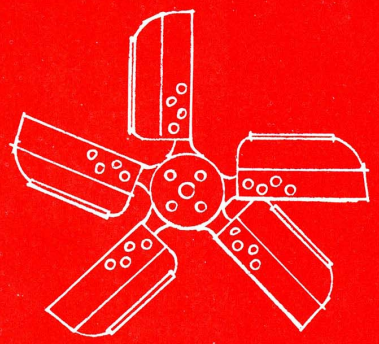
reference book 71 3

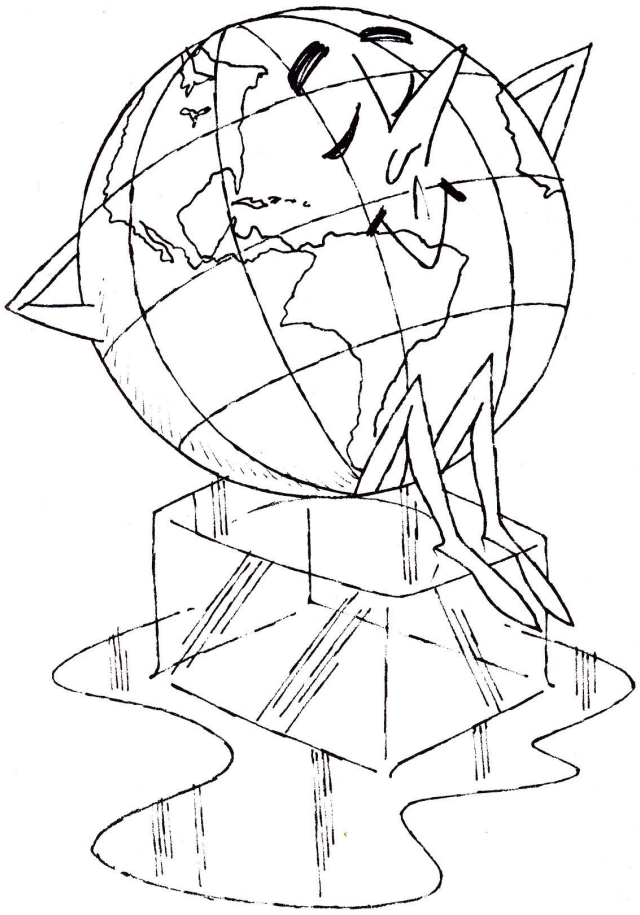
MASTER TECHNICIANS SERVICE CONFERENCE

CONTROLLING ENGINE TEMPERATURE



PLYMOUTH • DODGE • CHRYSLER • IMPERIAL • DODGE TRUCK

CHRYSLER MOTORS CORPORATION



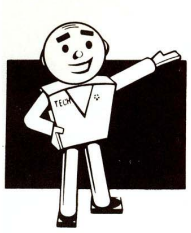
IT'S A COOL, COOL WORLD

And that's what you can tell any owner whose cooling system is functioning properly. And he can believe you with complete confidence if he doesn't have to worry about his cooling system doing the job that it was designed to do. When you see a car pulled off to the side of the road, it's a pretty safe bet that a good percentage of the time the reason is OVERHEATING.

Because of engine design changes that were made to effectively control emissions . . . the increasing volume of cars ordered with accessories such as automatic transmissions and air conditioning . . . and the rising popularity of boats and recreational vehicles which are being towed by cars, today's engines are being subjected to ever-increasing heat loads. However, with the exception of the maximum cooling package that must be ordered as optional equipment by the owner who is going to be towing above average loads, each car is built with a cooling system capable of handling any accessories that will put a load on the engine.

Keeping the engine from overheating is only half the job of the cooling system. It's just as important for the cooling system to maintain a minimum temperature as well as a maximum. This month's session provides you Technicians with a general review of how an engine generates heat and how the cooling system works to get rid of it and to maintain the best temperature range. It will also bring you up to date on the latest design changes that affect engine temperature and the latest components to effectively control engine temperature.

TABLE OF CONTENTS:



COOLING SYSTEM FUNDAMENTALS

WHY ENGINES GET HOT

An internal combustion engine gets its power from heat energy caused by the burning of the air/fuel mixture in the combustion chambers. The more powerful the engine, the more heat it is going to generate. In addition to normal combustion, any load that is put on the engine will increase its power output. And more power means only one thing . . . more heat. Controlling the heat caused by combustion is the job of the cooling system. Some accessories also place a load on the cooling system to raise the engine temperature even higher. Let's take a look at these two factors first and then go into how the cooling system functions to regulate the engine temperature.

WHAT HAPPENS TO HEAT?

Only about one-third of the heat generated by combustion is converted into power. Another third finds its way out the exhaust system, unused. The remaining third is the part that must be regulated by the cooling system.

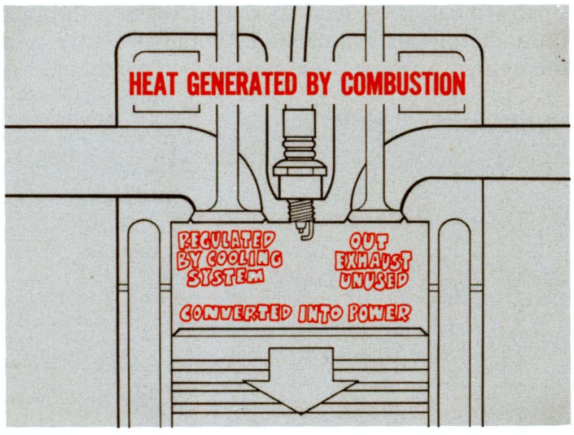


Fig. 1—Combustion heat divided into three parts

EMISSION CONTROLS AFFECT TEMPERATURE

Today's engines are designed to effectively control exhaust emissions – particularly at idle, where the problem is greatest. By using a lean mixture and retarded ignition timing, most of the fuel is burned in the lower part of the power stroke. Naturally, more heat goes out through the exhaust system and subjects the entire exhaust port area to higher temperatures as it does. The remainder of the unused heat is transferred to the cylinder walls and the surrounding engine block area which creates even higher engine temperatures.

