COOLING SYSTEM

02/05/04 website
A common problem with the V8 Datsun Z is overheating. Generally, they overheat due to insufficient air flow through the radiator, and because of inefficient radiator designs.

Some radiator designs restrict the air flow through the radiator. For example, a 4-row radiator is so thick, that an electric cooling fan cannot easily move air through a 4-row radiator. A 4-row radiator normally requires an engine-driven fan to draw air through the radiator.
For an engine-driven fan to work properly in the V8 swap, it needs a fan shroud. The shrouds shown on the cars in the introduction of this book are from a 1970-1974 Chevrolet Nova with a 350 V8, and the extension on the shroud is from a 1977 Monte Carlo with a 350 V8. The extension slides into the back of the Nova fan shroud and is held in place with staples, rivets, or screws. However, the shroud and extension are no longer readily available, and cannot be purchased new.

The most practical way to cool a V8 Z is with an electric cooling fan and a radiator that allows air to easily flow through the core, while transferring heat into the cooling air. Most modern cars use electric cooling fans, as well as radiators that allow air to easily flow through the radiator.

FOUR-ROW RADIATORS

People often recommend custom 4-row radiators for the V8 Z. The problem with them is that they are heavy (about 25 lbs), costly (over $300), and offer no cooling benefit over the radiator shown on the next page. A problem with 4-row radiators is that getting air through the core is difficult due to aerodynamic restriction. Also, once the cooling air has gone past the first row, the air is heated up so that it cannot draw as much heat from the next row, and so on.

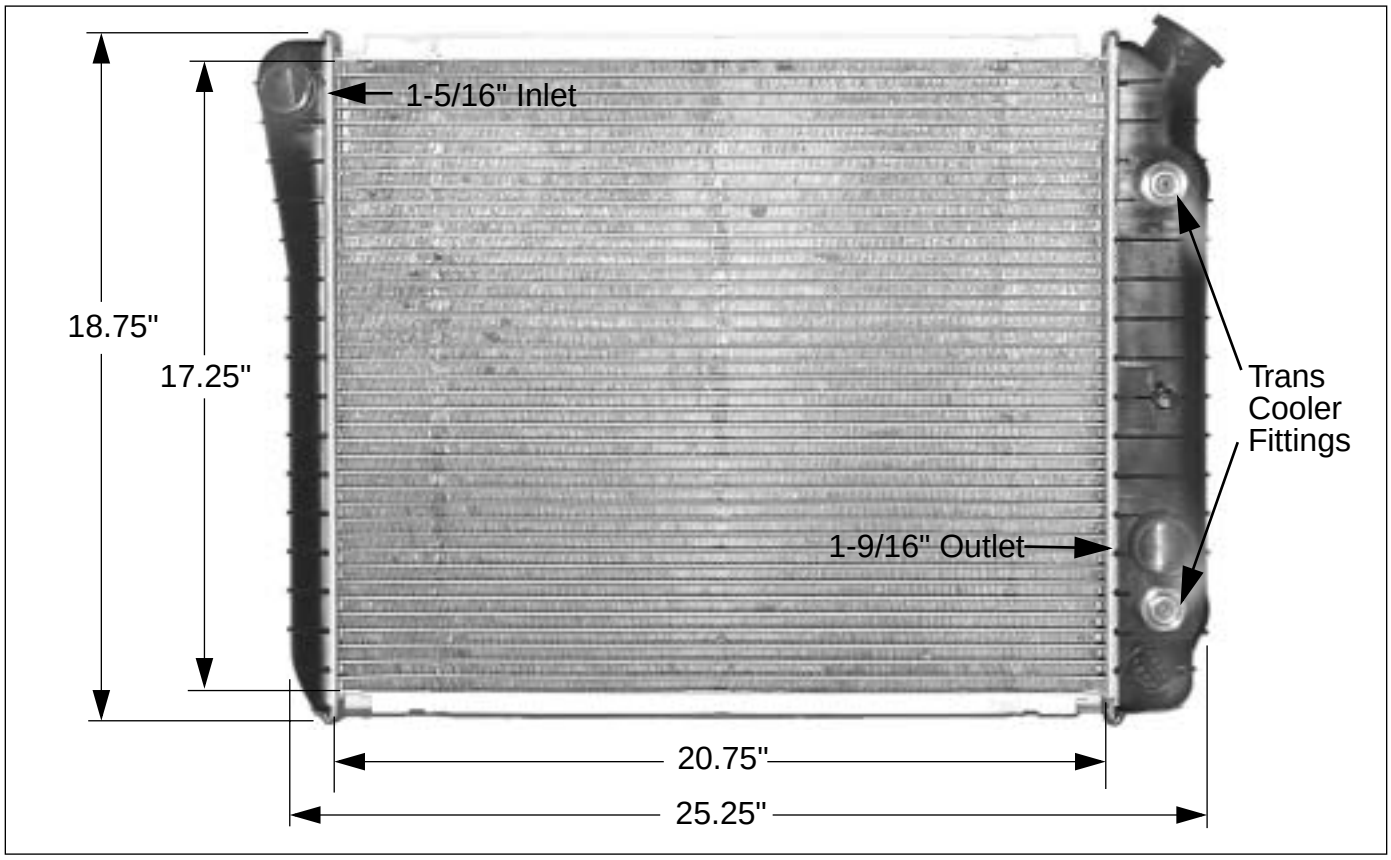
ALL-ALUMINUM RACING RADIATORS??? NOT FOR THE STREET!

All-aluminum racing radiators are often recommended for V8 Z cars. On the internet, there are many V8 Z-car experts giving out not-so-expert advice. Our experience with all-aluminum radiators in street cars is not good. The all-aluminum radiators are reasonably priced, they look good, and they cool well—they just don't last very long. One problem is that the side tanks are welded to the radiator core, and the welds tend to crack within a couple of years of everyday driving. Racing cars are seldom used for everyday driving. The all-aluminum racing radiators work great in racing because most race shops have a TIG welder that can quickly repair a radiator that has been damaged by a racing accident.

