TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

The P.O.A. valve is pre-set at the factory to maintain correct evaporator core pressure. If a malfunction in the refrigerant system is suspected due to the P.O.A. valve or below normal evaporator core pressures, check the following:

1. Restrictions in evaporator core, hoses, tubes, etc.

2. Refrigerant leaks.

3. Compressor clutch slippage.

4. Improper drive belt tension.

5. Capillary tube broken or not tight to evaporator tube.

6. Expansion valve inoperative.

7. P.O.A. valve bleed line, Schrader valve stuck open.

8. P.O.A. valve stuck.

The purpose of performing an operational test is to prove that the air conditioning electrical system, air system, vacuum system and refrigeration system are operating properly and efficiently. Results of the test are as follows:

1. Operation of the air conditioner blower at all four speeds and engagement of the compressor clutch would indicate that the electrical circuits are functioning properly.

2. A clear sight glass would indicate a properly charged refrigeration system.

3. Proper evaporator pressure, as controlled by the P.O.A. valve would provide proper freeze protection for the evaporator.

4. Proper nozzle temperature would indicate a system free from warm air leaks.

Check and correct all air and refrigerant leaks in the air conditioning system as well as operation of the air doors.

Check for proper compressor oil level during the repair of refrigerant leaks, before conducting an operational test.

PRELIMINARY CHECKS

1. Check compressor belt for proper tension; if below 100 lbs. adjust to 100-105 lbs. on Burroughs Belt Tension Gauge.

2. Check all refrigeration lines for leaks, kinks, or other restrictions.

3. Check all air hoses for leaks or restrictions. Air restriction may indicate a plugged (or partially plugged) evaporator core.

4. Check outer surfaces of radiator and condenser cores to be sure they are not plugged with dirt, leaves or other foreign material. Be sure to check between the condenser and radiator as well as the outer surfaces.

5. Connect engine tachometer.

6. Pontiac - Start engine and operate at 2000 rpm with "NORMAL" button depressed, temperature control knob set for maximum cooling and blower speed on "HI". After at least five minutes of engine operation, observe for bubbling at the sight glass (above 70°F. ambient). If the system is low on refrigerant, add Freon until receiver-dehydrator just shows clear and add an additional one (1) pound of Freon.

Tempest - Start engine and operate at 2000 rpm with SELECT lever "OUT" and TEMP lever set for maximum cooling, and BLOWER on "4". After at least five minutes of engine operation, observe for bubbling at the sight glass (above 70°F. ambient). If the system is low on refrigerant, add Freon until liquid indicator just shows clear and add an additional one (1) pound of Freon.

7. Pontiac - Under the same conditions as in step 6 above, turn the temperature control knob for maximum heating. This should disengage the compressor clutch. If clutch does not disengage, check the clutch control switch for proper adjustment.

Tempest - Under the same conditions as in step 6 above, move SELECT lever to "VENT". This should disengage the compressor clutch. If clutch does not disengage, check the clutch control switch for proper adjustment.

8. Pontiac - Re-set the temperature control knob for maximum cooling and observe clutch engagement action which should be without slip. If clutch slips, check clutch for proper adjustment, short in clutch coil, or leaking compressor shaft seal.

Tempest - Move SELECT lever to "OUT" again and observe clutch engagement action which should be without slip. If clutch slips, check clutch for proper adjustment, short in clutch coil, or leaking compressor shaft seal.

9. Change blower speed to "HI", "3", "2", or "LO" and observe for decreases in air flow.

10. Pontiac - With blower on "HI", check for air leakage at defroster nozzles and heater outlet. Depress "INSIDE" button and repeat. Leakage at these points, either with the "NORMAL" or "INSIDE" button depressed, indicates improper vacuum hose harness hook-up.

Tempest - With blower on "HI", check for air leakage at defroster nozzles and heater outlet. Move SELECT lever to "INSIDE" and repeat. Linkage at these points, either with "OUTSIDE" or "INSIDE" air selection, indicates improper vacuum hose connections.

FUNCTIONAL TEST

(This test should not be performed in direct rays of sun.)

1. Connect the charging manifold gauge set to gauge fitting at rear of compressor and a 30" vacuum—60 psi compound test gauge connected to Freon test fitting on P.O.A. valve.

2. Locate auxiliary fan (at least 20" in diameter) in front of condenser. Leave hood open.

3. Open both front doors.

4. Place a calibrated thermometer in front of condenser (preferably in the vicinity of the hood latch pilot) in auxiliary fan air stream.

