A/C SYSTEM GENERAL SERVICING

1993 Jeep Cherokee

1993 GENERAL SERVICING
General Servicing Procedures

Jeep

USING R-12 & R-134a REFRIGERANT

HANDLING/SAFETY PRECAUTIONS

1) Always work in a well-ventilated, clean area. Refrigerant (R-12 or R-134a) is colorless and invisible as a gas. Refrigerant is heavier than oxygen and will displace oxygen in a confined area. Avoid breathing refrigerant vapors. Exposure may irritate eyes, nose and throat.

2) The system's high pressure can cause severe injury to eyes and skin if a hose were to burst. Always wear eye protection when working around A/C system and refrigerant. If necessary, wear rubber gloves or other protective clothing.

3) Refrigerant evaporates quickly when exposed to atmosphere, freezing anything it contacts. If liquid refrigerant contacts eyes or skin (frostbite), DO NOT rub eyes or skin. Immediately flush affected area with cool water for 15 minutes and consult a doctor or hospital.

4) Never use R-134a in combination with compressed air for leak testing. Pressurized R-134a in the presence of oxygen (air concentrations greater than 60 percent by volume) may form a combustible mixture. DO NOT introduce compressed air into R-134a containers (full or empty), A/C system components, or service equipment.

5) DO NOT expose A/C system components to high temperatures (steam cleaning for example) as excessive heat will cause refrigerant/system pressure to increase. Never expose refrigerant directly to open flame. If refrigerant needs to be warmed, place bottom of refrigerant tank in warm water. Water temperature MUST NOT exceed 125°F (52°C).

6) Use care when handling refrigerant containers. DO NOT drop, strike, puncture, or incinerate containers. Use Department Of Transportation (DOT) approved (DOT 4BW or DOT 4BA) refrigerant containers.

7) Never overfill refrigerant containers. The safe filling level of a refrigerant container MUST NOT exceed 60% of the container's gross weight rating. Store refrigerant containers below 125°F (52°C).

8) Freon (R-12) will be sold and stored in White colored containers, while R-134a refrigerant will be sold and stored in 30 or 50 pound Light Blue containers.

9) Refrigerant R-12 and R-134a must never be mixed, as they and their desiccants and lubricants are not compatible. If the refrigerants are mixed, system cross-contamination or A/C system component failure may occur. Always use separate servicing and refrigerant recovery/recycling equipment.

10) Read and follow equipment manufacturer's instructions for all service equipment to be used. The Material Safety Data Sheet (MSDS), provided by refrigerant manufacturer/suppliers, contains valuable information regarding the safe handling of R-12 or R-134a refrigerants.

CAUTION: Keep work areas ventilated, and avoid operating engines near work area.

IDENTIFYING R-134a SYSTEMS & COMPONENTS

To prevent refrigerant cross-contamination, use following methods to identify R-134a based systems and components.

Fittings & "O" Rings

All R-134a based A/C systems use 1/2" - 16 ACME threaded fittings (identifiable by square threads) and quick-connect service couplings. See Fig. 1.

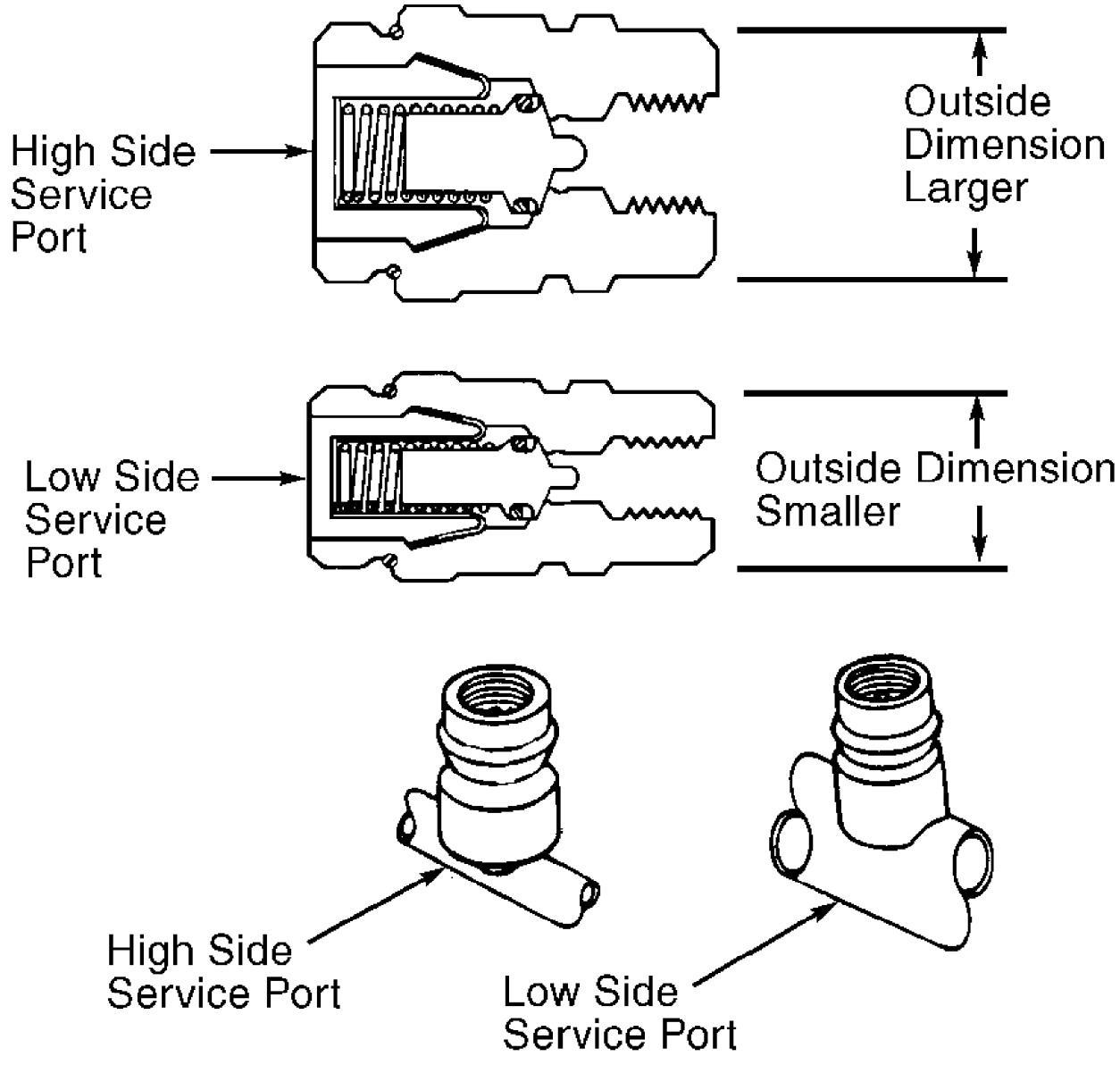

Fig. 1: Identifying R-134a Service Couplings
Courtesy of Chrysler Corp.

Underhood A/C Specification Labels

Most R-134a based systems will be identified through the use

of underhood labels with R-134a refrigerant clearly printed on labels. See Fig. 2. The underhood label used on Ford Motor Co. vehicles is Yellow. Most manufacturers will identify refrigerant type with labels affixed to compressor. Before servicing an A/C system, always determine which refrigerant is being used.

