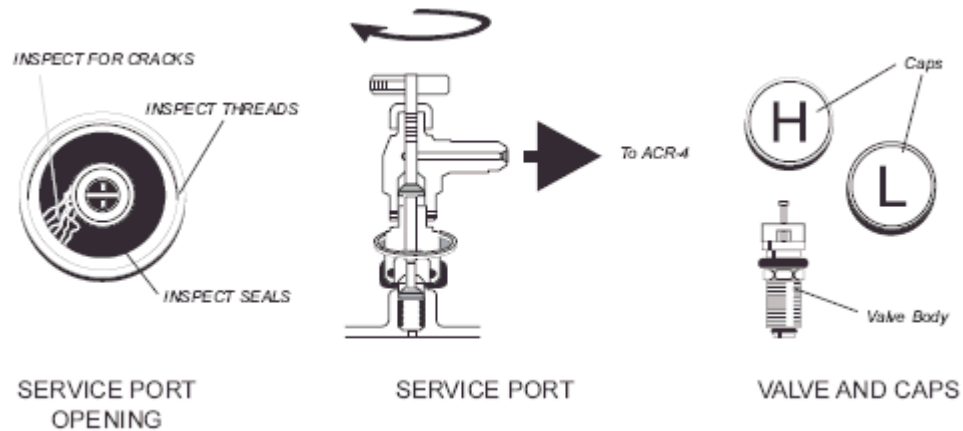


Service Ports

Operation

Service ports are pressure fittings for hose and gauge connections, and the only legal or safe openings in the air conditioning system. Each type of refrigerant, R-12 or R134a has its own type of service port to prevent accidental cross-contamination. Service ports are located in the low and high pressure refrigerant lines. You will use service ports to connect the manifold gauge set and the ACR5 AC Service Center when you are diagnosing and servicing the refrigerant loop.



Service port couplers close by rotating counter-clockwise. **Never connect quick couplers with their valves open or the engine running.**

Unlike previous systems, the valve body is not just a sealing point and the cap is not just for keeping out dust. Due to the molecular size of R134a, the sealing cap is the sealing point, not the valve body. Service ports should always have sealing caps installed to prevent leakage to the atmosphere.

Malfunctions

Service ports rarely fail, but make sure the valve stems and threads are not worn, and the sealing caps are in good condition.

Diagnosis

Always inspect the sealing caps for cracks, worn seals, or damaged threads. Check for refrigerant leaks if you see oil or fluorescent leak detection dye in or around the service port.

