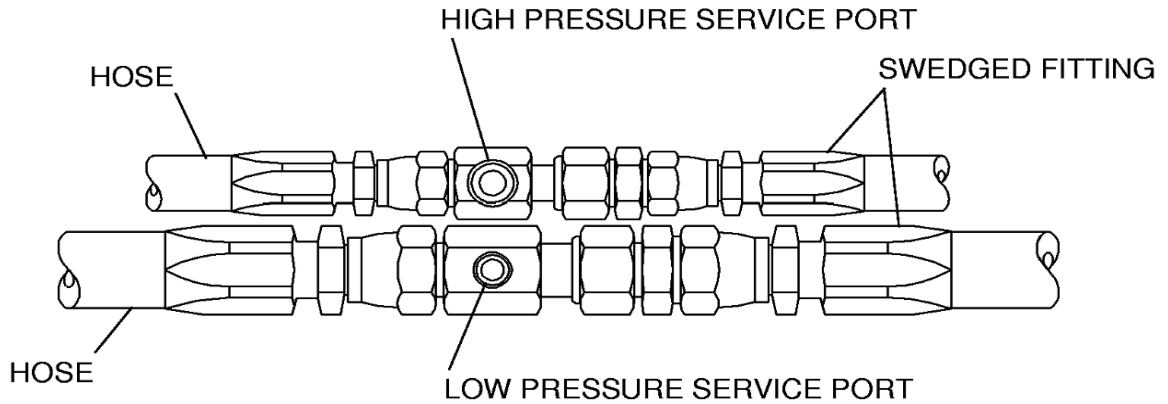
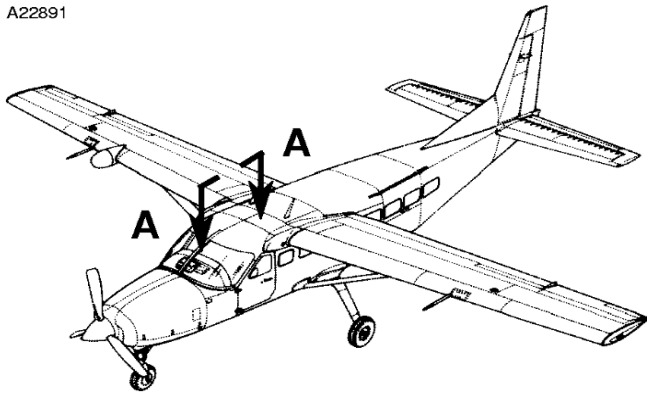
B. After all leaks are repaired, vent nitrogen pressure by closing valve on high pressure side service coupler and adjusting the regulator on nitrogen to 0 psig, allowing hose to service coupler to vent. Disconnect high pressure hose at adapter tee and slowly open valve on high side service coupler to allow the nitrogen to vent from system.