COOLING TIPS

On many engine swaps, the car overheats even though all the right parts are used. Often the overheating is caused by too much anti-freeze. Never use more than a 50% mixture of anti-freeze. A hydrometer (available at most auto parts stores for less than $10) should be used to determine the percentage of anti-freeze in the cooling system. As an example to the significance of anti-freeze on the efficiency of the cooling system, Chevrolet recommends using a 50% mixture of anti-freeze on S-10 Trucks in Canada, but only a 45% mixture for S-10 Trucks in America.

Some V8 Z cars overheat because the engine is poorly tuned for street driving. We have seen cars with aftermarket programmable fuel-injection overheat because the ignition timing was extremely retarded. In one case, the owner was running no part-throttle ignition advance— the car got horrible gas mileage, and it overheated. Running vacuum advance is important to prevent overheating.



PLASTIC/ALUMINUM RADIATOR

This is what we now feel is the best radiator for the V8 Z. It is made for Stealth Conversions. It is the base radiator for 1984-1986 V8 Camaro's, but with a thicker core (1-3/8" thick, compared to 7/8" for a stock radiator). It is light, inexpensive, and does an excellent job of cooling. It has the correct overall dimensions to fit in a Z car, and it has an automatic transmission cooler in the passenger's side tank. The heavy-duty radiator for a 1984-1986 Camaro has a 1-3/8" thick core, but it has an overall width of about 30" (compared to 25.25" on the radiator shown above) which is too wide to fit between the frame rails in the Z car.

The genuine Chevrolet base radiator for the 1984-1986 Camaro has a core that is only 7/8" thick. Also, the Genuine Chevrolet radiators sometime have cosmetic problems (bent, or unevenly spaced fins) which has caused complaints. The aftermarket radiator shown above is better than the genuine Chevrolet radiator, costs less, and has fewer cosmetic problems. It also has a thicker core, which is 1-3/8" thick, and has 18 fins/inch.

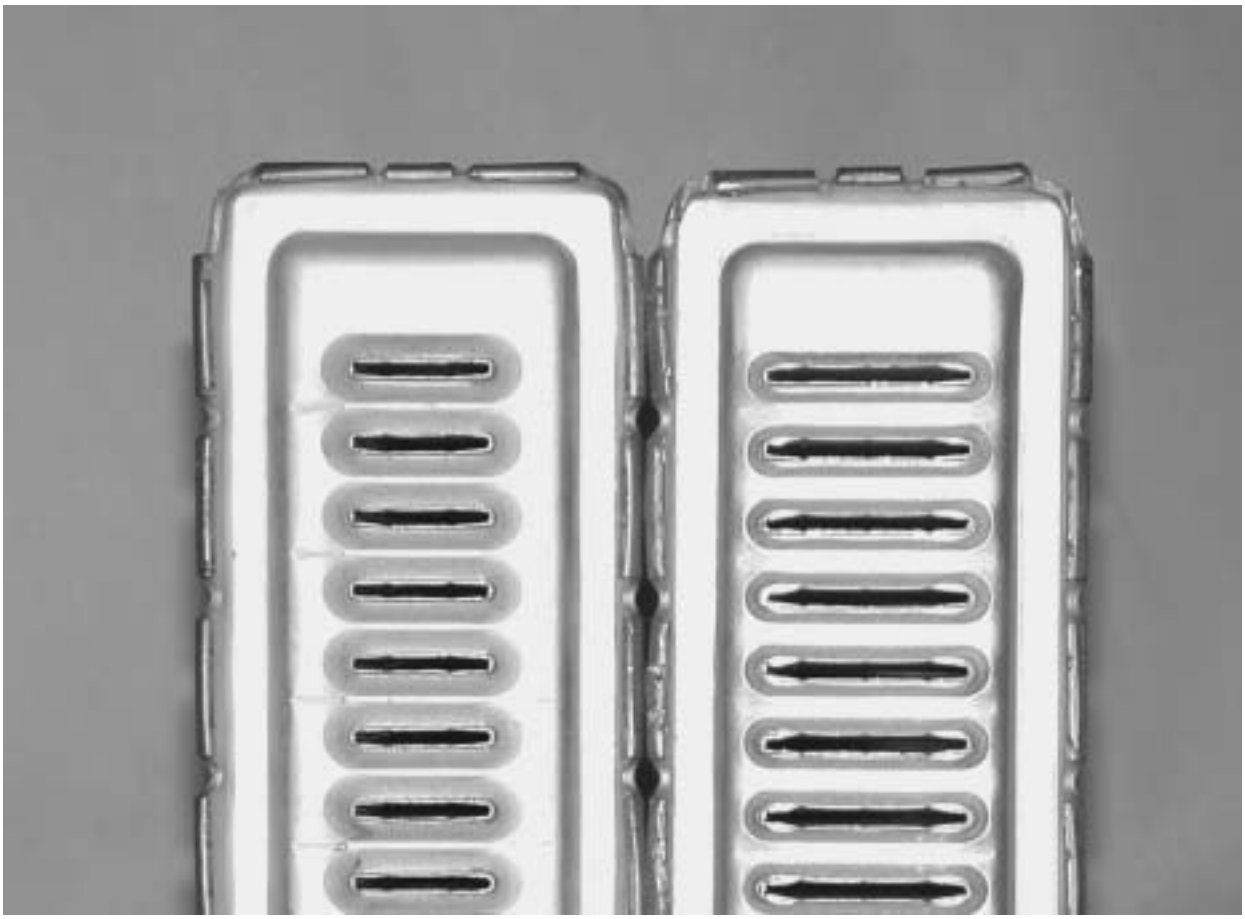
The inlet fitting is 1-5⁄16" and the outlet fitting is 1-9⁄16". If you are using a 1-1⁄2" diameter upper radiator hose, use a hose reducer bushing, available at most auto parts stores. Stealth Conversions also sell hose reducer bushings.

When used with a powerful electric cooling fan (see pages 12-9 through 12-11), the radiator does an excellent job cooling the V8 Z.

WEIGHT SAVINGS

The radiator shown above weighs less than 10 lbs pounds (empty). The side tanks do not hold a lot of coolant, and this also saves weight. When the radiator is filled with coolant, it weighs 15 lbs. The brackets which hold the radiator weigh 6 lbs, for a total weight of 21 lbs.

By comparison, a stock 280Z radiator weighs 20 lbs (empty), and 30 lbs full of coolant.