5. Connect engine tachometer.

6. Adjust two main ball nozzles concentric with face of bezel and open three center outlets fully.

7. Locate a calibrated thermometer in center outlet. (Use caution that sensing bult does not touch metal.)

8. Place automatic transmission lever in "Park" position or manual transmission in "Neutral" with Parking Brake On.

9. Pontiac - Start engine and depress "NORMAL" air button, rotate temperature knob full counterclockwise for maximum cooling and blower switch for "HI" blower speed.

Tempest - Start engine and set SELECT lever at "OUT", TEMP lever full left for maximum cooling and blower switch at "4" blower speed.

10. Set engine speed at 2000 rpm.

11. Allow engine to run for 10 minutes, or until stabilized.

NOTE: If at any time during test compressor head pressure exceeds 375 psi, discontinue test and check the following:

a. Engine cooling system.

b. Restricted receiver-dehydrator assembly.

c. Air in refrigeration system or overcharge of Freon.

d. Insufficient auxiliary fan air on radiator and condenser.

12. At the end of this time record the following:

a. Ambient air at condenser.

b. Wet bulb temperature in auxiliary fan air stream.

c. Compressor head pressure.

d. Freon test fitting gauge pressure.

e. Center outlet temperature.

Compare above with system pressures and temperature shown on Fig. 1B-120. If not within the limits shown, refer to the TROUBLE DIAGNOSIS GUIDE for possible cause of substandard performance. Reference should be made in the order listed with head pressure first, if not within Operational Test Chart limits, then P.O.A. valve inlet pressure and, finally, center outlet temperature.

13. Remove charging manifold gauge set, test fitting gauge, and install the fitting caps. Torque not to exceed 15 lb. ft.

OPERATIONAL TEST CHART

TEST CONDITIONS:

Hood	Raised
Front Doors	Open
A/C Control Push Button or A/C Select Lever	On "NORMAL" (PONTIAC) On "OUT" (TEMPEST)
A/C Blower Control	On "HI"
A/C Temperature Knob or A/C Temp Lever	Full Clockwise for Maximum Cooling (PONTIAC) Full Left for Maximum Cooling (TEMPEST)
Ball Nozzles and Air Outlets	Open
Engine Speed	2000 RPM

TEST READINGS:

Ambient Air in Degrees F. (In Auxiliary Fan Air Blast 2" Ahead of Condenser	70°		80°		90°		100°		110°	
Air Quality	Arid	Humid	Arid	Humid	Arid	Humid	Arid	Humid	Arid	Humid
*Average Compressor Head Pressure in PSI	163 to 187	193 to 217	193 to 217	223 to 247	223 to 247	263 to 287	258 to 282	313 to 337	298 to 322	373 to 397
Average P.O.A. Valve Pressure **PSI AT SEA LEVEL (PONTIAC)	27.5 to 29.5	28.5 to 30.5	28 to 30	29 to 31	28 to 30	30 to 32	28 to 30	33 to 35	28.5 to 30.5	37.5 to 39.5
Average P.O.A. Valve Pressure **PSI AT SEA LEVEL (TEMPEST)	27.5 to 29.5	28.5 to 30.5	28 to 30	29 to 31	28 to 30	29.5 to 31.5	28.5 to 30.5	30 to 32	29 to 31	34 to 36
Center Outlet Temperature in Degrees F. (PONTIAC)	38° to 42°	41° to 45°	39° to 43°	43° to 47°	40° to 44°	47° to 51°	41° to 45°	52° to 56°	43° to 47°	59° to 63°
Center Outlet Temperature in Degrees F. (TEMPEST)	38° to 42°	42° to 46°	40° to 44°	46° to 50°	42° to 46°	50° to 54°	45° to 49°	56° to 60°	49° to 53°	61° to 65°

(*)NOTE: These Pressures are for V-8 engine with engine fan clutch engaged and for 6 cylinder engine which does not have a fan clutch. For V-8 engine with fan clutch disengaged, pressures generally are 25-35 psi higher than shown here.

(**)NOTE: Interior pressure of the P.O.A. Valve is isolated from exterior atmospheric pressure. As a result, the controlling element (bronze bellows) of the P.O.A. Valve is able to operate independently of the effect of atmospheric pressure. However, any gauge used to check the P.O.A. Valve pressure will not be free from the effect of atmospheric pressure. This altitude effect on the gauge must be taken into account when interpreting a reading. As the altitude increases and atmospheric pressure goes down, the pressure reading on the gauge will go up.

