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OF COLOR**



# CHILL IT!

## DOUBLE THE LIFE OF YOUR AUTOMATIC TRANSMISSION WITH A TRANS COOLER

BY JIM BRIGHTLY

Experts in the field of hydraulics have long known a fact that few automatic-transmission car owners ever learn: Lowering the working temperature of hydraulic fluid extends its life. In fact, for each 20° F reduction in temperature, the life of the fluid is doubled.

Why all this talk about hydraulic fluid when we are dealing with an automatic transmission? Well, automotive experts, transmission design engineers and transmission cooler designers all treat an automatic transmission, no matter what make, as a very sophisticated hydraulic pump—which it is.

Glancing quickly over the functions of a modern auto trans will help explain why heat is generated in the automatic transmission fluid (or ATF). This heat must be reduced in order for the transmission to live a full, complete life. An auto trans consists of about four main parts: the torque converter, fluid pump, valve body and pan. The only part most of us ever see is the pan, that squarish trans fluid collector on the bottom of the transmission case. Inside the pan are a filter, which cleanses the ATF, and baffles to aid in cooling it.

From the pan, the fluid begins its journey through the contorted passages of the transmission, eventually

providing a power lockup between the engine and the driving wheels. The ATF is first sucked up by the pump and travels through the filter for removal of impurities. Then it passes through a pressure-regulating valve, through the ATF pump and on into the torque converter. A transmission's torque converter resembles a big doughnut (its size depends on the application) with a section of pipe about three inches long stuck in the middle. This pipe is actually a double shaft or pair of tubes, through which the ATF flows in and out of the torque converter. The ATF enters through the stator shaft and exits through the input shaft.

This torque converter is the object on which almost everything else depends. It provides the friction which moves the van, its design controls the power lockup and amount of stall speed (engine rpm at which the van begins to move), and it occupies the same space that a clutch assembly does on a vehicle with a standard shift. Through the use of internal fins, the torque converter, while spinning at the same speed as the engine's crankshaft, provides the friction which moves the van. This friction also generates most of the heat in the trans, heat which will destroy the ATF in short order if

not reduced.

Flowing out of the torque converter through the input shaft, the ATF then travels through the pump once again and into the valve body. The valve body, when opened, resembles the convoluted passages of a human brain. It is, in fact, the brain of the transmission. Through a series of various pressure relief valves and involved circuitry, the valve body decides which gear the transmission should be in.

After leaving the valve body, the ATF is pumped out of the transmission (the only time it leaves the case) and into the radiator. Then it is returned to the pan. This little trip is accomplished via steel tubing. This short description of the trans, by the way, is about as complete and detailed as saying the Empire State Building is tall.

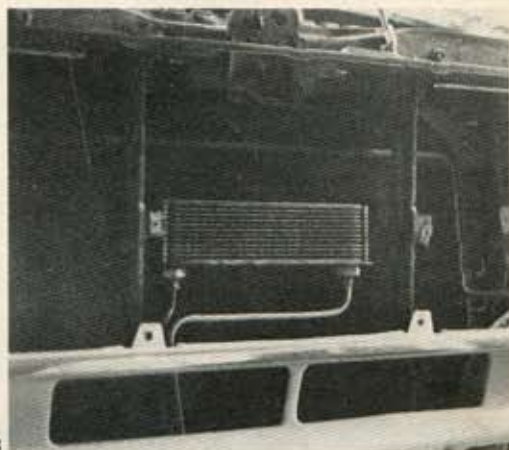
The radiator can cool the trans fluid down to acceptable temperatures, but only if the van is being driven normally. Any long hills will send the ATF temperature over 300° F. Towing a heavy trailer adds even more heat, and rocking a van back and forth from forward to reverse to get out of mud, snow or sand will rapidly make the temperature soar over 500° F.

Temperatures of this magnitude quickly cause varnishes, oxides and





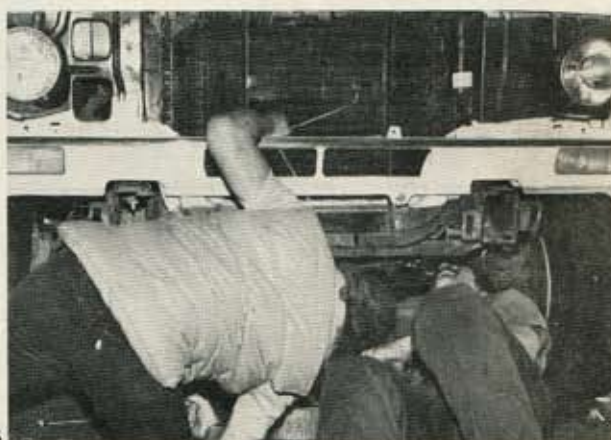
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1. Usually quite busy, Advanced Transmissions was able to squeeze us in easily during our early morning visit. If you live in Southern California and want to contact them, their number is (714) 984-3418.

2. First step is to remove the front bumper and grille. This exposes the radiator and air-conditioning condenser.

3. Here's Ford's optional factory-mounted trans cooler. We don't know what its rating is, but it can't be a very high one.

4. Depending on the make, model and whether the truck is equipped with a factory-mounted cooler, you may have to cut existing fluid lines in order to remove them from their cramped quarters. Don't be afraid to do so, because the installation kit includes plenty of high-pressure tubing and clamps to replace the steel tubing.

