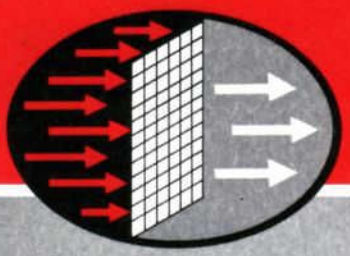
SHOP TIPS

Autolite Ford

VOL. 9, NO. 9 MAY, 1971



KEEPING IT COOL

Technical parts and service information published by the Autolite-Ford Parts Division and distributed by Ford and Lincoln-Mercury Dealers to assist servicemen in Service Stations, Independent Garages and Fleets.

IN THIS ISSUE

Be sure to file this and future issues for ready reference. If you have any suggestions for articles that you would like to see included in this publication, please write to: Autolite-Ford Parts Division, Merchandising Services Dept., P.O. Box 3000, Livonia, Michigan 48151.

The information in this publication was gathered from materials released by the National Service Department of Autolite-Ford, Ford and Lincoln-Mercury Divisions, as well as other vehicle and parts manufacturers. The descriptions and specifications contained in this issue were in effect at the time it was approved for printing. Our policy is one of continuous improvement and we reserve the right to change specifications or design without notice and without incurring obligation.

Autolite Ford

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VOL. 71 MSD 49 LITHO IN U.S.A.

GENERAL INFORMATION

Generally when you hear the term "Air Conditioning" or an "Air-Conditioned Car," the very first thing that comes to mind is *cold air*.

However, a factory installed air conditioning system controls much more than that. It affects the temperature of the car's interior, the humidity level, the purity and the movement of air.

And, it also provides the vehicle with a comfortable, restful compartment in which the driver and occupants ride.

AIR CONDITIONING COMPLAINTS

Whenever an owner of an air-conditioned car or truck pulls into your service area or service center for help, the complaint is usually one of a very broad nature. Normally you'll hear that the system is not providing any cooling . . . not enough cooling . . . inconsistent cooling . . . or a noise that develops whenever the system is turned on.

As the service technician, you must then, through your specialized training, knowledge and theory of air conditioning systems, isolate the cause of the owner complaint and be able to take the necessary service steps to get the system back in proper operation.

To do this, a number of specialized skills are needed. For one thing, it is necessary to be able to hook up pressure testing gauges and be able to interpret their readings. You'll also need to know exactly how to use refrigerant (R-12) leak testing equipment. Another skill is knowing how to discharge, purge, evacuate, and charge an air conditioning system. How to check and add refrigerant oil is also a necessary skill.

It is not uncommon for a malfunction occurring in one part of the system to show up as a problem in another part of the system. So, you as the serviceman must be able to maintain an open, alert mind. You must remember that for any one complaint there are usually a dozen or more probable causes. Each of these causes then must be pursued and eliminated.

Many times a searching, thorough inspection will uncover the cause of the complaint. And to save time and effort, you as the service technician should always work from the most obvious reasons for the complaint on down to the most time consuming test procedures.

In this issue of *Shop Tips* we intend to cover the details for performing the subjects mentioned. However, attending a training class plus careful reading of car division Shop Manuals is considered a must if you are to become a qualified specialist in the ever increasing field of Air Conditioner (A/C) service.

... AIR CONDITIONING

HOW THE AUTOMOTIVE REFRIGERATION CYCLE FUNCTIONS

In the course of operation, the "Refrigeration Cycle" is repeated over and over again as the refrigerant (R-12) is circulated within a set of closed lines and through other units that make up the air conditioning system.

Physical laws that never vary are the basis of this refrigeration system. These specific laws and what happens to the R-12 are covered in the following explanation of system operation.

To begin with, refrigerant in the EVAPORATOR is removed by the COMPRESSOR which lowers the pressure-temperature of the R-12 in the evaporator tubes. In other words, heat from the warm air blowing over these tubes and fins causes the R-12 to boil. Thus a physical change occurs as the liquid R-12 turns into a low pressure vapor. This air passing through the evaporator gives up its heat to the evaporator vapor (gas). And, because any liquid (including water) requires a large amount of heat in order to change to a vapor, the boiling (vaporizing) R-12 absorbs a great amount of heat from the air. As a result, air leaving the evaporator feels cool to the driver and occupants.

The vapor then travels through the SUCTION LINE (also called the LOW-PRESSURE LINE) and enters the compressor. Compressing any vapor increases its pressure and also increases its temperature. As a result, the compressed vapor leaving the compressor is a high temperature, high pressure vapor that is hotter than the outside (ambient) air.

Next, the vapor travels through the HIGH PRESSURE (also called the DISCHARGE) LINE, and enters the CONDENSER. At this point of the cycle, the R-12 in the condenser is under high pressure that forces it to condense (return to a liquid) at a temperature above outside air temperature. Now, when relatively cool outside air passes through the condenser, the loss of heat to the outside air causes the R-12 to change to a liquid R-12.

At this point of the cycle, the R-12 passing through the condenser exchanges its heat for the relative coolness of the outside air.

Because any vapor requires the removal of a large amount of heat in order to change back to a liquid (as steam back to water) the R-12 loses a great amount of heat to the outside air as it condenses while flowing through the condenser coils. Liquid R-12 at the bottom of the condenser then travels to the RECEIVER-DEHYDRATOR.

The R-12 remains a high pressure liquid but now it is cooler than the vapor that entered the condenser. It then travels through the receiver-dehydrator and through the HIGH PRESSURE (liquid line) to the THERMOSTATIC EXPANSION VALVE. It is at this point that the liquid R-12 is metered into the EVAPORATOR. When the R-12 enters the evaporator where the pressure is low (approximately 30 p.s.i.) its temperature drops to 33 degrees F., and the liquid R-12 boils (vaporizes) and the cycle is repeated again and again when the system is functioning properly.

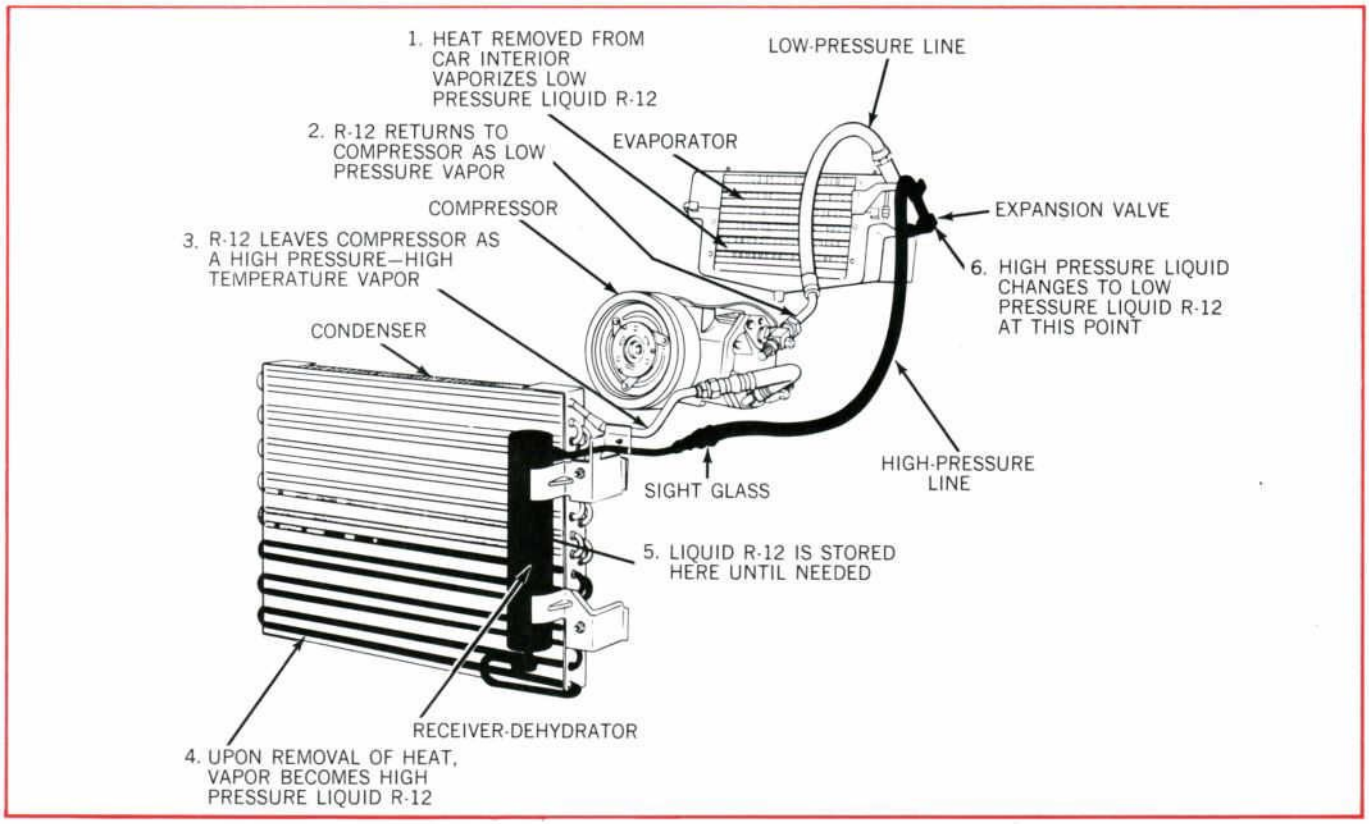


Figure 1—Basic Refrigeration Cycle

TESTING THE A/C SYSTEM

NOTE: Before performing a Compressor Test or a Performance Test, make a complete visual inspection of the A/C system. Look for obstructed air passages; broken drive belts; disconnected or broken wires; a loose clutch; a broken, cracked or loose mounting bracket.