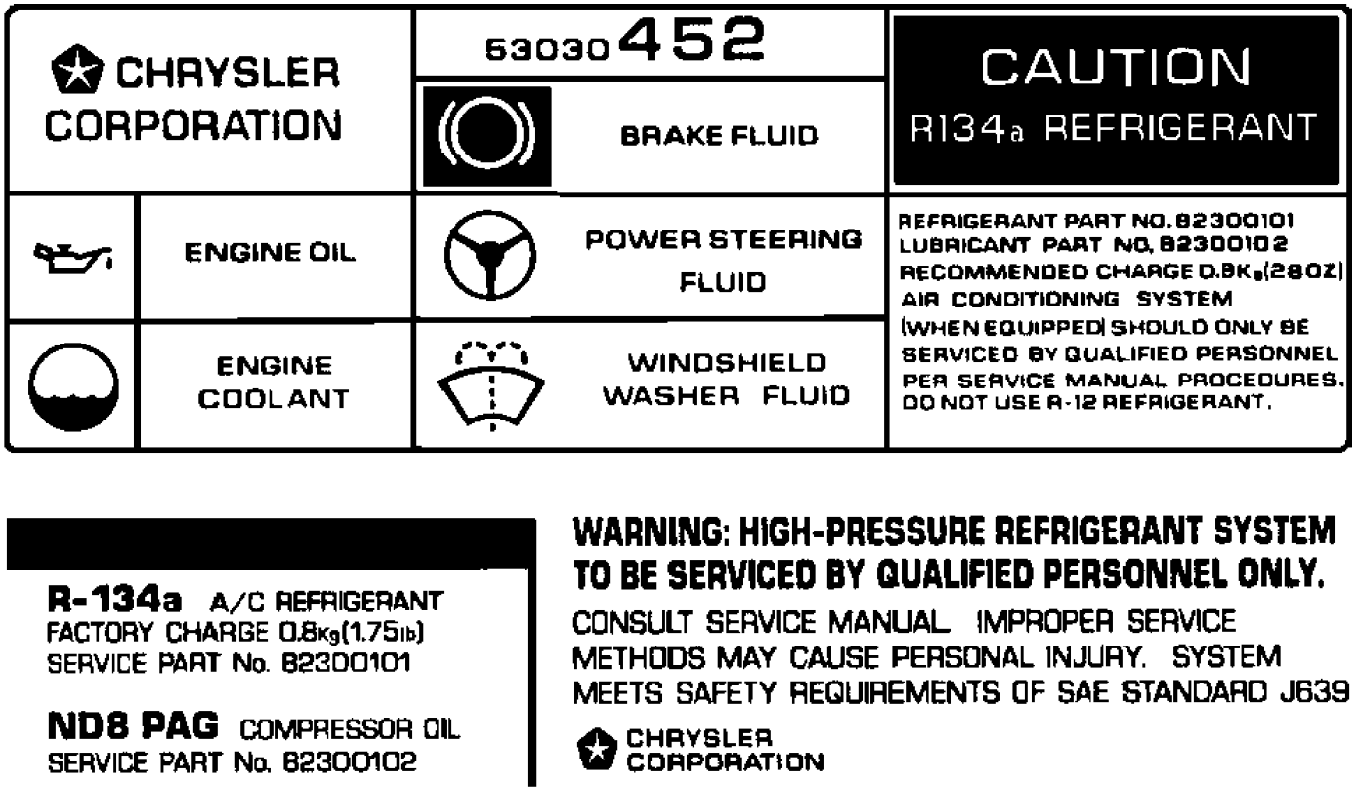

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Fig. 2: Underhood Refrigerant Identification Labels (Chrysler) Courtesy of Chrysler Corp.

Other Means Of Identification

Refrigerant R-134a, when viewed through a sight glass, may have a "milky" appearance due to the mixture of refrigerant and lubricating oil. As the refrigerant and oil DO NOT exhibit a "clear" sight glass on a properly charged A/C system, most R-134a systems have no sight glass.

REFRIGERANT OILS

Refrigerant R-12 based systems use mineral oil, while R-134a systems use synthetic/Polyalkylene Glycol (PAG) oils. Using a mineral oil based lubricant with R-134a will result in A/C compressor failure due to lack of proper lubrication.

Use only specified oil for the appropriate system and A/C compressor. Always check the underhood A/C specification label or A/C compressor label before adding refrigerant oil to A/C compressor/system. See Fig. 2. The following R-134a refrigerant oils are currently available.

Jeep

Use PAG (ND8) Refrigerant Oil (Part No. 82300102).

NOTE: Synthetic/PAG oils absorb moisture very rapidly, 2.3-5.6% by weight, as compared to a mineral oil absorption rate of .005% by weight.

SERVICE EQUIPMENT

NOTE: Ensure "O" rings are designed for use with specified refrigerant. Deterioration of "O" rings and system contamination will result if incorrect "O" rings are used.

Because R-134a is not interchangeable with R-12, separate sets of hoses, gauges and recovery/recycling equipment are required to service vehicles. This is necessary to avoid cross-contamination and damaging system.

All equipment used to service systems using R-134a must meet SAE standard J1991. The service hoses on the manifold gauge set must have manual (turn wheel) or automatic back-flow valves at the service port connector ends. This will prevent refrigerant from being released into the atmosphere.

For identification purposes, R-134a service hoses must have a Black stripe along their length and be clearly labeled SAE J2196/R-134a. The low pressure test hose is Blue with a Black stripe. The high pressure test hose is Red with a Black stripe. The center test hose is Yellow with a Black stripe.

NOTE: Refrigerant R-12 service hoses will ONLY be labeled SAE J2196.

R-134a manifold gauge sets can be identified by one or all of the following.

* Labeled FOR USE WITH R-134a on set
* Labeled HFC-134 or R-134a on gauge face
* Light Blue color on gauge face

In addition, pressure/temperature scales on R-134a gauge sets are different from R-12 manifold gauge sets.

SIGHT GLASS INDICATOR

NOTE: Sight glass indicator conditions listed are for R-12 systems. Information for R-134a systems is not available from manufacturer.

Not all systems use a sight glass. If used, a sight glass may be mounted in receiver-drier (accumulator) or in discharge line. Refrigerant's condition can be visually checked while passing through sight glass. The following are possible conditions of sight glass indicator, which may help in the diagnosis of problems. See Fig. 3.

Clear Sight Glass

A clear sight glass indicates refrigerant level is correct or is excessively low for system circulation. Sight glass may be clear, but system may contain excessive refrigerant. This must be verified by test gauge readings.

Bubbly/Foamy Sight Glass

A bubbly or foamy sight glass indicates system is low on refrigerant, and air has probably entered system. However, if only occasional bubbles are noticed, during clutch cycling or system start-up, this may be a normal condition.

Oil Streaked Sight Glass

If oil streaks appear on sight glass, a lack of refrigerant may be indicated, and the system's compressor oil is circulating through the system.

Cloudy Sight Glass

A cloudy sight glass indicates desiccant contained in receiver-drier or accumulator has broken down and is being circulated through system.

Sight glass readings are not positive identification of a problem. Readings should be relied upon only when other system symptoms exist.

