SECTION IX DIAGNOSIS AND TEST PROCEDURES

REFRIGERANT SUPPLY TEST

A quick check of the refrigerant supply can be made by observing the flow of refrigerant through the sight glass.

To check the refrigerant supply, place a large fan in front of the radiator to aid in cooling the engine. Set the control for maximum cooling and the blower on high. Operate the engine at 1500 r.p.m. and observe the sight glass while the compressor is operating. There should be no bubbles in the sight glass with the compressor in operation. Bubbles will appear when the compressor starts but should clear after a few moments.

If bubbles continue to appear in the sight glass, check the system for leaks. Refer to "Leak Test." Repair any leaks found and charge the system. Refer to "Charging the System" and "Partially Charging The System."

THERMOSTATIC SWITCH TEST

Check the interior temperature of the car. It must be above 45° F. to test the thermostatic switch. Set the air conditioning control for maximum cooling and turn the ignition switch on. It is not necessary to have the engine running. The magnetic clutch should engage. If it does not engage, connect the two switch lead wires together. If the clutch engages, replace the thermostatic switch. If it does not engage, check the wiring and clutch.

MAGNETIC CLUTCH TEST

Disconnect the magnetic clutch lead wire at the bullet connector near the compressor. Connect a jumper wire to the "BAT" terminal of the voltage regulator. Touch the other end of the jumper wire to the clutch lead wire. The clutch should engage.

If the clutch does not engage, check the lead wire connection and the brushes. If the clutch still does not engage, replace the clutch.

OPERATIONAL CHECK

An operational check of the system can be made to determine the system pressures and temperature for purposes of determining if and where trouble might exist in the system. The pressures developed in the system indicate whether or not the system is functioning properly and the outlet air temperature is a good overall check as to the cooling system efficiency. The checks should be made under the following conditions and in the following manner.

TEST CONDITIONS

Hood ..... Raised
Engine Speed ..... 1500 rpm
Air Conditioning Control....Set at Maximum Cooling
Blower Switch ..... High Speed
Test Manifold Gauge Set ..... Installed

Make the test in a garage where the sun load will not be factor. It is advantageous to place a large fan ahead of the radiator to maintain satisfactory engine temperatures.

Using a jumper wire, connect the compressor clutch lead to the battery or a hot lead so the compressor will run continuously.

Do not exceed 10 minutes operation under these conditions.

1. Start the engine and allow the system to operate for five minutes until the temperature becomes stabilized.
2. Place the thermometers in the air outlet registers.
3. Observe the low and high system pressures on the manifold gauge set. *If the gauge needles fluctuate excessively due to compressor pulsation, turn the service valves slowly counterclockwise until the fluttering ceases. Do not turn the valves far enough to close the opening to the gauge hoses.*

1958-59 LINCOLN

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250	260-300
Compressor Suction Pressure P.S.I.	15-21	16-22	18-26	22-30	40-50
System Discharge Air Temperature At Outlet Registers	35-39°	36-40°	37-42°	39-45°	44-49°

1960 LINCOLN

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250	260-300
Compressor Suction Pressure P.S.I.	15-21	16-22	18-26	22-30	40-50
System Discharge Air Temperature At Outlet Registers	38-42°	40-44°	41-45°	42-46°	44-50°

1961 LINCOLN CONTINENTAL

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	140-200	160-220	180-240	200-250	225-265
Compressor Suction Pressure P.S.I.	15-25	20-30	22-32	25-35	30-40
System Discharge Air Temperature At Outlet Registers	38-44°	42-48°	44-52°	46-54°	48-58°

1957 MERCURY

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250	260-300
Compressor Suction Pressure P.S.I.	15-21	16-22	18-26	22-30	40-55
System Discharge Air Temperature At Outlet Registers	35-39°	36-40°	37-42°	39-45°	44-49°

1958-59 MERCURY

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250	260-300
Compressor Suction Pressure P.S.I.	15-21	16-22	18-26	22-30	40-50
System Discharge Air Temperature At Outlet Registers	35-39°	36-40°	37-42°	39-45°	44-49°

1960-61 MERCURY

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250	260-300
Compressor Suction Pressure P.S.I.	15-21	16-22	18-26	22-30	40-50
System Discharge Air Temperature At Outlet Registers	38-42°	40-44°	41-45°	42-46°	44-50°