C. 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 : R134a Air Conditioning Servicing Ports

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VIEW A-A

**NOTE 1:** AIRPLANES  
2080274 AND ON  
AND 208B0655 AND  
ON

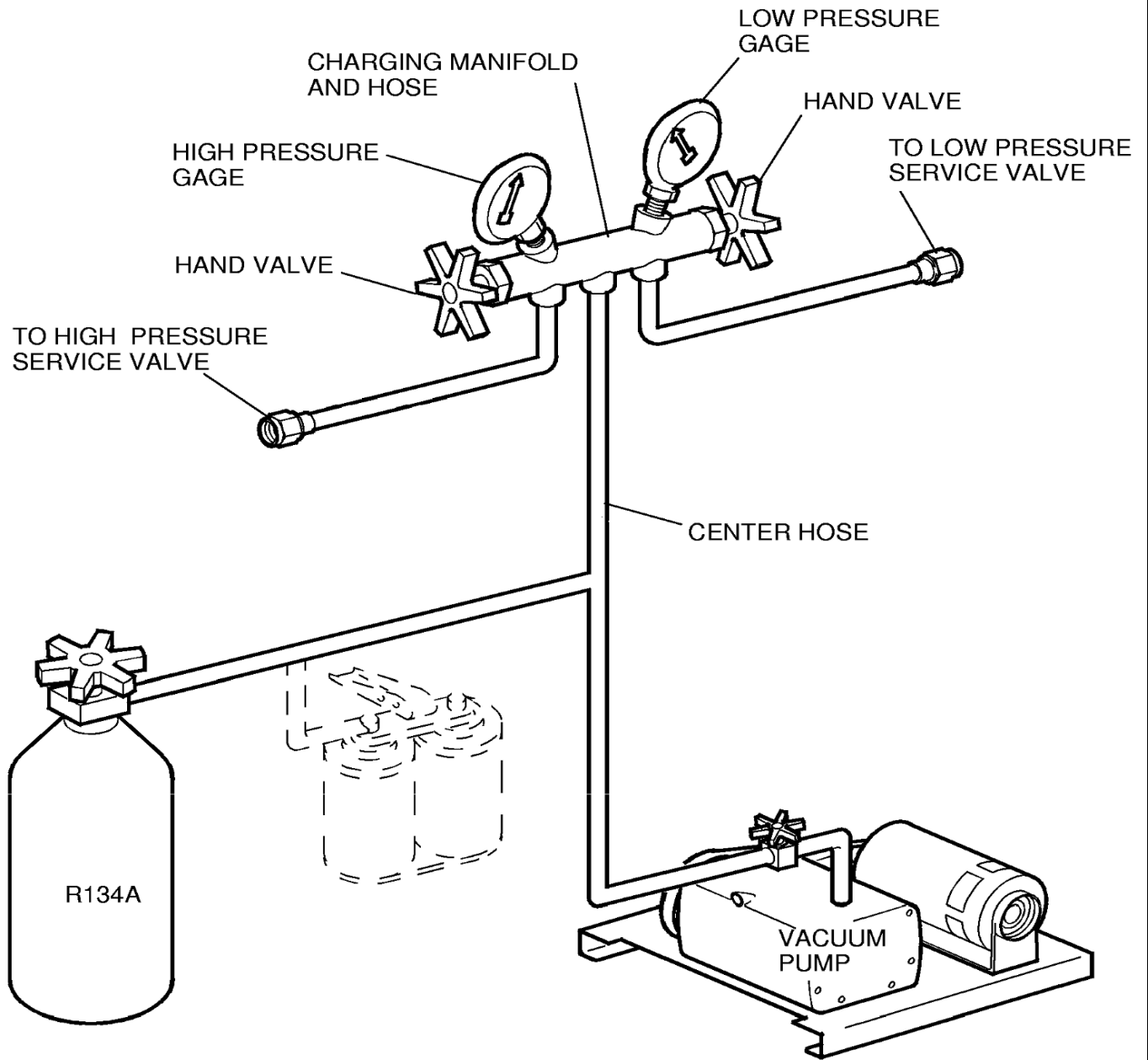
**NOTE 2:** ACCESS TO SERVICE PORTS  
IS UNDER PANEL 232AC LOCATED  
BETWEEN THE PILOT 251S SEATS

MODEL 208 AND 208B PASSENGER

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Figure 302 : Sheet 1 : R134a Charging Manifold Connections

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TYPICAL HOOKUP

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Figure 303 : Sheet 1 : R134a Compressor Oil Level Check