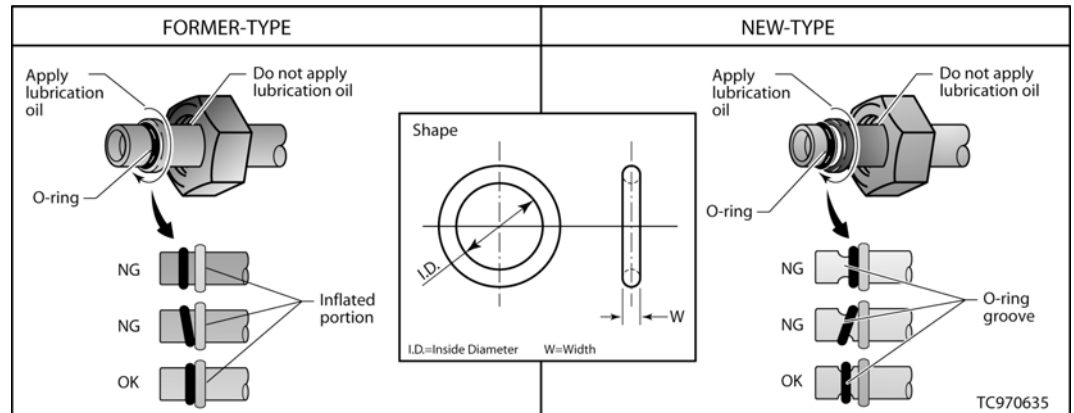
Seals and O-Rings

Operation

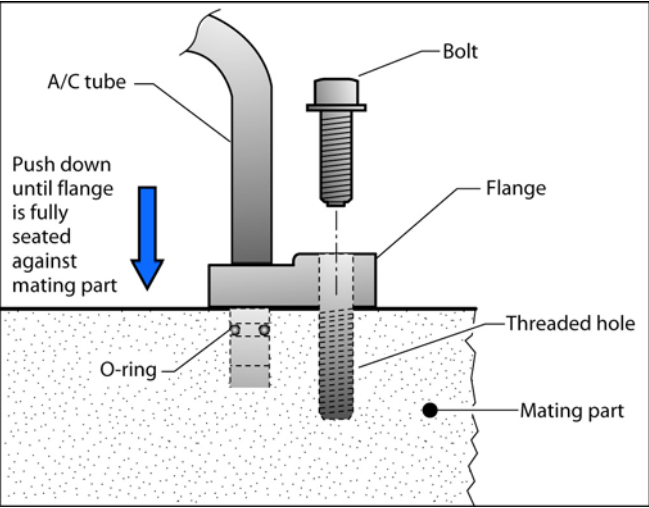
Refrigerant seals and O-rings are made of special synthetic materials that keep refrigerant and oil in and contamination out. Seals and O-rings fit between refrigerant components, fittings, and lines to form the sealing points in the system.

In 1998, Nissan introduced a new type of refrigerant connection to improve sealing characteristics and prevent damage during installation. The O-rings have been relocated and are now seated in a groove, as shown in the illustration. Always consult the service manual for the correct O-ring part numbers and specifications.

Some general tips for working with O-rings:



- Always replace used O-rings.
- Be careful not to damage the O-ring or tube.
- When connecting a tube, apply lubricant to circle of O-ring as shown in the illustration. Use the correct lubricant for the system, and avoid applying lubricant to the threaded portion.
- O-rings must be closely attached to the indented portion of the tube.
- Connect the tube until you hear it click, then tighten the nut or bolt by hand until snug. Make sure that the O-ring is installed correctly to the tube.
- Conduct a leak test after connecting a line to make sure the connection seals properly. If any leakage is found, recover and evacuate the system, then disconnect the line and replace the O-ring.
- Finally, tighten the connections of the seal seat to the specified torque.



Diagnostic Techniques

There is a wide range of methods and tools you can use to help you diagnose climate control problems. Keep in mind that no instrument can tell you what's wrong with a system—it just gives you the information you need to figure out the problem. The performance test is primarily a useful method to recheck the system after you complete any refrigerant repairs, but can also be used to verify problems if an operational check fails to reveal anything.

The most common techniques we present are:

- Examination
- Operational check
- ASIST for researching TSBs, tips, and diagnostic trees
- Performance test
- Touch and feel diagnosis
- Manifold gauge set or ACR5 AC Service Center
- Self-diagnosis
- CONSULT-II
- Leak detection dye

Begin with the quickest, simplest tests. Only use the more advanced techniques if you've already tried the simpler ones and need more information.

Least Complex



Most Complex

Plan your diagnostic strategic accordingly

Operational Check

You can perform an operational check to verify a customer complaint, or after repairs to verify the system operates as it should.

If the vehicle does not have ATC, skip any items which only apply to ATC.

- Blower
- Mode (Discharge Air)
- Ambient Display
- Intake Air
- Defrost
- Econ
- Auto
- Temperature Decrease
- Temperature Increase
- Memory Function

The Operational Check flow chart applies to all ATC systems. Use the appropriate service manual and the owner's manual to check specific operating features. If the vehicle does not have ATC, skip any items which only apply to ATC.

Conditions:

- Engine running at normal operating temperature.

Procedures:





1. Check Blower

- Operate the blower on all manual speeds. Verify the indicator lights work properly (if so equipped).
- After checking all blower speeds, leave the blower on high.



2. Check Discharge Air

- Check the operation of the following discharge modes (not all vehicles have all modes):

Icon	Name	Action
	Face	Verify air comes out of the face vents.
	Bi-Level	Verify air comes out of the face and foot vents.
	Foot	Verify most of the air comes out of the foot vents and a small amount comes out of the defrost vents.
	Foot/Defrost	Verify about 50% of the air comes from the foot vents and about 50% of the air comes from the defrost vents.