1958 EDSEL

Ambient Temperature	70°	80°	90°	100°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250
Compressor Suction Pressure P.S.I.	23-29	24-30	24-32	26-34
System Discharge Air Temperature At Outlet Registers	35-39°	36-40°	37-42°	39-45°

1959 EDSEL

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250	260-300
Compressor Suction Pressure P.S.I.	15-21	16-22	18-26	22-30	40-50
System Discharge Air Temperature At Outlet Registers	35-39°	36-40°	37-42°	39-45°	44-49°

1960 EDSEL

Ambient Temperature	70°	80°	90°	100°	110°
Compressor Discharge Pressure P.S.I.	120-140	138-172	161-209	190-250	260-300
Compressor Suction Pressure P.S.I.	15-21	16-22	18-26	22-30	40-50
System Discharge Air Temperature At Outlet Registers	38-42°	40-44°	41-45°	42-46°	44-50°

Trouble shooting and repair of an air conditioning system will be facilitated by using the two trouble shooting charts, wiring diagrams and other information which follows. (Figure 9-1 is a Diagnosis Chart of troubles and their probable causes. The Sequence Chart, figure 9-2, indicates the order in which air conditioning components should be checked for a given trouble.)

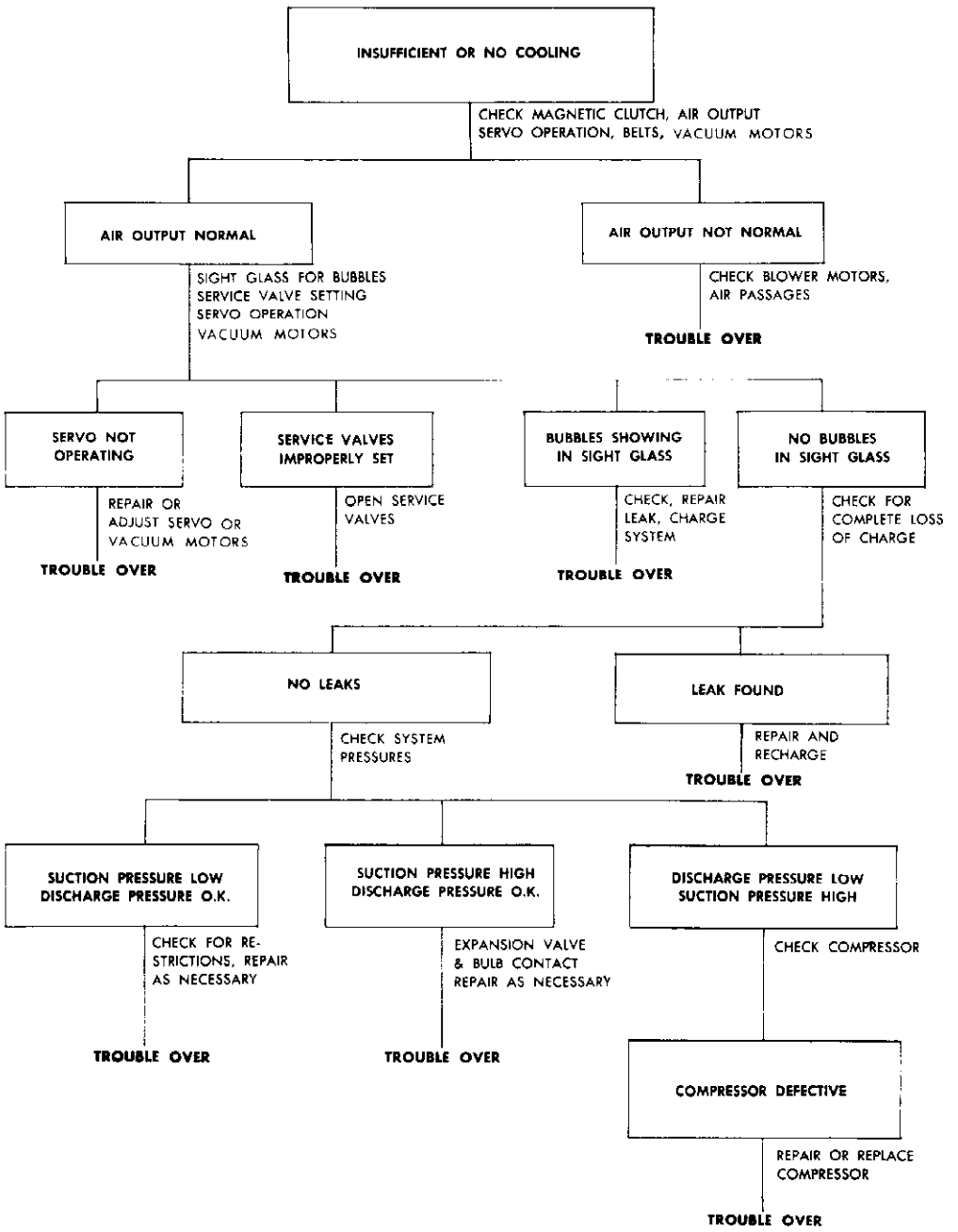

Fig. 9-1–Air Conditioning System Diagnosis Chart–(9M-8813)

COMPONENTS TO CHECK					
ABNORMAL OPERATING CONDITION	COMPRESSOR	CONDENSER-RECEIVER	EXPANSION VALVE	REFRIGERANT LINES	REFRIGERANT
SYSTEM PRESSURES					
Low Suction Low Discharge		4	3	2	1
Low Suction High Discharge		1	3	2	
High Suction Low Discharge	2		1		
High Suction High Discharge		2	1		
Normal Suction High Discharge		2		3	1
Low Suction Normal Discharge	1	3	2		

INSUFFICIENT COOLING-CLUTCH ENGAGES

1. Check the compressor drive belt tension. Adjust the tension to specifications.

2. Thoroughly clean the exterior of the condenser, removing anything that could interfere with the air flow through the fins.

3. Place a large fan in front of the radiator and run the engine at 1500 r.p.m. The control must be set for maximum cooling and the blower on high. Feel the low pressure line leading to the compressor service valve. The line should be cool. If it is warm, the system is not working at full capacity.

4. Check the refrigerant supply. Refer to "Refrigerant Supply Tests".

5. Check the receiver-dryer tank. With the unit in operation, feel the inlet and outlet receiver lines. The temperature of the lines should be the same. If they are not, the receiver is obstructing the refrigerant flow and must be replaced.

6. Inspect all tubing and hoses for sharp bends and kinks which could obstruct the flow of refrigerant. Replace all damaged lines and hoses.