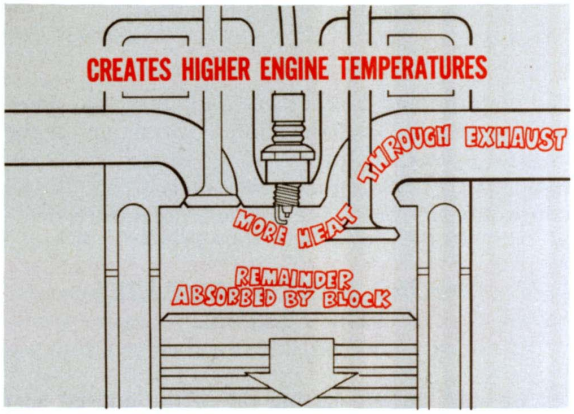


Fig. 2—Higher temperatures due to emission control

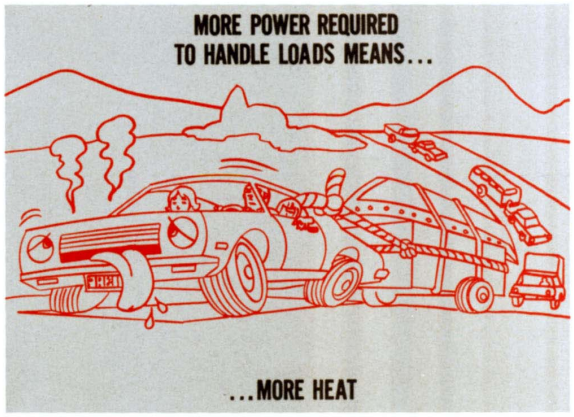


Fig. 3—More cars than ever being used for towing

MORE POWER MEANS MORE HEAT

In addition to normal combustion, the load on many engines is increased by the rising popularity of boats and recreational vehicles and the use of cars to tow them. Regardless of what speed the car is being driven, more power is required to handle these loads. And more power means only one thing . . . *more heat.*

AIR CONDITIONING GETS IN THE ACT, TOO

Air conditioning is one accessory that may keep the owners cool, but sure doesn't do much for the engine's temperature. Even though the load required to drive the compressor is slight, it still contributes to raising the engine temperature.

COOLING SYSTEM REGULATES TEMPERATURE

As we said earlier, getting rid of the unused heat that remains in the engine is only part of the job the cooling system is designed to do. Without a cooling system, the heat from normal combustion could become great enough to melt some of the engine parts. However, there are times when the cooling system uses this heat to the engine's advantage. The cooling system could more accurately be called a temperature regulating system. The following paragraphs explain why.

NOT TOO HOT . . . NOT TOO COLD

The cooling system is designed to make sure that the engine doesn't run too hot. However, it also makes sure that the engine does not run too cool. Temperature regulation is very important during warmup immediately after the engine is started. The combustion chamber and the surrounding area heat up very quickly while the rest of the engine remains cold. The first job of the cooling system is to equalize the temperature differences within the engine. Bringing all parts of the engine up to operating temperature as quickly and as evenly as possible reduces combustion blow-by, improves cold-engine lubrication which minimizes wear and distortion of engine parts.

NO COOLING AT THIS POINT

During warmup, the main objective of the cooling system is to take heat from the hot areas and transfer it to the cooler areas in the block. During warmup, the thermostat is closed and the coolant is recirculated through the engine through a coolant bypass in the water pump without going through the radiator. The coolant carries the heat from the hotter areas to the cooler areas to promote fast warmup and uniform engine temperatures.

THEN THE THERMOSTAT OPENS

When coolant temperature reaches the rating of the thermostat, the thermostat begins to open. With the thermostat open, the coolant flows through the radiator before returning to the block. As the coolant flows through the radiator, the coolant dissipates most of its heat to the air rushing through the radiator fins and around the radiator core, and the desired operating temperature is maintained.

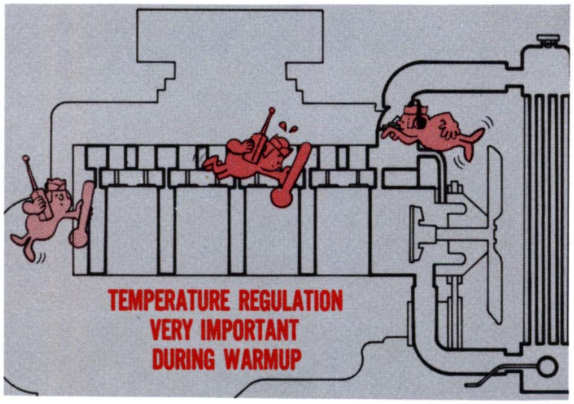


Fig. 4—Cooling system must equalize temperatures

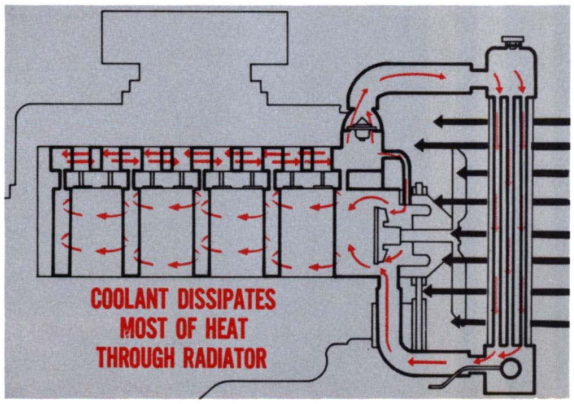
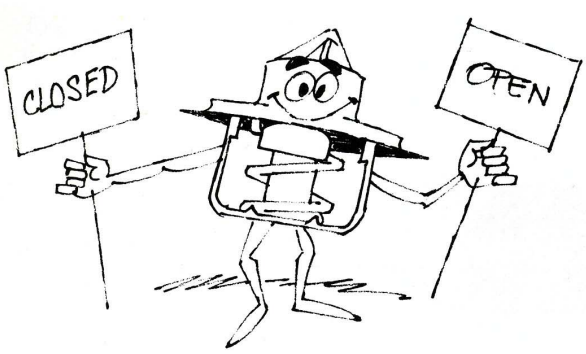


Fig. 5—Air rushing through radiator dissipates heat



COOLING SYSTEM LOADS

In the preceding paragraphs, situations or accessories that place additional loads on the engine and contribute to heat generation were discussed. Power steering is one accessory that has become so common that the cooling system has been designed to handle the load placed on the engine by the power steering pump and it is no longer a factor in normal operation. At this point, let's discuss other accessories that put a load on the cooling system. Basically, these two accessories are limited to automatic transmissions and air conditioning.

AUTOMATIC TRANSMISSION

In today's market, the automatic transmission is another item that has almost become standard equipment rather than an option. Because of this, the cooling system has been designed to handle the load placed on it by the transmission. However, there is one tip that can alleviate some of the load that is placed on the cooling system if it is practiced. First, we'll discuss what causes the load, and then we'll see how it can be lightened.

BLAME THE TORQUE CONVERTER

The torque converter is the prime generator of heat in the automatic transmission. If the fluid in the transmission was not provided with a means of cooling, it could easily climb to temperatures in excess of three hundred degrees. To control the temperature in the converter, the transmission fluid is circulated through a cooler in the radiator.

OIL COOLER PREVENTS DETERIORATION

The oil cooler for the transmission is located in the bottom of the radiator where the coolant is at its lowest temperature. The oil cooler is the first place the coolant picks up heat. Although it places an additional heat load on the cooling system, the oil cooler is necessary to prevent transmission oil deterioration from excess heat.