5. Pull out the existing oil lines and check all frame and subframe members for proper clearance. You don't want any metal rubbing against either the cooler or its lines and maybe causing a leak somewhere down the road.

6. Hayden's model K-1014 is a slim-line model, but it's still rated at 18,000 lbs. Hayden is located at 1531 Pomona Rd., Corona, CA 91720, in case you have any questions concerning your own particular van and its applications.

## CHILL IT!

waxes to form, and these turn the ATF sludgy. To clean the pollutants from the fluid, each transmission has been equipped with a filter—which must be cleaned periodically.

We asked an engineer about the feasibility of installing an external ATF filter somewhere on the cooling lines. This, we reasoned, would increase wear protection and allow the van owner to change the filter himself, without the services of an expensive expert. The engineer replied that with a trans cooler of sufficient size, an additional, external filter would not be necessary.

"Heat causes the pollutants. Without heat, a filter isn't needed. If you can keep the temperature

down below 150°, you can run the same ATF indefinitely. Theoretically, your transmission, with proper use, could last forever," he explained.

"At what temperature does a transmission operate in stock form?" we asked.

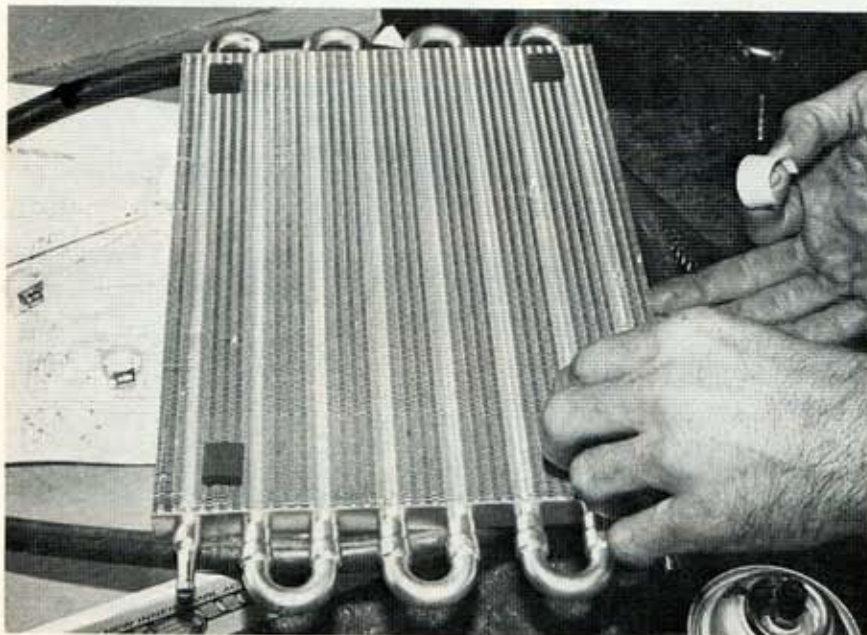
"Today's cars, trucks and vans are designed to operate at about 220° F in both engine and transmission. It has been proven that if operating temperatures can be kept below 180°, wear is reduced very substantially," he replied.

"Trans coolers are rated according to gross vehicle weight ratings, both alone and if towing. What would happen if we overcooled? Suppose we put an 18,000-lb.-rated trans

cooler on a Pinto. Would this hurt anything?" we queried.

"Nothing whatever. With that size unit the trans would operate at about 140° F and could virtually last forever," he concluded.

With all this new information floating around in our heads, we motored eastward to the transmission shop of Jim Galatioto (Advanced Transmissions, 1156 W. Holt Ave., Ontario, CA 91761) and asked him to install a cooler rated at 18,000 lbs. in our Pathfinder Quad-ravan. The trans cooler we used was manufactured by Hayden, a well-known and respected name in trans coolers, but other coolers can be substituted. ■



1. Hayden has a unique, patented application technique. Using these rubber cushions at each corner, the cooler is held tightly against either the radiator or the air-conditioning condenser (whichever is in front) by long, thin lengths of plastic.

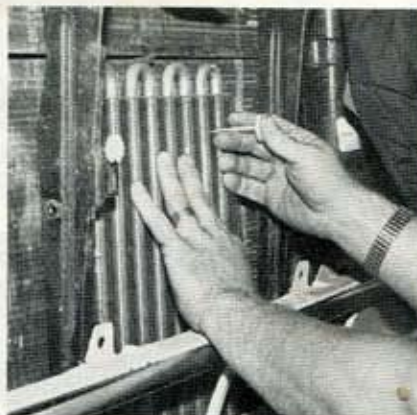
2. Carefully position the cooler and again check for proper clearance before permanently attaching cooler.

3. This is definitely a two-man operation. One man must push the plastic strips through both the radiator and condenser while the other man attaches the nylon securing "nuts" to the rear side of the radiator.

4. John Saltsman is cutting the high-pressure hoses to the proper lengths and tightening the four hose clamps. Two of the five supporting strips can be seen in the upper portion of the photograph.

5. With hoses in place and clamped down, the installation is complete, but it must be inspected for leaks. Start your engine. With the parking brake securely locked, place the shift lever into "drive." Allow the engine to idle for 5-10 minutes, shut off the ignition and inspect the fluid lines. There should be no fresh ATF at all on transmission lines.

6. If the installation passes the final inspection, replace the front bumper and grille. Now you're on your way with a transmission whose life span should be double that of a stocker.





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