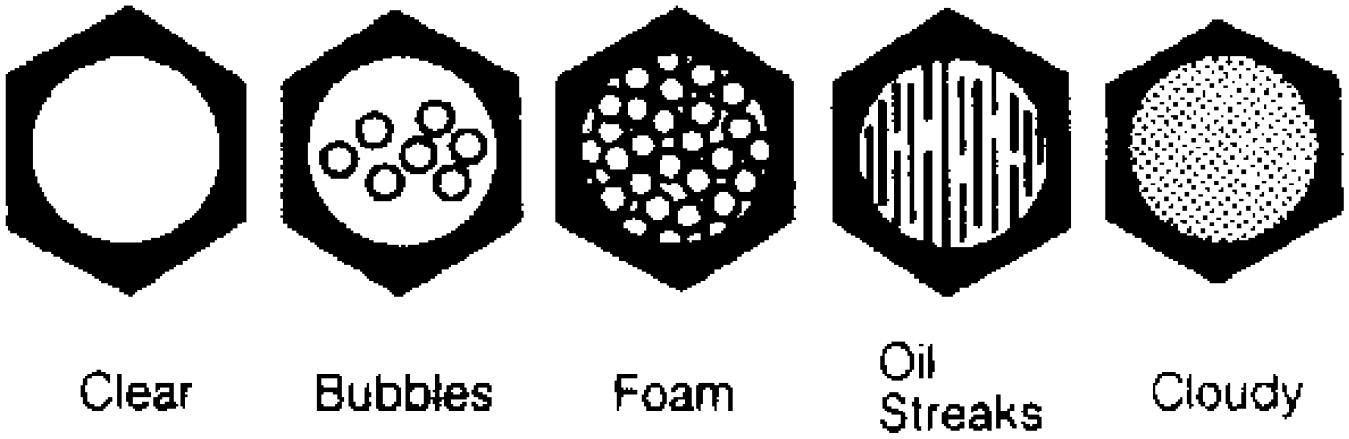

Fig. 3: Identifying Sight Glass Indicator Conditions

SYSTEM SERVICE VALVES

STEM-TYPE VALVES

This manually operated service valve has adjustable stem located under a protective cap. Valve stem must be manually positioned when making gauge connections and/or reading system pressure on the gauges. See Fig. 4.

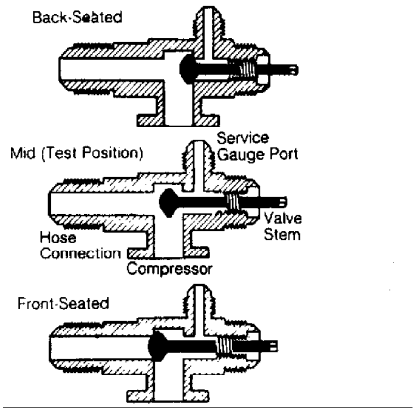

Fig. 4: Identifying Stem-Type Service Valve Positions

Back-Seated (Operating) Position

This is the normal operating position, which is also used for connecting and disconnecting manifold gauge set. Stem is turned fully

outward to seal the service gauge port.

Mid (Test) Position
After installing manifold gauge set (valve stem in back-seated position), turn valve stem 1 1/2 - 2 turns inward. This positions valve stem midway, allowing full system operation and permitting refrigerant pressure to reach gauges.

Front-Seated (Off) Position
With service valve stem turned inward, valve blocks refrigerant flow through system, isolating compressor for service.

CAUTION: NEVER operate A/C system with service valves in front-seated position, as the compressor will be damaged.

SCHRADER-TYPE VALVES

NOTE: Although similar in construction and operation to a tire valve, NEVER replace a Schrader-type valve with a tire valve.

Schrader valve is similar in construction and operation to a tire valve. When a test gauge hose is attached (hose has built-in valve core depressor), Schrader stem is pushed inward to the open position and allows system pressure to reach the gauge.
If test hose being used does not have a built-in core depressor, an adapter must be used. Never attach hoses or adapters to a Schrader valve unless it is first connected to manifold gauge set.

SERVICE VALVE LOCATIONS

For service valve locations, see SERVICE VALCE LOCATIONS (TRUCKS & VANS) table.

SERVICE VALVE LOCATIONS TABLE (TRUCKS & VANS)

Vehicle	High	Low
Jeep		
Cherokee & Wrangler	(1)	(1)
Grand Cherokee	(1)	(2)

(1) - On A/C compressor.
(2) - In suction line, near accumulator.

SPECIAL VALVE CONNECTORS

All vehicles with R-134a refrigerant use quick-disconnect service valves. To help prevent installing hoses and other parts used on R-12 systems, all fittings on R-134a systems use 1/2"-16 ACME threads.

MANIFOLD GAUGE SET

A manifold gauge set is used to determine system's high-side and low-side pressures, correct refrigerant charge, system diagnosis and operating efficiency. High (discharge) and low (suction) pressures must be compared to determine system operation. Manifold gauge sets for the two refrigerant types are basically the same. The fittings at the ends of the hoses are different to ensure connection only to a system using the type of refrigerant specified for that manifold gauge set.

Low-Side Gauge

The low-side gauge, which may have a Blue identifying feature, is used to measure low-side (suction) pressure. Low-side gauge is also called a compound gauge because it can measure pressure and vacuum. Pressure scale ranges from 0 to 150 psi; vacuum scale ranges from 0 to 30 in. Hg.

High-Side Gauge

The high-side gauge, which may have a Red identifying feature, is used to measure high-side (discharge) pressure. Gauge scale ranges from 0 to 500 psi.

CONNECTING GAUGE SET

Schrader-Type Valves

1) Put on safety goggles, and cover vehicle's fender. Remove protective caps from Schrader valves. Do this slowly to check for leaky valves.

CAUTION: Ensure hand valves on manifold gauge set are closed before connecting test hoses to Schrader valves.

2) Ensure service hoses are equipped with valve core depressor to match Schrader valve. Special adapters are required if service hoses do not have built-in core depressor. Ensure both manifold gauge hand valves are closed.

3) Connect low-side service hose to low-side (suction) service valve, and finger tighten connections. Connect high-side service hose to high-side (discharge) service valve, and finger tighten connections.

Stem-Type Valves

1) Put on safety goggles, and cover vehicle's fender. Place valves in back-seated position. Remove protective caps from service valves. Do this slowly to check for leaky valves.

CAUTION: Ensure hand valves on manifold gauge set are closed before turning service valve to mid-position.

2) Attach low-side service hose to low-side (suction) service valve. Connect high-side service hose to high-side (discharge) service valve. Finger-tighten both connections.

NOTE: After test gauges are installed, test hoses must be purged of all air before proceeding with testing.

PURGING TEST HOSES

1) Ensure high-side and low-side hoses are properly connected to service valves, and all hose connections are tight.

2) If stem-type service valves are used, turn stems inward 1 1/2 - 2 turns to mid-position. On all applications, place clean shop towel over end of center service hose.

3) Purge high-side test hose by opening hand valve on high-side gauge for 3-5 seconds. This allows system's refrigerant to force air through test hoses and out of center service hose into the shop towel. Immediately close high-side gauge hand valve.

4) Purge low-side test hose in the same manner using hand valve of low-side gauge. Close hand valve after 3-5 seconds. Purging of test hoses is now complete, and system is ready for testing.

STABILIZING A/C SYSTEM

1) Once manifold gauge set is attached to system and test hoses have been purged (if required), system is ready for testing. Place all test hoses, gauge set and other equipment away from all moving parts of engine.

2) Start engine, and turn A/C controls to maximum cooling position. Set blower fan on high speed. Open doors and/or windows, and operate system for 5-10 minutes. System should now be stabilized and ready for test readings.

PRESSURE GAUGE INDICATIONS

NOTE: Pressure gauge indications are for R-12 systems only. Information for R-134a systems is not available from manufacturers.

The following typical pressure gauge indications represent conditions that may be encountered during system servicing. See Figs. 8-14. Temperature and humidity, as well as other factors, affect pressure gauge readings. Pressure gauge indications should be used only as a guide.

EXCESSIVE MOISTURE GAUGE READINGS

Low Side Gauge - Normal-to-Low
High Side Gauge - Normal

Other Symptoms

Sight Glass - Tiny bubbles.