SHIFTING TO NEUTRAL HELPS

Do your good deed for the day and give your customers this little tip: When they're stopped by heavy traffic or at a light in hot weather, shifting into neutral helps cooling by taking a load off the converter and keeping oil temperature down. The engine idle speed will also increase and the cooling fan will draw more air through the radiator to increase cooling.

Fig. 6—Oil cooler is first place coolant picks up heat

AIR CONDITIONING ALSO GENERATES HEAT

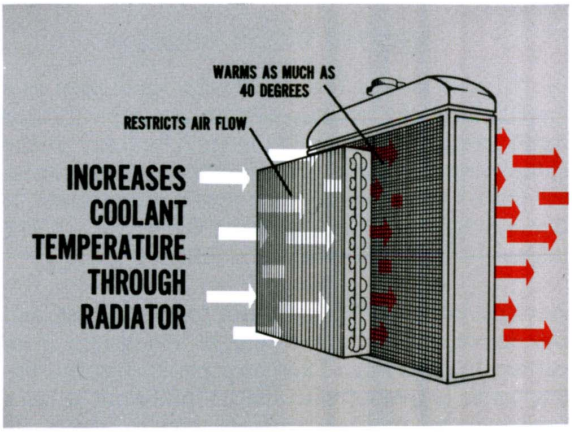
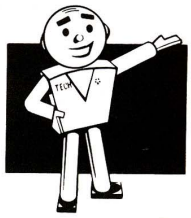


Fig. 7—Coolant affected only when A/C is working

The air-conditioning condenser is located directly in front of the radiator. This does two things . . . at low speeds, the air going through the condenser warms up as much as forty degrees; and restricts air flow through the radiator. This increases the coolant temperature through the radiator when the air conditioning is working.



COOLING SYSTEM COMPONENTS

By now you technicians have the basic fundamentals of how an engine generates heat, that a cooling system circulates coolant to regulate the engine temperature, and that there are certain factors that put a load on the cooling system itself. However, there are a number of components that work to circulate the coolant, cool it, and most of all *regulate* the temperature of the coolant. Let's discuss these in detail to see how they work, how to check them to make sure they're working properly, and how to service them if necessary.

COOLANT IS MOST IMPORTANT

The coolant is the most important part of the cooling system. The coolant is what carries the heat from the engine to the radiator where it is transferred to the fins surrounding the core and is dissipated by the air rushing past the fins. There are, however, a number of things that can affect the coolant and, in turn, affect the efficiency of the cooling system.

WATER WILL DO THE JOB, BUT . . .

. . . it does have a few drawbacks when used as a coolant for the engine despite its capacity for transferring and dissipating heat. A hot day in the summer or a cold day in the winter can cause water to make a lot of trouble for the cooling system. It doesn't take very much to make water boil . . . 212 degrees; or to make it freeze . . . 32 degrees.

Another drawback is that water promotes rust; and the minerals that are found in the water from certain localities can cause corrosion. Finally, unless water is treated with special inhibitors, it has a tendency to foam excessively which lowers its effectiveness as a coolant considerably.

ETHYLENE-GLYCOL IS THE BEST

Many different materials can be used with water as an antifreeze solution. However, with the higher operating temperatures of today's engines, it is also desirable to raise the boiling point of the coolant as well. Ethylene-glycol-type antifreeze is the only type that will do both and is used almost exclusively these days.

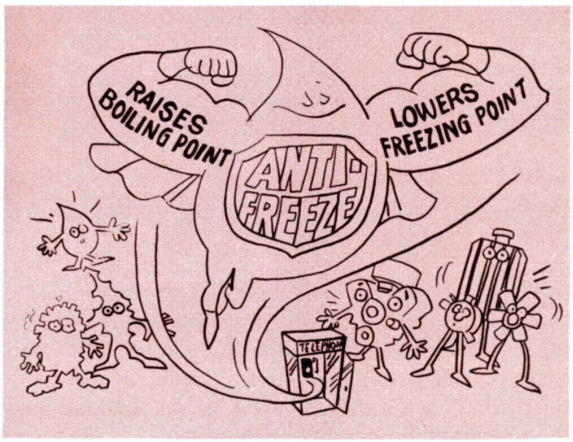


Fig. 8—Ethylene-glycol-type antifreeze is best

PERMANENT ONLY IN NAME

Ethylene-glycol-type antifreeze is what is commonly known as "permanent" antifreeze. However, it is permanent only in name. It could more accurately be called "four-season" antifreeze; which means that it can be left in the cooling system year 'round. However, it isn't a good idea to leave it in the system for more than one full year.

INHIBITORS WEAR OUT

Ethylene-glycol-type antifreeze contains inhibitors that retard rust and corrosion and prevent foaming

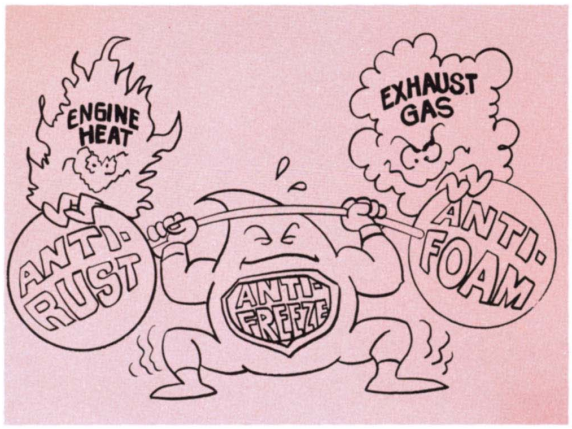


Fig. 9—Antifreeze only good for one full year

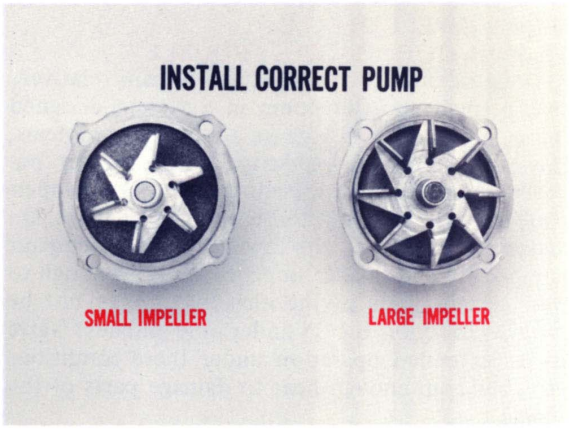


Fig. 10—Only remedy for failed pump is replacement

during circulation. After approximately a year, the inhibitors are depleted by a combination of engine heat and traces of exhaust gas that find their way into the cooling system.