Base Radiator core
for 1984-1986 Camaro

Radiator core used
on Radiator sold by
Stealth Conversions

RADIATOR CORES

The radiator core on the left is used on the base radiator for the 1984-1986 Camaro. The tube width is .800".

The radiator core on the right is used on the radiator sold by Stealth Conversions. The tube width is 1.25".

The base Camaro radiator with the thin core does a good job of cooling the V8 Z, but some people returned the radiators without ever using them because they felt the radiator was too thin to cool well.

Stealth Conversions has been able to purchase custom made radiators from American manufacturers for far less than the wholesale cost of radiators 10 years ago.

One of the reasons radiator prices have dropped over the years is due to the low cost of aluminum (Russia is now a large source of the ore used to produce Aluminum). Another reason for the cost reduction is because of competition from radiators manufactured from overseas. The quality of the radiators sold by Stealth Conversions is first rate.

Modern Style Typical of 1990 and Newer cars and Trucks

Typical 1980's style of core

Typical 1970's style of core

RADIATOR CORE DESIGNS

There are a lot of different radiator designs and different materials: Copper-brass, aluminum, 1-row core, 2-row core, 3-row core, continuous fin, louvered fin, straight fin, serpentine fin, dimpled tube, cross flow, down flow, high-efficiency core, 1-pass core, 2-pass core... etc.

A lot of the different designs have more to do with marketing than actual cooling ability.

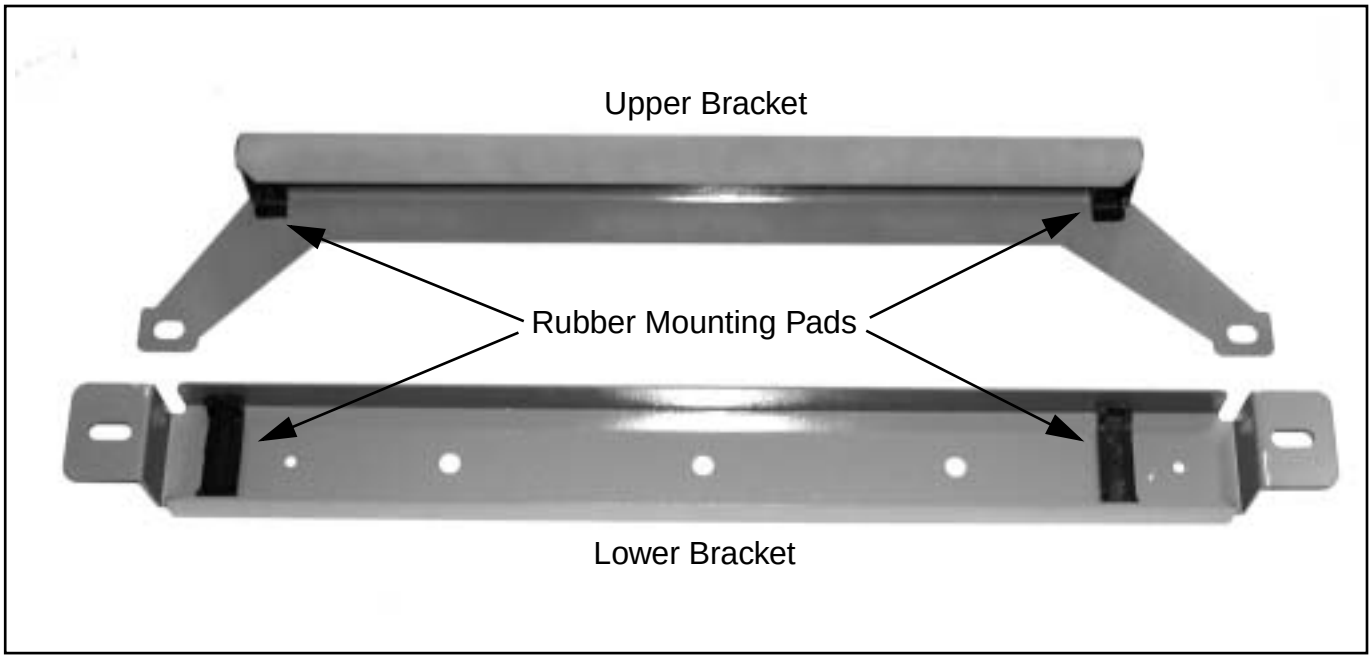
On the left is a modern style radiator core. The tube width is 1-1/4", and the tubes are spaced at 7/16" interval. The wide tube has more surface area that contacts the cooling fins than the radiator cores shown to the right. The better surface area results in better heat transfer.

The center radiator core is a two-row copper-brass design that is used on a lot of cars built in the early 1980's. The tubes are 3/8" wide and they are spaced at 7/16" intervals. The core on the right is also a two-row copper-brass design. Its tubes are 1/2" wide and they are spaced at 9/16" intervals. This design was used through the 1970's.

The one-row core design is the best for cooling and the lightest weight of the three radiators shown. Copper has better heat transfer characteristics than aluminum, but the aluminum is more easily formed into wide tubes, and it is lighter and less expensive than copper.

As mentioned previously, custom 4-row core radiators do not cool as well as often advertised because it is difficult to get air through the thick core due to aerodynamic restriction. Also, once the cooling air has gone past the first row, the air is heated up so that it cannot cool the second row as much as the first row, and this pattern continues to the fourth row, which does not provide much additional cooling.

The aluminum one-row radiator is the best radiator we have found for the V8 Z.