7. Remove the service valve stem caps and check the service valves. They must be back seated (full counterclockwise).

LOW PRESSURE BELOW NORMAL

This indicates a restriction between the reeiver and the low pressure service valve. If the gauge actually shows a vacuum, the expansion valve is probably tightly closed.

Shut the system down and allow it to warm to room temperature. Restart. If the evaporator discharge air now become momentarily cool, the expansion valve was freezing because of moisture in the system. Correct the malfunction as follows:

1. Discharge the system.
2. Replace the receiver-dryer.
3. Evacuate the system.
4. Charge the system and make an operational check.

Low pressure readings which are too low can also be caused by a sticking expansion valve or a restriction in the line (between the receiver outlet and the suction service valve).

A restriction in a line or at a connection should make that portion of the line noticeably colder than adjacent sections or cause the section to frost up.

Allowing the system to stand and warmup (as in checking for a freezing expansion valve) will not affect a sticking expansion valve.

High and low system pressures within 30 pounds of each other indicate an abnormal compressor condition. Replace restricted lines; clean or replace the expansion valve; or repair or replace the compressor as necessary.

LOW PRESSURE ABOVE NORMAL

A low pressure reading higher than normal indicates that the expansion valve is not closing. This allows large amounts of liquid refrigerant to flow to the compressor. The compressor will usually be noisy and the crankcase and head will be cooler than normal.

This expansion valve condition can be caused by poor contact between the expansion valve sensing bulb and the evaporator outlet tube. Check to see that the bulb is properly clipped to the tube and the insulation is properly installed before replacing the expansion valve.

HIGH PRESSURE BELOW NORMAL

There is a normal differential of 6 or 7 to 1 across the compressor, between the high side and low side. If the high side pressure is low and the low side pressure is higher than normal, check the expansion valve to see if it is closing. This could also indicate that the compressor is not working properly.

HIGH PRESSURE ABOVE NORMAL

High head pressure is usually caused by too much oil in the compressor, too much refrigerant, air in the system, high ambient temperatures, or a dirty condenser. Abnormally high pressures are generally evidenced by a pounding noise in the compressor.