DON'T ADD MORE INHIBITORS

It isn't a good idea to try to strengthen the coolant by adding rust inhibitors or antifoamants. Many of them contain chemicals that are not compatible and can cause an unfavorable reaction within the coolant. They can also attack rubber hoses and other components. Actually, rust inhibitors and anti-foamants used in ethylene-glycol antifreeze are better than additives found on the shelves.

WATER PUMP

To transfer heat from the engine to the radiator, the coolant is circulated through the engine by a water pump that is driven off the crankshaft. The only remedy for a water pump that has gone bad is to replace it with a new one. Check your Service Manual on how to determine if the pump is at fault and how to replace it if it is.

SMALL AND LARGE IMPELLER PUMPS

If a water pump is to be replaced, just make sure of one thing . . . that the right one for that particular cooling system is installed. If you replace a small impeller pump with a large impeller pump, the combination of the larger impeller and the high drive ratio of the small-impeller pump can build enough pressure to cause damage.

PULLEY IS ALSO IMPORTANT

Don't try to correct an overheating problem by thinking a larger impeller will increase capacity and aid cooling. Always replace the water pump or pulley with the correct part. The pulley is important because it determines the fan speed and therefore, impeller r.p.m.

TOO MUCH PRESSURE FROM LARGE IMPELLER

Too much pressure built up in the cooling system by replacing a small impeller with a large one may rupture the heater core or cause leaks at the core-sand clean-out hole plugs in the block. If this happens, I can guarantee it won't make the owner very happy.

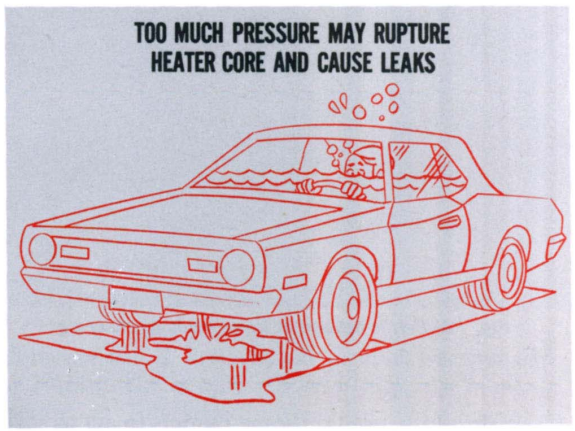


Fig. 11—This won't make the owner very happy

SMALL IMPELLER PLUS TEMPERATURE CAUSES TROUBLE

As long as outside temperatures remain relatively low, a small impeller pump in a system designed for a large one won't cause too many problems. However, the lower capacity of the smaller impeller could cause overheating when the temperature starts to climb on those hot summer days. On extremely cold days, the lower amount of coolant pumped by the smaller impeller may be enough to cool certain parts of the engine but may not be enough to cool the cylinder and exhaust valve areas. Extended operation under these conditions may build up enough heat to damage parts of the engine.

FANS DECREASE AIR FLOW

As the water pump is driven to circulate the coolant, the water pump pulley is used to drive the cooling system fan which is attached to the pulley. If a car is driven fast enough, the ram air through the radiator can dissipate enough heat to handle *most* of the cooling job. However, at low speeds, a fan is needed to draw air through the radiator to dissipate the heat that has been transferred from the engine.

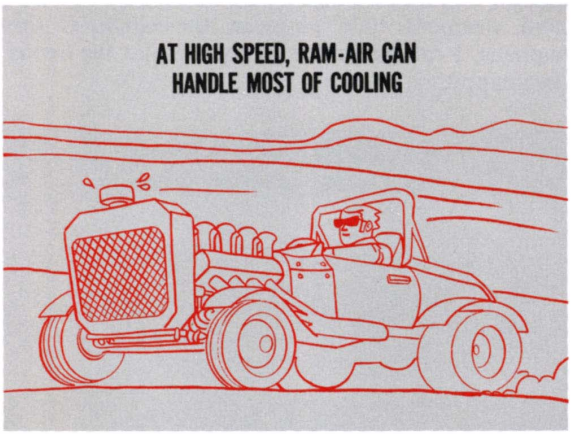


Fig. 12—Fan is needed at low speeds to draw air

SHROUD HELPS FAN

A fan shroud is used on some models to act as sort of a suction chamber to draw more air through the entire radiator surface. Without a shroud, the area that the fan would draw air through the radiator would be pretty much restricted to the diameter of the fan itself. The fan shroud also prevents underhood air from recirculating behind the radiator. Both functions work to increase the flow of cool air through the radiator.

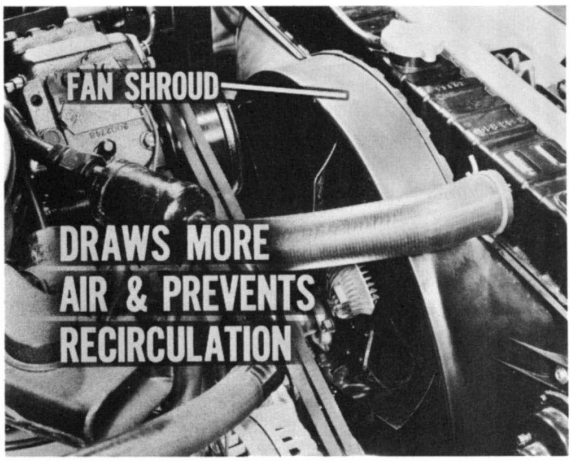


Fig. 13—Radiator yoke seal helps shroud do job

RADIATOR YOKE SEAL

The seal between the radiator yoke and the hood also improves air flow through the radiator. In addition to helping the fan shroud prevent recirculation, it prevents ram air from going over the radiator into the engine compartment, thereby increasing air flow through the radiator.

THREE TYPES OF FANS

Basically, there are three different fans used on Chrysler Corporation engines. The four-blade, which is used on the smaller engines; the seven-blade, which is used on the larger V-8's and some maximum cooling packages on the smaller engines. Last is the flex-fan which is used on a limited number of applications.

VARIETY OF FAN AND DRIVE COMBINATIONS

There are a variety of fan and drive combinations used on Chrysler Corporation cars. On some engines, the fan is working continuously. On others, the fan is allowed to coast whenever the cooling system doesn't need it.

FAN DRIVES

The fan drive is what allows the fan to coast at high engine speeds. Use of a drive unit to control fan operation permits the use of a high-capacity fan to deliver more air when needed and at the same time eliminate fan noise at high engine speeds by limiting fan speed. There are two types of fluid fan drives used. The straight fluid coupling; and a temperature-sensitive fluid coupling.

FLUID FAN DRIVE

Some heavy-duty cooling systems use a fluid fan drive, or what is referred to as a "torque control drive" in the Service Manual. The torque control drive is a silicone fluid-filled coupling connecting the fan to the fan pulley on the water pump. At high engine speeds, the drive unit starts to slip to limit the speed of the fan at a pre-determined level. This effectively reduces the level of fan noise.