RADIATOR MOUNTING BRACKETS

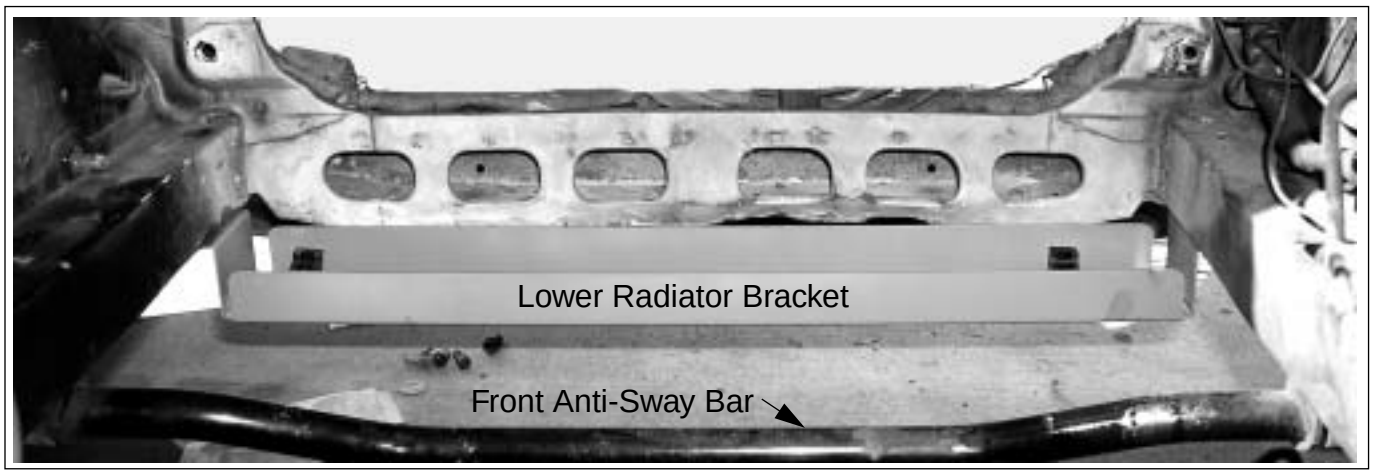
For durability, it is important to completely rubber mount the radiator using Chevrolet radiator pads, and making sure that nothing rubs on the radiator core.

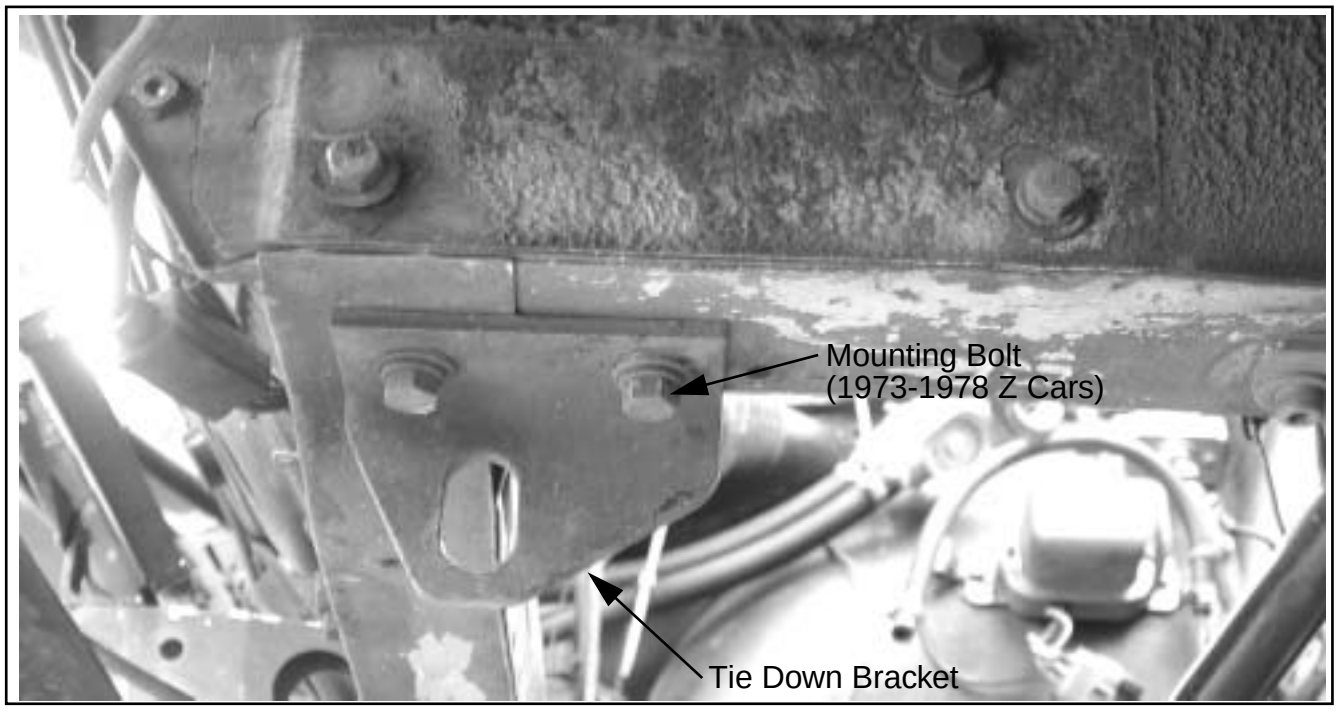
The aluminum radiators need to be rubber mounted to protect from vibration and from electrolytic corrosion. One of the reasons the all-aluminum racing radiators don't last long on street cars is because they are often mounted metal-to-metal.

The Stealth Conversions brackets shown above, are used to mount the Chevrolet style radiator to the Z car using rubber mounting pads (from a 1986-1993 S-10 Truck) that isolate the radiator from vibration and electrolytic corrosion. The brackets come with the rubber mounting pads (GM part #12338053).

The brackets have alignment holes which hold the rubber pads in place for installation purposes, but silicone sealant must be used to hold the rubber mounting pads to the radiator brackets.

The brackets are made from Zinc Plated steel to prevent rust, although the parts shown above were painted. To see the appearance of the zinc plated parts, see page 12-10.



