CHAPTER
7 NOVI

Novi Equipment Co.
Novi, Mich.

Novi air conditioners are currently being manufactured for the 1954 and 1955 Ford (both "6" and "V-8"), Mercury, Lincoln, Oldsmobile, Buick, Cadillac, and the 1955 Chevrolet. These units are also original equipment (factory installed) on the 1955 Studebaker.

Major components of the Novi system are arranged conventionally with the compressor being mounted on the car engine, the condenser in front of the radiator, and the evaporator-blower assembly in the trunk of the car.

Refrigerant used is "Freon-12." Charge is 4 lbs. of liquid refrigerant.

Compressor

Compressor employed on Novi systems is the Tecumseh 2-cylinder model HH compressor.

Suction service valve of this compressor is located on the left side, as viewed from the flywheel end, and the discharge service valve is on the right side of the compressor.

FIG. 1—Compressor and condenser arrangement of Novi air conditioner are indicated here. Third line leaving condenser is part of by-pass hookup.

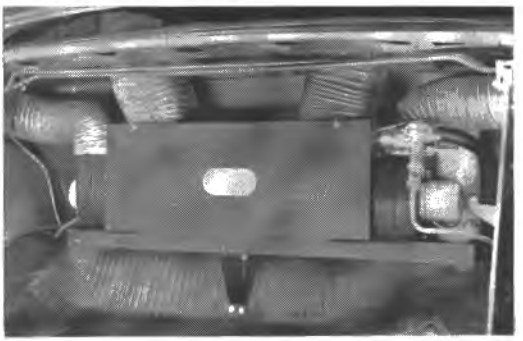

FIG. 2—Evaporator-blower assembly of Novi unit goes in trunk of car.

Condenser

Condenser of the Novi air conditioner is installed in front of the car radiator. Inlet and outlet connections are usually on the right (curb) side though not always. (See Fig. 1.)

Also on the same side is the connection for the modulating by-pass arrangement. The by-pass is taken off the condenser a few passes down from the top.

Evaporator

Evaporator-blower assembly mounts in the forward section of the trunk. (See Fig. 2.)

This assembly consists of the evaporator coil (4½ by 8½ by 18 in. with 12 fins per inch), two blowers, thermostatic expansion valve (Detroit 777), sight glass, and combination receiver-drier.

A flexible discharge duct extends from each blower (located at opposite ends of the evaporator assembly) to outlets on opposite sides of the parcel shelf directly overhead.

Similarly, two flexible return air ducts run from intake grilles on the parcel shelf to the evaporator assembly.

Refrigerant flow is from the condenser to the receiver-drier, thence to sight glass installed at inlet of expansion valve, through evaporator, and thence to compressor and condenser.

Controls

Controls of the Novi air conditioner consist of individual speed control switches for each of the two blowers and a temperature control. These are mounted in a control panel attached to the dashboard. (See Fig. 3.)

Blower controls are of the push-pull type and have three positions—off, low, and high speed. Control for left-hand blower is on the left side of control panel. Switch on right of panel controls operation of right-hand blower.

In center of panel is the temperature control knob. This is connected by a flexible cable to the pressure-regulated modulating by-pass valve (Detroit 669) intalled on the suction valve of the compressor. (See Fig. 4.)

A by-pass line runs from the condenser to the by-pass valve, the line being taken off the condenser a few passes from the top.

Purpose of the by-pass arrangement is to by-pass some or all of the refrigerant around the evaporator. When the temperature control is pushed in all the way, all of the refrigerant is by-passed around the evapo-

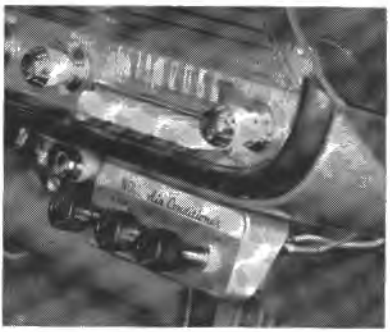

FIG. 3—Control panel attached to dash includes two blower controls and push-pull lever controlling temperature through manual over-ride of pressure regulated modulating by-pass valve.