Discharge Air - Becomes warm as low side cycles into vacuum. As moisture is released by saturated desiccant, it becomes released by saturated desiccant, it becomes trapped and freezes at expansion valve or orifice tube, blocking R-12 flow into the evaporator. As low side drops to a vacuum, high side may rise.

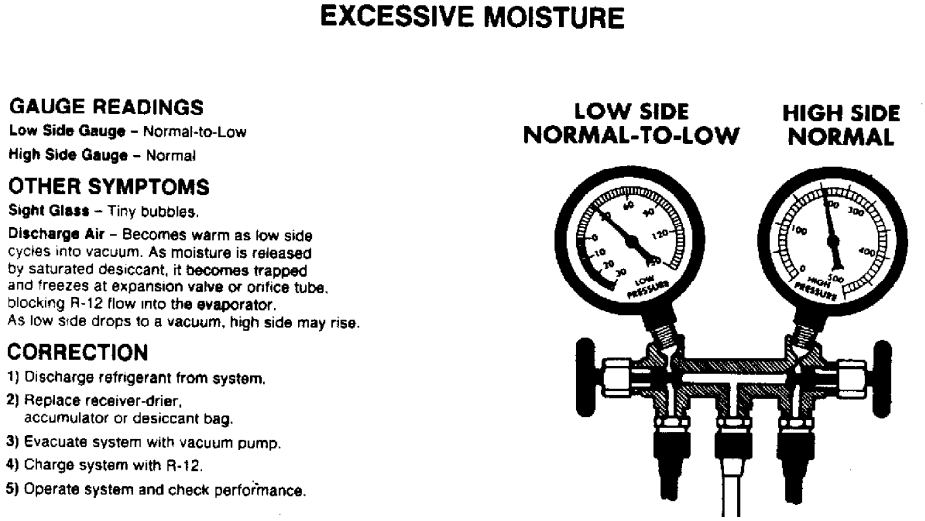

Fig. 5: Excessive Moisture Pressure Gauge Indications
Courtesy of Ford Motor Co.

Correction

1) Discharge refrigerant from system.
2) Replace receiver-drier, accumulator or desiccant bag.
3) Evacuate system with vacuum pump.
4) Charge system with R-12.
5) Operate system and check performance.

DEFECTIVE THERMOSTATIC SWITCH GAUGE READINGS

Low Side Gauge - Normal
High Side Gauge - Normal

Other Symptoms

Compressor - Cycles on and off too fast.
Low Side Gauge - Not enough range shown on low side gauge.

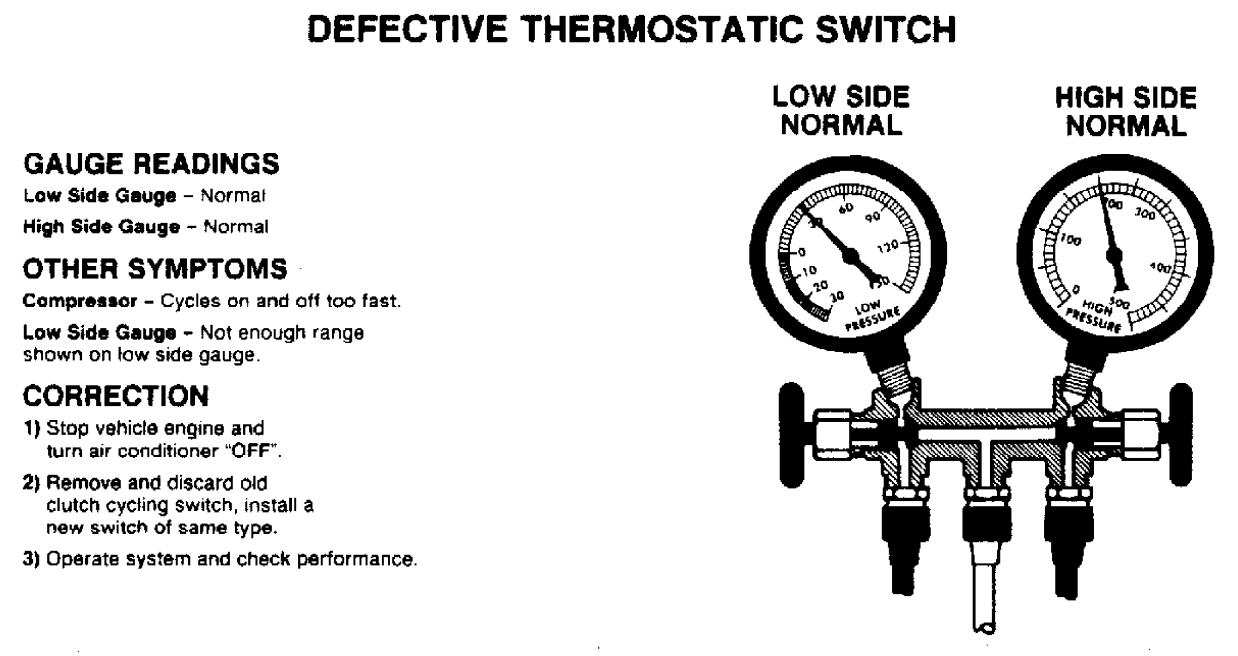

Fig. 6: Defective Thermostatic Switch Pressure Gauge Indications
Courtesy of Ford Motor Co.

Correction

1) Stop vehicle engine and turn air conditioner "OFF".
2) Remove and discard old clutch cycling switch, install a new switch of same type.
3) Operate system and check performance.

MISADJUSTED THERMOSTATIC SWITCH GAUGE READINGS

See DEFECTIVE CLUTCH CYCLING SWITCH PRESSURE GAUGE READINGS below.

DEFECTIVE CLUTCH CYCLING SWITCH PRESSURE GAUGE READINGS

Low Side Gauge - Low-to-Normal/Normal-to-High
High Side Gauge - Normal

Other Symptoms

Compressor - Cycles at incorrect temperature or pressure.

Evaporator - May freeze and restrict airflow if switch is allowing compressor to remain on too long.

MISADJUSTED THERMOSTATIC SWITCH OR DEFECTIVE CLUTCH CYCLING SWITCH

GAUGE READINGS

Low Side Gauge - Low-to-Normal/Normal-to-High

High Side Gauge - Normal

OTHER SYMPTOMS

Compressor - Cycles at incorrect temperature or pressure.

Evaporator - May freeze and restrict airflow if switch is allowing compressor to remain on too long.

CORRECTION

With Thermostatic Switch

1) Stop engine and turn air conditioner off.

2) Remove components necessary to gain access to thermostatic adjustment screw.

NOTE: If no adjusting screw is provided, the switch is nonadjustable and must be replaced.

3) Make certain that all wiring is positioned so that no short-circuiting can occur. Connect battery cable so that engine can be operated while making switch adjustment. Adjust thermostatic switch.

With Clutch Cycling Switch

1) Stop engine and turn air conditioner off.

NOTE: Switch is nonadjustable and is mounted on a Schrader valve fitting. Therefore, no system discharge is required.

2) Detach electrical connector from pressure sensing switch at accumulator.

3) Remove pressure sensing switch, and install a new switch.

NOTE: A pressure sensing switch is used on most late Ford Motor Co., General Motors and Eagle models with accumulator-type systems. It performs the same function as thermostatic switch.