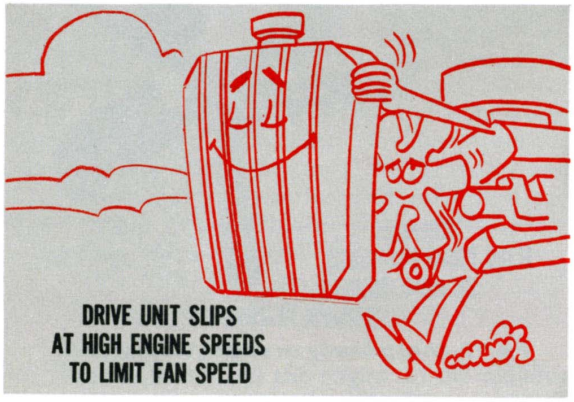


Fig. 14—Limiting fan speed also keeps noise down

THERMAL CONTROL FAN DRIVE

The temperature-sensitive fan drive unit is known as a "thermal control fan drive." The thermal control drive unit is also a fluid coupling that limits top fan speed the same as the torque control unit. However, it also contains a thermostatic coil that allows the fan to coast when the radiator is cold. The coil on the front of the drive unit controls the opening and closing of an orifice *inside* the unit.

HERE'S WHAT HAPPENS

When the coil is cold, the orifice is closed and the fluid coupling is inoperative. As the coolant starts to flow through the radiator, the air coming through the radiator also warms up. Air flow from the radiator heats the coil which opens the orifice inside the coupling. The coil will open the orifice at about one hundred-sixty-five degrees. With the internal orifice open, the fluid coupling is supplied with fluid and the fan starts to turn. The fan speed increases until it creates enough torque for the fluid coupling to slip and limit the fan speed.

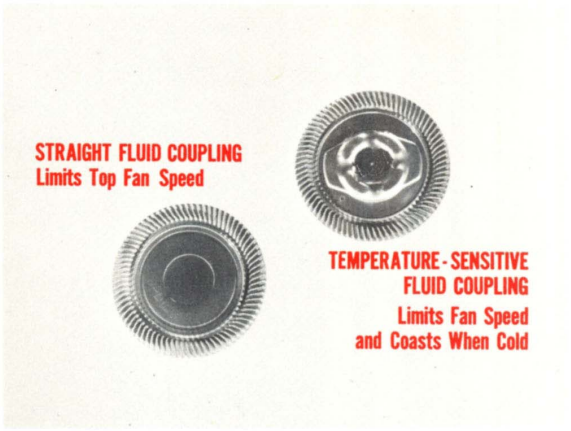


Fig. 15—Two types of fluid fan drives

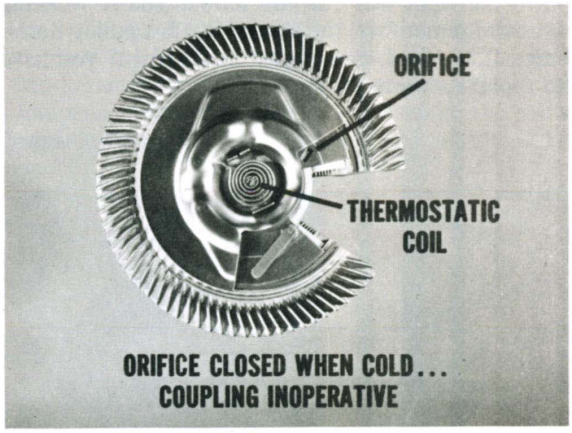


Fig. 16—Control orifice is inside drive unit

IT MIGHT PLAY TRICKS WHEN COLD

When the car is first started in cold weather and the fluid in the coupling is very thick, the fan may operate at full speed instead of coasting as it should. However, as the car is driven a short dis-

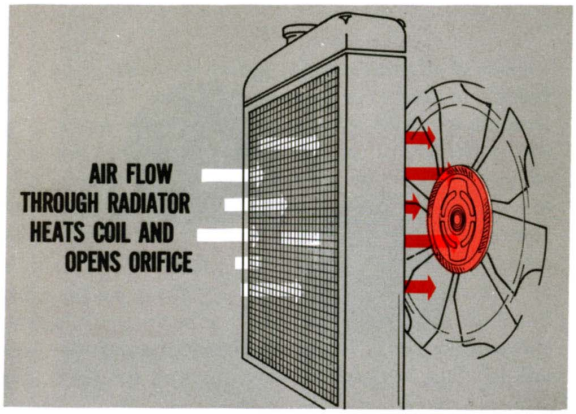


Fig. 17—Coil will open orifice at 165 degrees

tance, the coupling will operate normally as the fluid warms up and thins out. Then it will coast until the coil warms up and opens the orifice inside the drive unit.

DON'T GUESS ON FAN AND DRIVE UNITS

There are a variety of different fan and drive unit combinations with different drive ratios. Fan and drive unit combinations will also vary with different axle ratios in some models. If you have to replace either a fan, or drive unit, make sure that you have the right one for the model you're working on. And remember, the size of the fan pulley determines fan speed. So, be just as careful if you have to replace a water pump.

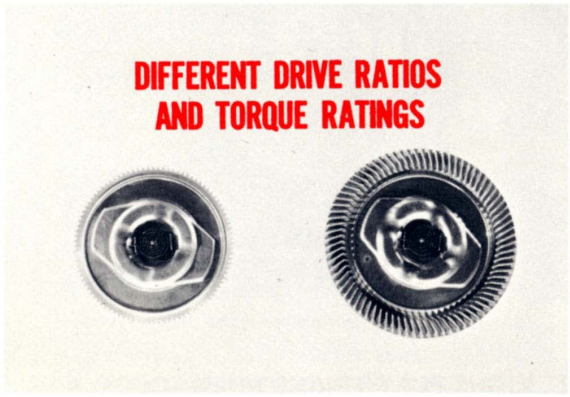


Fig. 18—Variety of temperature-sensitive drive units

FLUID VISCOSITY IS ANOTHER REASON

The peak torque capacity and top speed of each drive unit is determined in production by filling it with the correct viscosity hydraulic fluid. Two couplings with same dimensions and outward appearance will not have the same terminal speed if they are filled with fluids of different viscosity. Don't depend on outward appearances when replacing a drive unit; check the part number to be sure.

FLEX-FAN

Some models are equipped with a fan that has flexible blades. The flex-fan is designed to replace some torque-control and thermal-control fluid fan drives. The flex-fan will be used primarily on smaller engine models that are equipped with factory air conditioning.

Fig. 19—Used primarily on smaller V-8's with A/C

BLADES FLATTEN BY CENTRIFUGAL FORCE

The flex-fan has blades that start to flatten and change their pitch at high engine speeds. The main thing that causes the blade to flatten is centrifugal force. Air pressure against the blade does help; however, it only provides a small part of the force to flatten the blade.