- Leave the mode control in the foot mode after testing.

3. Check Ambient Display

- Press the ambient button (if present). The ambient air temperature should display for approximately 5 seconds.

AMB

4. Check Recirc

- Select the RECIRC position.
- Listen for the intake door to change position (you should hear a change in the blower sound). The RECIRC indicator should light.
- Leave the switch in the RECIRC position.



5. Check Defrost

- Press the DEFROST button.
- Check that RECIRC has been cancelled and that air comes out of the defrost vents.
- Confirm that the compressor clutch is engaged.



6. Check Econ Mode

- Press the ECON button (if equipped). Defrost should be cancelled. The discharge air outlet depends on ambient temperature, in-vehicle temperature and set temperature.
- Confirm the compressor clutch is not engaged.

ECON

7. Check Auto Mode

- Select the AUTO position.
- Confirm the compressor clutch engages.

AUTO

Note: Step 7 does not check that all the automatic functions are working. It only verifies the system goes into the Auto mode.

8. Check Temperature Decrease (for driver and passenger on Dual Zone systems)

- Select 65°F with the temperature select switch.
- Check for cold air at the discharge air outlets.

9. Check Temperature Increase (for driver and passenger on Dual Zone systems)

- Select 85°F with the temperature select switch.
- Listen for changes in blower speed as set temperature changes.
- Check for hot air at the discharge outlets.

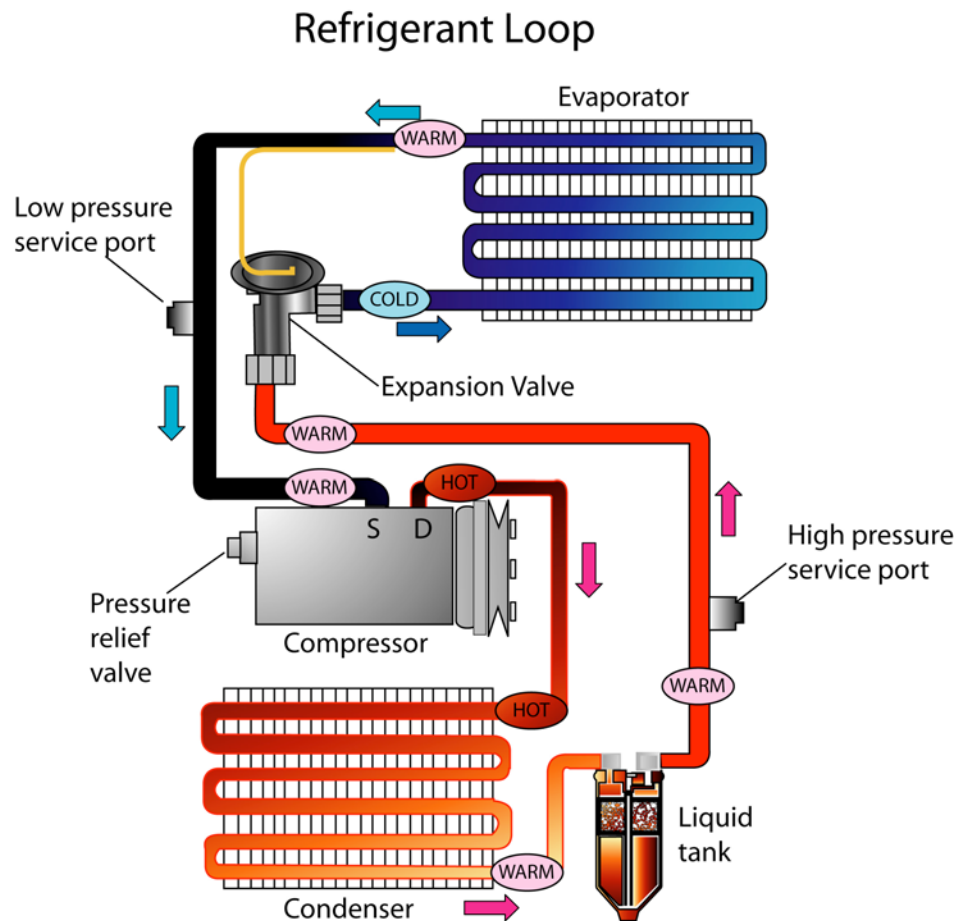
10. Check the Memory Function

- Press the OFF button.
- Switch the ignition OFF.
- Wait 15 seconds.
- Switch the ignition ON.
- Press the AUTO button.
- Confirm the set temperature remains at 85°F.