HOW TO USE THE COMPRESSOR SERVICE VALVES

When the service valves are in the BACK-SEATED position, both valves are cut off from the manifold gauge set. See Figure 2. In this position, the low-pressure valve is OPEN between the suction side of the compressor and the evaporator while the high-pressure valve is OPEN between the discharge side of the compressor and the condenser. This is the normal operating position of the service valves.

In the FRONT-SEATED position, the low-pressure valve cuts off the suction side of the compressor from the evaporator while the high-pressure valve cuts off the discharge side of the compressor from the condenser.

In the MID-POSITION, the valves are OPEN between the gauge manifold set, the refrigeration system, and the compressor.

HOW TO MAKE A COMPRESSOR TEST

Attach the manifold gauge set to the service valves at the compressor. It is not necessary to attach the R-12 tank or the vacuum pump.

Make sure both manifold gauge set valves are at the full-clockwise (closed) position.

Now, turn the low-pressure service valve to the *front-seated* (full clockwise) position and turn the high-pressure service valve to the *back-seated* (full-counterclockwise) position.

Start the engine and let it run at idle speed. Set the A/C controls at their maximum cooling position to engage the compressor clutch. CAUTION: Perform this test for 30 seconds only. Then, to avoid damaging the compressor, quickly disengage the clutch by returning the A/C controls to the off position.

The low-pressure (suction) gauge should reach 20 inches of vacuum within the 30 seconds of operation and also should remain below zero (0) psi for at least one minute.

If the compressor does not meet these two conditions after at least THREE cycles of clutch engagement, the compressor has either a blown head gasket or leaking valves.

Remove the compressor head and inspect the valve plate and gaskets for damage. Replace parts as necessary.

Replace the compressor if the cylinder walls are scored or pieces of metal are found imbedded in the piston heads.

HOW TO CHECK FOR REFRIGERANT LEAKS

With the manifold gauge set attached to the compressor service valves, make sure that both manifold gauge valves are at their maximum *clockwise* position.

Set both service valves at their *center* (mid) position. Both gauge valves should show about 60 to 80 pounds of pressure at 75 degrees F. with the *engine not running.*

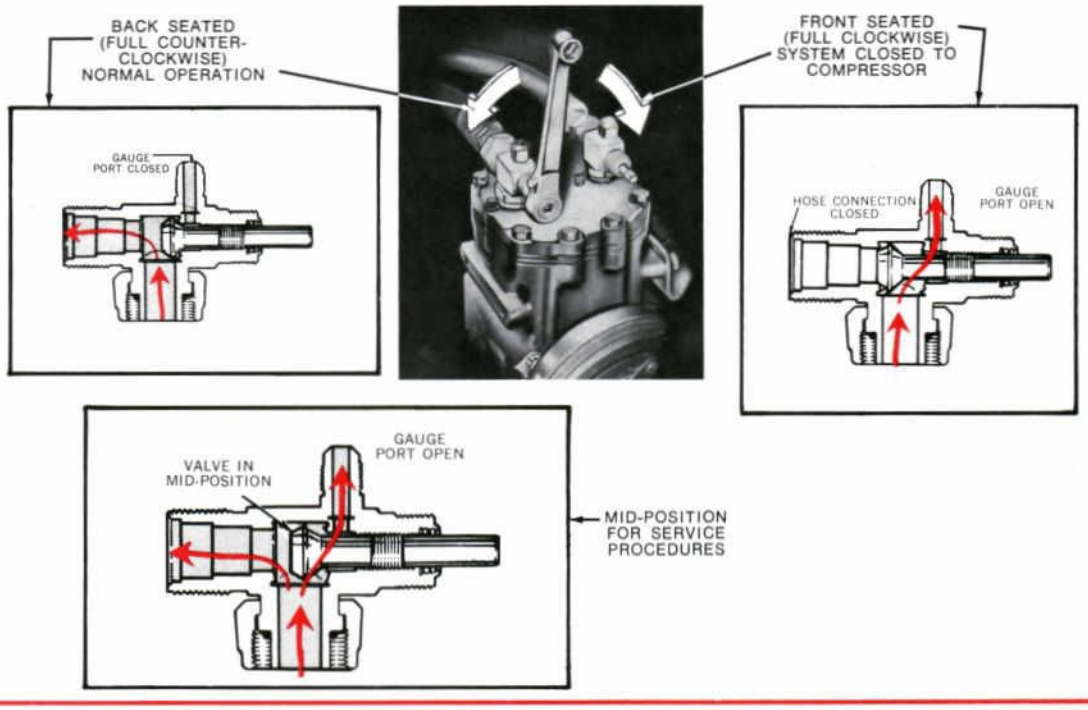


Figure 2—The Three Positions of the Compressor Service Valves

If very little or no pressure is indicated on the gauge set, let the vacuum pump valve remain closed and open the R-12 tank valve. Now, make sure the low-pressure (suction) manifold gauge set valve is at its counterclockwise position. This opens the A/C system to refrigerant tank pressure.

Using a flame-type leak detector, see Figure 3, check all connections; the compressor head gasket area; the oil filler plug area; and the compressor shaft seal. Follow the directions supplied with the leak detector if you are not familiar with its operation.

NOTE: The smaller the flame, the more sensitive it is to refrigerant leaks. Keep the flame as small as possible. The copper element must be red hot. If it is burned away, replace this element.

Hold the open end of the hose at each of the suspected leakage points for at least two or three seconds. Normally the flame will be almost colorless. However, the slightest leak of R-12 will be indicated by a bright green-blue color of the flame.

Be sure to check the manifold gauge set and attaching hoses for leaks as well as the rest of the system.

NOTE: If the surrounding air is contaminated with R-12 vapor, the leak detector will indicate this vapor all the time. Therefore, it is necessary to have good ventilation to prevent this from happening. Using a fan, even in a well ventilated area is also helpful in removing small traces of R-12 vapor.

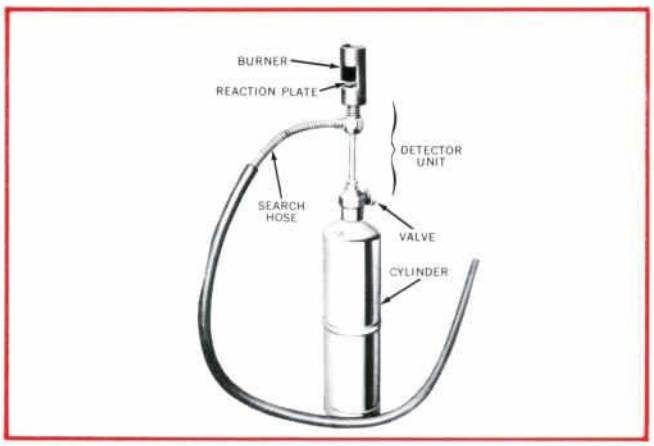


Figure 3—The Torch Type of Leak Detector

HOW TO READ THE SIGHT GLASS

First clean the sight glass before checking the system refrigerant charge condition. Then run the engine at 1500 rpm with the A/C controls set at maximum cooling position. A continuous stream or large amount of bubbles in the sight glass indicates an undercharge of refrigerant. If you find this condition, check the system thoroughly for leaks as described previously. Repair any leaks found, then evacuate the system with a good vacuum pump and charge the system with the proper amount of refrigerant R-12. See the specifications listed on page 11, for 1971 Ford-built, factory installed air conditioners.

No bubbles in the sight glass may indicate one of two things: there is too much R-12 in the system; or there is a complete loss of R-12.

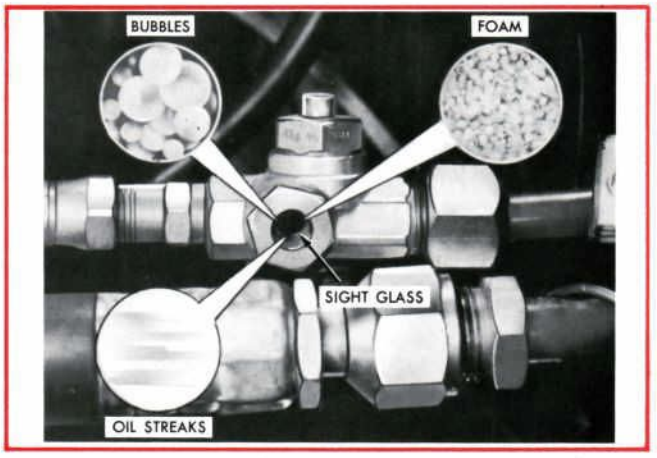


Figure 4—A Typical Sight Glass Showing Various Conditions That Can Occur Within the Closed A/C System

While looking at the sight glass, have someone cycle the magnetic clutch off and on with the engine still running at 1500 rpm. If R-12 is in the system, bubbles will appear while the clutch is off and disappear when the clutch is on and engaged. If no bubbles appear during the on and off cycle of the magnetic clutch, there is no R-12 in the system.