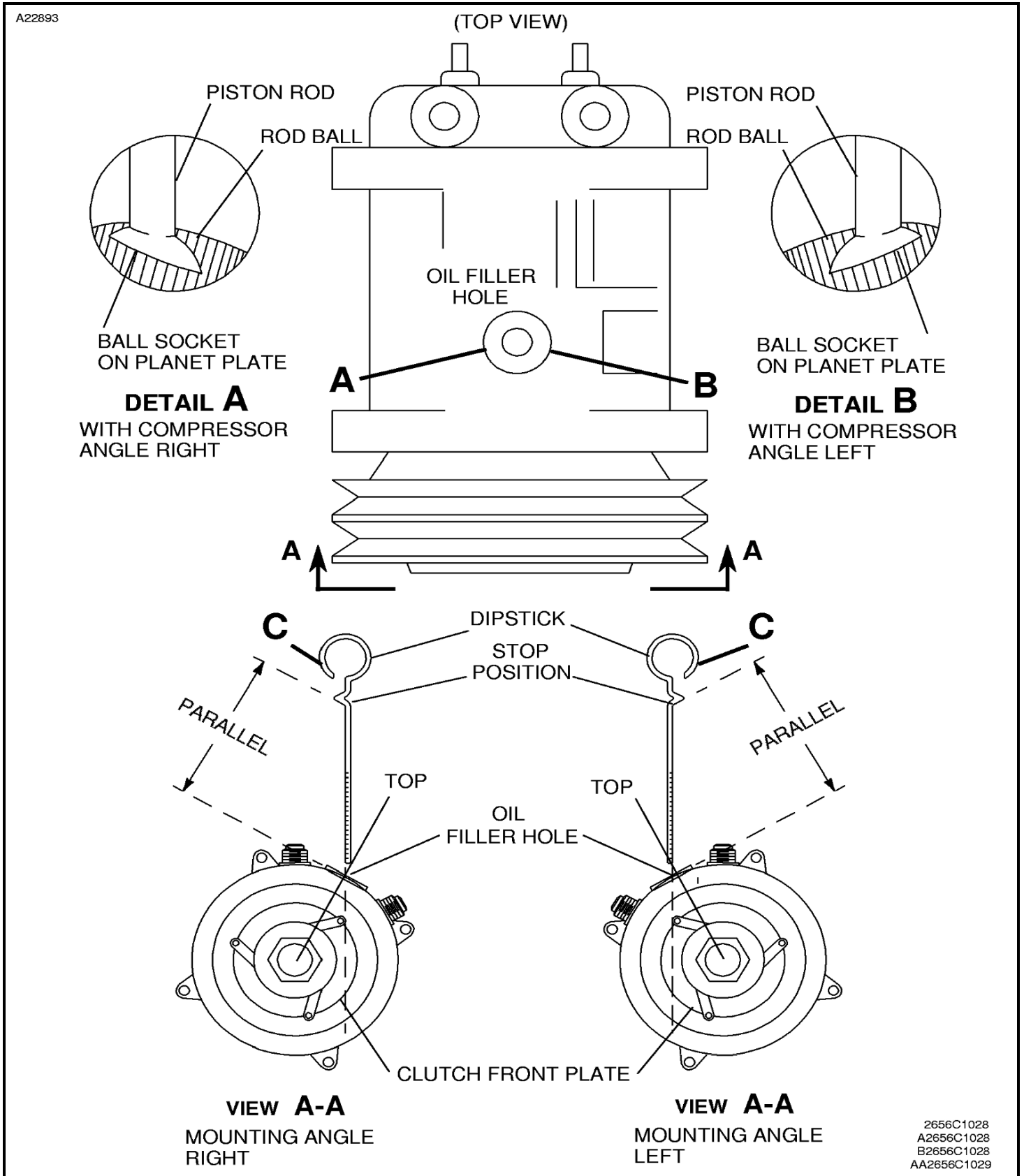
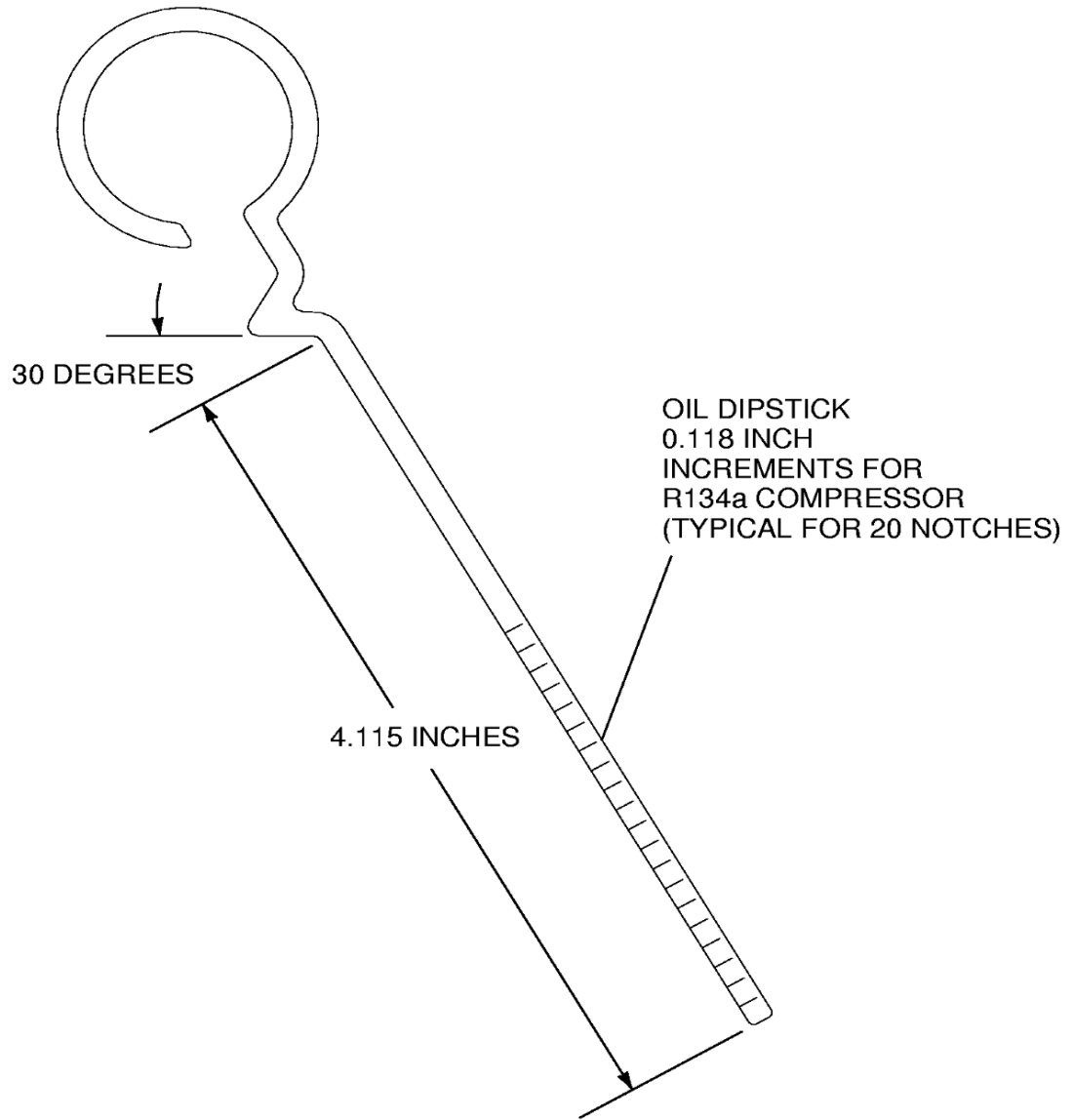