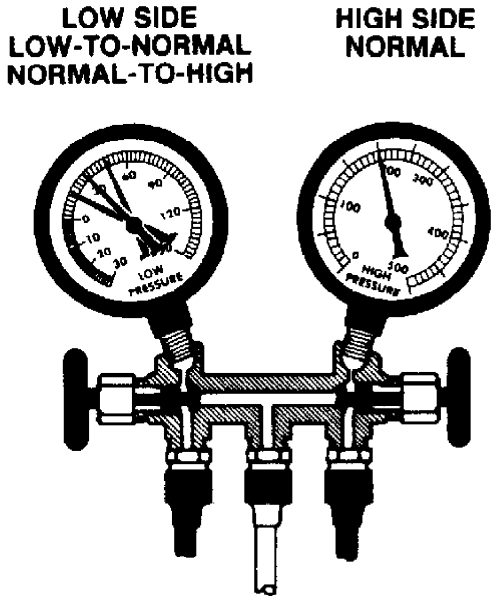

Fig. 7: Misadjusted Thermostatic Switch or Defective Clutch Cycling Switch Gauge Indications
Courtesy of Ford Motor Co.

Correction With Thermostatic Switch

NOTE: If no adjusting screw is provided, the switch is nonadjustable and must be replaced.

1) Stop engine and turn air conditioner off.
2) Remove components necessary to gain access to thermostatic adjustment screw.
3) Make certain that all wiring is positioned so that no short-circuiting can occur.
   Connect battery cable so that engine can be operated while making switch adjustment.

Adjust thermostatic switch.

Correction With Clutch Cycling Switch

NOTE: Switch is non adjustable and is mounted on a Schrader valve fitting. Therefore, no system discharge is required.

1) Stop engine and turn air conditioner off.
2) Detach electrical connector from pressure sensing switch at accumulator.
3) Remove pressure sensing switch, and install a new switch.

LOW R-12 CHARGE GAUGE READINGS

Low Side Gauge - Low
High Side Gauge - Low

Other Symptoms

Discharge Air - Slightly cool.
Sight Glass - Some bubbles.

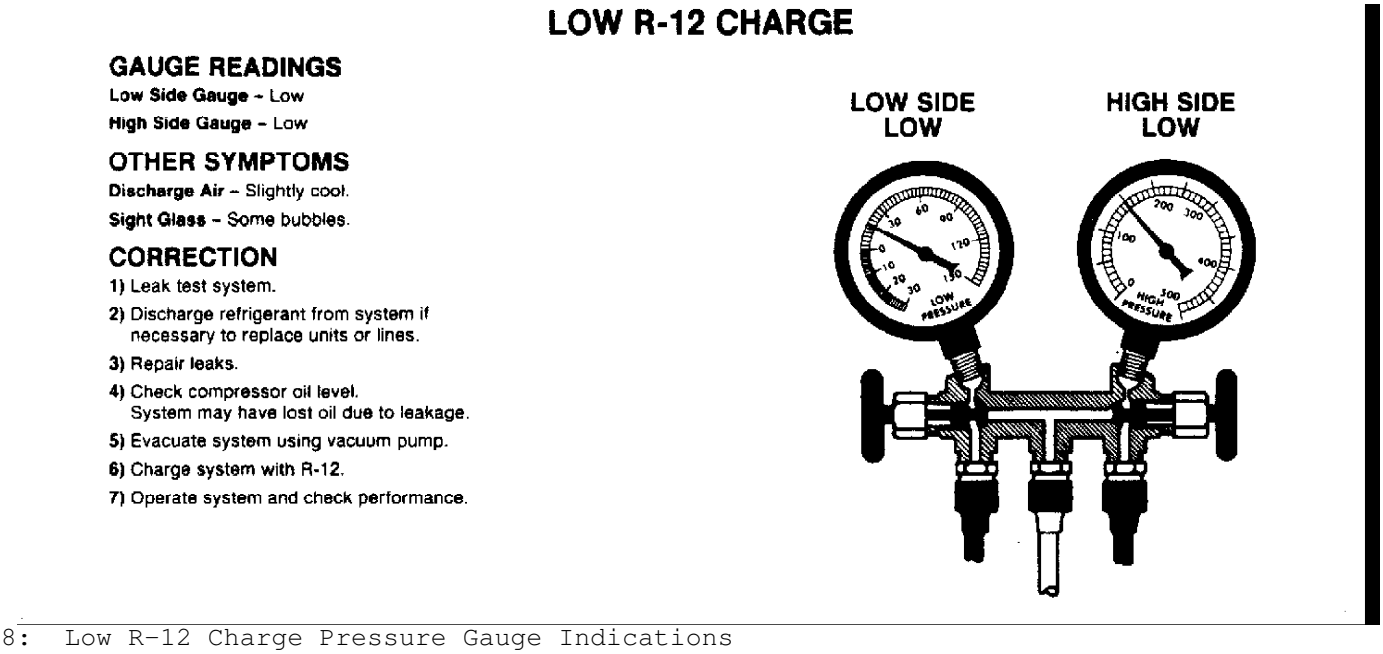

Fig. 8: Low R-12 Charge Pressure Gauge Indications
Courtesy of Ford Motor Co.

Correction

1) Leak test system.
2) Discharge refrigerant from system if necessary to replace units or lines.
3) Repair leaks.
4) Check compressor oil level. System may have lost oil due to leakage.
5) Evacuate system using vacuum pump.
6) Charge system with R-12.
7) Operate system and check performance.

VERY LOW R-12 CHARGE GAUGE READINGS

Low Side Gauge - Low
High Side Gauge - Low

Other Symptoms

Discharge Air - Warm.
Sight Glass - Clear or Oil Streaks.
Compressor - Operation may have stopped if system is equipped with a refrigerant pressure sensing switch.

VERY LOW R-12 CHARGE

GAUGE READINGS

Low Side Gauge – Low

High Side Gauge – Low

OTHER SYMPTOMS

Discharge Air – Warm.

Sight Glass – Clear or Oil Streaks.

Compressor – Operation may have stopped if system is equipped with a refrigerant pressure sensing switch.

CORRECTION

1) If compressor operation is stopped due to a pressure sensing switch, by-pass switch with jumper wire until testing and correction are complete.
2) Add a partial refrigerant charge (to at least 50 percent system capacity), then make thorough leak test.
3) Discharge refrigerant from system.
4) Check compressor oil level. System may have lost oil due to leakage.
5) Evacuate system using vacuum pump.
6) Charge system with R-12.
7) Operate system and check performance.

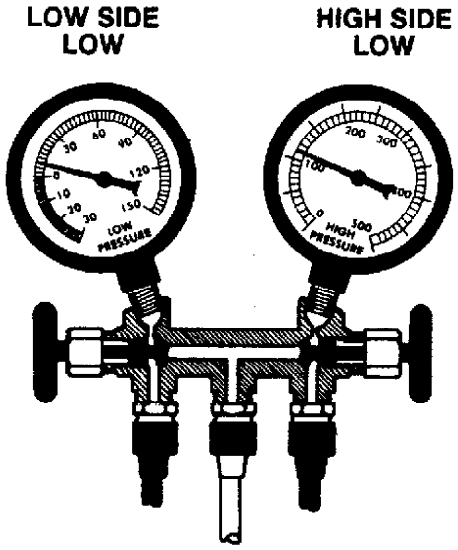

Fig. 9: Very Low R-12 Charge Pressure Gauge Indications
Courtesy of Ford Motor Co.

Correction

1) If compressor operation is stopped due to a pressure sensing switch, by-pass switch with jumper wire until testing and correction are complete.
2) Add a partial refrigerant charge (to at least 50 percent system capacity), then make thorough leak test.
3) Discharge refrigerant from system.
4) Check compressor oil level. System may have lost oil due to leakage.
5) Evacuate system using vacuum pump.
6) Charge system with R-12.
7) Operate system and check performance.