NOTE: Under conditions of extremely high temperatures, occasional foam or bubbles may appear in the sight glass, even though the system has the proper amount of R-12 charge.

HOW TO CONDUCT A PERFORMANCE TEST

Pressures developed on the high pressure (discharge) and low pressure (suction) side of the compressor indicate whether or not the system is operating properly.

To make a performance test, first attach the manifold gauge set to the compressor service valves.

It is not necessary to attach the R-12 tank to the manifold gauge set unless refrigerant is to be added to the A/C system.

Make sure both manifold gauge set valves are at the maximum *clockwise* (or closed) position. Set both compressor service valves at the *center* (mid) position.

With the engine running at 1500 rpm, check A/C system pressures. Controls must be set for maximum cooling position.

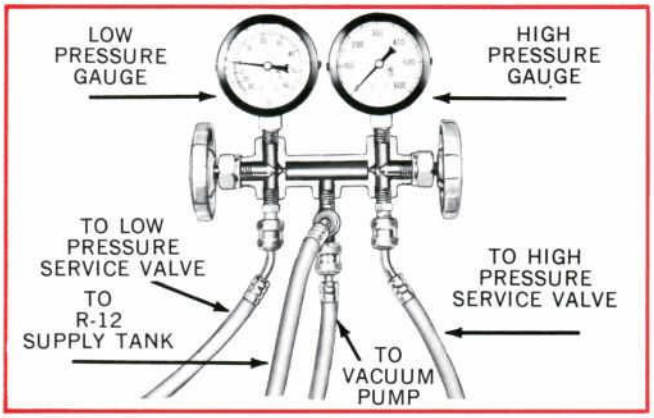
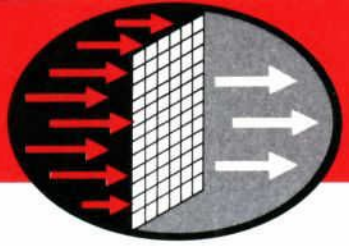


Figure 5—Cutaway View of a Typical Manifold Gauge Set



KEEPING IT COOL

Make sure the front of the car is at least 5 feet away from any wall. Actual pressures indicated on the gauges will, to a large extent, depend on the temperature of the surrounding (ambient) air and the humidity. Higher air temperatures along with high humidity will give higher system pressures.

At idle speed, for example, with the surrounding air at a temperature of 100 degrees F., the high pressure gauge may go as high as 300 pounds or more. CAUTION: If it becomes necessary to operate the air conditioner under these conditions keep the high pressure down with a large fan directing its air flow at the A/C condenser and cooling system radiator.

Correct pressures for a normally operating system are shown in the Refrigerant System Analysis Chart. As shown, the low pressure gauge should read 10 to 20 psi while the high pressure gauge should read 180 to 225 psi. Lines 2 through 8 show various abnormal pressure conditions and the possible problems that could be their cause.

REFRIGERANT SYSTEM ANALYSIS CHART

Low Press (Suction) Gauge	High Press (Discharge) Gauge	Problem
(1) 10-20 psi	180-225 psi	Normal
(2) Normal	Too High	Restriction in line. } Look for Plugged condenser. } frost ring. Radiator overheating. Air in system. Engine fan too small or viscous fan (Fluid clutch) inoperative. Condenser blower not operating (Trucks only).
(3) Too High	Too High	Condenser blower not operating (Trucks only). Very hot shop, no auxiliary fan directed toward condenser. Restricted air flow through condenser. Overcharged system.
(4) Too High	Too Low	Compressor head gasket blown.
(5) Too Low	Too Low	Undercharged system.
(6) Vacuum	Normal	Expansion valve stuck closed. Plugged receiver (see Note). Iced up (Moisture in system).
(7) Too High	Normal	Capillary tube temperature sensing bulb uncovered and exposed to engine compartment heat.
(8) Normal (Complaint of Intermittent Cooling)	Normal	Moisture in system, passes critical point and clears up but freezes again.

NOTE: If the condenser is hot from top to bottom and the receiver is hot but the receiver outlet line is cool, the receiver desiccant is restricted. Replace the receiver.

SERVICING THE REFRIGERANT SYSTEM

HOW TO DISCHARGE THE SYSTEM

Before replacing any part of the A/C system (except the compressor) first discharge the refrigerant from the system. To do this, connect the manifold gauge set to the service valves, but do not connect the manifold gauge set center connection hoses to the R-12 tank or vacuum pump.

Place the open ends of these hoses in a garage exhaust eliminating outlet.

Set both manifold gauge set valves at the maximum counterclockwise or open position. Now, open both service valves at the compressor only a slight amount and allow the refrigerant to discharge *slowly* from the A/C system.

CAUTION: Do not allow the R-12 to rush out as the oil in the compressor will be forced out along with the refrigerant.

HOW TO EVACUATE THE SYSTEM

Attach the manifold gauge set to the compressor service valves and the two center hoses to their respective attachments . . . the refrigerant R-12 tank and the vacuum pump. Make sure that the R-12 tank valve is closed tightly. Set both compressor service valves at the mid-position. Open both manifold gauge set valves. Release any pressure in the system. Open the vacuum pump valve and let the pump run until the low pressure gauge reads at least 25 inches and as close to 30 inches of vacuum as possible.

Continue the vacuum pump operation for 20 to 30 minutes to boil out any moisture in the closed A/C system.

When you have completed this service, close the pump valve and turn off the pump.

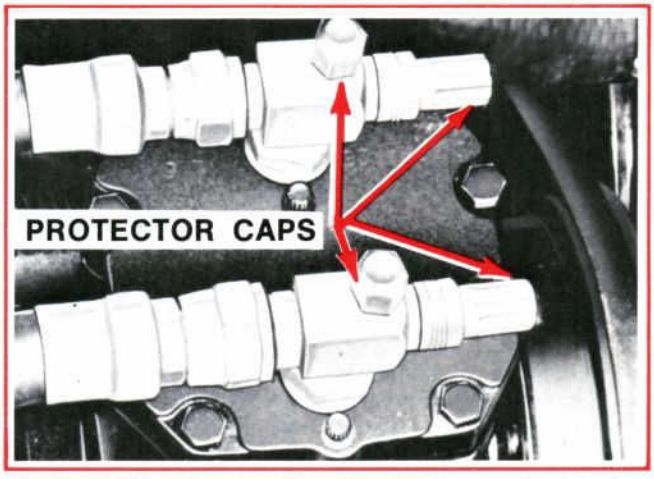


Figure 6—These Protector Caps Must Be Removed to Hook Up the Manifold Gauge Set and to be Able to Turn the Compressor Service Valves as Required

HOW TO MAKE A COMPLETE R-12 CHARGE

First, the A/C system must be evacuated as described. Then, leave both compressor service valves at the mid-position, see Figure 2, page 4. The vacuum pump valve must be

closed. Leave the low-pressure (suction) manifold gauge set valve at the full counterclockwise (open) position. Set the high pressure (discharge) manifold gauge set valve at the full clockwise or closed position. Open the R-12 tank valve to allow the refrigerant to enter the system and, while doing so, observe the gauges.

When both gauges reach 60 to 80 pounds at about 75 degrees F., shut off the tank valve.

Perform a leak test with the leak detector as described earlier if it is necessary at this time.

Set both A/C controls to the maximum COLD position and set the blower switch to HI SPEED position. Start the engine and open the R-12 tank valve again to prevent drawing vacuum on the suction side of the system. When the suction gauge shows pressure instead of vacuum, close the R-12 tank valve.

Run the engine at 1500 rpm for about 10 minutes or until both gauge readings have stabilized. If the compressor clutch disengages during the stabilization procedure, continue running the engine until the pressures again stabilize after the clutch re-engages.

With the engine still running, open the R-12 tank valve and charge the system until the specified pressures are indicated on the manifold gauge set . . . low pressure (suction gauge) should read 10 to 20 psi while the high pressure (discharge gauge) should read 180 to 225 psi.

Now, if the R-12 will not enter the system due to low temperature, it may be necessary to place the R-12 tank in a container of hot water at about 150 degrees F. This will increase the vapor from the tank during charging.

CAUTION: Never heat the R-12 tank with a torch. A dangerous explosion may occur.

During the charging process, the high pressure (discharge) side may build up to an excessive value. This can be caused by an overcharge of R-12 or an overheated engine in combination with high surrounding temperatures. CAUTION: Never allow the high pressure side to exceed 240 pounds while charging. If this happens, stop the engine, diagnose the cause and correct it.

After the proper charge has been made, close the R-12 tank valve and check the system pressures for proper operation as described in the Performance Test outlined earlier.

After a satisfactory operation has been achieved, set both compressor service valves at the maximum counterclockwise (gauge port closed) position. Remove the gauge set and be sure to cap the compressor service valve gauge ports and valve stems. (See Figure 6.)

