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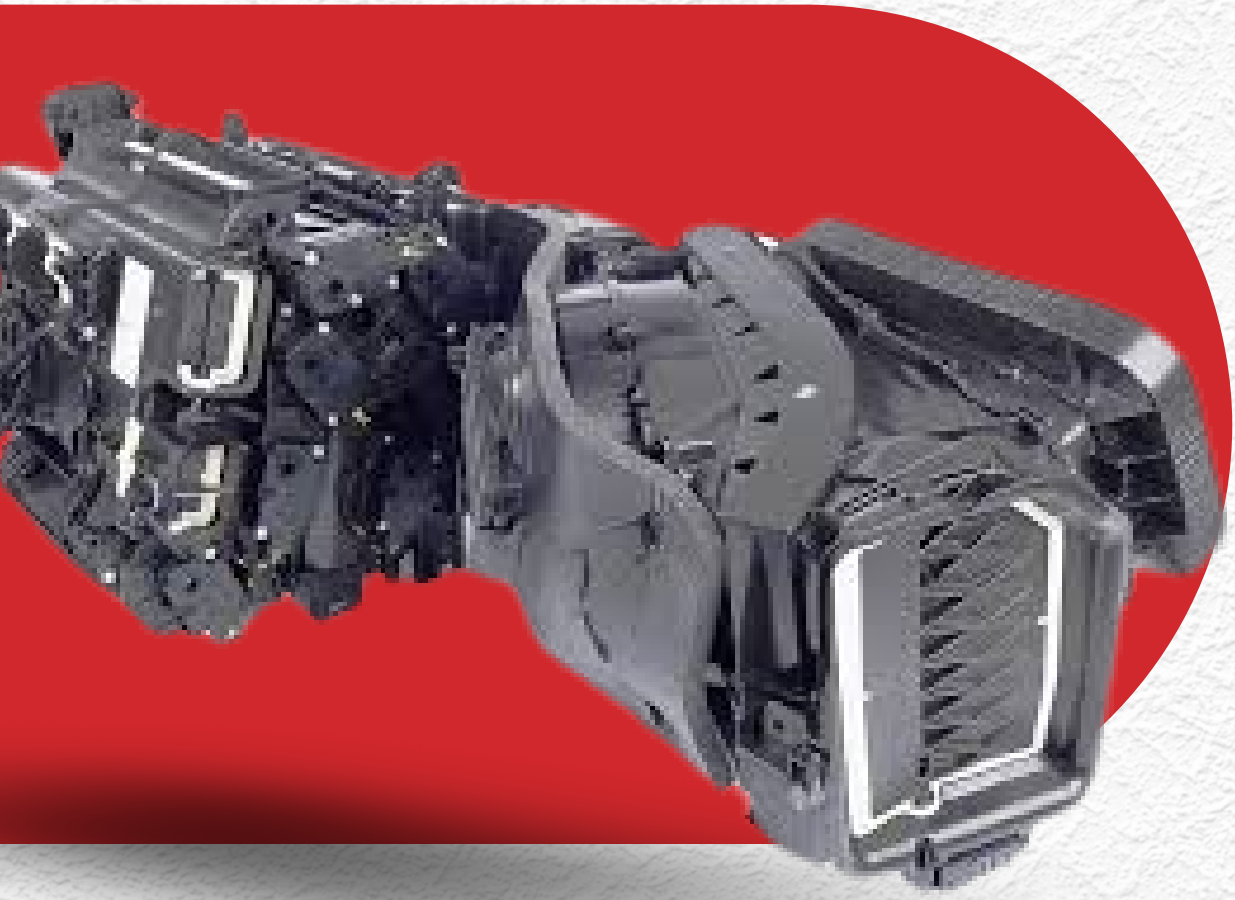

USER MANUAL

COOLING & HEATING SYSTEM MANUAL: A/C, RADIATOR & HVAC EXPLAINED

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This manual explains how your vehicle handles engine heat and cabin temperature. It covers the radiator, heater core, and air conditioning systems. Each part matters. If one goes out, it either affects engine function or makes the cabin uncomfortable. This isn't theory, It's what you need to know to spot issues early and keep your car running right.

1. RADIATOR SYSTEM

The radiator removes heat from the engine. It pushes coolant through the block, pulls heat out, and moves it through the radiator where it cools down using airflow.