Figure 303 : Sheet 2 : R134a Compressor Oil Level Check

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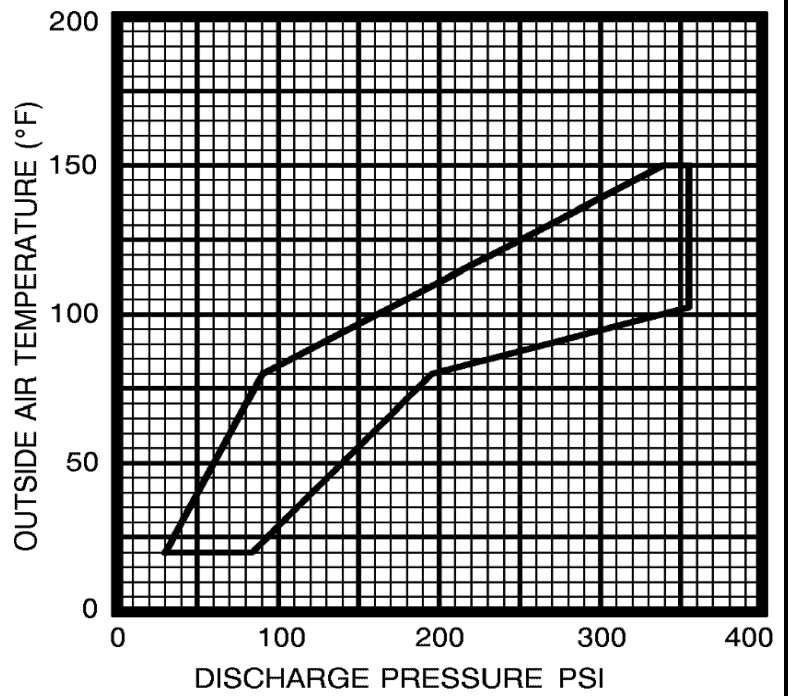
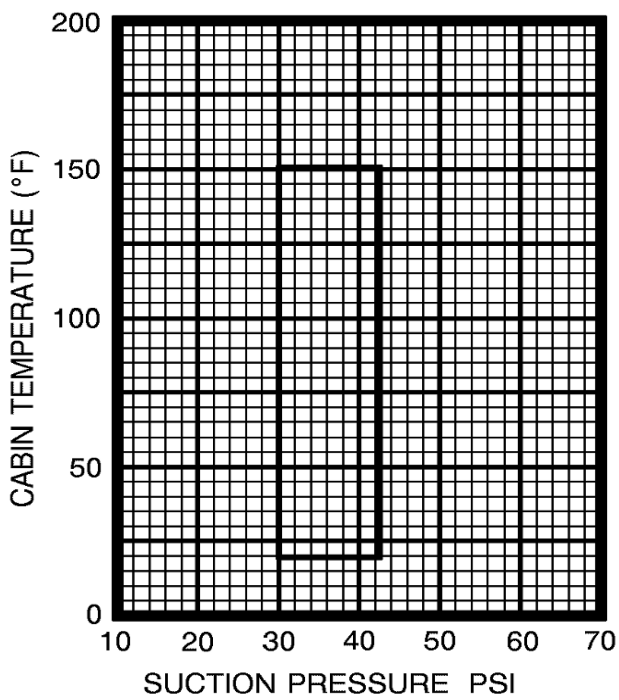
**DETAIL C**

**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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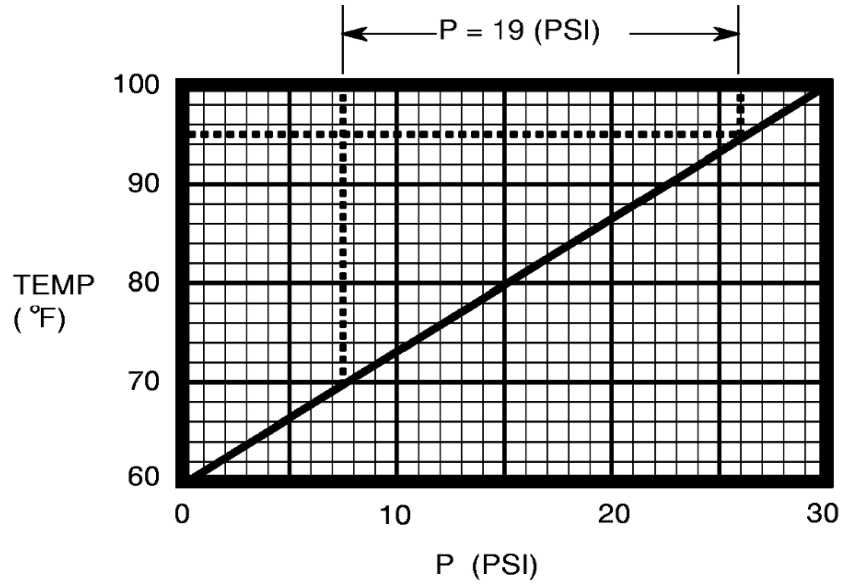