HOW TO TEST THE RECEIVER-DRYER

Operate the A/C system for about five minutes. Then, slowly move your hand across the length of the unit from one end to the other. There should be NO NOTICEABLE DIFFERENCE in temperature. If cold spots are felt, it indicates that the unit is restricting the flow of R-12 and the receiver-dryer must be replaced.

HOW TO TEST THE MAGNETIC CLUTCH

To make this test, disconnect the bullet type connector at the magnetic clutch and connect it to a negative lead of an ammeter.

Connect the positive lead of the ammeter to the battery positive (+) terminal. The magnetic clutch should pull in with a distinct "click" sound and the current reading on the ammeter should be within specifications called for in the chart on page 11 for 1971 Ford-built, factory installed A/C systems.

HOW TO CHECK COMPRESSOR OIL LEVEL

When the A/C system is operating satisfactorily under normal conditions, the compressor oil level does not need to be checked. There is no place for the oil to go except inside the sealed system. When the A/C system is first started, some of the refrigerant oil will be pumped into the rest of the refrigerant system. After a few minutes of operation, most of this oil is returned to the compressor crankcase.

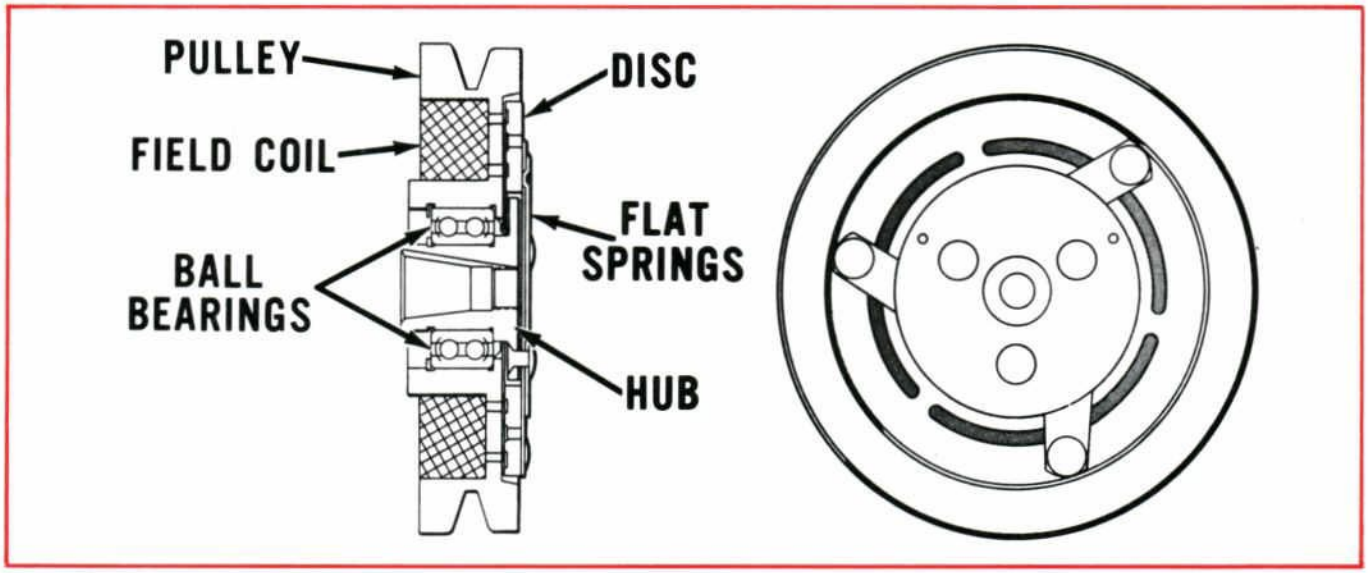


Figure 7—Details of the Compressor Magnetic Clutch-Typical

NOTE: Compressor oil level need only be checked if any unit in the A/C system is being replaced, or if a leak developed in the system and the R-12 is being replaced.

To check compressor oil level, first turn both the high and the low pressure service valves at the compressor to their extreme clockwise (front seated) position. See Figure 2, page 4.

Loosen the cap on the high pressure service valve port and allow the R-12 vapor to escape until the compressor is relieved of refrigerant pressure. CAUTION: Loosen the cap only a small amount and do not remove it until the pressure has completely discharged.

To connect the compressor back into the system, evacuate the compressor with a vacuum pump at both service valve gauge ports, close the vacuum pump valve, turn both service valves to the maximum counterclockwise (back-seat) position and cap the high pressure service valve gauge port and the service valve stems.

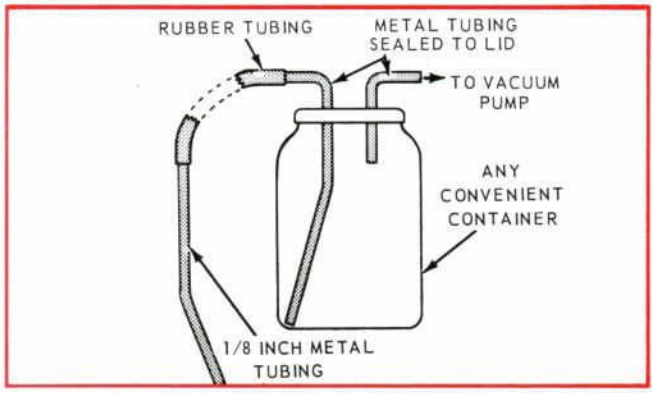


Figure 8—Details for Making an Oil Trap That Can Be Used for Removing Excess Refrigerant Oil from a Compressor Mounted on the Engine

Now, operate the system for about 10 minutes or until the pressures have been stabilized in the surrounding air which should be at a temperature of 60 degrees F. or above.

When this has been accomplished, isolate the compressor as described previously.

Then, remove the oil filler plug from the compressor. Insert a flattened ⅛ inch diameter rod (either the type shown in Figure 10 or 11 depending on the compressor make), into the oil fill hole until it bottoms. The dipstick must be clean. If necessary, slightly rotate the compressor crankshaft by hand so that the dipstick will clear the crankshaft throws.

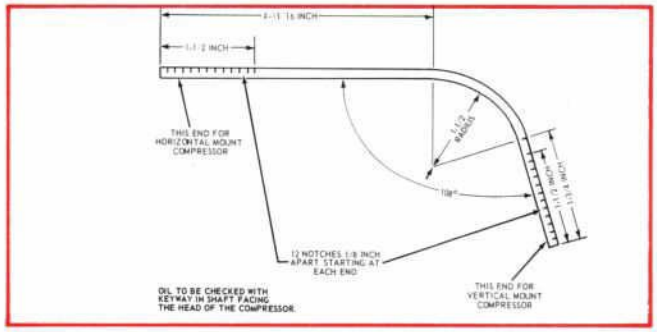


Figure 10—Details for Making the Dipstick for York Compressors

On horizontal mounted compressors the oil check hole is located on the side of the crankcase that faces up. See Figure 9.

If the oil level is low, add refrigerant oil meeting Ford specification ESA-M2C31-A (Ford Part No. C9AZ-19577-A).

If too much oil is shown on the dipstick, proceed as follows: Draw out all the oil using a trap similar to the one shown in Figure 8, or remove the compressor and pour the oil out of the crankcase.

Add about 4 ounces of oil to the crankcase and replace the filler plug. Reinstall the compressor if removed.

Evacuate the compressor with the vacuum pump (both service valves front-seated and both manifold gauge set valves open). Connect the compressor back into the system by turning both service valves to the back-seated (full counterclockwise) position.

Operate the A/C system for another 10 minutes as outlined earlier and recheck the oil level.

Replace the oil filler plug. Evacuate and connect the compressor back into the A/C system.

Again, operate the A/C system for 5 minutes and make a final oil level check so that you get a true reading.

Replace the oil filler plug, evacuate and connect the compressor back into the system, then check for any leaks at the oil filler plug area with a leak detector.

Figure 9—Making an Oil Level Check at the Compressor

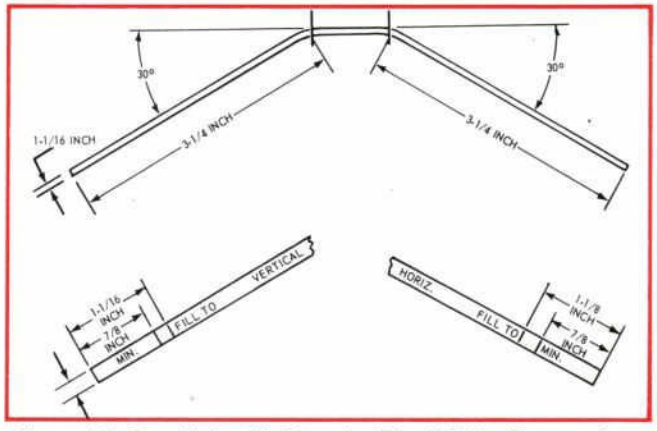


Figure 11—Details for Making the Dipstick for Tecumseh Compressors

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Now available for all po

Now, by popular demand! . . . Tailored Ignition Sets for popular Chrysler and General Motors applications.

Here are some frank questions and answers about SIPCON ignition sets that will assist you to get off to a fast selling start:

Q WHAT DOES SIPCON MEAN?

A SIPCON is the acronym for SILENT POWER CONDUCTORS.