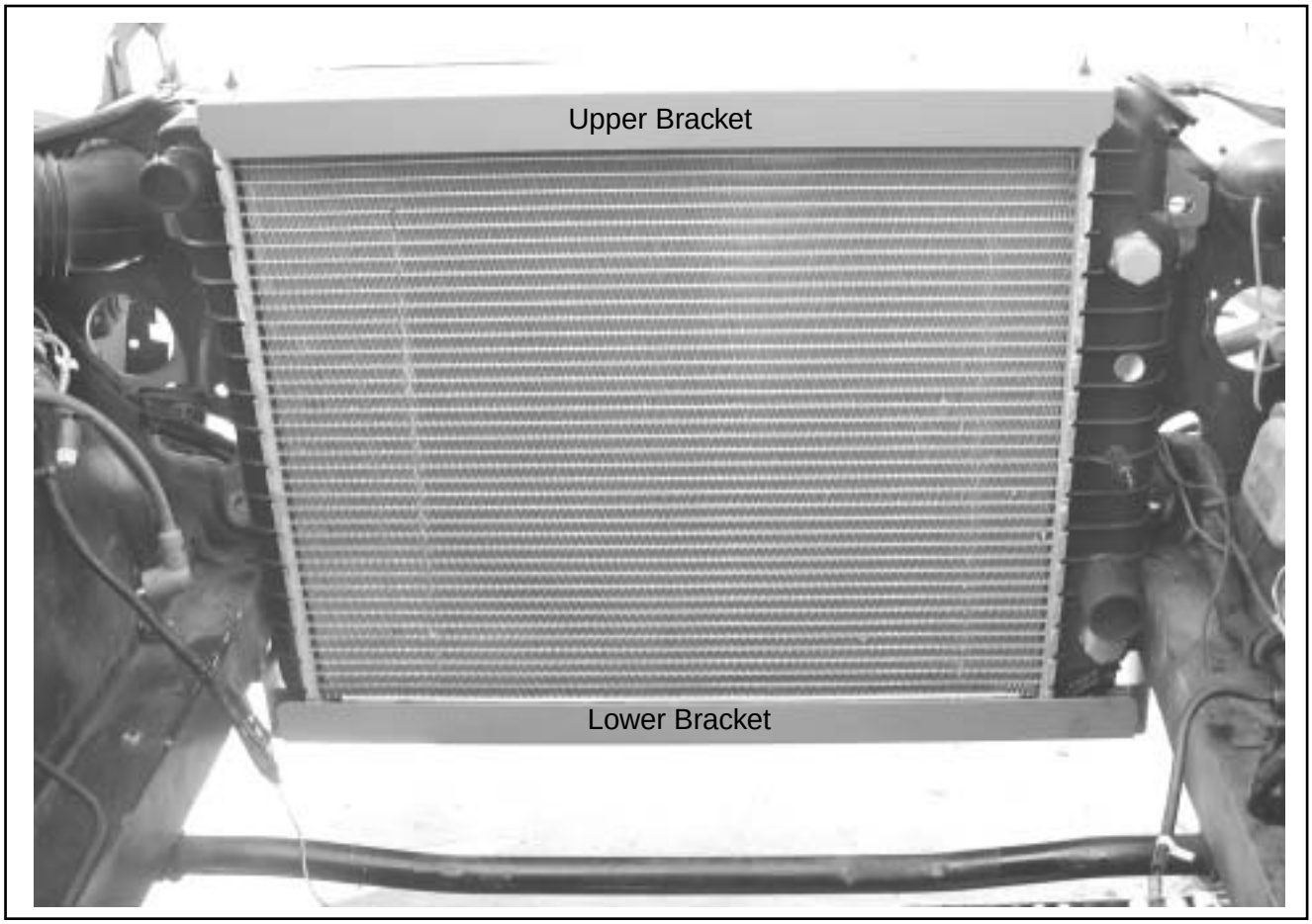


LOWER RADIATOR BRACKET INSTALLATION

The lower radiator bracket is attached to the Z car below the frame rails.

On 1973-1978 cars, the original bolts which hold the tie-down brackets are used to hold the lower radiator bracket in place.

On 1970-1972 cars, holes have to be drilled through the frame rails to install the lower radiator brackets. One 1/4" diameter, 3-1/2" long bolt on each side will hold the lower radiator bracket to the frame rails. Be sure to use large washers to distribute the loads on the frame rails because the frame rails are easily crushed by over-tightening the bolts.