It is normal for a compressor to pound a little (until the system stabilizes itself) after it has just been placed into operation, also the high pressure can normally be as high as 300 p.s.i. in ambient temperatures of 110° F.

Correct the oil level or purge the system at the high pressure service valve to relieve an overcharge of refrigerant.

INSUFFICIENT COOLING OPERATION OF AIR CONDITIONING SYSTEM DUE TO LACK OF REFRIGERANT

Any time bubbles are found in the sight glass (indicating a partial loss of charge) or when the system is opened to perform repairs, a leak test should be performed.

Use the flame-type leak detector (Tool ACL-53-2). Adjust the torch to a very small flame and test all around each connection (especially the compressor shaft seal). Refer to "Leak Test".

CAUTION: *Work in a well ventilated area. The presence of any gas will spoil a leak test. Flame plus refrigerant gas combines to form poisonous gas. Do not inhale the fumes.*

CHECKING MODULATOR VALVE

Improper pressure reading and inadequate cooling could indicate that the modulator valve is stuck either open or shut.

1. **Valve Stuck Open**

With engine running at high idle, there will be minimum cooling. Changing position of temperature control lever will have little or no effect on pressure readings.

2. **Valve Stuck Shut**

With engine running at high idle, there will be maximum cooling. Changing the position of the manual control will have little or no effect on the pressures.

CHECKING THE EXPANSION VALVE

Little or no cooling and improper pressure readings could indicate that the expansion valve is stuck either open or shut.

1. **Valve Stuck Open**

With engine running at idle, the compressor may knock from liquid slugging and any cooling will take place in the upper portion of the evaporator core and the return line leading to the compressor.

2. **Valve Stuck Shut or Partially Shut**

With the engine running at high idle and the temperature control lever in the full cold position, little or no cooling will take place in evaporator core.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE	INDICATIONS	REMEDY
(1) Insufficient cooling.	(a) Low charge of refrigerant.	(a) Sight gauge will show bubbles and low pressure gauge will show excessively low readings.	(a) Check for leaks, and charge system until bubbles disappear and pressure returns to normal.
	(b) Defective expansion valve.	(b) Excessively high and excessively low pressure readings.	(b) Pump system down and replace expansion valve.
	(c) Obstruction in air circulating system.	(c) Blowers will not circulate correct amount of air.	(c) Check and clean air filter, check for blocked grille on rear seat package tray. Check flexible air ducts for tears or restrictions.
	(d) Defective modulator valve.	(d) High pressure reading below normal; low pressure reading above normal.	(d) Replace valve.

TROUBLE SHOOTING CHART

TROUBLE	CAUSE	INDICATIONS	REMEDY
(2) No Cooling.	(a) Loose or broken drive belt.	(a) Pressure readings will be the same on both the high and low pressure gauges at any engine speed.	(a) Tighten or replace belt.
	(b) Inoperative valves in compressor	(b) Pressure readings will vary only slightly on both the high and low pressure gauges at any engine speed.	(b) Repair compressor (Note: Check expansion valve to make sure it is not stuck in the open position.)
	(c) Break in any part of closed refrigeration system.	(c) No pressure in any part of the system.	(c) Replace defective part, install new dehydrator.
(3) Compressor is excessively noisy.	(a) High pressure valve is shut off.	(a) High pressure gauge reading excessively high, and compressor knocks noticeably.	(a) OPEN VALVE IMMEDIATELY.
	(b) Insufficient compressor lubricating oil.	(b) Compressor crank case becomes excessively hot and noisy.	(b) Check system for oil leaks. Correct leak or replace defective part. Refill with special compressor oil.
	(c) Loose or worn parts in compressor.	(c) Noisy operation.	(c) Repair or replace compressor.
	(d) High charge of refrigerant.	(d) High pressure gauge will show excessively high readings.	(d) Release pressure through Pressure Test Gauge Manifold until pressure becomes normal.
(4) No blower operation, or blower operation is intermittent.	(a) Blower motors have shorted or open field or armature windings, electrical connections are loose or disconnected, electrical wiring is shorted or open or panel switches are inoperative. Burned out fuse.	(a) Blower motors operate intermittently or will not operate at all.	(a) Check refrigeration electrical system, repair or replace defective parts, replace fuse.