SI (Silent)—Indicates that SIPCON suppresses radio and TV interference.

P (Power)—SIPCON ignition sets allow the engine to develop its full rated horsepower.

CON (Conductors)—The connections between the distributor and the spark plugs which transmit the electrical energy to fire up the engine for peak performance.

SIPCON—The quality ignition set.

now!

put this quality product to work for you . . .
let this expanded application from Autolite
broaden your coverage of the market!

Quick Reference Chart For Chrysler and General Motors Applications

CHRYSLER										OTHER
Autolite No.	Barracuda	Chrysler	Dart	Dodge	Dodge Truck	Imperial	Plymouth	Valiant		Volkswagen
WR-3125 6 Cyl.			1962-70	1962-71			1962-70	1962-71		
WR-3828 8 Cyl.	1965-70		1961-68, 70-71	1962-69	1959-70		1960-71	1964-69, 71		
WR-3831 8 Cyl.	1967-69	1969-71	1969	1965, 67, 69		1969-70	1964-69			
WR-3832 8 Cyl.		1965-68		1965-69		1965-68	1965-67			
WR-3328 4 Cyl.										1947-70
WR-3824 4 Cyl.										1966-70

opular Chrysler and General Motors applications!

Q ARE SIPCON IGNITION SETS DEPENDABLE?

A SIPCON quality features have been used as original equipment on Ford, Mercury and Lincoln cars and Ford trucks since 1965. These same features have also been used in Autolite replacement sets since that time. This adds up to millions of Autolite ignition cables that have and are giving service equal to or better than any ignition set on the market. These Autolite sets meet the same high standards required for the SIPCON sets that go on the Continental Mark III.

Q WHAT ARE THE ADVANTAGES TO REPLACING WITH SIPCON IGNITION SETS?

A There are several advantages. SIPCON ignition sets will give performance equal to metallic core sets with the following benefits:

- SIPCON will reduce radio and TV interference which copper does not.
- SIPCON ignition sets reduce spark plug gap erosion. This increases spark plug life.
- SIPCON used with non-resistor spark plugs permits using a wider plug gap (.035") for improved idling and cold weather starting.

Q HOW STRONG ARE SIPCON IGNITION SETS?

A The terminal will pull off before the core will separate. The tensile strength of SIPCON, over 150 pounds under controlled laboratory test conditions, is much greater than the strength of the terminal attachment. Autolite's method of terminating suppression ignition cable is superior to the "pin" method still being used in some competitive brands.

Q HOW ARE THE TERMINATIONS MADE ON SIPCON IGNITION CABLE AND WHY IS THIS METHOD SUPERIOR TO THE "PIN" METHOD?

A Starting in 1965, Autolite began the "strip and fold" method of terminating ignition cables, eliminating the use of pins entirely. In the "strip and fold" method, about 5/8" of the insulation is stripped from the center conductor. The conductor is then folded back over the insulation and securely fastened under the crimped terminals. Dependability has been proved by millions of these terminations in actual vehicle service since 1965. Controlled laboratory torture tests have proved that the SIPCON "strip and fold" method of construction is ten times as durable as the "pin" construction method.

GENERAL MOTORS

Autolite No	Buick	Buick Special	Cadillac	Chevelle	Chevrolet	Chevrolet Nova	Chevy II Nova	Corvair	GMC Truck	Olds-mobile	Olds F-85	Pontiac	Firebird	Tempest
WR-3327 6 Cyl.								1960-69						
WR-3826 6 Cyl.		1967-71		1964-71	1962-71	1963-69	1964-71		1965-70		1966-71		1967-69	1964-71
WR-3827 8 Cyl.	1968-71	1968-71												
WR-3829 8 Cyl.					1957-69	1955-69			1965-70					
WR-3830 8 Cyl.				1964-70			1964-70							
WR-3833 8 Cyl.												1965-67		1965-67
WR-3834 8 Cyl.												1968-71	1967-71	1968-71
WR-3835 8 Cyl.			1963-70											
WR-3836 8 Cyl.	1967	1967										1961-63		1963
WR-3837 8 Cyl.										1964-68	1961-67			

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Cars waiting for repairs on your service drive reduce profits . . . make customers unhappy. You've got to get them out of your shop and back on the road fast. Ford Authorized Remanufactured Parts can be installed in a fraction of the time required for tear-down repairs. You can handle more work, turn it out faster and be sure by installing Ford Authorized Remanufactured Parts. Any way you look at it, you'll make more money and have more satisfied customers too.

See us when you need a replacement part for any Ford-built car or truck . . . Available at our parts counter.

BETTER BUSINESS BUILDERS

ELECTRICAL PARTS • *Alternators* • *Armatures* • *Generators* • *Distributors* • *Voltage Regulators* • *Starters*

ENGINES • *Complete Assemblies* • *Short Block Assemblies*

ENGINE COMPONENTS • *Cylinder Heads* • *Water Pumps* • *Carburetors* • *Rocker Arm Kits* • *Crankshaft Kits* • *Fuel Pumps* • *Power Steering Pumps*

POWER TRAIN COMPONENTS • *Clutch Discs* • *Pressure Plates* • *Brake Shoes* • *Torque Converters* • *Transmissions* • *Power Brake Boosters*

NATIONAL WARRANTY

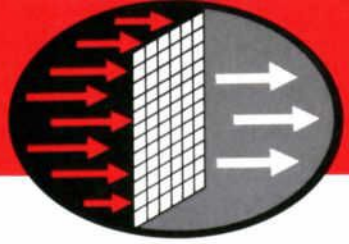
Every Remanufactured Ford Part is warranted nationally by the Remanufacturer to be free of defects in materials and workmanship for 90 days or 4000 miles from date of installation, whichever occurs first. Complete OHV engine assemblies are warranted for 12 months or 12,000 miles on passenger vehicles, and 6 months or 12,000 miles on trucks, whichever occurs first. This Warranty includes parts replacement plus related labor.

Ford and Lincoln-Mercury dealers will honor this warranty anywhere in the country.

Remanufactured

Ford

Engines · Parts



KEEPING IT COOL... AIR CONDITIONING *Continued*

IMPORTANT TIPS ON AIR CONDITIONING SYSTEMS

- Leakage of refrigerant-12 can be so silent that the complete charge in the system can be lost without warning.
- Refrigerant gas (vapor) is heavier than air and will settle to the floor as it flows from a point of leakage or controlled discharge.
- Pressure in the system may momentarily get as high as 400 psi and under such pressure, the refrigerant is forced out through the smallest opening or needlepoint size pore.
- The compressor is continually giving up some lubricating oil to the refrigerant as it circulates and depends upon oil in the returning refrigerant for a continuous supply. Any stoppage or major loss of refrigerant will therefore be fatal to the moving parts of the compressor.
- All parts of the refrigerant system are under pressure at all times whether the compressor is operating or not operating and thus any leakage point is losing refrigerant-12 continuously.
- The refrigerant system is a completely sealed assembly. This sealed condition is absolutely necessary to retain the chemicals and keep them in a pure and stable condition.
- The extreme internal dryness of a properly prepared system is a truly desert-like condition.

SAFETY INFORMATION ON AIR CONDITIONING REFRIGERANT

Refrigerant-12 is a relatively safe refrigerant and is used in all Ford, Mercury and Lincoln air conditioning systems. It operates at low pressure and condenses easily in the temperature ranges found in automotive condensers. A list of advantages include these qualities:

- Odorless
- Colorless
- Tasteless
- Non-Corrosive
- Non-Toxic
- Non-Inflammable
- Has a high affinity for oil
- Has the ability to absorb great quantities of heat
- Readily changes state
- Low boiling point

However, refrigerant-12 is used under pressure and its low boiling point (minus 21.7°F.) combined with its chemical change when exposed to flame requires certain handling precautions for personal safety.

NEVER TOUCH LIQUID

Liquid refrigerant-12 vaporizes so quickly and takes on so much latent heat in the process that even a drop on your skin will cause severe and painful frostbite. Therefore, open fittings carefully and slowly to release pressure inside the system.

If skin areas are exposed to refrigerant-12, treat as you would for frostbite and consult a physician.

ALWAYS WEAR SAFETY GOGGLES

When performing any type of service around an air conditioning system it is vital that you wear safety goggles. Liquid refrigerant in your eyes could cause blindness. If you should get any near your eyes, rinse them immediately with mineral oil to absorb the refrigerant. Follow by flooding your eyes with clear water and contact a doctor immediately.

AVOID HEAT

Store refrigerant containers upright out of the sun and away from building heat outlets. Pressure in a container will rise with heat.

Always discharge the refrigerant from the system if the car is going into a paint drying oven, or if welding or steam cleaning jobs are to be done near the system. Also, watch the temperature and pressure when testing the system. It may be necessary to direct the flow of air from a large fan through the front grille to avoid overheating.

