

# System Diagnosis

Proper vehicle diagnosis requires a plan before you start

*Following a set procedure to base your troubleshooting on will help you find the root cause of a problem and prevent unnecessary repeat repairs .*

**STEP ONE:** Understand the Customer's Concern

Information collection beyond the basics.

Questions asked MUST be related To the system you will be working on and the customer complaint

**STEP TWO:** Check for Technical Service Bulletins

Every vehicle that comes into the shop for a repair (not necessary for routine maintenance) should be checked for TSB's , This can save you hours of troubleshooting.

**STEP THREE:** Conduct a Systematic Diagnosis

*This step will be different for every system*

Follow the troubleshooting steps for the system you are working on.

Make sure to check EVERY component of the system and that they are in proper working order.

Document your diagnosis including tests and results.

**STEP FOUR:** Complete and Confirm the Repair

Make sure you have taken care of the customers concerns.

Try to duplicate the conditions that were present when the vehicle failed

**DENSO**

# The Diagnostic Process

## STEP ONE:

### Confirm the Customer's Concern

<u>What is the concern?</u>	<i>No cooling</i>	<i>Poor cooling</i>	<i>Air flow issue</i>	
<u>How often?</u>	<i>One time</i>	<i>Intermittent</i>	<i>Constant</i>	
<u>When did it happen?</u>	<i>Day</i>	<i>Time</i>	<i>Ambient temp</i>	
<u>Conditions?</u>	<i>Highway</i>	<i>Local</i>	<i>Traffic</i>	<i>Vehicle speed</i>
<u>Who was operating the vehicle?</u>	<i>Primary Driver</i>	<i>Other</i>		

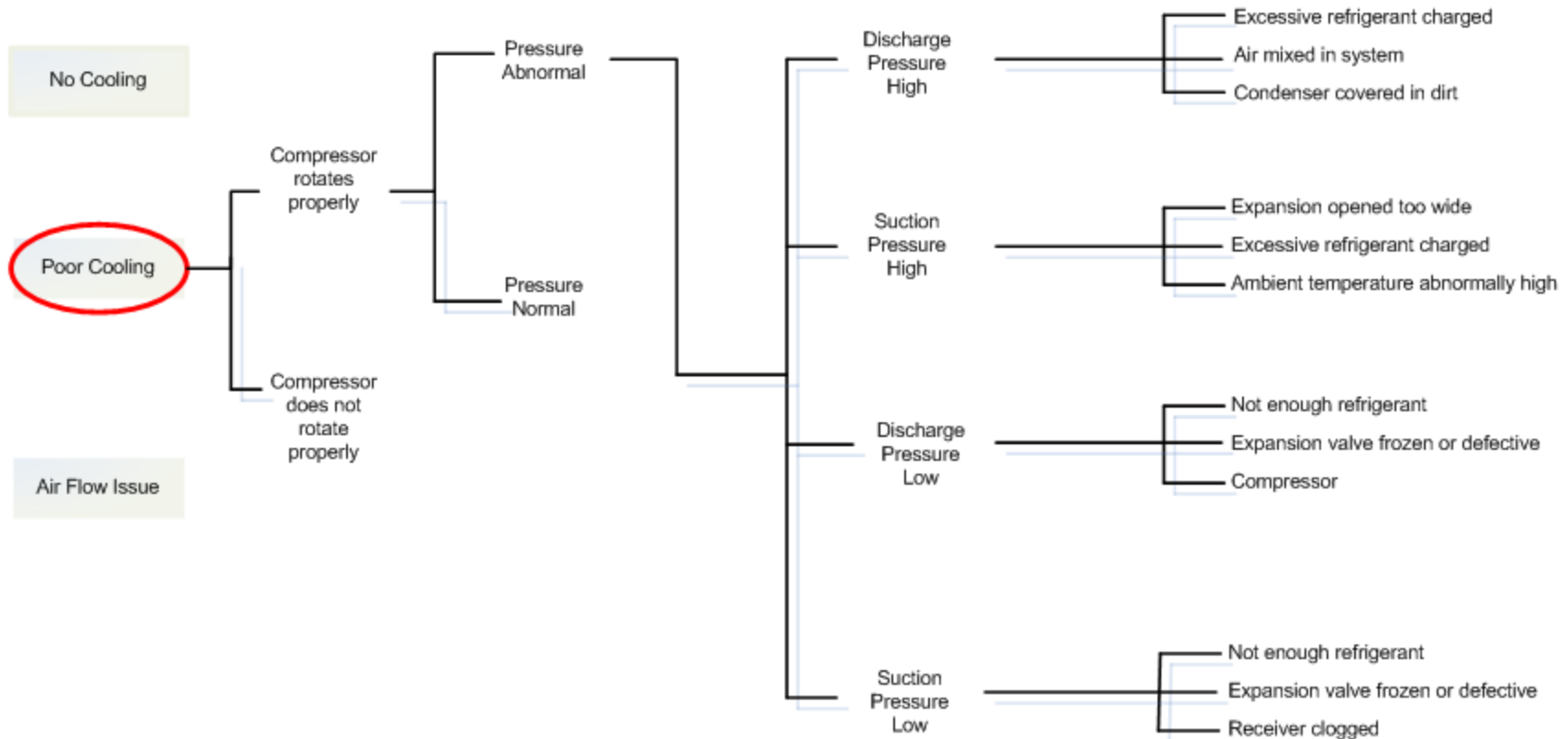
***Know the facts vehicle air conditioning expectations differ from driver to driver***