R134A SYSTEM OPERATING PRESSURES

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 2614C1234

Figure 305 : Sheet 1 : R134a Temperature and Pressure Chart

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**LEGEND**

- T<sub>1</sub> = TEMPERATURE AT CHARGE
- T<sub>2</sub> = TEMPERATURE AT CHECK
- P<sub>1</sub> = PRESSURE AT CHARGE
- P<sub>2</sub> = PRESSURE AT CHECK

**EXAMPLE:**

T<sub>1</sub> = 70 °F  
 T<sub>2</sub> = 95 °F  
 P<sub>1</sub> = 300 PSI  
 P<sub>2</sub> = 305 PSI

P+P<sub>1</sub> = 319 PSI  
 319 PSI - P<sub>2</sub> = 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

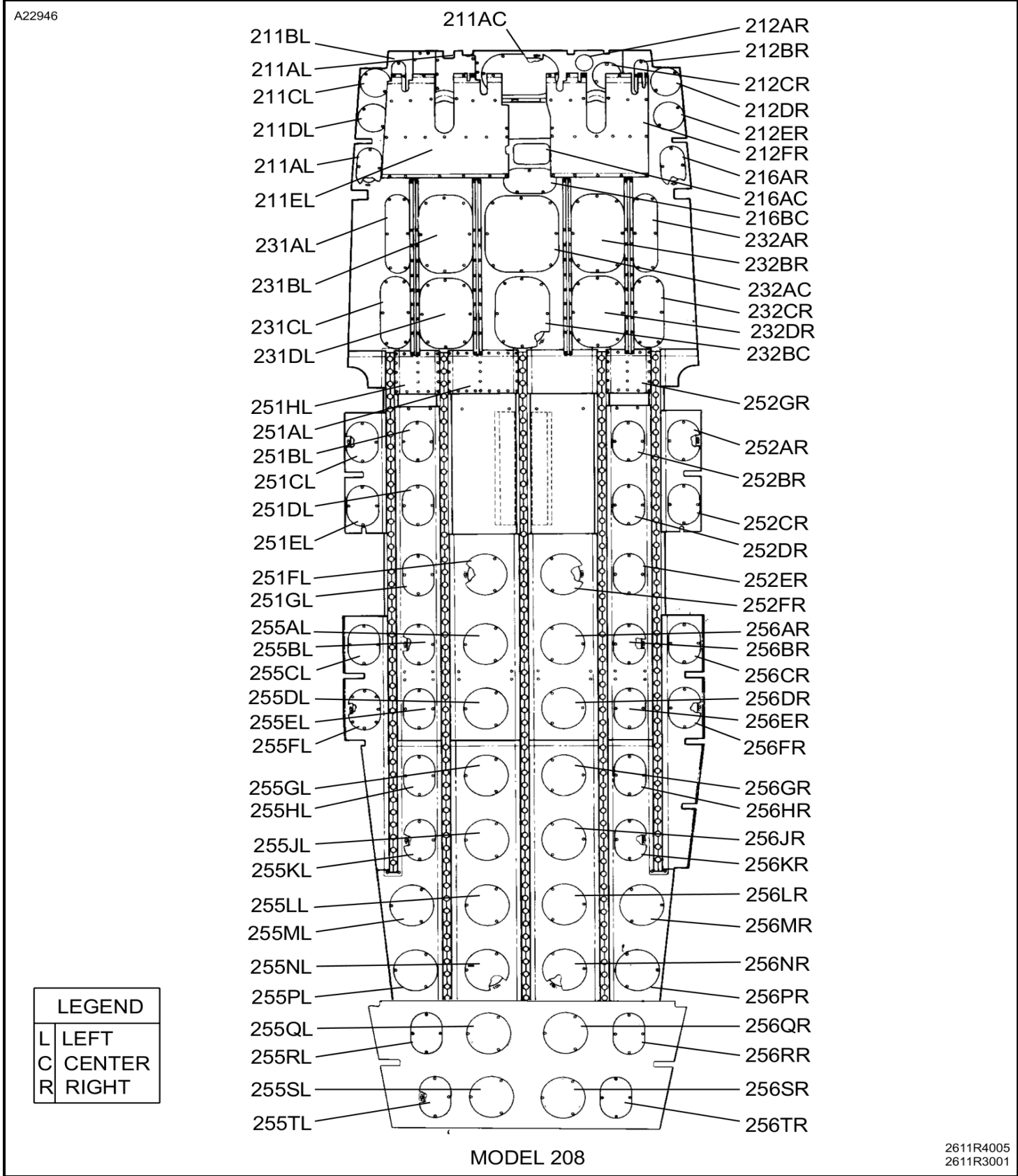
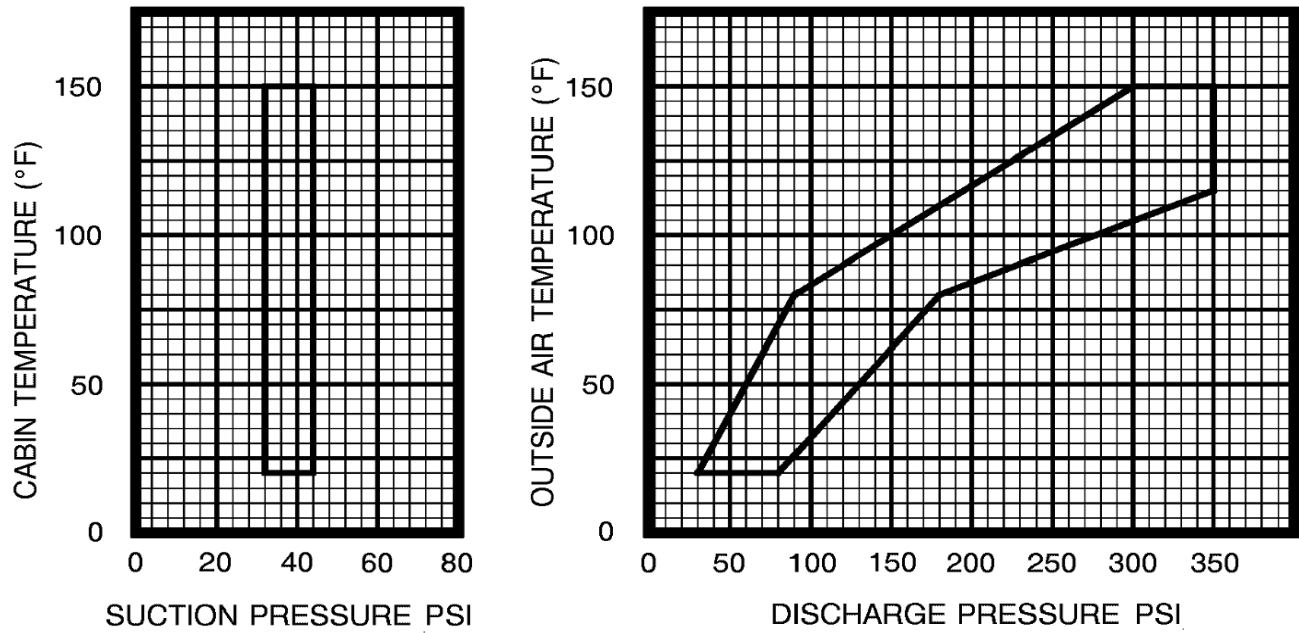