Performance Test

This diagram shows the results from a “touch and feel” diagnosis on a properly operating refrigerant loop. Keep the following points in mind when performing this test.

- Your body is 37°C (98°F). Anything that feels hot is over 37°C (98°F); anything that feels cold is under 37°C (98°F).
- The high side to the condenser should be hot. Take care not to burn yourself when checking high side lines.
- If there is a restriction in the system, the refrigerant line will be cold right after the restriction.
- The “touch and feel” diagnosis is a quick way to see if there is a malfunction in the refrigerant loop. A complete performance test should be performed before starting any repairs.
- Check the temperature of the coolant exiting the radiator by touching the radiator hose. It should be the same as the air temperature. If it's hotter, there may be a problem with the cooling system. If it's colder, the thermostat is stuck open.



You may have noticed that in the “Refrigerant Loop” section, each section about a component included a “touch and feel” diagnosis of common problems. For example:

- If there is a blockage in the evaporator, the incoming line is cool, the evaporator is not as cold as usual, and the outgoing line is cool as well.
- If the compressor is faulty, the compressor outlet line is only warm to the touch, rather than hot.
- If there is an air flow problem with the condenser, both inlet and outlet are hot, as no heat is transferred out of the refrigerant.
- If the receiver/drier is clogged, the inlet is warm and the outlet is cold.

Note: Because the touch and feel method can locate problem areas so quickly, use this technique early in your diagnosis. The Touch and Feel Diagnosis Job Aid is a quick reference for typical results.

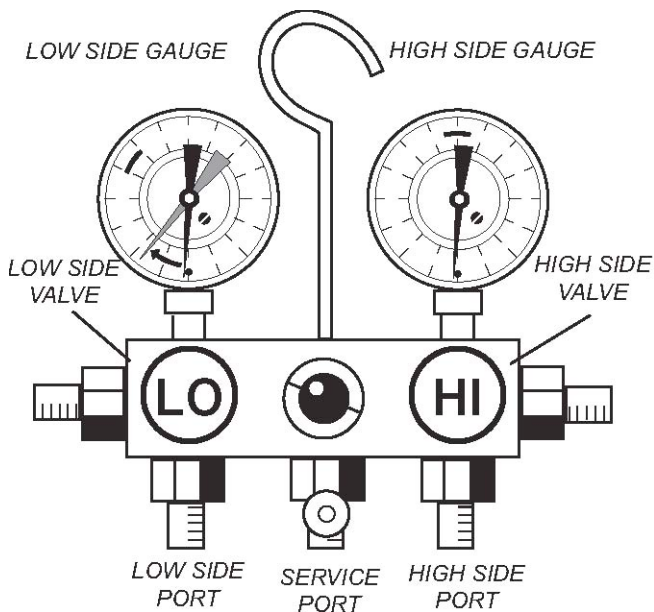
Examination

A keen eye can spot certain signs of trouble, so observe the appearance of components while conducting the touch and feel diagnosis.

- Trash and leaves can block air flow through the condenser. The air scoops on sporty models such as the 350Z are notorious for scooping up plastic grocery bags, which stick to the front of the condenser. Since the condenser is hidden by the front bumper, this problem isn’t immediately visible.
- Frost may form on a restricted thermal expansion valve.
- Oil leaks on refrigerant lines and components are often a sign of a refrigerant leak. Follow up with a leak detection test.

Manifold Gauge Set

Part of the air conditioning performance test procedure is reading and interpreting the manifold gauge set. The performance test procedure in the service manual provides information on normal and abnormal gauge readings.



The gauge on the left side is the low side gauge. It reads the pressure on the low side of the system. The low side gauge usually has a scale which reads from 0 to 150 psi and 0 to 30 inches of vacuum.