# The Diagnostic Process

## STEP THREE:

### Conduct a Systematic Diagnosis

### SAMPLE



# Systematic Diagnosis

**THIS TABLE SHOWS THE PRIORITY IN WHICH EACH PROBLEM SHOULD BE INSPECTED. AFTER IDENTIFYING THE PROBLEM USE THE AREA OF INSPECTION IN NUMBER PRIORITY, THEN REPAIR OR REPLACE AS NECESSARY.**

PROBLEM	AREA OF INSPECTION																						
	Refrigerant volume	Inspect refrigeration system with manifold gauge set	Inspect drive belt tension	A/C control lever adjustment	Engine coolant volume	A/C fuses	Blower speed control switch	A/C switch	Pressure switch	Blower relay	Blower motor	Blower resistor	A/C thermistor	Compressor	Condenser	Receiver	A/C evaporator	A/C expansion valve	Heater radiator	Wiring or wiring connection	Blocked air inlet	Air leak from heater unit or air duct hose kinked	
No blower operation						1	3		2	5	4										6		
No blower control							2		1		3										4		
No air flow mode control							1																
No air inlet control							1																
Insufficient air flow																					2	1	
No cool air comes out	2	4	6	8				5				1	7				3	9					
Cool air comes out intermittently	1	2	3									6	5		4								
Cool air comes out only at high engine speed	2	3	1										5	4									
Insufficient cooling	1	3	2	8											4	5	7	6					
No warm air comes out				2	1														3				
Air temperature control not functioning				1																			

# Systematic Diagnosis

## Typical pressure readings

### Temperature/Humidity/Pressure Relationships for R134a

Relative Humidity	Ambient Air Temp (°F)	Max Gauge Pres Low Side (psi)	Max Gauge Pres High Side (psi)	Center Duct Air Temp (°F)
40%	70	37	260	48
	80	37	305	54
	90	42	370	61
	100	49	395	66
50%	70	37	275	52
	80	39	320	57
	90	46	375	64
	100	55	430	72
60%	70	37	290	54
	80	42	340	48
	90	49	390	68
	100	60	445	79

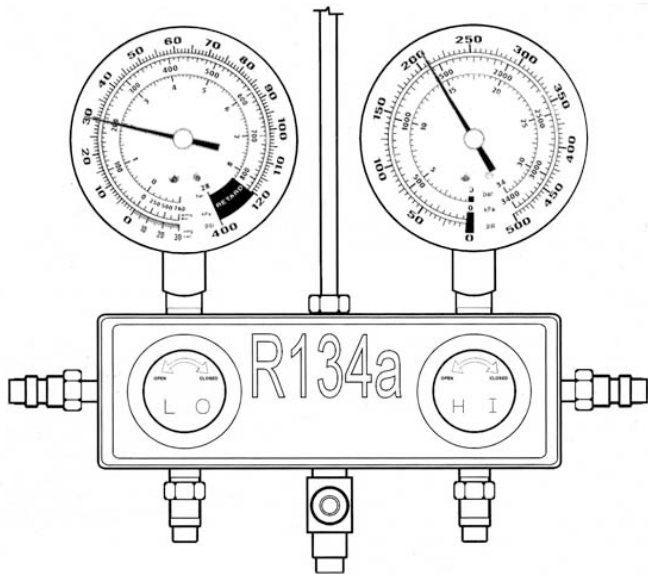
# Manifold Gauges (sample readings)