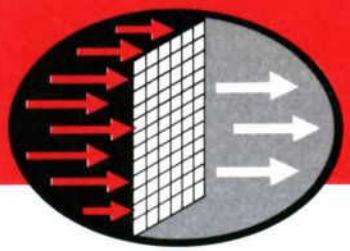
It is common practice to put a refrigerant container (can or drum) in a pan of warm water to raise the pressure and thus speed up the charging operation . . . but never heat the containers with an open flame or exceed water temperature of 150°F. to make charging occur faster. *The pressure rise may happen so fast that the containers may explode.*

VENTILATION

Proper ventilation in the area of air conditioning work is essential. Although R-12 is non-toxic, too much in a confined space can be suffocating as it doesn't contain the oxygen we need to breathe. Therefore, always discharge the refrigeration system into an exhaust fan or through an open window or doorway.

AVOID FLAME

At all normal temperatures R-12 is non-toxic. But, in contact with an open flame, it forms phosgene gas, which can be extremely harmful. Never discharge a system near an open flame. When the flame type leak detector is used to check for leaks, never breathe the fumes.



KEEPING IT COOL

COMMONLY USED AIR CONDITIONING TERMS

AMBIENT—Air outside the car.

AUXILIARY SEAL—Prevents refrigerant oil from entering the compressor clutch.

CHARGE—A specific amount of refrigerant or refrigerant oil by weight.

CHARGING—The process of placing a "charge" of refrigerant or refrigerant oil into the system.

CLUTCH—A coupling which transfers torque from a driving to a driven member when desired. The compressor clutch delivers torque transmitted from the engine through a drive belt, causing the compressor drive shaft to rotate.

COMPRESSOR – Component of a refrigeration system that pumps refrigerant and that increases the pressure and temperature of refrigerant vapor.

CONDENSER—Component of a refrigeration system in which refrigerant vapor is changed to a liquid by the removal of heat.

DESICCANT—A drying agent used in the refrigeration system to remove moisture. It is located in the receiver-dehydrator.

DICHLORODIFLUOROMETHANE—See "Refrigerant-12."

DISCHARGE—To bleed some or all refrigerant from a system by opening a valve or connection and permitting the refrigerant to escape slowly.

DISCHARGE LINE—Connects the compressor outlet and the condenser inlet. High-pressure refrigerant vapor flows through this line.

DISCHARGE PRESSURE—Pressure of refrigerant being discharged from the compressor.

DISCHARGE SIDE—That portion of the refrigeration system under high pressure, extending from the compressor outlet to the thermostatic expansion valve.

EVACUATE—To create a vacuum within a system.

EVAPORATOR—Component of an air-conditioning system which conditions the air. Refrigerant liquid is changed into a vapor in this component.

HEAD PRESSURE—Same as "Discharge Pressure."

HIGH-PRESSURE LINES—Lines from the compressor outlet to the thermostatic expansion valve inlet that carry high-pressure refrigerant. The two longest high-pressure lines are the "discharge" and "liquid" lines.

LIQUID LINE—Connects the receiver-dehydrator outlet and the thermostatic expansion valve inlet. High-pressure liquid refrigerant flows through this line.

LOW-PRESSURE VAPOR LINE—Same as "Suction Line."

PERFORMANCE TEST—Taking temperature and pressure readings under specified conditions to determine if an air-conditioning system is operating satisfactorily.

PRESSURE LINE—See "Discharge Line." All refrigerant lines are under pressure.

P.S.I.—Pounds per square inch of gauge pressure.

PURGE—To remove moisture from air from a system or a component by flushing with a dry gas, such as nitrogen or Refrigerant-12.

RECEIVER-DEHYDRATOR (also known as Receiver-Dryer)—A container for storing liquid refrigerant from the condenser. A sack of desiccant in this container removes small traces of moisture that may be left in the system after purging and evacuating.

R-12 OR REFRIGERANT-12—The refrigerant used in air-conditioning systems. It is sold under various trade names. Part number for Ford's Refrigerant-12 is B9LF-19B519-A.

SIGHT GLASS—A window in the high pressure refrigerant line between the receiver-dehydrator and expansion valve used to observe liquid refrigerant flow.

SUCTION LINE—Connects the evaporator outlet and the compressor inlet. Low-pressure refrigerant vapor flows through this line.

SUCTION PRESSURE—Compressor intake pressure as indicated by a gauge set.

SUCTION SIDE—That portion of the refrigeration system under low pressure, extending from the thermostatic expansion valve to the compressor inlet.

VACUUM PUMP—A mechanical device used to evacuate a system.

VAPOR LINES—Lines that carry refrigerant vapor. Also see "Suction Line" and "Discharge Line."

AIR CONDITIONING SYSTEM SPECIFICATIONS—1971 MODELS

PINTO A/C SPECIFICATIONS

Protective Device—30 Amp. Fuse in Fuse Panel.
Control Illumination—One 1.5 CP, No. 1445 bulb.
Compressor Drive Ratio—.89:1
Refrigerant Charge: 30 oz. Refrigerant-12
Clutch Current Draw: 3.75 amps (maximum)

Blower Motor Current Draw @ 12.8 volts
High —15.0 amps ± 1 amp
Medium— 7.0 amps ± 1 amp
Low — 3.0 amps ± .5 amps

MAVERICK AND COMET A/C—HEATER SPECIFICATIONS

Protective Device	30 Amp. Fuse in Fuse Panel
Control Illumination	2 CP 1895 Bulb
Magnetic Clutch Current Draw	3.75 Amps. Max.

Blower Motor Current Draw at 12 Volts	16 to 20 Amps. on High Blower
Refrigerant Charge	1-7/8 pounds

MUSTANG AND COUGAR A/C—HEATER SPECIFICATIONS

Protective Device	30 Amp. Fuse in Fuse Panel
Blower Motor Current Draw @ 12.8 volts.	
Low	3.0 amps.
Medium	7.1 amps.
High	15.4 amps
Clutch Current Draw	3.75 amps (maximum)
Compressor Displacement—	
York and Tecumseh	10.3 cubic inch.

Compressor Oil Capacity—	
York	10 oz.
Tecumseh	11 oz.
Compressor Drive Ratio—	
250 CID Engine	1.09:1
302 CID Engine	1.32:1
351 CID Engine	1.32:1
429 CID Engine	1.16:1
Total Refrigerant Charge	1-3/4 lbs. of Refrigerant-12

MONTEGO AND TORINO A/C—HEATER SPECIFICATIONS

Blower Motor Current Draw at 12 Volts	16 to 20 Amps. on High Blower
Magnetic Clutch	3.75 Amps. Max.

Protective Device	30 Amp. Fuse in Fuse Panel
Control Illumination	2 CP No. 1895 Blub
Refrigerant Charge	1-7/8 lbs. of Refrigerant-12

FORD AND MERCURY MANUAL A/C—HEATER SPECIFICATIONS

Protective Device—30 Amp. circuit breaker located to the left of the glove box on a plate behind the instrument panel.	
Control Illumination	One 1 CP—GE 161 Bulb
Blower Motor Current Draw @ 12.8 Volts—	
Low	5.0 amps.
Medium Low	9.0 amps.
Medium High	14.0 amps.
High	22.0 amps.
Refrigerant Charge	3-1/4 lbs. of R-12

Compressor: Displacement	10.3 Cubic Inch.
Oil Capacity:	
York	10 oz.
Tecumseh	11 oz.
Drive Ratio:	
351 CID	1.32:1
390 CID	1.40:1
400-429 2V CID	1.32:1
429 4V CID	1.16:1
Clutch Current Draw @ 12.8 Volts	3.75 Amps.

THUNDERBIRD A/C—HEATER SPECIFICATIONS

Blower Motor Current Draw at 12 Volts	16-20 Amps on High Blower
Magnetic Clutch	3.75 Amps. Max.

Protective Device	30 Amp. C.B. in C.B. Panel
Control Illumination	2 CP 1895 Bulb
Refrigerant Charge	2-1/4 lbs. of Refrigerant-12

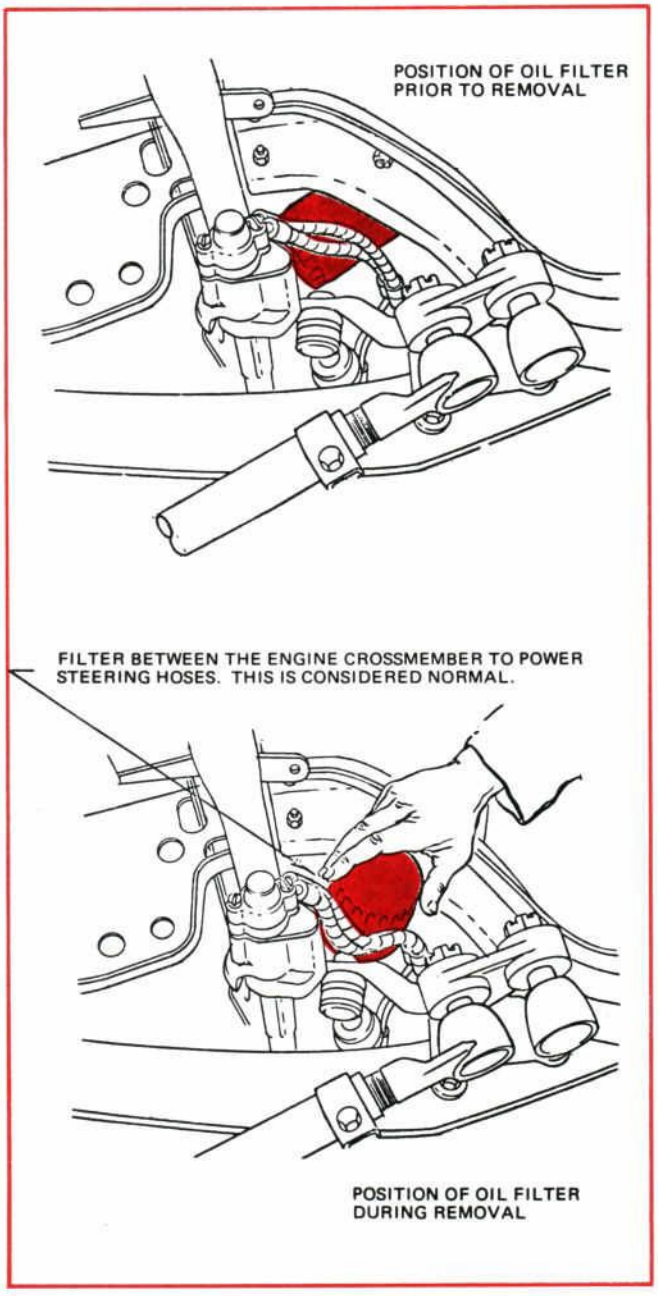
LINCOLN-CONTINENTAL A/C—HEATER SPECIFICATIONS