Figure 304 : Sheet 1 : Pressure Versus Temperature Chart

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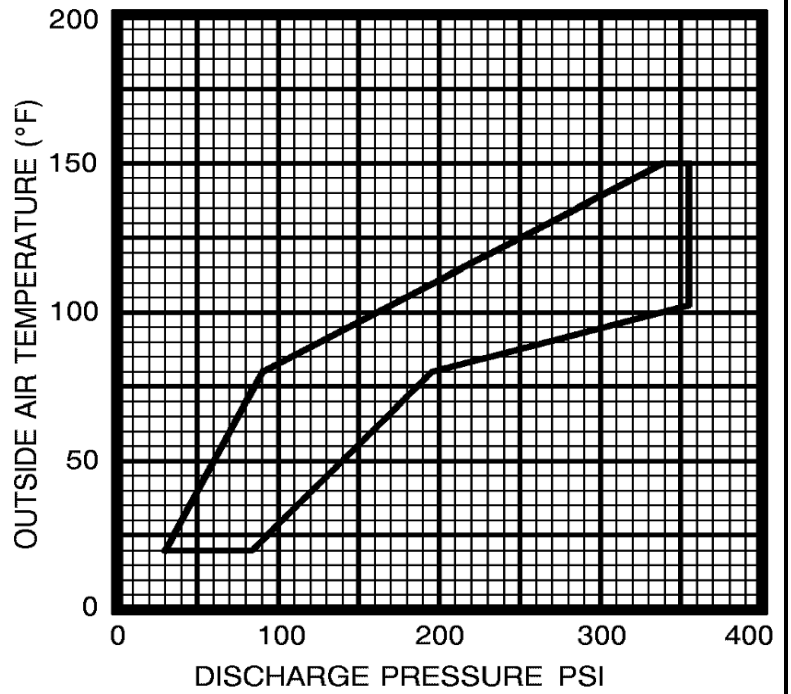
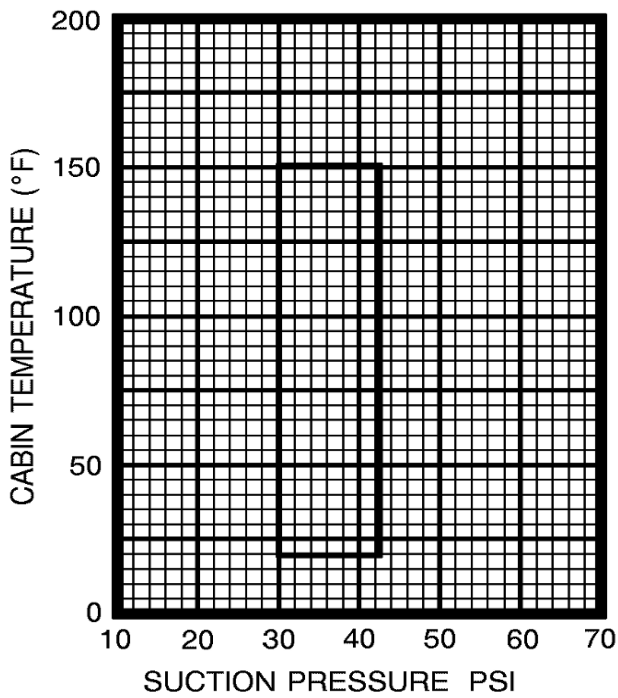


R12 SYSTEM OPERATING PRESSURES

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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 301 : Sheet 1 : Typical Air Conditioning Servicing Ports