The increase noted in the above readings will be approximately .5 psi per 1,000 feet above sea level. For example at 90 F in an arid climate at 2000 feet above sea level, both Pontiac and Tempest P.O.A. valve pressures would be 29 to 31 psi.

Fig. 1B-120 Operational Test Data

TROUBLE DIAGNOSIS

CONDITION AND CAUSE	CORRECTION
INSUFFICIENT HEATING	
Heater outlet temperature too low.	Check for proper engine thermostat. Check blower operation. Inspect temperature control knob (or TEMP lever) and cable for proper operation. Pontiac Only: Check operation of water control valve on intake manifold as follows: 1. Start engine and allow to warm up. 2. Set temperature control knob off full cold. 3. Feel hose from water valve to determine if water is flowing to heater core. If water is not flowing, inspect vacuum switch at heater core and case assembly and vacuum line to valve for leaks. If vacuum is sufficient, water control valve is defective and should be replaced.
INSUFFICIENT COOLING	
Nozzle temperature too high.	See NOZZLE OUTLET TEMPERATURE TOO LOW and also P.O.A. VALVE INLET PRESSURE TOO HIGH. Check blower operation. Check for obstructions, proper routing and proper connection of the vacuum hoses and check valve.
Insufficient air flow.	Flush evaporator core. If evaporator is iced, de-ice and check P.O.A. valve. Air leaks in air system.
Nozzle temperature varies too much.	A frequent 7°F. or more temperature variation at nozzle during operational check indicates P.O.A. valve is "hunting" excessively and the valve should be replaced.
Erratic cooling.	P.O.A. valve piston sticking; if stuck closed, no cooling due to lack of flow of refrigerant through the evaporator core; if stuck open no controlled cooling and car may get too cold—evaporator may freeze. Replace valve.

CONDITION AND CAUSE	CORRECTION
COMPRESSOR DISCHARGE PRESSURE TOO HIGH	
Engine overheated.	See Engine Section.
Overcharge of refrigerant or air in system.	Systems with excess discharge pressures should be slowly depressurized at the receiver inlet connection, observing behavior of high pressure gauge indicator. 1. Rapid discharge pressure drop indicates air (with the possibility of moisture) in system. When pressure drop levels but still indicates in excess of specifications shown in OPERATIONAL TEST CHART, slowly bleed system until bubbles appear in sight glass and stop. Add refrigerant until bubbles clear, then add one (1) pound of refrigerant. Recheck operational pressures. If discharge pressure still remains above specifications and suction pressure is slightly above normal, then a restriction exists in the high pressure side of system. 2. Slow discharge pressure drop indicates excessive refrigerant. If pressures drop to specifications and sight glass remains clear, stop depressurizing and recheck operational pressures. If pressures are satisfactory, depressurize until bubbles appear in sight glass, stop depressurizing, then add one (1) pound of refrigerant. Recheck operational pressures. 3. If discharge pressure remains high after depressurizing system, continue depressurizing until bubbles appear in sight glass. The system will have high pressure control more frequently under this condition. Also see P.O.A. VALVE INLET PRESSURE TOO HIGH.
Overcharge of Freon or air in system.	Install gauge set and bleed off Freon from P.O.A. valve suction side and compressor discharge side for 20 seconds. After 20 seconds close valves and recheck operating pressures. Repeat until discharge pressure is normal. Check sight glass. If bubbles appear it indicates that air was in system. Charge with Freon as follows: 2000 engine rpm, Outside (normal) air, Hi blower and maximum cooling. Add Freon until sight glass clears, then add one (1) pound additional.
Restriction in condenser, receiver-dehydrator or any high pressure line.	Remove parts, inspect and clean or replace.
Condenser air flow blocked.	Clean condenser.
P.O.A. Valve Inlet Pressure too high.	See "P.O.A. Valve Inlet Pressure Too High".