86° - 95° F    1500 RPM    Max Cool    High Blower

## ❖ Normal Reading

21-35 PSI

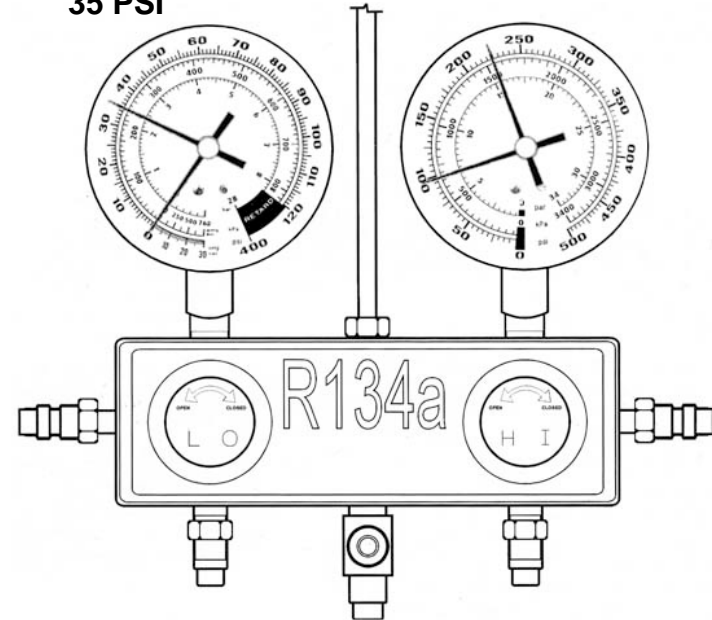
199-227 PSI



## ❖ Moisture Entered In Cycle

Alternating  
between  
vacuum and  
35 PSI

~99-227 PSI

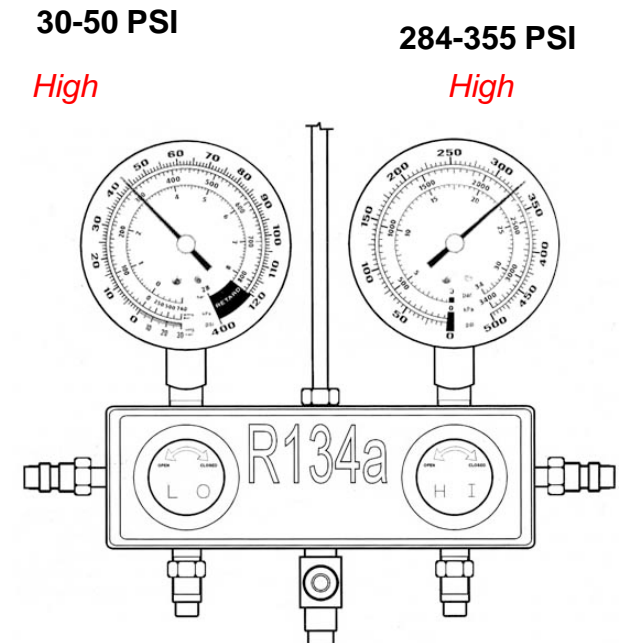
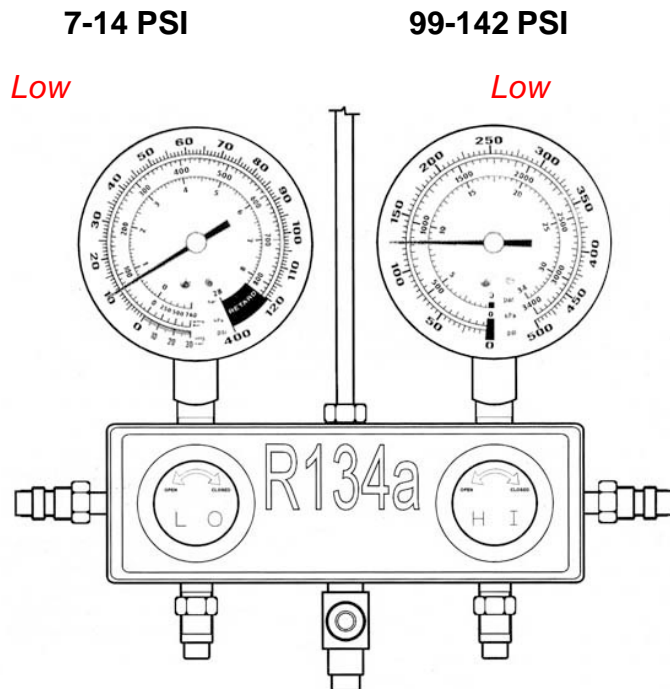