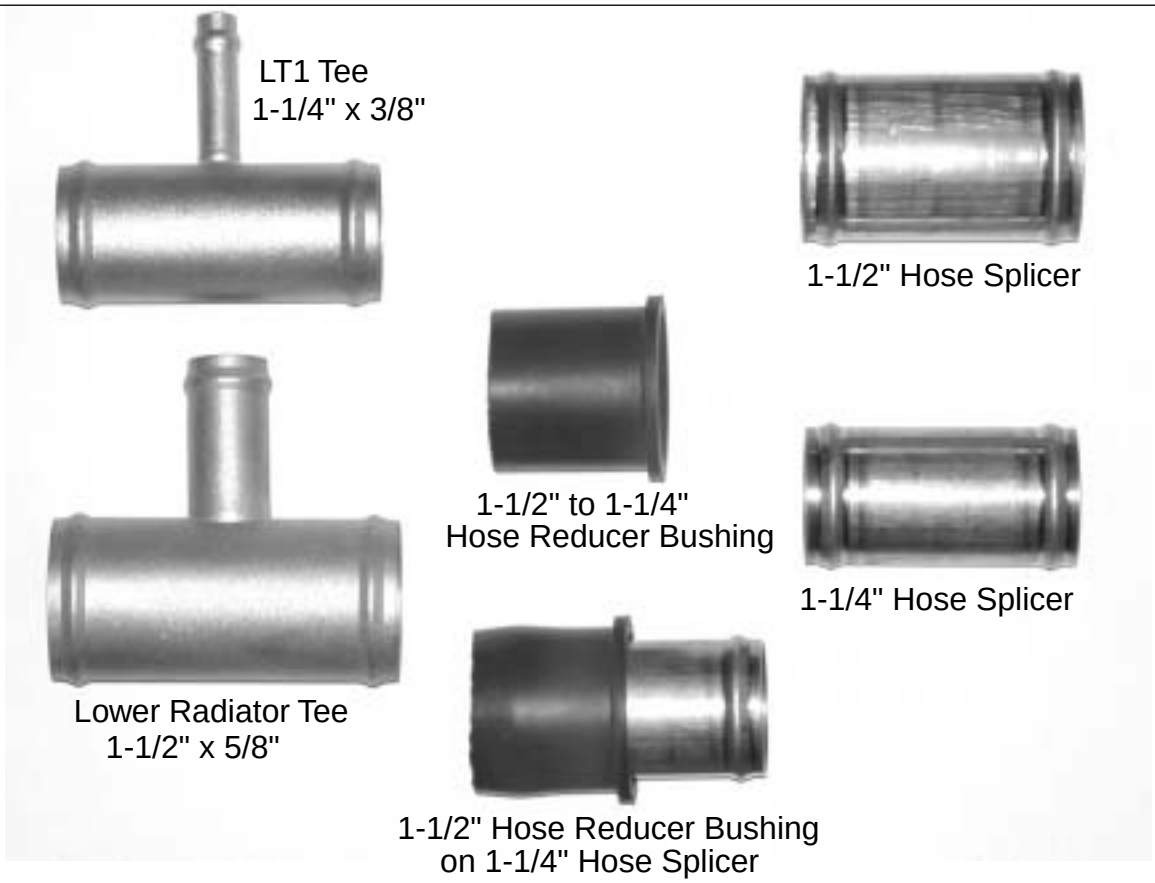
RADIATOR MOUNTED IN CAR

The radiator is mounted in this car (a 1973 car) as a bolt-in. No cutting or drilling was required.

The 1970-1972 cars need to have a hole drilled through the top and bottom of each frame rail to install the lower bracket using a 1/4" x 3-1/2" long bolt.

There is only about 1/8" between each side of the radiator and the frame rails on 1970-1974 cars.

The 1975-1978 cars have a little more room between the sides of the radiator and the frame rails because the sides of the frame rail near the radiator are formed slightly differently than earlier models.



RADIATOR HOSE SPLICERS, HOSE TEES, AND REDUCERS

The car shown on page 1-4 uses radiator hoses from a 1971 Chevrolet Nova with a 350 V8. The radiator hoses from a 1984 V8 Camaro will also work on the V8 Z. To use the Nova upper radiator hose on the Camaro radiator, a hose reducer bushing will need to be used.

One problem with radiator hoses for older applications is that different manufacturers make "replacement" hoses that don't all fit the same. Often, it necessary to cut and splice radiator hoses to fit an application. The hose splicers and hose reducer bushing shown can save a lot of time when connecting hoses in the V8 Z. Stealth Conversions sells a hose splicer kit which includes two 1-1/2" brass hose splicers, one 1-1/4" hose splicer and one 1-1/2" to 1-1/4" hose reducer bushing as part # DAT- 128 (cost is $17).

HEATER HOSE TEE

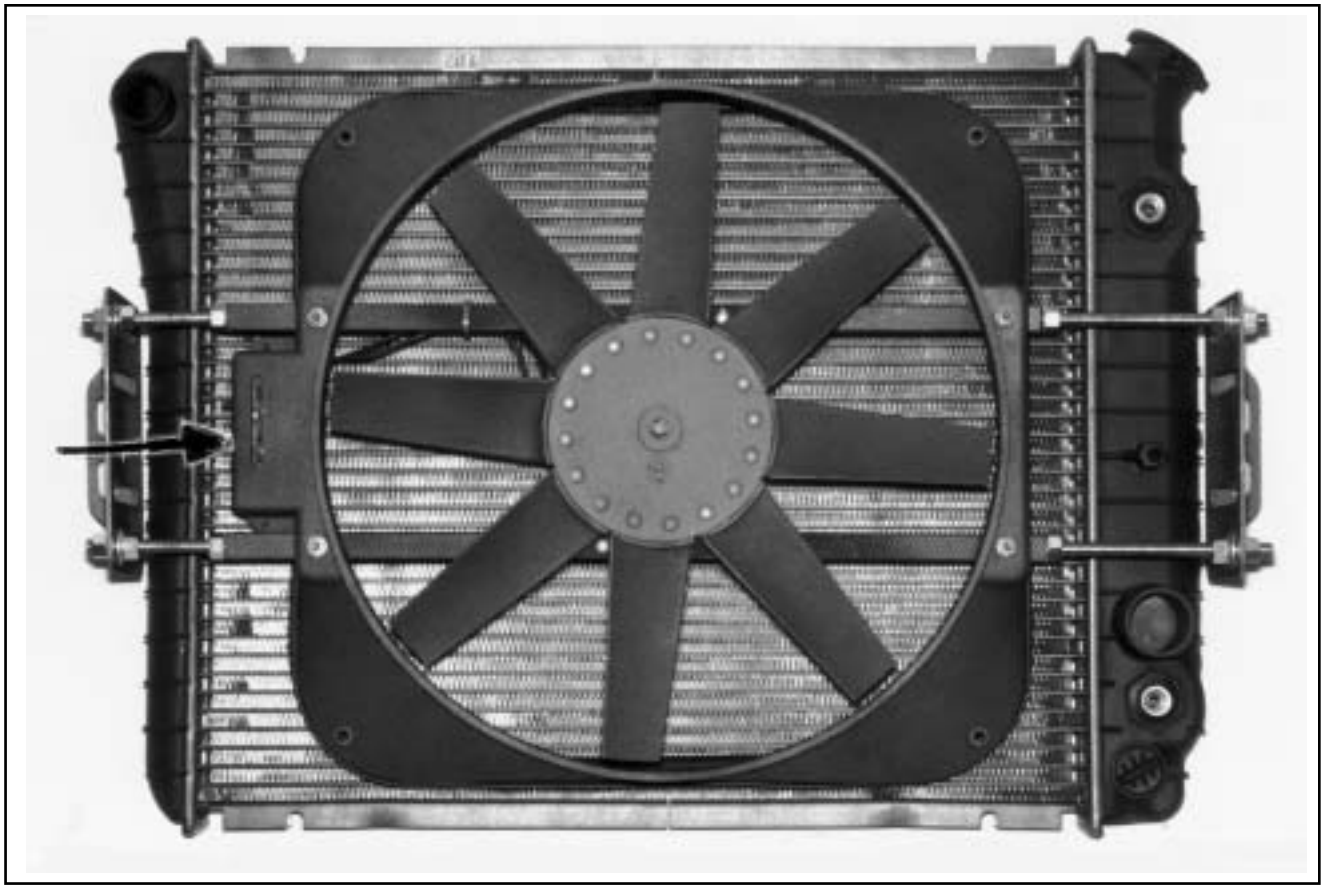
If you are using an engine which has only one heater hose fitting, a Tee must be used in the lower radiator hose for the heater hose return line when using the Stealth Conversions radiator.