FLEX-FAN TURNS EASIER AND QUIETER

As the blade flattens and the pitch changes, the fan turns more easily and takes a small load off the engine. At the same time, the fan noise is reduced due to the decreased resistance. Unlike the fluid drive unit, the speed is not limited, but increases along with the engine speed.

Fig. 20—Flex-blade fan speed is not limited

NO SUBSTITUTES, PLEASE

There is one very important thing to keep in mind if you have to replace a fan or drive unit. Because of different drive ratios, *always* use the fan and drive unit specified for that particular cooling system. Switching fans or drive units can cause serious problems.

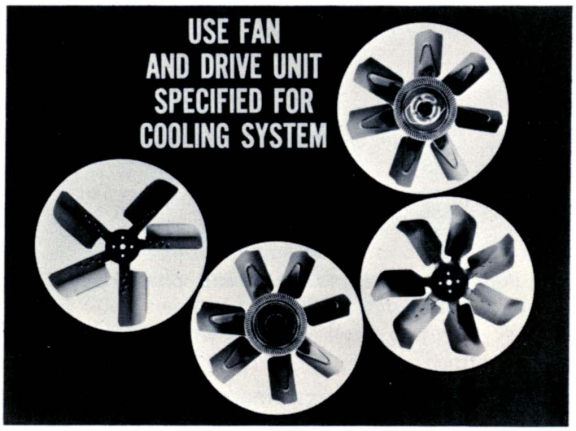


Fig. 21—Switching fans or drives can cause problems

RADIATOR DISSIPATES COOLANT HEAT

The radiator is not a very complicated component, but deserves close attention, nevertheless. The radiator is the workhorse of the cooling system because it is where the actual cooling takes place. The radiator is a series of many coolant passages, or tubes, surrounded by thin metal fins. The coolant flows through the tubes and transfers the heat to the fins, which are in contact with the tubes. The air rushing through the fins in the radiator dissipates the heat from the fins.

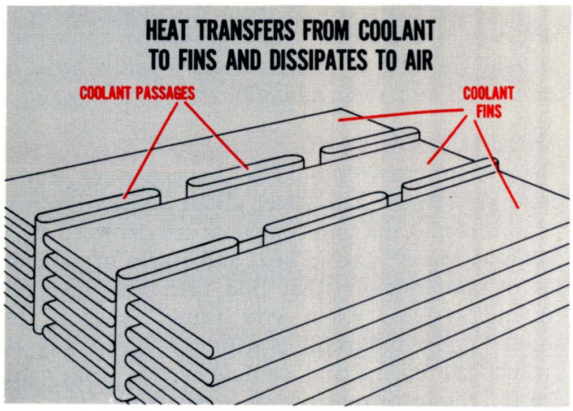


Fig. 22—Coolant passage tubes must be kept clean

RADIATOR MUST BE KEPT CLEAN TO WORK EFFECTIVELY

The coolant passage tubes and the fins surrounding them are small and numerous to speed distribution of coolant and dissipation of heat. Both the tubes and the fins must be kept clean for the radiator to do its job effectively.

COOLANT WILL TAKE CARE OF PASSAGES

The best way to keep the coolant tubes clean is to let the coolant do the job. The rust and corrosion inhibitors in the antifreeze will do a very good job

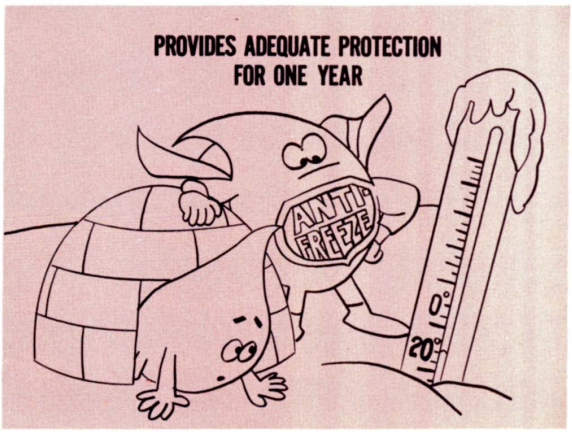


Fig. 23—Antifreeze solution must be good to −20°

of preventing the tubes from becoming blocked. However, the solution must be strong enough to prevent freezing to twenty degrees below zero, or about 50% antifreeze and 50% water.

ANNUAL DRAIN AND REFILL

The coolant charge should be changed every year – preferably in the fall. After about a year, the rust inhibitors and the anti-foamants are depleted by a combination of engine heat and traces of exhaust gas or contaminants that find their way into the cooling system. When you think about it, an annual drain and refill is a pretty cheap way to protect the engine and cooling system from damage and the inconvenience of overheating.

NO ADDITIVES, PLEASE

It isn't a good idea to try and strengthen the coolant by adding inhibitors. Many of them contain chemicals that are not compatible and can cause an unfavorable chemical reaction. Actually, the anti-foamants and rust and corrosion inhibitors contained in ethylene-glycol-type antifreeze are better than the additives you buy off the shelf.

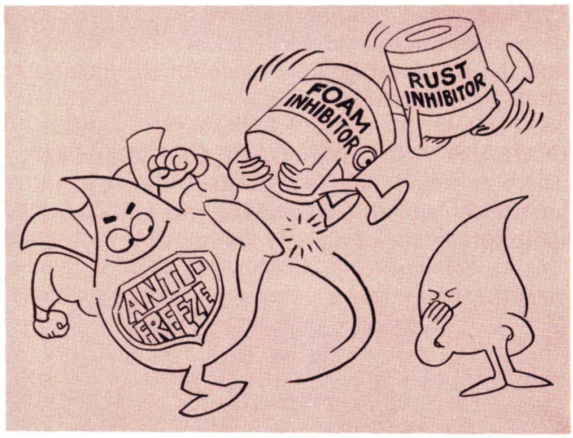


Fig. 24–Don't add inhibitors to strengthen coolant

NIX ON ANTI-LEAK ANTIFREEZE

There are currently on the market a number of "wonder" antifreezes that magically stop leaks within seconds. DON'T USE THEM. You may be trading a small leak for another problem. Some of them contain plastic balls of varying size which move to the leak and plug it. However, these balls may be too big to pass through the very small heater core passages if they have become slightly clogged by contamination. The pressure in the heater core caused by blocked passages may be sufficient to rupture it.

FLUSHING COOLING SYSTEM

When the antifreeze is drained for changing, the entire cooling system should be thoroughly flushed with clean water or with a cooling system cleaner to completely remove all of the old coolant and any contamination from the system before adding the new antifreeze. The best way to flush the system in connection with routine, annual service is to remove the thermostat and place a garden hose in the thermostat opening. Open the radiator drain and adjust the hose flow to keep the cooling system full. Letting it run for about ten minutes will do a good job of cleaning the engine block, heads, heater core, and radiator core.