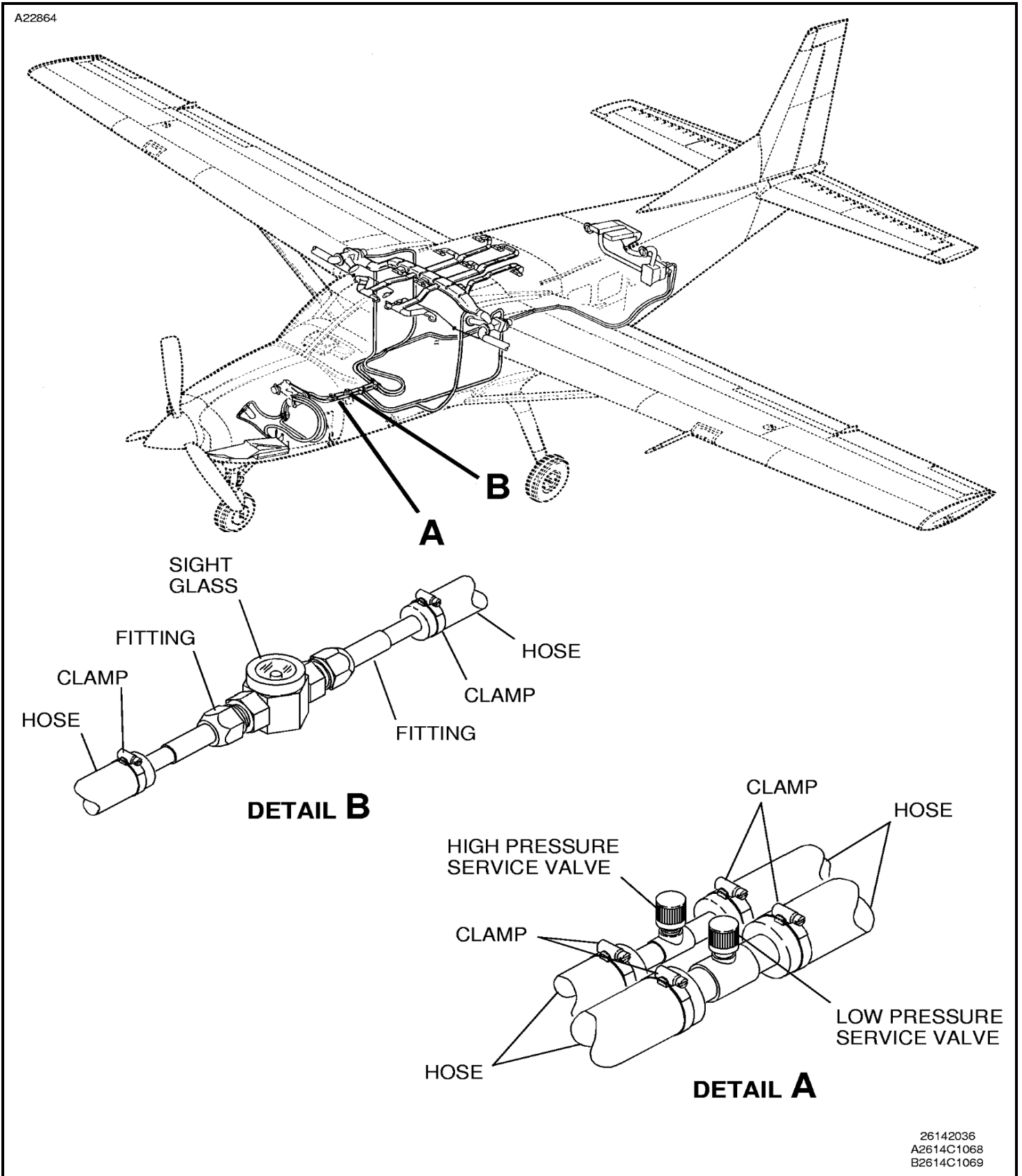
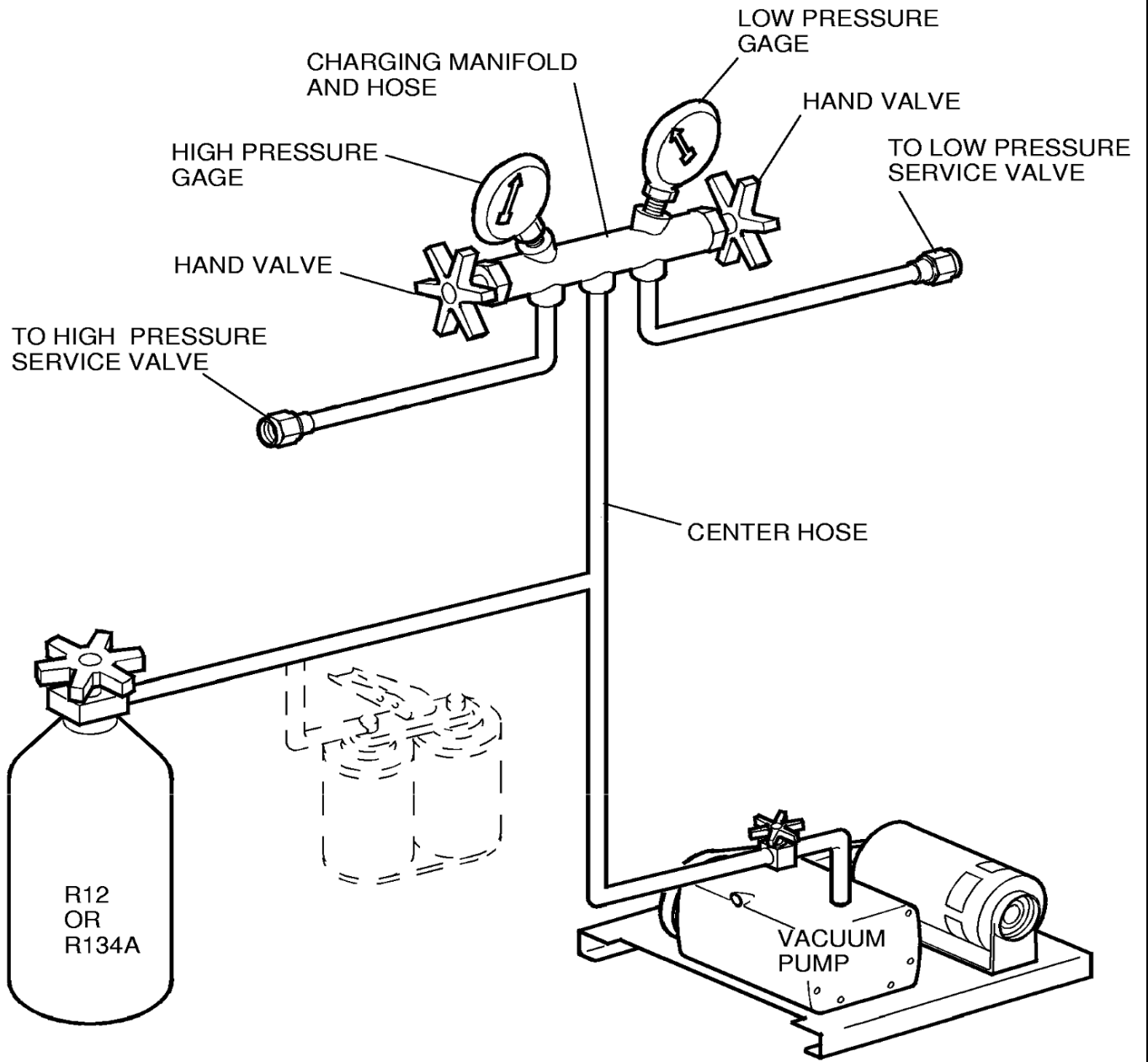


Figure 302 : Sheet 1 : Charging Manifold Connections

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TYPICAL HOOKUP

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