The "Tees" are available from Stealth in different sizes, but the most common size for the Z V8 swap is a 1-1/2" hose with a 5/8" heater hose fitting. The tees are $21 each.

Do not install the heater hose into the upper radiator hose because the coolant will go through the radiator, bypassing the thermostat.

LT1 TEE

LT1 engines have a steam vent tube which requires plumbing from the back of the block to the radiator side tank or upper radiator hose. 1993-1997 Camaro's run the vent tube into the radiator tank. 1993-1996 Corvettes run the vent tube into the upper radiator hose. Stealth Conversions offers a brass tee which splices into the 1-1/4" upper radiator hose and a 3/8" vent tube can be attached to the 3/8" fitting. The Tees are $21 each. More information on LT1 engine and hoses is in the book, Chevrolet TPI &TBI Engine Swapping.



ELECTRIC COOLING FAN

A good electric cooling fan for the V8 Z car is the Flex-a-lite model 150 (not to be confused with the similarly styled, but less powerful models 30 and 35). It is also called the “Black Magic” fan. Cost is about $200.

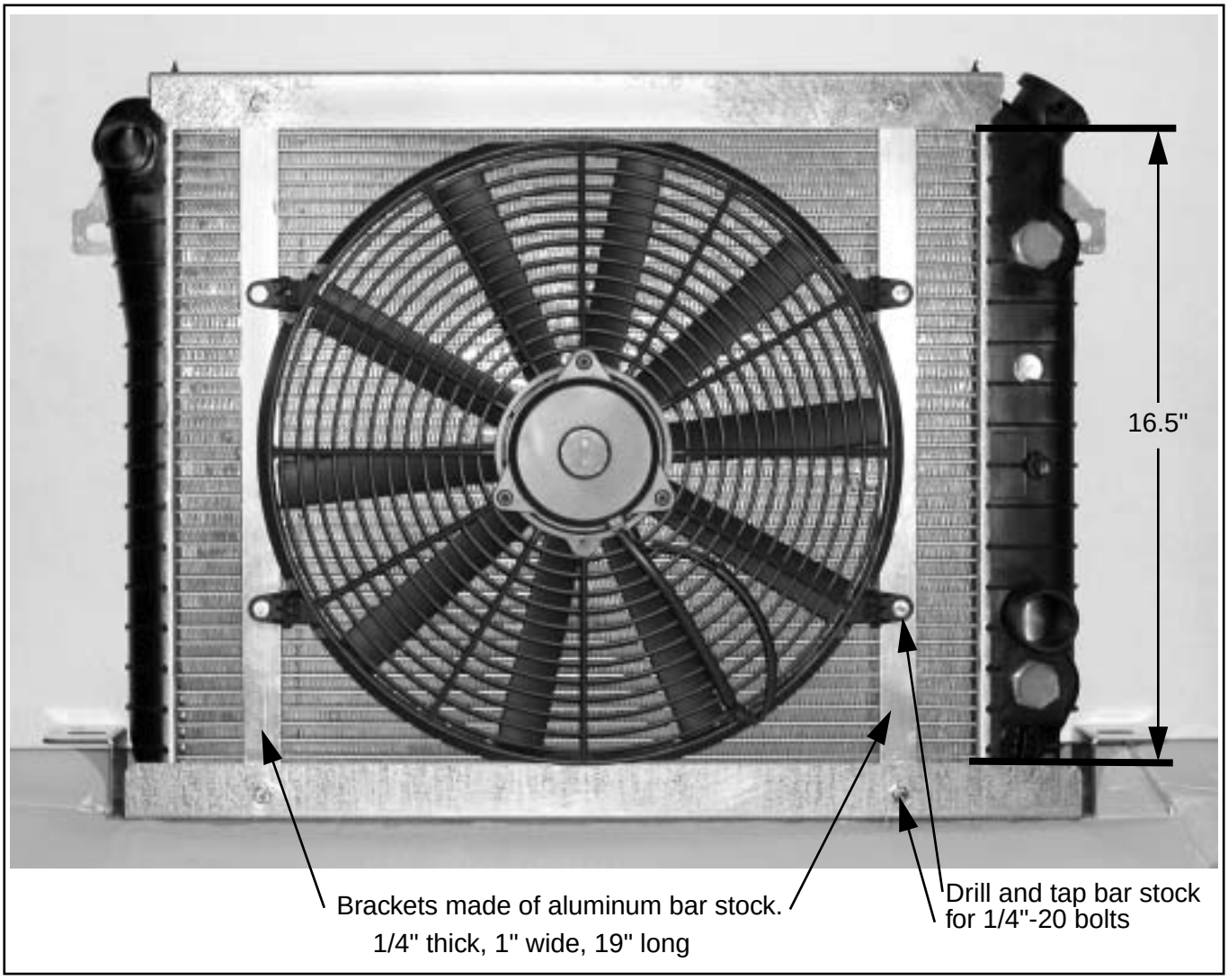
This fan assembly is shown on the car on page 1-8.

This fan assembly will not fit in a 6-cylinder Z car because there is not enough room between the engine and the radiator. The fan assembly is about 4-1/2" deep.

The Flex-a-lite model 150 draws 14 amps. The shroud covers nearly 90% of the core area, and does a good job of drawing air evenly through the radiator. The model 150’s adjustable bracketry holds the fan solidly in place without strain on the radiator core. Four 3⁄8" holes need to be drilled in the Z Car radiator support to install the fan assembly.

Make sure the thermostat (arrow) is mounted on the driver’s side of the radiator as shown, so that it senses the temperature of the coolant coming out of the engine. If it is mounted on the passenger’s side, it will sense the temperature of the coolant that has been cooled by the fan, and it will cycle on and off even if the engine is overheating.

With the radiator and fan combination shown above, the fan will only run in stop and go traffic. Once the car is moving over 15-20 mph, the radiator’s efficient core design allows enough air to go through the radiator for adequate cooling. Also note that the fan itself offers very little airflow restriction. If you use a 4-row radiator, it may be too restrictive for ram air to easily flow through it. All new GM cars with electric cooling fans use thin radiator cores because they depend on ram air for cooling when moving.