EXPANSION OR "H" VALVE STUCK CLOSED GAUGE READINGS

Low-Side Gauge - Low
High-Side Gauge - Low

Other Symptoms

Discharge Air - Slightly cool
Evaporator Inlet Pipe - Sweating or frost build up

Testing

1) If evaporator inlet is cool to touch, proceed as follows:

a. Set air conditioner for maximum cooling, and operate the system.
b. Spray liquid R-12 on head of valve or capillary tube (if equipped). Note low-side gauge reading. Low-side gauge should drop into a vacuum.
c. If low-side vacuum reading was obtained, warm expansion valve diaphragm chamber with hand, then repeat test step b.
d. If expansion valve test indicates valve operation is satisfactory, clean contact surface of evaporator outlet pipe and temperature sensing bulb. Ensure bulb is securely in contact with pipe.
e. If expansion valve test indicates the valve is defective, discharge the system, replace expansion valve, and proceed with correction procedure.

2) If expansion valve inlet shows sweating or frost proceed as follows:

a. Discharge system.
b. Disconnect inlet line at expansion valve. Remove and inspect screen.
c. Clean and replace screen, and reconnect inlet line.
d. Proceed with correction procedure.

EXPANSION OR "H" VALVE STUCK CLOSED

GAUGE READINGS

Low Side Gauge – Low

High Side Gauge – Low

OTHER SYMPTOMS

Discharge Air – Slightly cool

Evaporator Inlet Pipe – Sweating or frost build up

TESTING

1) If evaporator inlet is cool to touch, proceed as follows:

- **a.** Set air conditioner for maximum cooling and operate the system.
- **b.** Spray liquid R-12 on head of valve or capillary tube (if equipped). Note low side gauge reading. Low side gauge should drop into a vacuum.
- **c.** If low side vacuum reading was obtained, warm expansion valve diaphragm chamber with hand, then repeat test step **b.**
- **d.** If expansion valve test indicates valve operation is satisfactory, clean contact surface of evaporator outlet pipe and temperature sensing bulb. Make sure bulb is securely in contact with pipe.
- **e.** If expansion valve test indicates the valve is defective, discharge the system, replace expansion valve, and proceed with correction procedure.

2) If expansion valve inlet shows sweating or frost proceed as follows:

- **a.** Discharge system.
- **b.** Disconnect inlet line at expansion valve. Remove and inspect screen.
- **c.** Clean and replace screen and reconnect inlet line.
- **d.** Proceed with correction procedure.

CORRECTION

1) Evacuate system using vacuum pump.

2) Charge system with R-12.

3) Operate system and check performance.

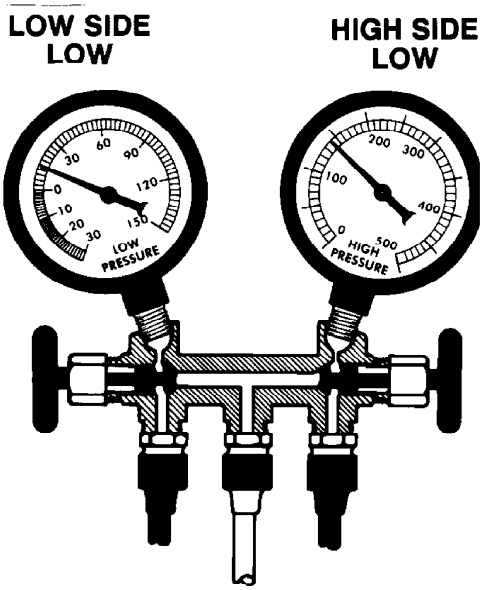

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Fig. 10: Expansion or "H" Valve Stuck Closed
Courtesy of Ford Motor Co.

Correction

1) Evacuate system using vacuum pump.
2) Charge system with R-12.
3) Operate system and check performance.

ORIFICE TUBE PLUGGED GAUGE READINGS

Low Side Gauge - Low
High Side Gauge - Low

Other Symptoms

Discharge Air - Slightly cool.
Evaporator Inlet Pipe - Sweating or frost build up just ahead of orifice tube.

Testing

If evaporator inlet pipe after orifice tube and accumulator surface are warm, orifice tube is plugged.

ORIFICE TUBE PLUGGED

GAUGE READINGS

Low Side Gauge – Low

High Side Gauge – Low

OTHER SYMPTOMS

Discharge Air – Slightly cool

Evaporator Inlet Pipe – Sweating or frost build up just ahead of orifice tube.

TESTING

If evaporator inlet pipe after orifice tube and accumulator surface are warm, orifice tube is plugged.

CORRECTION

1) Evacuate system using vacuum pump.

2) Replace orifice tube.

3) Charge system with R-12.

4) Operate system and check performance.

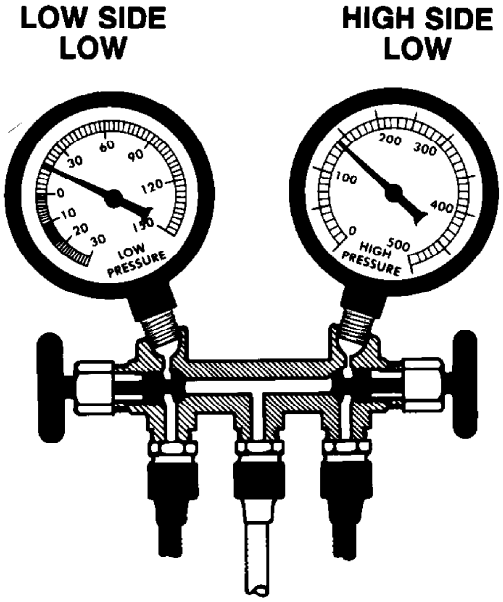

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Fig. 11: Orifice Tube Plugged Pressure Gauge Indications
Courtesy of Ford Motor Co.

Correction

1) Evacuate system using vacuum pump.
2) Replace orifice tube.
3) Charge system with R-12.
4) Operate system and check performance.

EXPANSION OR "H" VALVE STUCK OPEN GAUGE READINGS

Low Side Gauge - High
High Side Gauge - High

Other Symptoms

Discharge Air - Warm
Evaporator - Sweating or frost.

Testing

Check for expansion valve stuck open, or incorrect mounting of temperature sensing bulb as follows:

a. Set air conditioner for maximum cooling and operate system several minutes.
b. Spray liquid R-12 on head of valve or capillary bulb, and note low side gauge reading. It should drop into a vacuum (if not, a stuck open valve or incorrect bulb mounting is

indicated). This test may not be possible on applications where sensing bulb is not accessible.

c. If low side vacuum reading is obtained, warm expansion valve diaphragm chamber with hand, then repeat test.

EXPANSION OR "H" VALVE STUCK OPEN

GAUGE READINGS

Low Side Gauge - High

High Side Gauge - High

OTHER SYMPTOMS

Discharge Air - Warm

Evaporator - Sweating or frost.

TESTING

Check for expansion valve stuck open, or incorrect mounting of temperature sensing bulb as follows:

a. Set air conditioner for maximum cooling and operate system several minutes.

b. Spray liquid R-12 on head of valve or capillary bulb, and note low side gauge reading. It should drop into a vacuum (if not, a stuck open valve or incorrect bulb mounting is indicated). This test may not be possible on applications where sensing bulb is not accessible.

c. If low side vacuum reading is obtained, warm expansion valve diaphragm chamber with hand, then repeat test.

CORRECTION

1) If expansion valve test indicates valve operation is satisfactory, proceed as follows:

a. Clean contact surface of evaporator outlet pipe and temperature sensing bulb, then clamp bulb securely in contact with pipe and recover with proper insulation tape.

b. Operate system and check performance.