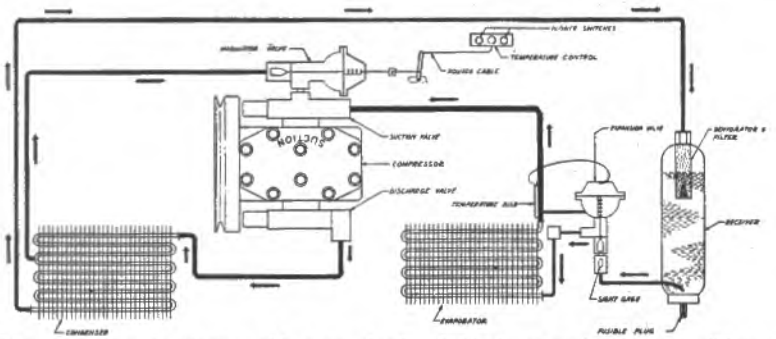

FIG. 4—Schematic shows refrigerant circuit of Novi automobile air conditioner, including controls.

rator and the air conditioner is, in effect, turned off.

When the temperature control is pulled out fully, the by-pass valve is closed and all the refrigerant flows to the evaporator. Setting the control lever at intermediate positions lets the user control the amount of cooling obtained.

Temperature control is actually an over-ride arrangement, the action of the by-pass modulating valve being normally controlled by the suction pressure.

The following are approximate operating pressures of the Novi unit. These are based on constant car speed with the blowers turned on:

Outside Air Temp.	Car Speed (M.p.h.)	High Pres. (P.s.i.g.)	Low Pres. (P.s.i.g.)
80°	20	140	40
80°	40	160	30
80°	60	180	20
100°	20	160	45
100°	40	180	40
100°	60	200	30

Wiring

Wiring of the Novi air conditioner is quite simple. Two leads run from the car ignition to the control panel, one lead being connected to each blower switch.

Two leads extend from each blower switch to the corresponding blower motors on the evaporator assembly in the trunk. The two leads, connected to the proper terminals of the motors, provide the two-speed control of the blowers. One terminal of each motor is grounded.

Other Components

Flexible hose is used throughout the Novi system as refrigerant tubing for the connections between compressor, condenser, and evaporator. Because hose is used care must be taken to prevent the hose touching or getting close to high temperature parts of the car, especially the exhaust pipe and muffler.

Plastic discharge tubes are installed on the air outlets on the parcel shelf to direct flow of air forward along roof of the car. (See Fig. 5.)

SERVICE HINTS

Evacuating System

If a refrigeration vacuum pump is available, it should be used for evacuating the system, Novi advises.

Attach it to the discharge valve gauge port and operate the pump until the highest vacuum reading is reached. A vacuum gauge should be on the pump or in the evacuating line.

Then back out by turning counter-clockwise the discharge valve stem until it seats. Then remove vacuum pump and line.

If no vacuum pump is available, the compressor itself can be used for evacuating the system, Novi explains.

Screw in (clockwise) the discharge valve stem until it seats. Be sure the discharge valve gauge port cap is off. Then start the car engine and idle for five to 10 minutes until the air stops flowing from the gauge port. A slight amount of oil loss is okay, providing the oil level is still visible in the compressor sight glass after the engine is stopped.

Cap the discharge gauge port tightly, then shut off the engine. Back out, by turning counter-clockwise, the discharge valve stem until it seats. Then remove the gauge port cap.

Charging the System

The Novi automobile air conditioner requires a charge of 4 lbs. of "Freon-12."

If charging from a cylinder, Novi suggests that the cylinder be placed on a scales with the valve down so that only liquid refrigerant will flow out, and proceed as follows:

1. Attach charging line between refrigerant cylinder valve and the compressor discharge valve gauge port.

2. Balance the scales with the cylinder on it.

3. Open cylinder valve and compressor discharge valve (four full turns), and allow 4 lbs. of refrigerant to enter system.

4. Shut cylinder valve and back out discharge valve.

5. Remove charging line from gauge port and install gauge port cap and the two valve stem caps.

If system is to be charged from 1-lb. cans of refrigerant, Novi recommends the following procedure:

1. Attach charging line between special valve used with cans and the discharge valve gauge port.

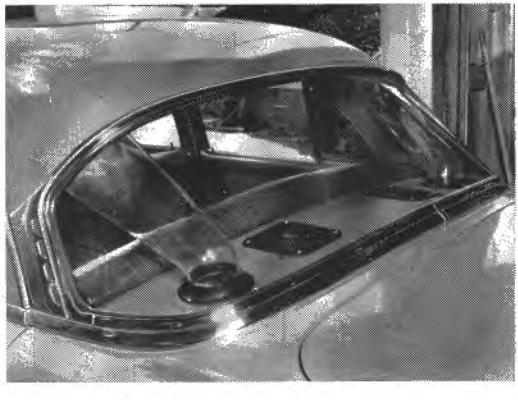

FIG. 5—Plastic discharge outlets are used by Novi to direct flow of air forward along roof of car.