RADIATOR BRACKETS AND ELECTRIC FAN INSTALLATION

It is important to protect the radiator by not attaching the fans to the radiator core.

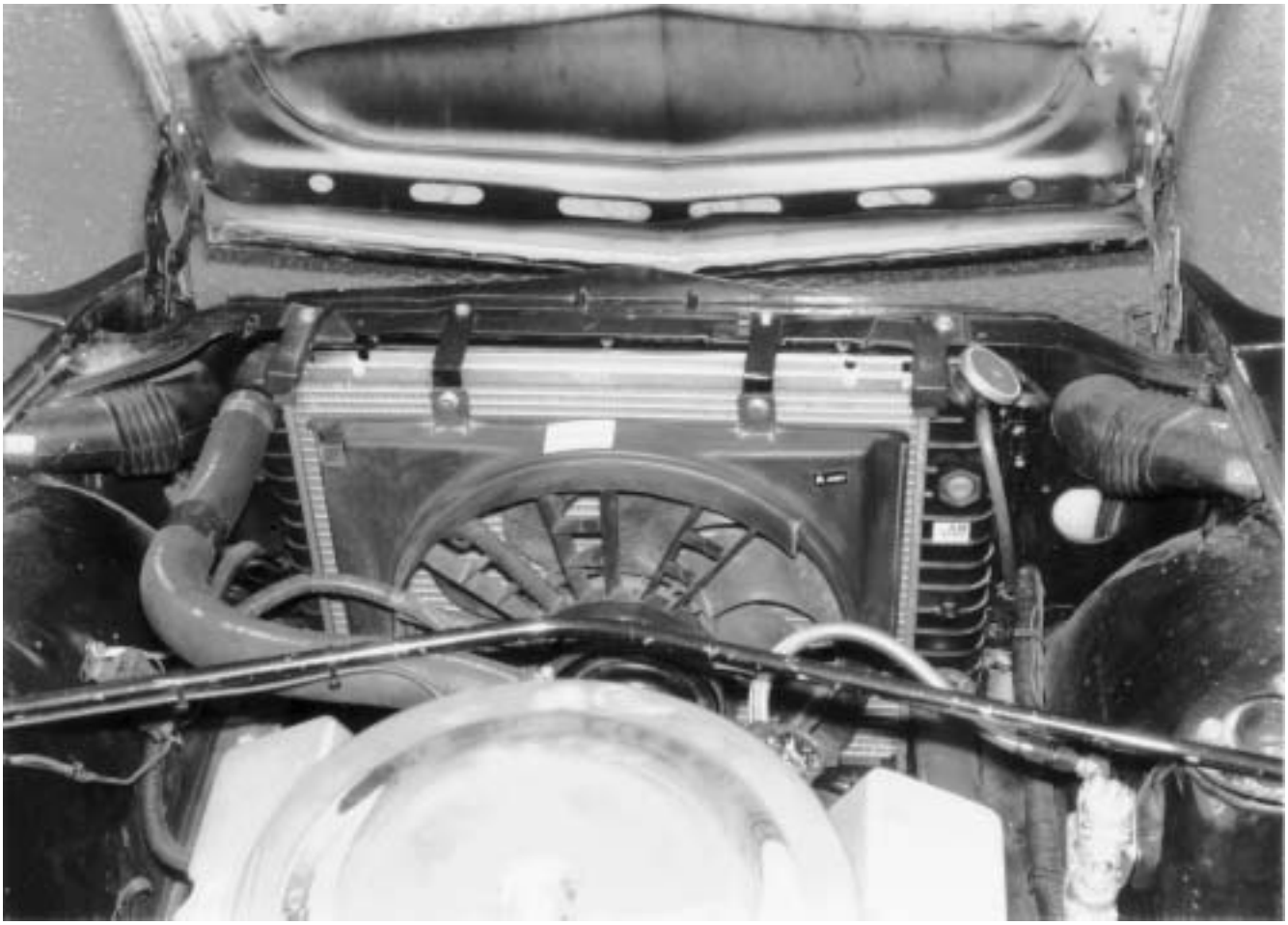
The thick flanges on the radiator brackets allow bolting fan assemblies to the brackets using 1/4" thick x 1" wide, x 19" long aluminum flat bar, which has holes drilled and tapped to accept 1/4"-20 x 1/2" long bolts. The tapped holes are located 1/2" from each end of the 19" long aluminum bar stock.

The bolts that attach the fan to the aluminum bar stock are 5/8" to 3/4" long and need to be secured with Loctite® or some other bolt adhesive to prevent loosening because the plastic brackets will break if the bolts are tightened too much.

Using lock-nuts on the bolts is not a good idea because they may protrude into the radiator core.

The fan shown is a 16" diameter "puller" and it will cool a non-air-conditioned V8 Z in moderate climates. We have seen people install "pusher" fans behind the radiator, and they don't cool as well because the air foil on the fan blade does not work as well when running backwards. The convex part of the blade must point to the front of the car.

The design of the Stealth Conversions radiator brackets leaves enough room between the upper and lower brackets to use the Flex-a-lite model 150 fan shown on the previous page, which has more cooling capacity than the fan shown above.



COOLING OPTIONS

The electric cooling fan/shroud assembly is from a Ford Escort, or Ford Probe (we aren't exactly sure what model Ford it came from). A Ford Taurus has a similar fan (but a different shroud) that will also work well in the V8 Z car. The 1990 and newer Ford models have a powerful 2-speed electric motor. The two-speed motors can be identified by the three heavy wires that go to the motor. On low speed, the fan is about as powerful as the Flex-a-lite fan, but the large curved blades are quieter than the Flex-a-lite fan. On high-speed, the Ford 2-speed fan pulls significantly more air through the radiator than the Flex-a-lite model 150 fan. These fans can often be purchased at wrecking yards for $25-$50.

The fans should be wired to turn on automatically when the coolant gets hot. We don't like to see the coolant get above 200° F. Adjustable thermostats are available at many auto part stores.

Mounting these fan/shroud assemblies requires custom brackets. Make sure the brackets hold the fan/shroud assembly securely, without touching the radiator.

Another electric cooling fan that works well in the V8 Z is the electric fan from a 1985-1992 Camaro. The dual-fan set-up will not fit the Z car, but the single fan will fit fine.