The gauge on the right side is the high side gauge. It reads the pressure in the high side of the system. The high side gauge usually has a scale which reads from 0 to 500 psi.

Valves control the refrigerant flow through the gauge set. With the valves closed, refrigerant will not flow through the gauge set. Pressure in the system is read with the gauges in the closed position. When the valves are open, refrigerant flows to the center hose. The valves can be used to control refrigerant charging and discharging.

Keep the following in mind when using a manifold gauge set:

- Always install the gauge set with the engine OFF.
- Make sure the valves are closed when installing the gauge set.
- Never open the high side valve with the engine running.
- Use low loss couplers, quick disconnects and check valves to keep from releasing refrigerant into the atmosphere.
- Separate gauge sets must be used for R-134a and R-12 systems. R-134a systems use quick-disconnect type fittings. R-12 systems use threaded fittings.

Performance Test

The operational test verifies that all A/C system controls and modes operate correctly. The performance test checks the system's ability to change the air temperature under different ambient air conditions. If you are not sure what the problem is after completing an operational test, a performance test can give a more accurate picture of how the system is performing.

A performance test is also the most accurate way to recheck your work following repairs.

The performance test measures several factors to verify if the system is operating according to factory specifications.

The test is a series of three temperature/humidity-pressure comparisons:

1. Recirculating-to-Discharge Air Temperature Test
2. Ambient Air Temperature-to-Operating Pressure Test
3. Touch and Feel Diagnosis

Typical Conditions (may vary by vehicle):

- Vehicle location Indoors or shaded area w/ventilation
- Doors..... Closed
- Windows Open
- Hood..... Open
- Temperature setting Max. COLD
- Discharge Air Face Vent
- Fan Speed 4-speed
- A/C Switch..... ON
- Engine Speed 1,500 rpm or idle, depending on the vehicle
- Operate engine 10 minutes before measuring

Always refer to the service manual of the vehicle you are working on for the exact performance test conditions.

Discharge Air Temperature Test

This is a comparison of the Relative Humidity, Air Temperature and Discharge Air Temperature of interior air.

Test Reading

Discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
50 - 60	20 (68)	1.5 - 2.6 (35-37)
	25 (77)	3.7 - 5.7 (39-42)
	30 (86)	7.6 - 10.0 (46-50)
	35 (95)	12.4 - 15.2 (54-59)
60 - 70	20 (68)	2.6 - 3.6 (37-38)
	25 (77)	5.7 - 7.6 (42-46)
	30 (86)	10.0 - 12.4 (50-54)
	35 (95)	15.2 - 18.0 (59-64)

Ambient Air Temperature-to-Operating Pressure Test

This is a comparison of the Relative Humidity, Air Temperature and High/Low pressures in the air conditioning system.

Test Reading

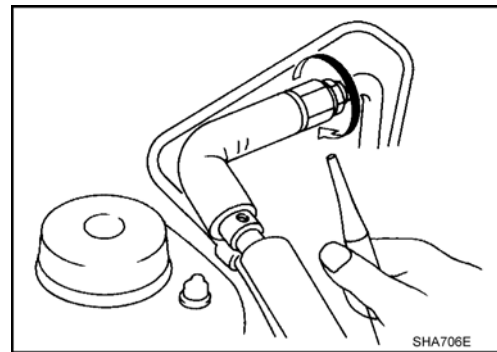
Ambient air temperature-to-operating pressure table

Ambient air		High-pressure (Discharge side) kPa (kg/cm ² , psi)	Low-pressure (Suction side) kPa (kg/cm ² , psi)
Relative humidity %	Air temperature °C (°F)		
50 - 70	20 (68)	785 - 1,040 (8.0 - 10.6, 114 - 151)	137 - 167 (1.4 - 1.7, 20 - 24)
	25 (77)	981 - 1,304 (10.0 - 13.3, 142 - 189)	137 - 167 (1.4 - 1.7, 20 - 24)
	30 (86)	1,167 - 1,550 (11.9 - 15.8, 169 - 225)	147 - 177 (1.5 - 1.8, 21 - 26)
	35 (95)	1,373 - 1,804 (14.0 - 18.4, 199 - 262)	157 - 186 (1.6 - 1.9, 23 - 27)
	40 (104)	1,550 - 2,059 (15.8 - 21.0, 225 - 299)	167 - 206 (1.7 - 2.1, 24 - 30)

Leak Detection Equipment and Dye

Leaks in the refrigerant system can be detected with fluorescent dye and a UV light, and then pinpointed with an electronic leak detector.