2) If expansion valve test indicates valve is defective, proceed as follows:

a. Discharge system.

b. Replace expansion valve, making sure all contacts are clean and secure.

c. Evacuate system using vacuum pump, then charge system with R-12.

d. Operate system and check performance.

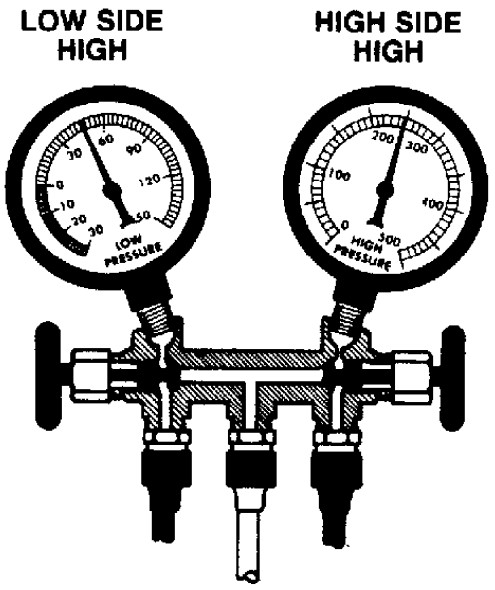

Fig. 12: Expansion or "H" Valve Stuck Open Pressure Gauge Indications Courtesy of Ford Motor Co.

Correction

1) If expansion valve test indicates valve operation is satisfactory, proceed as follows:

   a. Clean contact surface of evaporator outlet pipe and temperature sensing bulb, then clamp bulb securely in contact with pipe and recover with proper insulation tape.
   b. Operate system and check performance.

2) If expansion valve test indicates valve is defective, proceed as follows:

   a. Discharge system.
   b. Replace expansion valve, making sure all contacts are clean and secure.
   c. Evacuate system using vacuum pump, then charge system with R-12.

d. Operate system and check performance.

COMPRESSOR MALFUNCTION GAUGE READINGS

Low Side Gauge - High
High Side Gauge - Low

Other Symptoms

Compressor - Noisy.

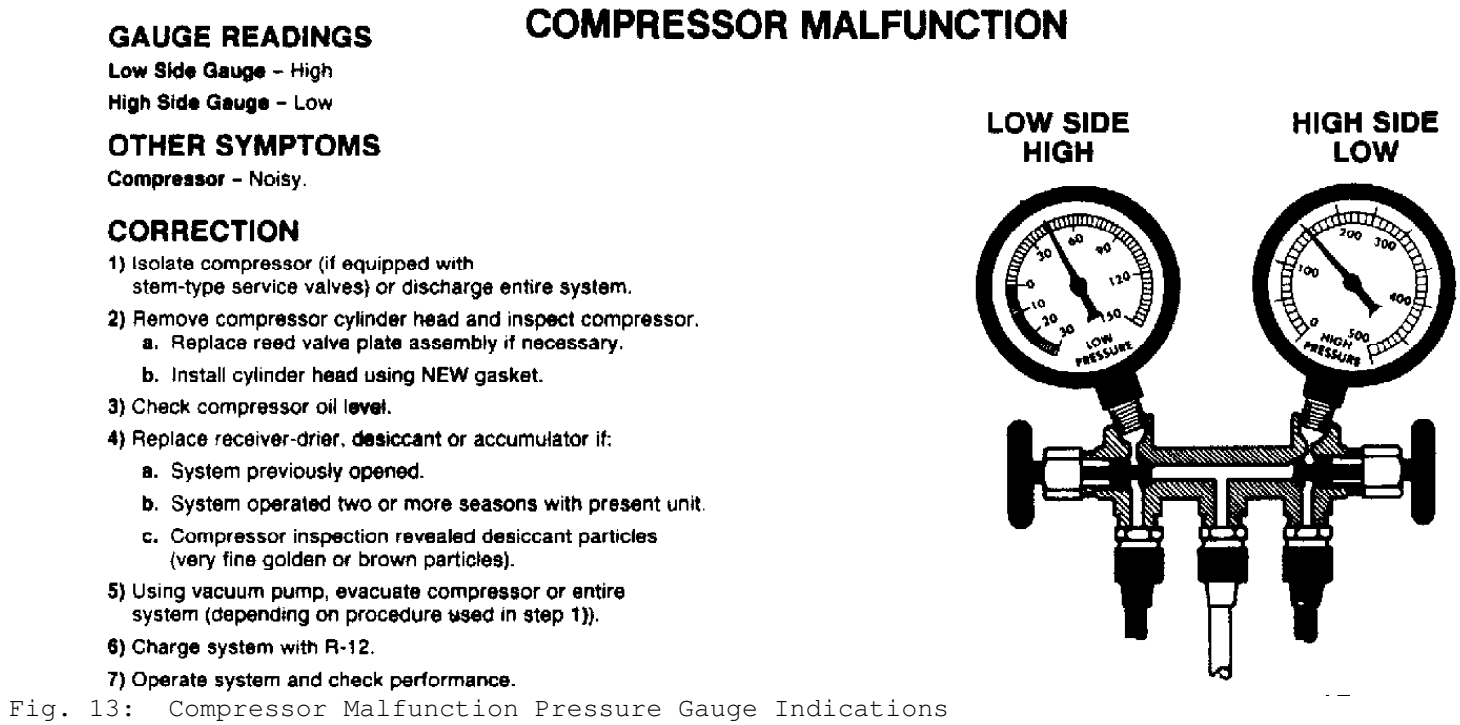

Fig. 13: Compressor Malfunction Pressure Gauge Indications
Courtesy of Ford Motor Co.

Correction

1) Isolate compressor (if equipped with stem-type service valves) or discharge entire system.
2) Remove compressor cylinder head and inspect compressor.
   a. Replace reed valve plate assembly if necessary.
   b. Install cylinder head using NEW gasket.
3) Check compressor oil level.
4) Replace receiver-drier, desiccant or accumulator if:
   a. System previously opened.
   b. System operated two or more seasons with present unit.
   c. Compressor inspection revealed desiccant particles (very fine golden or brown particles).
5) Using vacuum pump, evacuate compressor or entire system (depending on procedure used in step 1).
6) Charge system with R-12.
7) Operate system and check performance.

CONDENSER MALFUNCTION OR R-12 OVERCHARGE GAUGE READINGS

Low Side Gauge - High
High Side Gauge - High

Other Symptoms

Discharge Air - Warm.
High Side Lines - Very Hot.
Sight Glass - Bubbles.

CONDENSER MALFUNCTION OR R-12 OVERCHARGE

GAUGE READINGS

Low Side Gauge - High

High Side Gauge - High

OTHER SYMPTOMS

Discharge Air - Warm.

High Side Lines - Very Hot.

Sight Glass - Bubbles.

CORRECTION

1) Check electric cooling fan operation.

2) Inspect condenser for clogged air passages, bug screen, or other obstructions preventing airflow through condenser.

3) Inspect condenser mounting for proper radiator clearance. Inspect clutch type fan for proper operation. Inspect radiator pressure cap for correct type and proper operation.

After Making Above Corrections

Operate system and check performance.

If Condition is Not Corrected

1) Inspect system for overcharge of refrigerant and correct as follows:
   a. Discharge refrigerant until stream of bubbles appears in sight glass and both high and low gauge readings drop below normal.
   b. Add R-12 until bubbles disappear and pressures are normal, then add an additional 1/4-1/2 lb. of refrigerant.

2) Operate system and check performance.