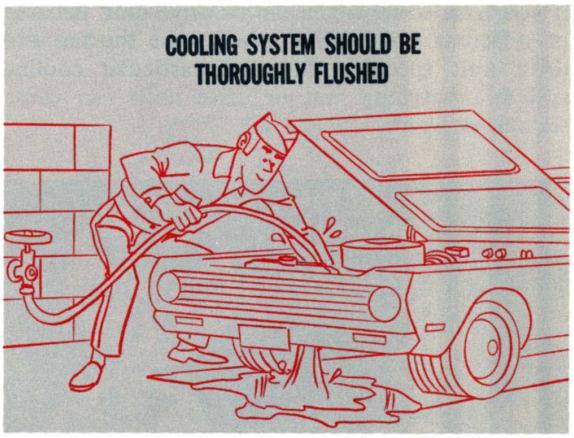


Fig. 25–Removes old coolant and contamination

PRESSURE FLUSHING AND CHEMICAL CLEANERS

Unless the system is extremely dirty or neglected, or there is some unusual cooling problem, pressure flushing, reverse flushing, and the use of chemical cleaners is not recommended. Follow the Service Manual for proper procedures to avoid rupturing a heater or radiator core seam. Advise the owner that if he changes the antifreeze himself next fall, that the operator's manual has instructions for draining and flushing the cooling system.

CHECK AIR SIDE OF RADIATOR

The front side of the radiator can become easily clogged – usually by bugs. The restricted air flow

lowers cooling system efficiency. Use a brush to remove any accumulation of bugs and other debris from the front of the radiator. Use a garden hose with the water at a low velocity to clean any remaining debris by running the water through the radiator from the *back* side. Be careful not to damage the fins with either the brush or by turning the water to a high velocity.

PRESSURE-VENT RADIATOR CAP

The pressure-vent radiator cap is an essential part of our cooling system. For each pound of pressure applied to the cooling system, the boiling point of the coolant is raised approximately three degrees. By pressurizing the system, the boiling point of the coolant is raised, allowing the engine to operate in a more efficient heat range.

CAP IS NORMALLY VENTED

The pressure-vent radiator cap does not start to function until the coolant reaches the boiling point and is being turned into steam. Until that point, the cooling system is vented to atmosphere through the cap and the overflow tube. Venting the cooling system to atmosphere prevents unnecessary pressurization.

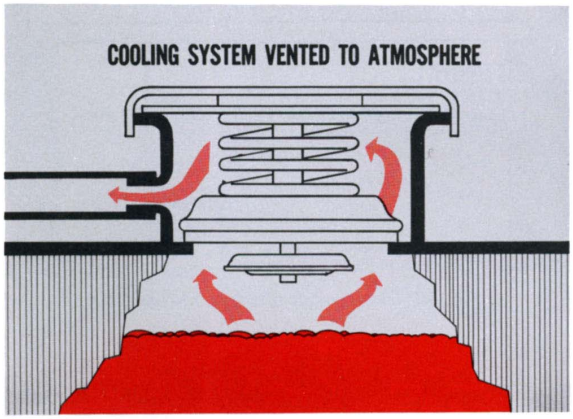


Fig. 26—Venting prevents unnecessary pressurization

VENT VALVE CLOSES AT BOILING POINT

When the coolant reaches the boiling temperature, the vent valve closes to pressurize the system. As pressure within the cooling system increases, the boiling point of the coolant rises continuously.

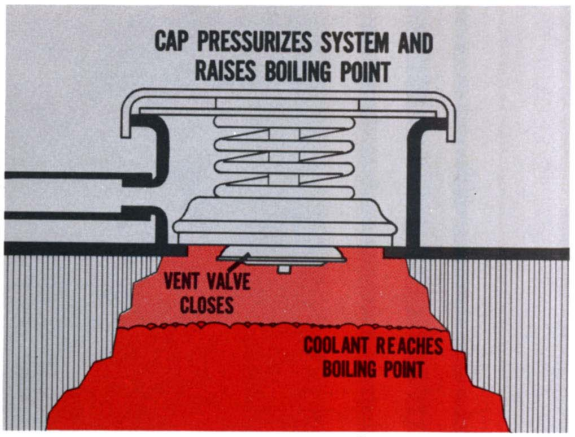


Fig. 27—Boiling point raises 3° per lb. pressure

Otherwise, the cooling system would be venting coolant in the form of steam any time the temperature of the coolant reached the boiling point.

RELIEF VALVE VENTS SYSTEM AGAIN

The pressure in the cooling system continues to build and prevent the coolant from reaching its boiling point. When pressure in the cooling system builds to between fourteen and seventeen pounds, it will unseat the *relief* valve. This again vents the system to atmosphere through the overflow tube and allows excess pressure to escape.

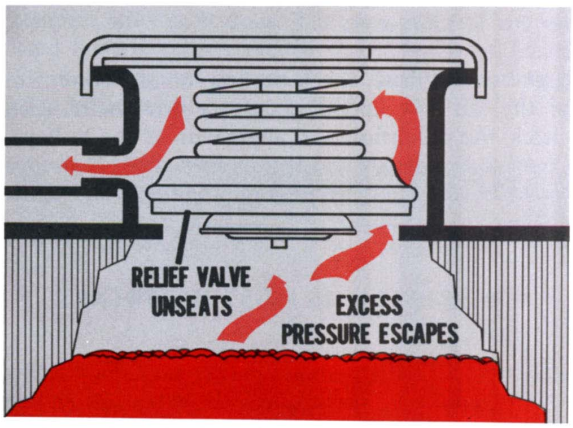


Fig. 28—Valve unseats between 14 and 17 lbs. pressure

INSPECT AND TEST CAP

To check the radiator cap, visually inspect the gaskets and valves to make sure they are not dirty, damaged, or distorted to prevent them from seat-

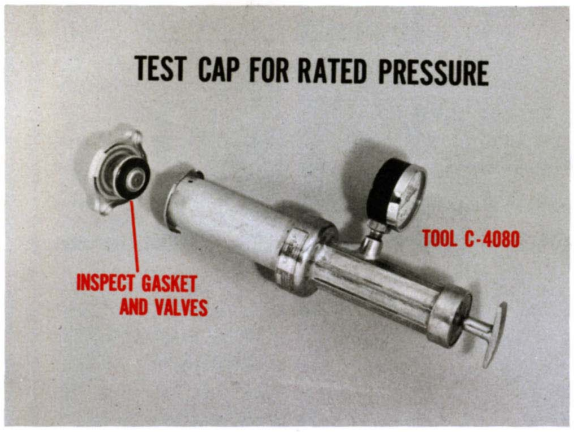


Fig. 29—Follow instructions in Service Manual

ing properly and maintaining cooling system pressure. Use Tool C-4080 and follow instructions in the Service Manual to make sure that the cap operates at the rated pressure. If the cap fails to hold pressure between 14 and 17 pounds, replace it with a new one.