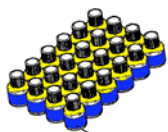
Current Nissan and Infiniti vehicles already have leak detection dye installed at the factory. These vehicles are identified by a label on the underside of the hood. For earlier vehicles, you will need to inject dye using the tools and materials provided in the kit.



Note: Always follow safety precautions such as wearing UV goggles and clean gloves.

Note: Other substances besides leak detection dye can glow under UV light, producing false positive results. These include the soap-like lubricant used to insert the refrigerant lines through the rubber grommets in the firewall. If the glowing material wipes off easily, it is not leak detection dye. You can also refer to the service manual and TSB's to check whether or not the vehicle has leak detection dye already installed.

Leak Detection Dye Safety



Refrigerant dye
(24 bottles)

Using leak detection dye is a convenient technique for finding leaks quickly. However, certain safety precautions are in order when using it.

- Read the manufacturer's operating instructions and precautions provided with the kit prior to starting work.
- Protect your eyes from the UV light. Always wear UV goggles when operating the UV light, and never stare directly into the beam of light.
- Do not spill the dye on painted surfaces, carpet, interior surfaces, skin, hair, or



clothes. Change gloves if they become contaminated to avoid transferring the dye to other objects. Fluorescent dye is permanent on contact with porous or painted surfaces, and can make stains that are visible under certain types of outdoor lighting.

- Do not add more than one bottle of leak detection dye to an air conditioning system. Also, some vehicles may already have leak detection dye. Check with a UV light before adding additional dye. All current Nissan and Infiniti vehicles have had leak detection dye installed at the factory. Leak detection dye is fluorescent for three years or unless the compressor is replaced and the system is flushed.
- There are different leak detection dyes for R-134a and R-12 systems. Use only the correct type of leak detection dye for your system, or air conditioning system damage

Please note that the cleaner included in the kit only works on bare metal—not skin, hair, carpet, or auto paint. The purpose of the cleaner is to clean dye traces from metal components, such as refrigerant lines and condenser fins, to avoid false readings at the next air conditioning service.

CAUTION:

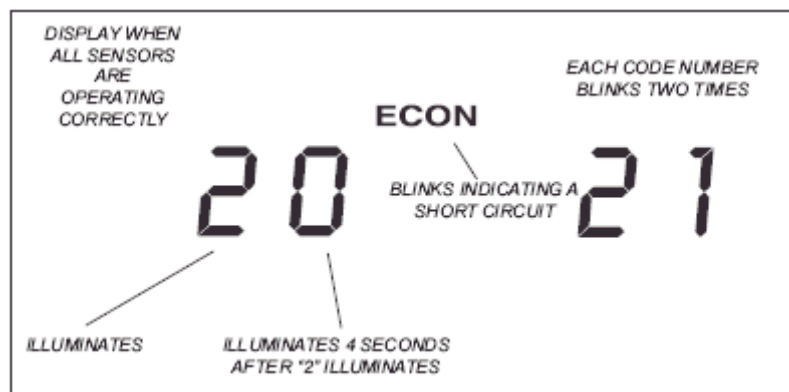
Refrigerant leak detection dye stains most materials, including skin and painted surfaces, permanently and immediately! Always wear protective gloves while working with the dye. Be certain your hands are not contaminated with dye before touching painted surfaces (such as the vehicle's doors or hood) or interior surfaces (such as ATC controls).

Note: Other substances besides leak detection dye can glow under UV light, producing false positive results. These include the soap-like lubricant used to insert the refrigerant lines through the rubber grommets in the firewall. If the glowing material wipes off easily, it is not leak detection dye. You can also refer to the service manual and TSB's to check whether or not the vehicle has leak detection dye already installed.