CONDITION AND CAUSE	CORRECTION
COMPRESSOR DISCHARGE PRESSURE TOO LOW	
Insufficient Freon.	Check for presence of bubbles or foam. If bubbles or foam are noted, charge with Freon as follows: 2000 engine rpm, "Normal" air, Hi blower and Maximum Cooling. Add Freon until sight glass clears, then add an additional one (1) pound. *NOTE: It is not unusual for bubbling to occur on minimum cooling and "LO" blower in mild weather even with fully charged system.*
Defective Compressor.	See section on Compressor Service.
Plug in Freon System.	1. Disconnect fittings assembly and detach hoses from the compressor; disconnect receiver-dehydrator inlet and outlet tubes. Seal the compressor ports and receiver fittings. 2. Check ends of lines for slipping plugs or torn-off pieces of these plugs left in at assembly. 3. Blow dry nitrogen, Freon or dry air thru lines to determine if lines or condenser is plugged. *CAUTION: If done at a dealership, bleed air hose of all moisture.* 4. If plug in the system has not been found, disconnect P.O.A. valve from the evaporator. 5. Blow thru expansion valve and evaporator, to check for plugged evaporator.
P.O.A. Valve inlet pressure too low.	See "P.O.A. Valve Inlet Pressure Too Low".
P.O.A. VALVE INLET PRESSURE TOO HIGH	
P.O.A. Valve Schrader stuck open.	Remove Schrader valve and inspect. *CAUTION: Use only Schrader valve prescribed.*
Expansion valve capillary tube to evaporator tube.	Remove insulation and inspect for clearance between tube and bulb. If gap exists, move bulb to establish contact, reclamp and reinsulate.
Expansion valve inoperative.	Remove expansion valve and inspect screen for foreign objects. If present, there is a possibility seat is being held open. Install new expansion valve; if condition is corrected, discard valve removed.

CONDITION AND CAUSE	CORRECTION
P.O.A. VALVE INLET PRESSURE TOO LOW	
P.O.A. Valve stuck open.	Shut off engine. If inlet pressure does not rise, valve is stuck open. Also indicated by less than 3 to 4 psi pressure differential between suction pressure and P.O.A. Valve inlet pressure.
Expansion valve capillary tube broken, inlet screen plugged or valve otherwise fails.	Remove expansion valve and inspect. Install new thermostatic expansion valve; if condition is corrected, discard the valve removed.
Restriction in system hoses or tubes.	Inspect and replace restricted hose or kinked tube.
NOZZLE OUTLET TEMPERATURE TOO WARM	
Poor seal—evaporator core to evaporator inlet case or evaporator to heater case.	Correct sealing.
Defective or missing evaporator drain hose.	Replace.
Air hoses not properly connected.	Inspect air hoses.
Vacuum control hoses not connected properly.	Check connections (Fig. 1B-30).
Insufficient Freon.	See "Compressor Discharge Pressure Too Low".
P.O.A. Valve faulty.	See "P.O.A. Valve Inlet Pressure Too High".
Expansion valve faulty.	See "P.O.A. Valve Inlet Pressure Too High".
NOZZLE OUTLET TEMPERATURE TOO COLD	
P.O.A. valve faulty.	See "P.O.A. Valve Inlet Pressure Too Low".

SPECIFICATIONS

Compressor

Armature plate and hub assembly . . . . . .0002"-.0007" press fit to shaft
Armature plate to pulley clearance . . . . . .022"-.057" (air gap)
Mainshaft assembly end play . . . . . .0003"-.0013"
Oil charge (new) . . . . . 11 fluid ozs.
Oil type . . . . . Frigidaire 525 visc.
Piston shoe clearance . . . . . .0005"-.0010"
Pulley diameter . . . . . (nominal) 4.815" (approximately 4-13/16")
Rear head to shell nuts . . . . . 19-23 lb. ft. torque
Service compressor oil charge . . . . . 11 ozs. Frigidaire 525 oil

Compressor Belt

Size . . . . . 1/2"
Tension . . . . . 100-105 (140-145 new) lbs. indicated on Burroughs Belt Tension Gauge

Compressor Coil

Current (maximum demand) . . . . . 3.2 amps. at 12 v.
Resistance . . . . . 3.85 ohms at 80°F.

Cooling System Capacity . . . . . Pontiac with heater 20 qts.
Tempest 6 cylinder 14.5 qts.
Tempest V-8 27.0 qts.

Engine Idle Speed— See Engine Section

Fan . . . . . 7 blades

Refrigerant—12 Capacity . . . . . Pontiac - 4-1/8 lbs.
Tempest - 3-3/4 lbs.

Fuse

In line at alternator . . . . . 30 amp.
At heater terminal in fuse block . . . . . 25 amp.

Radiator Cap . . . . . 15 psi

HOSE AND TUBING CONNECTIONS TORQUE CHART

Metal Tube Outside Diameter	Thread and Fitting Size	Steel Tubing Torque Lb.-Ft.	Aluminum or Copper Tubing Torque Lb.-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1-1/16
3/4	1-1/16	30-35	23-28	1-1/4

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Use steel torques only when both ends of connection are steel.