Blower Motor Current Draw at 12 Volts	21 to 24 Amps on High Blower
Magnetic Clutch	3.75 Amps. Max.

Protective Device	30 Amp. C.B. in Fuse & C.B. Panel
Control Illumination	2 CP 1895 Blub
Refrigerant Charge	4-1/4 lbs. Refrigerant-12

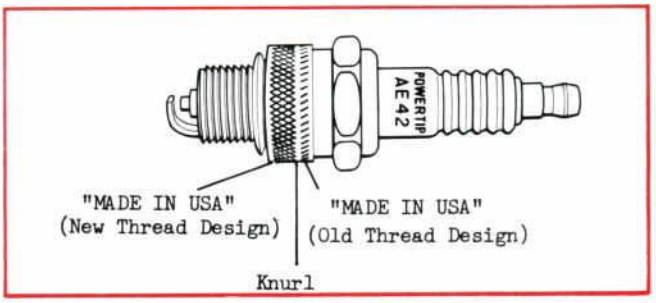
OIL FILTER REMOVAL—ECONOLINE WITH 302 CID AND POWER STEERING

1. With the wheels straight ahead, loosen the oil filter.
2. Unscrew the filter and turn to horizontal to drain.
3. Slide the filter rearward between the engine crossmember and the power steering hoses.
4. Some interference will exist between the hoses and the crossmember. This is normal.



AUTOLITE SPARK PLUG THREAD DESIGN—AE-42

Recently a design change was made on the AE-42 spark plug thread, which now makes it applicable for SAE and European applications. The *old* thread design had "MADE IN U.S.A." stamped ABOVE the knurl. Now with the *new* thread design, "MADE IN U.S.A." is stamped BELOW the knurl as shown in the illustration below.



AE-42 SPARK PLUG APPLICATION

Passenger Cars

Buick	1964
Buick Special	1961-64
Corvair	1964-66
Kaiser Jeep	1963-65
Olds—F-85	1961-62
Tempest	1961-62

Import Cars

Jaguar	1959-67
Triumph	1959-66
Volkswagen	All
Volvo	1961-65

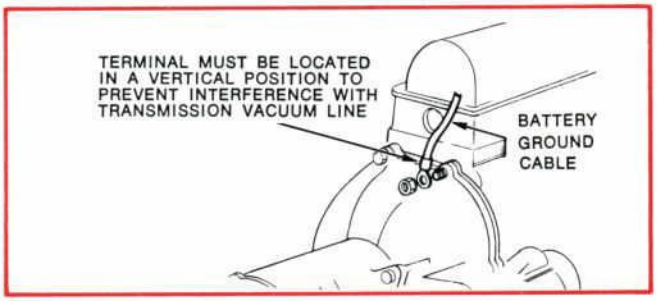
Trucks

Corvair	1965-66
Willys	1963-65

BATTERY GROUND CABLE—PROPER POSITIONING

1971 PINTO WITH 2000 cc ENGINE

In some cases, rough engine idle coupled with an erratic shift pattern can be caused by improper attachment of the battery ground cable to the engine bell housing. The cable improperly rotated interferes with the transmission vacuum line causing the line to be disconnected at the transmission end. To provide clearance, rotate the battery ground cable at the engine bell housing as shown.



SERVICE BRIEFS

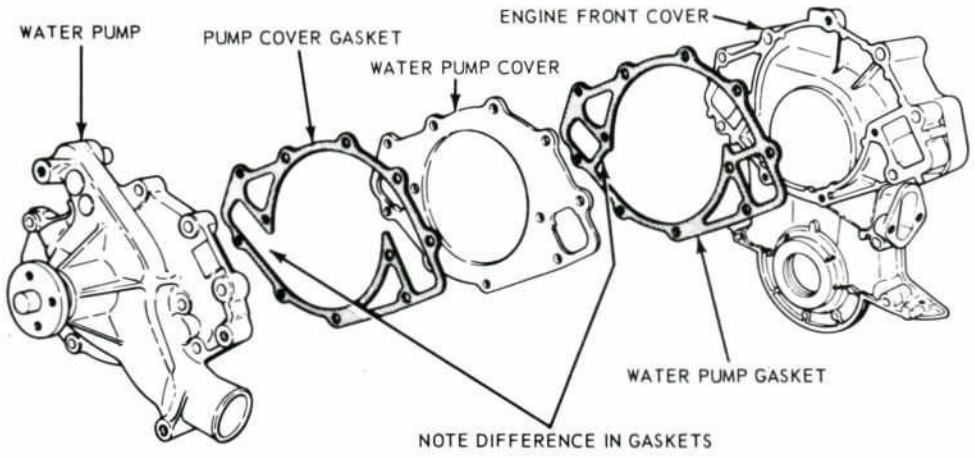
WATER PUMP GASKETS—APPLICATIONS

ALL FORD-BUILT 429 CID ENGINES (1968-1971)

A probable cause of coolant leaks on a newly installed 429 CID water pump may result from improper gasket usage. It is imperative to use the two gaskets in their correct location. Note correct installation sequence in illustration.

PARTS:

Part No.	Part Name
C8VZ-8507-A	Water Pump Gasket
C8SZ-8513-A	Water Pump Cover Gasket



POWER BRAKE BOOSTER DIAGNOSIS INFORMATION

ALL FORD-BUILT PASSENGER CARS

This article is a diagnostic aid when a brake booster is suspected to be cause for customer complaint. Complaints of pedal effort, vacuum leak, noise, sticking, or erratic operation can be diagnosed by the following procedures.

PEDAL EFFORT, INOPERATIVE, VACUUM LEAKS

With engine off, apply the brake pedal five times to exhaust all vacuum. Depress the pedal and hold down with foot pressure. Start the engine. If the vacuum system is operating properly the pedal will move slightly downward. If no action is felt, inspect the brake vacuum hoses and connections for leaks or damage to the check valve on the booster assembly. If the vacuum system is found good, then the booster is not operating properly.

If movement was felt at the pedal, operate the engine at fast idle for 10 seconds. Without depressing the brake pedal, stop the engine and let vehicle stand 10 minutes. Depress the pedal using approximately 20 lbs. of force; the pedal-feel should be the same as noted with the engine operating. If the pedal feel is hard (no assist), replacement of the booster is necessary.

If the pedal-feel is the same as noted with the engine operating, proceed to operate the engine at fast idle and apply a steady force of approximately 30 lbs. Continue to hold the pressure constant for 30 seconds. If the pedal moves upward, the booster should be replaced.

NOISE

Operate engine at fast idle for 10 seconds. Depress the brake pedal and listen for noise. Stop the engine, apply the brake pedal again and listen for noise. Do not replace the booster unless the noise is definitely coming from the booster assembly.

STICKING, BINDING, ERRATIC OPERATION

Operate engine at fast idle and pull the brake pedal upward by hand as far as it will travel. Release the pedal and measure the distance to the toe-board. Apply the pedal using heavy foot pressure. Release the pedal and again measure the distance from pedal to toe-board. The pedal should return to its original position and the distance should measure the same if the booster is operating properly.

Another quick check is to observe fluid in the master cylinder while the pedal is depressed rapidly one inch. Fluid should have movement or spouting should occur at the forward reservoir. Minor movement or spouting may occur in the rear reservoir also. If no movement or spouting occurs in the forward reservoir, the booster is not operating properly.