Self Diagnosis

You can access diagnosis trouble codes (DTCs) in the system to help troubleshoot existing malfunctions. Depending on the vehicle, self-diagnosis checks the following items:

- Control panel display
- System sensors
- Mode and intake door position
- Actuators
- Temperature sensor accuracy



Refer to the service manual for the specific vehicle you're servicing.

CONSULT and CONSULT-II for Electrical Diagnosis

On some models, you can use CONSULT or CONSULT-II to diagnose the climate control system. Even if CONSULT doesn't show all the sensor readings, sometimes you can use it as a useful shortcut to rule out some of the possible causes.

All Nissan and Infiniti vehicles are CONSULT-II compatible. This allows technicians to view signals which indicate AC compressor operation, fan operation, AC pressure sensor, and AC ON signal operation. Information is located in both BCM and engine for AC operation.

DATA MONITOR			
MONITOR			
IGN ON SW		ON	
FAN ON SIG		ON	
COMP ON SIG		ON	
		RECORD	
MODE	BACK	LIGHT	COPY

AC SIGNALS in BCM

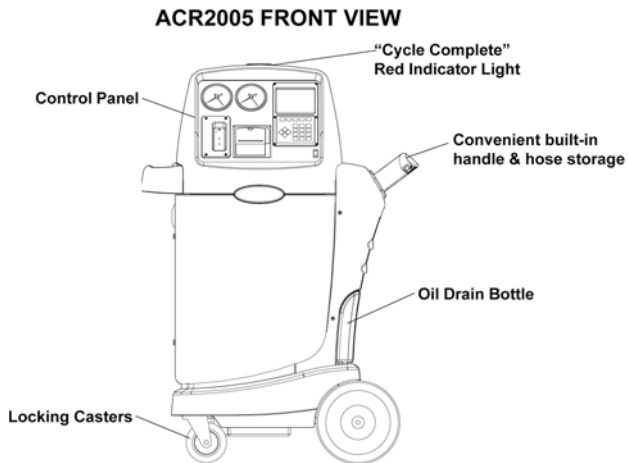
DATA MONITOR			
MONITOR		NO DTC	
ENG SPEED		700 rpm	
AIR COND SIG		ON	
AC PRESS SEN		1.815	
COOLING FAN		OFF	
AIR COND RLY		OFF	
		RECORD	
MODE	BACK	LIGHT	COPY

AC SIGNALS in ECM

These screens indicate that the ECM is sending a ground signal to the A/C relay. The relay could be inoperative.

For example, if you can use CONSULT-II to determine whether or not the ECM provides a signal to the A/C relay, reading the schematic will show you which components are still relevant to the problem.

Refrigerant Recovery & Recycling



Increased concerns regarding the environment as well as Federal regulations have prompted the development of equipment that prevents releasing refrigerant into the atmosphere when servicing vehicle air conditioning systems. This equipment, the ACR5 AC Service Center evacuates, filters, recycles the refrigerant, and recharges the system before and after system repairs.

Before opening the system, use the ACR5 AC Service Center to recover/remove the refrigerant. As the refrigerant is recovered it is recycled to remove any moisture or contaminants. Refrigerant oil is separated from the refrigerant, and the refrigerant is filtered, dried and stored in a container for reuse.

After repairing the air conditioning system, an evacuation pump on the recovery/recycling station removes moisture and contaminants from the system. The station then recharges the air conditioning system with clean, dry refrigerant.

The recovery/recycling station also contains high and low pressure gauges to monitor the operation of the air conditioning system. The gauges are also used to troubleshoot and diagnose system malfunctions.

Note: Separate stations are required for R-134a and R-12 systems. You cannot use an R-12 recovery/recycling station on an R-134a system. To prevent refrigerant and equipment contamination, A/C systems using R-134a refrigerant use different couplers than R-12 systems. The ACR5 AC Service Center samples the refrigerant prior to recovery.

For R-12 equipped vehicles, the ACR-3 machine can be used for recovery and recycling of refrigerant. A separate charging station will be needed to recharge the system following service and repair to the refrigerant loop.