# Manifold Gauges (sample readings)

86° - 95° F    1500 RPM    Max Cool    High Blower

- ❖ Insufficient Refrigerant
- ❖ Refrigerant Fails to Circulate

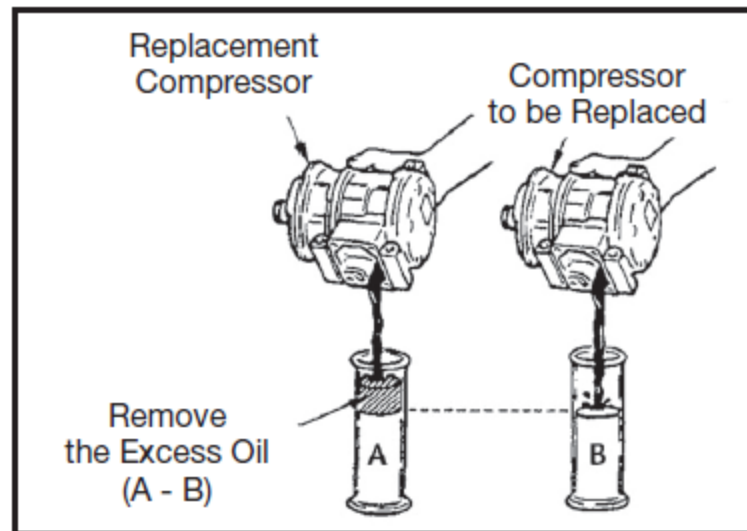
- ❖ Excessive Refrigerant or Insufficient Condenser Cooling
- ❖ Expansion Valve Trouble (Opens Too Much) or Improper Installation of Heat Sensitizing Tube
- ❖ Air Entered In The Cycle



# Compressor replacement

## Compressor Preparation

1. Slowly release the pressure from the Schrader valve located on the compressor shipping plate(s) or hose caps.
2. To prevent the loss of refrigerant oil:  
Place the compressor on a flat surface with the shipping plate(s) or hose caps in an upright position,  
Then remove and save the shipping plate(s), O-ring(s) and mounting bolts or hose caps.
3. Remove the service valve(s) or hose caps from the old compressor. Make sure service valves and O-ring surfaces are clean.
4. Verify the level of compressor lubricant



*\*Refer to vehicle manufacturers service manual for proper oil specifications*



# Flushing The A/C System

## What is the purpose of flushing the A/C system

Remove contaminants that are in the A/C system

Most of the contamination is caught up in the oil, not the refrigerant

## When to Flush

- Oil Contamination
- Non pure refrigerant (R12 or R134a) used
- Compressor Failure
- Receiver/drier or Accumulator failure (descant)

## What to Flush

- Hoses and Piping (without inline mufflers)
- Condenser (Round Tube and Fin/Serpentine)
- Evaporator (Round Tube and Fin/Serpentine)
- Compressor (Swash plate/Scroll/Through Vane)

## What NOT to Flush

- Hoses and Piping with inline mufflers
- Condenser (Flat Tube Multi flow)
- Evaporator (Flat Tube Multi flow)
- Compressor (Variable Displacement)
- Complete system (Closed loop)

*The system should be broken down to as many individual components as possible. Do not try to flush the entire high side of the A/C system as one long piece with hoses and the condenser attached.*

The screenshot shows the DENSO Aftermarket website homepage. At the top, the DENSO logo is on the left, followed by the "First Time Fit" slogan. Navigation links include "CONTACT US", "FIND MY PART", and "WHERE TO BUY". A secondary navigation bar contains "Home", "Why DENSO", "First Time Fit", "DENSOHeavyDuty.com", "DENSOIridium.com", "Parts Professional Library", "Videos/Downloads", "Training", and a language dropdown set to "English".

The main content area features a large banner with the text: "I keep up with the latest technology and specs with the DENSO Parts Professional Library". Below this text are five icons representing different automotive components: a car, gears, a wrench, a molecular structure, and a document. A "Free Trial" button is prominently displayed. To the right of the banner is a smiling male mechanic in a dark blue shirt, holding a pen and a notepad.

On the left side, there is a vertical navigation menu with two main sections: "Products" and "Resources". The "Products" section lists various automotive parts such as A/C Components, A/C Compressors, Alternators, Condensers, Direct Ignition Coils (COP), Evaporators, Filters, Fuel Injectors, Fuel Pumps, Ignition Wire Sets, Mass Air Flow Sensors, Oxygen & A/F Sensors, Radiators, Relays, Spark Plugs, Starters, and Wiper Blades. The "Resources" section includes DENSO Connect, FAQ, Find My Part, News and Events, Parts Professional Library, Promotions, Training, Videos/Downloads, and Other DENSO Sites. At the bottom of the menu are social media icons for Facebook, Twitter, and YouTube.

Below the banner, a "DENSO Products" section features a grid of five product images with their respective labels: SPARK PLUG, AIR FILTER, STARTER, A/C COMPRESSOR, and OIL FILTER. Below the grid, the text reads: "A WINNING TRADITION. The DENSO name means high quality and superior technology in the automotive industry. DENSO now offers its First Time Fit® brand of products to the aftermarket. Products precision-built for exact replacement so you don't have to worry about doing the same job twice."

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