TECH TIP:
Engine Cooling - The Best Solution?

By: John Rowe

Editor's Note: The following Tech Tip tells why and how to install a reliable electric fan on a '75 Bricklin. Owners of '74s may have to adjust accordingly.

In Volume 16, #4, I gave information on two ways I used to operate my Bricklin within an acceptable engine temperature range of 180-200°. This works well for me but I still felt other improvements could be made. For instance, I noticed that after switching the engine off following a reasonable drive, the temperature would quickly climb to the 240° range and would remain there for a considerable time. I had also installed a six blade flex fan in an earlier attempt to keep the engine cool. It was fairly noisy. It was of little use when traveling at highway speeds, and probably wasted up to 10 hp. I was also concerned about the position of the radiator and fan shroud, and their very close proximity to the engine, possibly preventing efficient air flow, and greatly contributing to over-heating at high speed.

I now have a solution to these concerns.

One of my other cars is an Avanti which has heat problems similar to a Bricklin. A member of the Avanti club, George Dimitas, has been experimenting with electric fans and has come up with what he considers to be the ultimate solution to this problem. I have taken his idea and changed it somewhat so the credit really belongs to him -- thanks, George.

Although there are many aftermarket electric fans available, there appear to be many drawbacks to adapting them to a Bricklin. The question of reliability is paramount, no one wants to be miles from home and the electric fan stops working. If it does go on the blink, are spare parts available locally, can you even buy spare parts, or do you have to buy a complete new assembly? What about the turn around time (pun intended) away from metropolitan areas? Also, many of the aftermarket fans are installed by bolting them directly through the core of the radiator and I shudder to think of these bolts either crushing the core or else working loose and wearing through the tubes. It is also very important that the fan not restrict the natural air flow at high speeds and "windmills" so that the air moves freely.

After months of looking at different configurations, asking hundreds of questions, checking costs and availability of parts, I have come to the conclusion that for our purposes, the single large fan that GM uses in the 1985-92 Corvettes, Camaros and Firebirds is the best. You can get replacement parts at most any automotive supply store as well as GM dealers. It does everything we require and best of all, you can pick up a used one at the nearest wreckers at a very reasonable price (mine cost $60).

The big question -- how does it work? In one word -- GREAT.

On the highway the fan does not come on at all, due to the greatly improved air flow through the radiator without the restriction of the shroud and the fact that the air can freely run down both sides of the engine, rather being directed to the front of the engine and having the engine, compressor, alternator, etc. blocking it off.

When stopped in traffic the fan comes on and keeps the engine temperature at 200 degrees unless I have the air conditioner on and then it stays at 185. The reason for this apparent abnormality is that I have the adjustable fan thermal switch set at 200 so that it does not come on when the thermostat opens at 185. I also have the fan wired into the air conditioning compressor circuit so that it operates whenever the air conditioner is in operation to help cool the condenser. This is probably not necessary but I like to be on the safe side and it also allows me to switch the fan on at any time, regard-
less of engine temperature, by just putting the air conditioner on low. This could be useful if the engine coolant sensing switch becomes defective at any time and you don’t have a manual switch.

One thing that is really noticeable is that after a run and the car is at rest and the fan comes on, there is a considerable amount of hot air being blown from under the car. I think that this is the result of the fan now being mounted at the same angle as the radiator, and deflecting the air downwards and out, rather than trying to cool the engine through the narrow opening between hood and windshield.

One thing I haven’t figured out yet is a cheap and easy method of having the coolant circulate after the engine is switched off. With the fan running after about 3-4 minutes the engine still shows in the 200 range but the bottom of the radiator is almost cold. Starting the engine for about 20 seconds will drop the temperature way down. The problem is that the hot fluid stays at the top of the radiator and will not circulate unless forced to do so. An electric pump is the answer but I think the cure may be worse than the problem which isn’t much of a concern anyway.

One other benefit of going to this type of fan etc., is that it does not make any permanent changes to the car. You can always return it to stock class with little difficulty.

Another benefit is the ease you can check engine timing, change the water pump or any of the bolts now that the shroud has gone, also there is less strain on water pump bearings.

The completed installation looks good, clean and professional (See photo 1).

Parts required:

1 1985-92 GM 16” fan assembly (Firebird or Camaro)
1 Thermal switch kit (I used Flex-a-lite #31147)
1 20-30 amp relay (from K-Mart, Radio Shack, etc.)

1 Bend all four pieces of 5/8 x 1/8” steel as per Figure 1. Drill a 1/4” hole 5/8” from each end and in the center of each end. Paint each piece gloss black. Grind or cut about 1/4” off of one side of four of the 1” washers, this will leave them looking somewhat like the letter “D”.