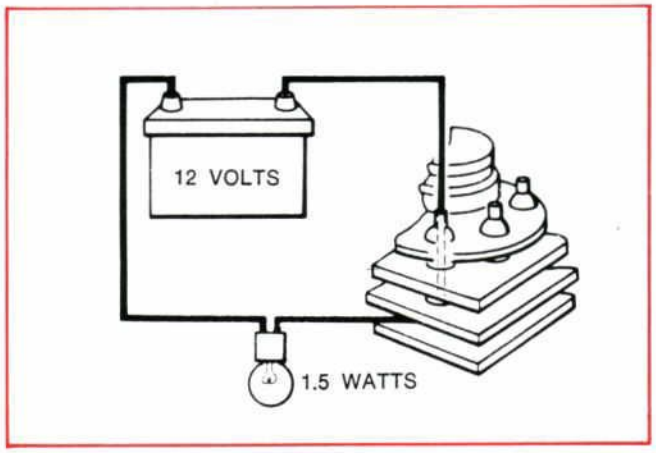
TESTING LUCAS ALTERNATOR, 1971 CAPRI

The Lucas 35-ampere alternator is a negative ground and is the "B" type circuit. The regulator is integral with the alternator.

The voltage drop, rotor and stator test procedures are the same as those used on other Autolite alternators.

DIODE TESTS:

In the event of a fault in one or more of the diodes, as indicated by the alternator output test, the rectifier pack must be removed from the alternaor.

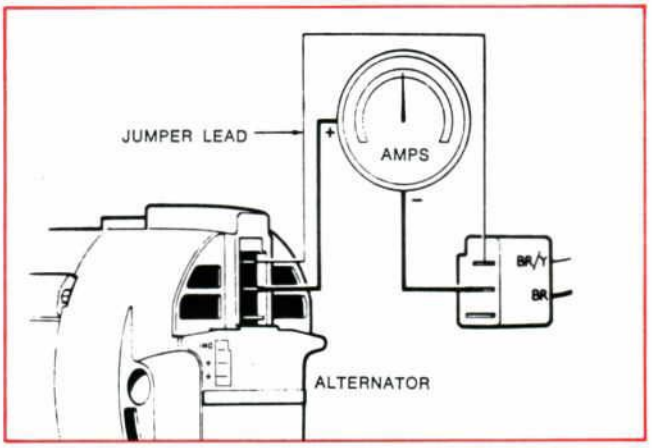


CAUTION: Never run the alternator with the leads disconnected, as this will cause irreparable damage to the regulator.

1. Connect each of the nine diode pins in series with a 1.5 watt test bulb and one terminal of a 12-volt battery.
2. Connect the other battery terminal to the particular heat sink into which the diode is soldered.
3. Reverse the test lamp connections to the diode pin and heat sink.
4. The bulb should light in one test only.
   - Should the bulb light in both tests . . . or not in either test . . . the diode is defective and a new rectifier pack must be installed.

ALTERNATOR OUTPUT TEST

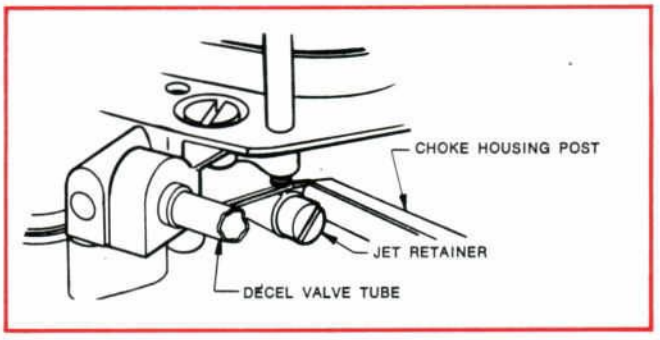
1. Disconnect the terminal plug from the rear of the alternator and connect an ammeter in series between the positive alternator terminal and the corresponding socket in the terminal plug.
2. Also connect a jumper lead between the indicator terminal and its corresponding socket in the terminal plug.
3. Start the engine and increase speed to 3100 rpm (6000 alternator rpm). The warning light should go out at approximately 600 engine rpm (1100 alternator rpm).
4. Switch on all vehicle lighting with the headlights on main beam for five minutes.
   - The ammeter should now show rated output (36 amps) at normal operating temperature.
   - Should the output fall below 34 amps, the alternator should be removed for bench testing in line with shop manual procedures.
   - If bench testing indicates a faulty diode, the rectifier pack should be replaced. Separate diodes are not available.



ROUGH IDLE COMPLAINTS ON 1971 PINTO EQUIPPED WITH 2000 cc ENGINE

WEBER MODEL 5200C CARBURETOR

Investigations of rough idle complaints on the subject vehicles equipped with Weber Model 5200C carburetors indicate a loose or missing idle jet retainer may be the cause of the rough idle complaint. Note the location of the idle jet retainer in the illustration below.



When diagnosing rough idle complaints, check for a loose or missing idle jet retainer. If required, torque to 10 inch-pounds to 15 inch-pounds.

SERVICE BRIEFS

BATTERY POWER REQUIREMENTS

It is estimated that more than one-third of all the replacement batteries purchased for use in automobiles are of less capacity than required for adequate starting power. In other words, customers are purchasing substantial numbers of batteries that will fall far short of their expectations. When such batteries fail to perform, the customers are inconvenienced and aggravated and the perfectly good batteries end up as warranty claims.

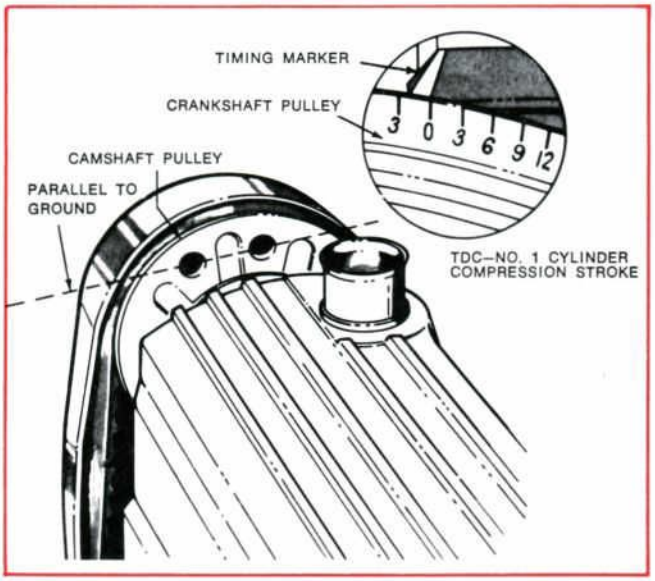
One way to overcome this industry-wide problem is better customer education. If a customer can be shown the need for adequate power in a simple manner so that he understands it, he will more likely buy the right battery for his car. We think the Power Requirement Chart does a good job of conveying the message. Bring it to the attention of your customers and include it in your battery training file.

POWER REQUIREMENT	BATTERY POINTS
Air Conditioning	10
Heater	5
Electric Windshield Wipers	3
Automatic Transmission	10
Engine Over 390 CID	10
Power Brakes	2
Power Steering	2
Power Windows	3
Convertible Top	3
Radio	5
Two-Way Radio	10
Power Antenna	3
Vehicle 1-3 Years Old	3
Vehicle Over 3 Years Old	5
Below-Freezing Winter Zone Operations	5
Below —10° Winter Zone Operations	10
Vehicle Used To Tow Boat Or Light Trailer With Lights	2
Vehicle Used To Tow Heavy Trailer With Lights	3

IF THE TOTAL NUMBER OF POINTS IS:	SUGGESTED AUTOLITE BATTERY
UNDER 40	STANDARD
40-50	STA-FUL
OVER 50	UNIFILL OR EXTRA-HIGH CAPACITY

IMPROPER ENGINE PERFORMANCE —CAMSHAFT TIMING 1971 PINTO

2000 cc ENGINE



Improper installation of the camshaft drive belt can result in lack of performance. The engine will run if the drive belt is displaced one or two teeth. A quick check for proper camshaft timing can be made visually. Turn the engine over until the two round locating holes in the camshaft pulley are visible from left rear of engine and parallel to the ground. When these holes are parallel to the ground, the timing pointer should point to TDC (0°). See insert. If the drive belt is mislocated, the crankshaft damper will be retarded or advanced 19° per tooth. Refer to the Pinto Shop Manual, page 21-03-08, for corrective procedures.

DISTRIBUTOR—400-2V 1971 FORD

The distributor model indicated by the preliminary manual for the 400-2V engine has been changed to D0OF-12127-U.

The advance characteristics for this single diaphragm distributor are as shown in the chart below.

Vacuum Advance		Centrifugal Advance	
Vacuum	Degrees	RPM	Degrees
5 in.	0—1	350	0—½
10 in.	2— 5¼	500	1¼— 3¼
15 in.	6½— 9¾	750	5¼— 7¼
20 in.	9½—12½	1100	6¼— 8¼
25 in.	10½—12½	1500	8¼—10½
		2000	10¼—12¾

COMPLIMENTS OF

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Air conditioners are now installed in over 60% of all new cars. An additional 700,000 "hang-ons" are bought each year . . . many require annual maintenance service.

Air conditioning units have been simplified and servicing them is now fast, clean and highly profitable. So get your fair share of this big and booming business.

When servicing Ford-built vehicles our dealership can serve you promptly with replacement parts manufactured to the same exacting specifications as original equipment . . . parts made right to fit right and last longer. In addition to Genuine Ford air conditioning parts, consider "one-stop-shopping" at our parts counter for your other Ford parts requirements.

CALL US . . . We're headquarters for all Genuine Ford and Autolite parts!