Talking Technical

A LOT OF HOT AIR, by Robert Platz, Midatlantic Section

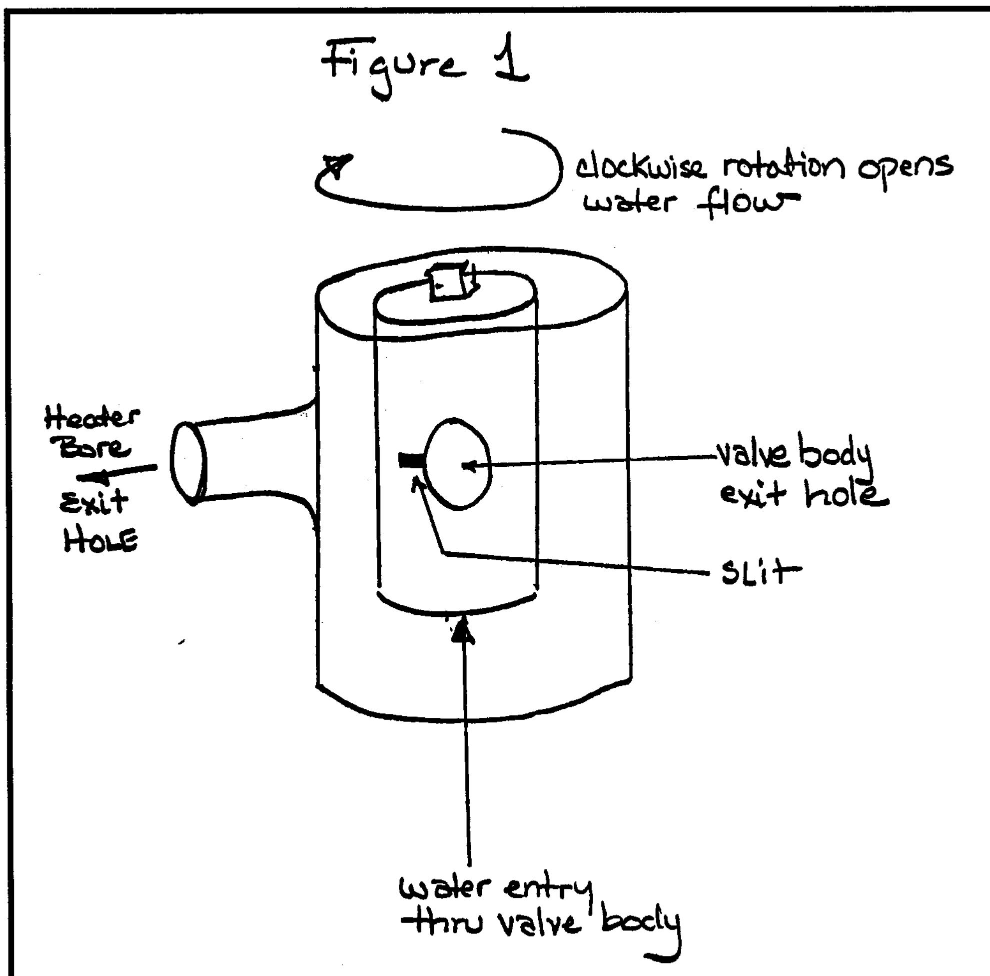
It is the late spring of 2000, and the AACA Nationals this time were in Winchester, Va-some four hours away. The weather forecast was not good as I pulled the 190SL from its berth outside of Philadelphia and aimed it West. The rainy bad news came as I wound through the mountains surrounding the Potomac River where Maryland, Virginia, and West Virginia come together. With the top up and the windows closed, I drove in comfort, but I could certainly remember all those past years when the defroster blasted me with hot air even though the heaters were turned off, and the compartment would become a huge sweat box. On my "driver" car I had solved this problem years ago by making a trip to Home Depot and obtaining a small ball valve from the plumbing department which I inserted into the hose exiting the cylinder head. But this was a show car and such ugly non-original solutions would never do.