Step 1:

Remove the four bolts holding the fan assembly to the water pump. You may wish to loosen the belts, but it is really not necessary. Remove the four small self-tapping screws that mount the shroud to the radiator. You should now be able to
remove the fan assembly first and then the shroud from the car with little difficulty, but be careful not to damage the radiator by bending the heat dissipation fins. BE CAREFUL OF THE AIR CONDITIONING HOSE ON THE PASSENGER SIDE OF THE CAR. It will rotate with no trouble but if you put too much strain on it you might damage the top of the condenser core and this could be expensive. You can now replace the water pump pulley using the 3/4" 20-thread bolts and washers.

Step 2:

Inspect the radiator and hoses. If you have doubts about them, now is the time to replace them. Wash the radiator from the back with a medium pressure hose, this will remove any dirt, bugs, etc. from the front of both the radiator and the air conditioning condenser. To make a more professional looking job, when it is dry, spray the radiator with heat resistant black paint.

Step 3:

Enlarge the four holes where the shroud mounting screws were located in the radiator to 5/32". Use one of the 1/4" self-tapping screws to cut threads in each hole (it’s easier to do it now rather than when it is supporting the fan assembly).

Step 4:

While the fan assembly is out of the car, attach the brackets as shown in Figure 2. The two shorter brackets go to the top, the longer to the bottom. The two wires that come from the fan motor are in the bottom. It is important that the "D" shaped 1" washers are positioned so that they will be flat against the plastic fan mounting bracket. If they are not, you may have to cut a bit more off the washers. Semi tighten the nuts and bolts, leaving them just loose enough so that you can still move the brackets.

Step 5:

Position the brackets as in Figure 3, and with someone to help hold the fan assembly, move it into position behind the radiator. With the fan in position, mount the top brackets to the radiator support using two of the #14 self-tapping screws and washers. If the bottom bracket holes do not line up it may be necessary to loosen all the bracket mounting bolts, but even with this done, the fan assembly should still stay in position since the top brackets will not go over center as long as the fan mount does not turn. This is because the total distance between the mounting holes is less than that of the fan frame and brackets combined. This is deliberate, since this gives the assembly a solid position to rest on and takes up any strain of the fan assembly trying to fall lower on the radiator due to road shock, etc.

Mount the lower brackets using two #14 screws. Make sure the assembly is even on both sides and then tighten up all nuts and bolts. The very center of the fan should be about 3/8" to 1/2" away from the face of the radiator. If you have forgotten to put the 1 1/4" rubber tubing onto the bolt extensions (Photo 2), you can still do it and even though they are probably not necessary, it is a good precaution just in case the mounting bolts get loose. They will stop the fan from damaging the radiator and act as a buffer preventing any forward motion of the fan when in operation.
Step 6:

Drain about a quart of fluid from the radiator. Remove the rad end of the top hose. Install the capillary tube as per the instructions that come with it but make sure that the bulb lays at the bottom of the radiator opening where it will get the maximum of fluid going over it. Mount the adjustable control on the inside of the headlight support bracket so that it is protected (Photo 3). If your control does not have a mounting bracket then make one from a piece of light gauge metal and use a self-tapping screw to secure it in place. For extra protection of the capillary tube, I split a similar length of 1/8" rubber tubing and covered it with it.

Step 7:

Connect one of the wires from the fan to ground. Touch the other to a positive power source. If the fan works in the right direction, that is, sucking air through the rad, you’ve hit it right the first time. If it goes in the wrong direction, just reverse the two wires. Now you’ve identified the positive wire, run it directly to a positive terminal (but to be safe put a 20 amp fuse somewhere in the circuit). I would suggest you connect it to the "hot" side of the starter solenoid. The other fan wire (ground) goes to one of the double terminals on the adjustable control. Run a wire from the single terminal on the control to ground (you can put it to one of the self-tapping screws that hold the control in position).

Step 8:

Find a convenient location to mount the 20 amp relay (can be below the control). Join a wire to the air conditioning clutch wire and run it to terminal 86 on the relay (these terminals are clearly marked if you have the correct relay). Jumper terminal 30 to terminal 85 and 85 to ground. Run a wire from terminal 87 to the other one of the double terminal on the control. If you want to go hog wild and have a manual switch to also turn the fan on, you can if you wish, and if you wire it correctly, any time the fan comes on a light will also come on. I’ve shown a wiring diagram (Figure 4) that has a separate switch and light but I believe that an illuminated switch will work as well, although you will probably have to modify it, so that the third or positive terminal is not connected to the middle or fan terminal, while the switch is in the off position. Failure to do this will result in a blown fuse. One interesting side effect to having such a light is that at highway speeds, the fan will windmill and generate its own current, this will very dimly show a light at 45 mph but will grow brighter as speed increases.

Step 9:

Fill the radiator (prior to filling may wish to install a 185 high-flow thermostat if your heat problems were severe), tidy up the wires using ties, etc., and go for a test run. Set the control to come on at about 195-200 degrees (this is done best with the car idling and observing the temperature gauge to see when the fan comes on).

Step 10:

Enjoy a cooler car with more horsepower.

Step 11:

Please let me know how you like it, or if you experience any difficulties.