2. Back out needle valve stem of special can valve. Screw one can tightly onto valve. Screw needle valve stem in fully to puncture the can, then back it out fully to allow refrigerant to flow. Hold the can upside down and open the compressor discharge valve about four turns.

3. Immerse refrigerant can in pail of hot water to force out all of refrigerant for about half a minute. Back out discharge valve stem, lift can from water, and remove empty can from special valve, allowing pressure to escape.

4. Repeat procedure with three more 1-lb. cans.

5. Remove charging line from the gauge port and install gauge port cap and two valve stem caps.

Trouble Chart

1. Blowers operating, but not cooling.

A. Check liquid sight glass for refrigerant flow. If there is foaming action, or no visible signs of liquid are seen, this denotes a shortage of refrigerant. Refrigerant shortage means a leak in system. Check entire system for leaks. Discharge system, repair leaks, and recharge.

B. Check for restrictions. Connect the high and low pressure gauges to the compressor suction and discharge valve ports. Check operating pressures with car engine running at fast idle or approximately 1,500 r.p.m. with blowers on high speed.

If low pressure gauge reading is lower than normal, it indicates a restriction in the high side of the system. This may be caused by a kinked refrigerant line, dirty or clogged inlet screen in expansion valve, or clogged drier, or moisture in system freezing at expansion valve.

2. Blowers operating with only partial cooling.

A. First check for refrigerant shortage at liquid indicator. Shortage of refrigerant results in the cooling coil doing only a partial job of cooling. Refrigerant shortage probably means leaks which should be found and corrected, and the system recharged.

B. If refrigerant supply appears ample, check expansion valve for proper adjustment. A valve that opens too wide will more than flood the coil and reduce cooling capacity of system. A valve that doesn't open enough will starve the coil. This may be due to improper adjustment of valve, a discharged power element, or improper clamping of thermo bulb of valve.

Proper setting and functioning of expansion valve will cause suction line fitting at compressor to be cool after the system has operated steadily for several minutes, and the compressor crankcase will be hotter than air temperature.

If crankcase is cooler than air, valve is open too wide. Screw in clockwise superheat adjustment steam (under the hex cap on right side of expansion valve) one turn. Run the system several more minutes and then check temperature of crankcase. Adjust superheat

setting further if necessary, Novi advises.

C. If refrigerant supply appears ample and expansion valve is properly adjusted, partial cooling may be result of compressor's working against a higher than normal head pressure.

D. Also check modulating by-pass valve. Make sure loop on end of cable from dash control panel is attached to lever arm on valve assembly. Operate cable control in and out. If cable is improperly set and lever arm on valve does not pull out to its maximum position, the system will by-pass refrigerant at too high a pressure and will limit the cooling capacity considerably.

3. High operating pressure.

A. Check high pressure by noting high pressure gauge reading at fast idle. A reading higher than normal (as listed on pressure chart) can be caused by one of the following:

a. Restricted air flow through condenser.

b. Overcharge of refrigerant.

c. Air in system.

d. Engine temperature above normal.

B. Shortage of water in car cooling system will cause radiator to overheat. This will increase temperature of the condenser and raise temperature and pressure of the refrigerant inside condenser. A dirty or clogged condenser also raises the refrigerant temperature within the condenser.

C. If system still shows unusually high pressure after car radiator and condenser have been cleaned and radiator water level is brought up to full point, the trouble may be due to overcharge of refrigerant. Excess refrigerant should be discharged intermittently through high pressure gauge port.

D. Air in system will also cause high operating pressures. This can result from improper evacuating and charging.

4. Blowers not operating.

Check fuses in wiring harness leading from ignition switch to blower switches on control panel. Check blower switches. Check for loose connections and broken wires between switches and blower motors.

Remove valve cap from compressor suction service valve. Use valve ratchet wrench and check valve stem to be sure that valve is backseated.

Remove gauge port cap and attach low pressure gauge hose. Open suction valve slightly to obtain reading.

Start car engine and operate at idling speed with blowers off for at least five minutes. This will help dissipate refrigerant from compressor crankcase.

Close suction valve (clockwise) until fully seated. Gauge reading should drop steadily and eventually show 20 in. vacuum or more. Shut engine off.

Gauge reading should not lose more than 5 in. vacuum in one minute. If the compressor fails to pump a 20-in. vacuum, or loses the vacuum more rapidly than specified above, the compressor valves are not working properly.