So let us start at the beginning, and I will try to explain why this problem persists in most cars and what can be done about it, especially if the fix is not to be visually detectable.

Obviously, hot air arrives inside your compartment only if the heater core is hot. In my opinion it will get hot from two basic design weaknesses. First of all, the heater valve is located on the exit side of the heater core. Therefore even if the valve is closed, the hot water from the engine will conductively heat the water in the heater core. Secondly, with the heater valve closed, sufficient water is passing through the valve to establish a hot water flow from the engine thereby heating your core. This is internal leakage as opposed to external leakage from a hose, the valve 0 ring or a fracture in the heater core itself.

Of the two problems, internal leakage is by far the more important. I experimented with my driver by shutting off the water with my added ball valve and opened my heater valves to permit conductive heating from the radiator for an extended drive. My defroster air remained at ambient temperatures.

So what causes internal leakage? The first source is a result of the design of the valve itself.



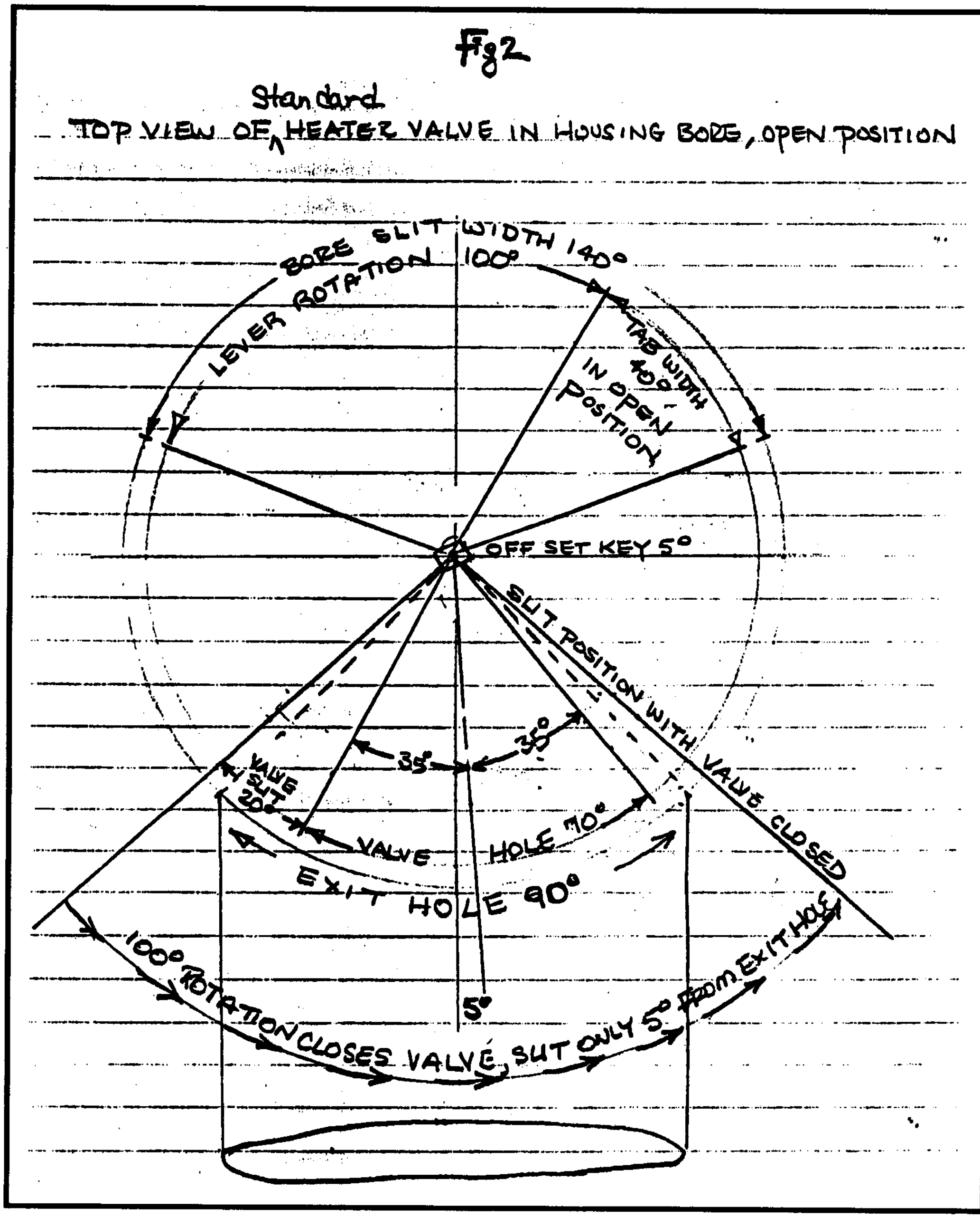
As shown in **Figure 1**, Mercedes designed a horizontal slit into the valve body for "controlled" leakage so that when the dash lever is moved only slightly off the closed position, a little heat will result. Unfortunately, the slit ideally in a perfect valve setup will only clear the exit hole when the valve is shut off by about 5 degrees, as demonstrated in **Figure 2.** Hence, if one cannot achieve a full 100° rotation between the lever being on and off due to a limitation in your cable hookup or if your tab controller is larger than 400 thereby reducing the valve rotation, the valve slit will always remain open to the exit hole of the heater housing bore even though the lever on the dash will indicate that the valve is closed.