Main Parts:

- Radiator
- Thermostat
- Water pump
- Radiator hoses
- Coolant reservoir
- Cooling fan

How It Works:

Coolant goes through the engine. It heats up, then moves to the radiator. The thermostat controls the flow. It stays closed when cold. Once it hits operating temperature, it opens and allows coolant to move. The fan kicks in when needed.

What to Watch:

- **Coolant level** - check when the engine is cold. Also, look for leaks near the hose ends or radiator sides
- **Fan** -should spin when the engine warms up
- **Smell** -sweet smell means coolant may be leaking

Usual Problems:

- Low coolant often -check for leaks or a bad gasket
- Cracks or leaks around radiator plastic ends
- Fan not spinning -may be fuse, motor, or relay

2. HEATING SYSTEM (HEATER CORE + HVAC)

Heat in the cabin doesn't come from a separate system. It uses hot coolant from the engine and pushes it through a heater core.

Main Parts:

- Heater core
- Heater hoses
- Blower motor
- HVAC switches and controls
- Same thermostat used in radiator system

How It Works:

Coolant moves through the heater core. The blower motor pushes air over it. That air goes into the cabin through the vents. Heat will only work once the engine is warm.

Check This Regularly:

- **Blower** -test all fan speeds
- **Cabin temp** -warm air should come after a few minutes
- **Coolant level** -low coolant = no heat
- **Smell** -sweet odor in vents usually means heater core leak

Frequent Issues:

- No heat -check coolant, thermostat, or if heater core is blocked
- Foggy inside windows with sweet smell -heater core is leaking
- Fan works only on high -blower resistor may be burned out

3. A/C SYSTEM

The A/C system cools the cabin. It doesn't affect engine cooling but is important for comfort and defogging windows.

Main Parts:

- Compressor
- Condenser
- Expansion valve or orifice tube
- Evaporator
- Refrigerant
- Blower motor

How It Works:

The compressor pressurizes refrigerant. It flows through the condenser and then through an expansion valve. The evaporator cools the air as the refrigerant absorbs heat. Blower motor sends cold air into the cabin.

To Check:

- A/C should get cold within 30 seconds
- Compressor should click when turned on
- Look for greasy/oily spots -could be a refrigerant leak
- Fan should blow consistently

Typical Problems:

- A/C blows warm -usually low refrigerant or bad compressor
- No compressor engagement -may be clutch, relay, or no pressure
- Loud noise when A/C is on -bearing or internal damage

4. MAINTENANCE TIPS

Radiator + Heating:

- Coolant should be changed every 2–5 years·Use only the coolant type your vehicle takes
- Check hoses once a year & look for cracks or bulges
- Radiator flush should be done by 50,000–100,000 miles

A/C + HVAC:

Run the A/C once a week, even in winter
Change cabin air filter every 15,000–20,000 miles
Watch for weak airflow which is often due to a clogged cabin filter
Listen for blower sounds that weren't there before

5. QUICK TROUBLESHOOTING

If Engine Overheats:

- Coolant low? Check reservoir
- Radiator cap cracked? Replace it
- Fan not spinning? Could be sensor or motor
- Hose collapsed or leaking? Replace it

If No Heat in Cabin:

- Engine reaching normal temperature?
- Coolant low? Heater won't work if low
- Blower working but no hot air? Heater core could be blocked
- Only cold air at idle? Air trapped or thermostat issue

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If A/C Isn’t Working:

- Compressor clicking on?
- Is refrigerant low? You’ll need gauges to confirm
- Any weird smells or foggy windows? Check evaporator
- Air cold at first, and then warm? Might be low pressure

6. SAFETY

- Never touch radiator cap when hot -could burst
- Use gloves when dealing with coolant or refrigerant
- Keep coolant away from kids and animals -it's toxic
- Only handle refrigerant with proper gear
- Label and keep track of everything you remove or check

7. BASIC TOOLS YOU SHOULD KEEP

- Coolant -pre-mixed, same type as your car uses
- Screwdrivers and a wrench set
- Flashlight
- Work gloves and rags
- Hose clamps
- A/C gauge (if you plan to check pressure)

CONCLUSION

You don’t need to be a mechanic to understand your cooling and heating system. If your cabin isn’t staying warm or your engine keeps heating up, there’s usually a simple reason. Checking coolant levels, listening to the blower, and feeling for hot or cold air can save time and money.

This manual is written to be direct. No vague instructions, you can use this to check problems before you bring the car in. It gives you enough to know what’s going wrong and how serious it is. Stick to these checks, and you’ll avoid bigger issues in the long run.

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