RADIATOR FILLER NECK

It's a real good idea to check the radiator pressure cap seat on the filler neck of the radiator. Dirt or damage may prevent the cap gasket from sealing properly and maintaining system pressure or may interfere with the operation of either valve.

BELTS AND HOSES

Last but not least, check the tension and condition of the fan belt, and all accessory drive belts. Also check the condition and alignment of the pulleys. Check the radiator and heater hose and all clamps to make sure they are in good condition and tightened securely.

THERMOSTAT IS MOST IMPORTANT

If you recall, it was stated earlier that the cooling system could be more correctly called an engine temperature regulating system. Remember, it's as important to make sure that the engine does not run too cool as well as too hot. The thermostat is the main regulating component of the cooling system because its job is to regulate engine temperature. However, its first function is to speed warmup of the engine.

COOLANT DISTRIBUTES HEAT THROUGH BLOCK

Any time the coolant temperature is below the rating of the thermostat, the thermostat is closed to recirculate the coolant through the engine block by going through the water pump bypass. What the coolant does at this state is to take heat from the hotter parts of the engine and carry it to the cooler areas to establish uniform temperatures as quickly as possible.

TWENTY DEGREES TO FULLY OPEN THERMOSTAT

A thermostat that is rated at 185 degrees will start to open when the coolant reaches that temperature and allows some of the coolant to flow through the radiator. When the coolant temperature increases about twenty degrees above the rating of the thermostat, the thermostat will be fully open and will not restrict coolant flow through the radiator to any degree.

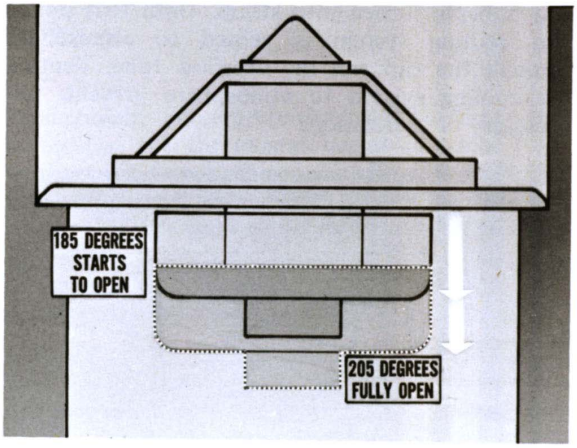


Fig. 30—Thermostat operates in this range

THERMOSTAT MAY START TO CLOSE AGAIN

In cold weather, the air rushing through the radiator will lower the coolant temperature below the rating of the thermostat. If the thermostat remained open, and allowed the coolant to continue to flow through the radiator, the engine temperature would drop below the desired level. So, the thermostat starts to close again and restrict flow to the radiator and raise the temperature of the coolant and the engine.

CHRYSLER THERMOSTATS ARE FAIL-SAFE

Chrysler Corporation thermostats are designed with a fail-safe aspect so that if the thermostat fails, it will usually stick in the "open" position rather than "closed". Naturally, that would cause overcooling rather than overheating. It is possible, however, for the thermostat to fail and stay in the closed position. This condition is usually caused by some bit of debris such as core sand or sludge getting lodged in the thermostat.

REPLACEMENT MUST BE CORRECT RATING

If the thermostat does fail, make sure that you replace it with one that has the proper temperature rating. Because of engine design changes, the rating of the thermostat may vary from model year to model year, and for different size engines. Most of the thermostats on the '71s have been dropped ten degrees down to 185 degrees. You can easily test the thermostat by placing it in water and watching it as you heat the water. The Service Manual has detailed instructions and specifications.

TEMPERATURE-OPERATED VACUUM BYPASS VALVE

Some seventy-ones with the larger V-8's will have a temperature-operated vacuum bypass valve. The bypass valve advances ignition timing to increase engine idle speed to prevent overheating. At two-hundred-twenty-five degrees coolant temperature, the bypass valve opens to supply full manifold vacuum rather than spark port vacuum to the distributor advance unit. The increased manifold vacuum advances the ignition timing to reduce the engine heat load on the cooling system. It also increases idle speed by approximately two-hundred r.p.m.'s which increases fan speed to help prevent overheating.

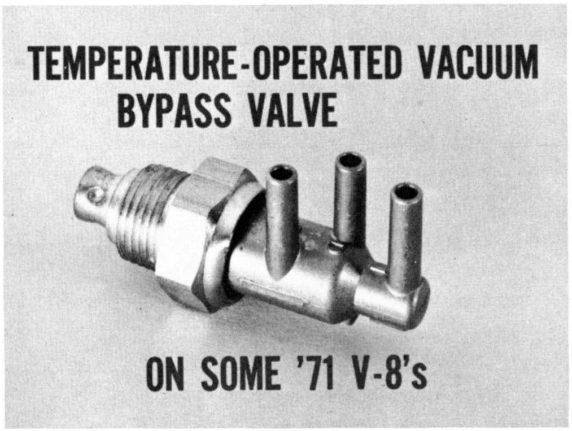


Fig. 31—Vacuum bypass valve advances ignition timing

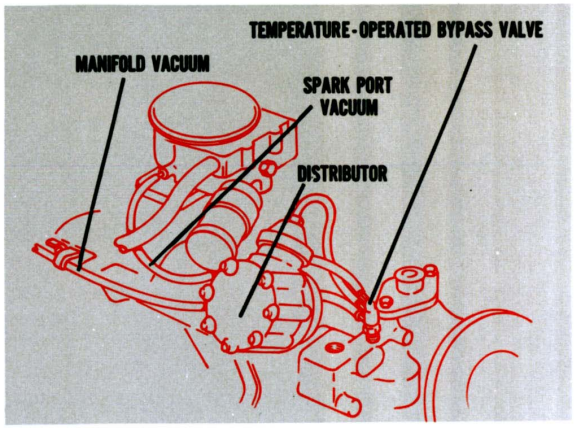


Fig. 32—Reduces engine heat load on cooling system

NEW OPTION FOR 1971

An engine block heater is offered as optional equipment on all 1971 Chrysler Corporation cars. The heater operates on standard 115-volt house current and keeps the coolant in the engine block warm for easier starting and faster warmup. The heater elements are located in core holes and replace the plugs. Routing of the heater cord along the left wheelhouse allows the plug to be conveniently located at the radiator yoke. So, don't let it throw you when you see a standard household-type male electric plug under the hood.

Master Technician customer care

LITHO IN U.S.A.