If Gauge Readings Still Too High

1) Discharge system, and remove and inspect condenser to ensure free passage of refrigerant or replace condenser.

2) Replace receiver-drier, desiccant bag or accumulator.

3) Evacuate system using vacuum pump.

4) Charge system with R-12.

5) Operate system and check performance.

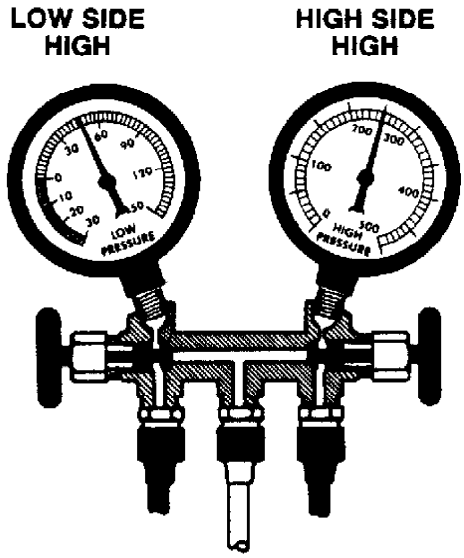

Fig. 14: Condenser Malfunction or R-12 Overcharge Pressure Gauge Indications
Courtesy of Ford Motor Co.

Correction

1) Check electric cooling fan operation.
2) Inspect condenser for clogged air passages, bug screen, or other obstructions preventing airflow through condenser.
3) Inspect condenser mounting for proper radiator clearance. Inspect clutch type fan for proper operation. Inspect radiator pressure cap for correct type and proper operation.

After Making Above Corrections. Operate system and check performance. If Condition is Not Corrected.

1) Inspect system for overcharge of refrigerant and correct as follows:

   a. Discharge refrigerant until stream of bubbles appears in sight glass and both high and low gauge readings drop below normal.
   b. Add R-12 until bubbles disappear and pressures are normal, then add an additional 1/4-1/2 lb. of refrigerant.

2) Operate system and check performance. If Gauge Readings Still Too High

   a. Discharge system, and remove and inspect condenser to ensure free passage of refrigerant or replace condenser.
   b. Replace receiver-drier, desiccant bag or accumulator.
   c. Evacuate system using vacuum pump.
   d. Charge system with R-12.
   e. Operate system and check performance.

JEEP

The orifice tube is located in the liquid refrigerant line near the condenser. Orifice tube cannot be replaced as a separate component. If orifice tube is faulty or if compressor is replaced, liquid line must be replaced.

REFRIGERANT RECOVERY/RECYCLING

NOTE: The use of recovery/recycling equipment is required by law.

Refrigerant recovery/recycling equipment is used to remove refrigerant from vehicle's A/C system without polluting atmosphere. To remove and recycle refrigerant, ALWAYS follow instructions provided with the refrigerant/recovery equipment being used.

The removed refrigerant is filtered, dried and stored in a tank within the recovery/recycling equipment until it is ready to be pumped back into the vehicle's A/C system.

NOTE: Separate sets of hoses, gauges and refrigerant recovery/recycling equipment MUST be used for R-12 and R-134a based systems. DO NOT mix R-12 and R-134a refrigerants, as their refrigerant oils and desiccants are NOT compatible.

Manufacturer recommends using refrigerant recovery/recycling equipment which meets SAE standard J1991. Always use instructions provided with the recovery/recycling equipment being used.

DISCHARGING A/C SYSTEM

NOTE: When discharging refrigerant from A/C system, use refrigerant recovery/recycling equipment to prevent refrigerant from entering the atmosphere. The use of recovery/recycling equipment is required by law.

Manufacturer does not provide procedures for discharging A/C system. Discharge A/C system using approved refrigerant recovery/recycling equipment. Follow instructions provided with

recovery/recycling equipment for recovery and recycling of refrigerant.

FLUSHING A/C SYSTEM

Information is not available from manufacturer.

EVACUATING A/C SYSTEM

CHRYSLER CORP.

1) Close both valves on manifold gauge set. Connect manifold gauge set to high-side and low-side service valves. See SERVICE VALVE LOCATIONS under SYSTEM SERVICE VALVES. Connect a hose to center connector on manifold gauge set and evacuation pump.

2) Fully open both valves on manifold gauge set. Start evacuation pump, and operate it until a vacuum reading of 26 in. Hg is obtained on low-side gauge. If vacuum reading of 26 in. Hg cannot be reached,either A/C system or gauge set leaks, or evacuation pump is defective. Repair or replace as necessary.

3) When specified vacuum reading has been reached, close both valves on manifold gauge set. Turn off evacuation pump. Observe low-side gauge. If vacuum drops within 30 minutes, system has a leak and must be repaired.

4) If vacuum remains steady, reopen valves, and continue operating evacuation pump for an additional 10 minutes. Close both valves, and stop evacuation pump.

CHARGING A/C SYSTEM

NOTE: Manufacturer does not recommend using one-pound cans. Using a charging station will allow precise measurement of refrigerant charge. See REFRIGERANT OIL & REFRIGERANT SPECIFICATIONS at the end of this article for system capacities.

1) System must be evacuated before charging. With manifold gauge set attached from evacuation procedures, attach refrigerant container(s) to hose on center connector of manifold gauge set. Fully open refrigerant container valve(s), purge air from center hose, and close valves.

2) Adjust service valves on the compressor to the mid-position (if equipped). Slowly open low-side valve, and allow refrigerant to enter the system. Start and operate engine. Place A/C-heater controls to maximum cold position.

3) When proper amount of refrigerant has been added, close low-side valve on manifold gauge set. Stop engine, close service valves on compressor, and disconnect manifold gauge set. Start engine, and operate A/C system for 10 minutes to stabilize the system.

LEAK TESTING

Operate system to stabilize high-side and low-side pressures. Turn engine off. Using a refrigerant leak detector, check all refrigerant line connections for leaks. Check compressor seal area and condenser.

Refrigerants are heavier than air. Always check for leaks at bottom of refrigerant lines and components. Refrigerant oil will leak with refrigerant. Visually check all connections and compressor clutch area for oil stains. If compressor shaft seal is leaking, a fresh oil

streak will normally be seen on underside of hood, above compressor clutch.

Always perform leak testing after A/C service. Move refrigerant leak detector slowly to check for leaks, as leaks will not be detected if leak testing is performed too quickly.

REFRIGERANT OIL & REFRIGERANT SPECIFICATIONS

NOTE: Due to late changes, always refer to underhood A/C Specification Label in engine compartment or A/C compressor label while servicing A/C system. If A/C Specification Label and specifications in table differ, use label specifications.

REFRIGERANT OIL & REFRIGERANT CAPACITY TABLE (LIGHT TRUCKS & VANS)

Application	(1) Oil Ounces	Refrigerant Ounces
Jeep		
Cherokee	4.6	38
Grand Cherokee (2)	8.0	28
Wrangler	4.6	32

(1) - Total system capacity, unless otherwise noted.
(2) - Models use R-134a refrigerant and PAG (ND8) Refrigerant Oil (Part No. 82300102).

COMPRESSOR APPLICATIONS

NOTE: Due to late changes, always refer to underhood A/C Specification Label in engine compartment or A/C compressor label while servicing A/C system. If A/C Specification Label and specifications differ, use label specifications.

COMPRESSOR APPLICATIONS TABLE (LIGHT TRUCKS & VANS)

Application	Compressor
Jeep	
Cherokee & Wrangler	Sanden SD-709 7-Cyl.
Grand Cherokee	Nippondenso 10PA17 10-Cyl.

(1) - Series codes are determined by fifth character of VIN code.