Secondly, if the clearance between the valve and the bore is greater than .lmm, water is prone to escape from the valve hole to the bore exit hole. This is very often the case. While the diameter of the valve is consistently at 17.98 to 18.00mm, the diameter of the bore ranges from 18.00 to 18.50mm. The O ring on the top of the valve can accommodate a .5mm clearance and still prevent external leakage, but internal leakage will prevail. It would appear that the needed tolerances in the manufacturing of the bore relative to the heater valve itself were insufficient. An ideal operating clearance appears to be in the .05mm range. I have discovered that at .02mm clearance, expansion from ambient to 180 degrees operating temperature can bind up the valve.

At first I thought that some high density vacuum grease or a selective replacement of the heater housing to bring the clearances in line would solve the first problem and the other by reducing the size of the tab controller to achieve a greater rotation.

Not so, the mechanical cable action of the valve lever arm itself is basically limited to 100°. Trying to pick up another 20° this way is not realistic.

The final solution required a newly designed heater valve. I first observed that the opening at the base of the heater valve has a diameter of 15mm while the exit hole of the valve has a diameter of 10mm. Increasing the wail thickness by 2.5mm will not degrade the valve's efficiency. But it will permit me to press a teflon bushing onto a slightly smaller brass housing. Using teflon now removes the need to grease the valve every year or two. The 0 ring groove was redesigned to accept a commercially available 0 ring; the key on top of the valve was repositioned to gain another 5°; the horizontal slit was eliminated, and the overall diameter was increased to 18.02mm. The end result is that the valve hole and bore exit hole now miss each other by 30° with the valve closed; after very little honing, my bore to valve clearance was in the .05mm range, and lastly, I do not have to grease the valve anymore. In addition, even though the teflon bushing has been pressed onto the valve body, as a precaution to prevent slippage thereby closing the hole, it has been pinned into place with a recessed stainless pin that will not scrape the bore itself.



The next concern is with the cardboard heater box and air flow doors. Over half of the cars we repair or arrive at the shop for service for the first time are not hooked up correctly. Once one has rebuilt the cardboard heater box so that it has no tears, cracks, or leaks, I have found it best to initiate the cable hook up process at the dash. The chromed escutcheon on the left should have a blue arrow on one end and mounted so that the arrow is on the inside nearest the steering column. There are two cable controls of unequal length: one for the defroster and one for

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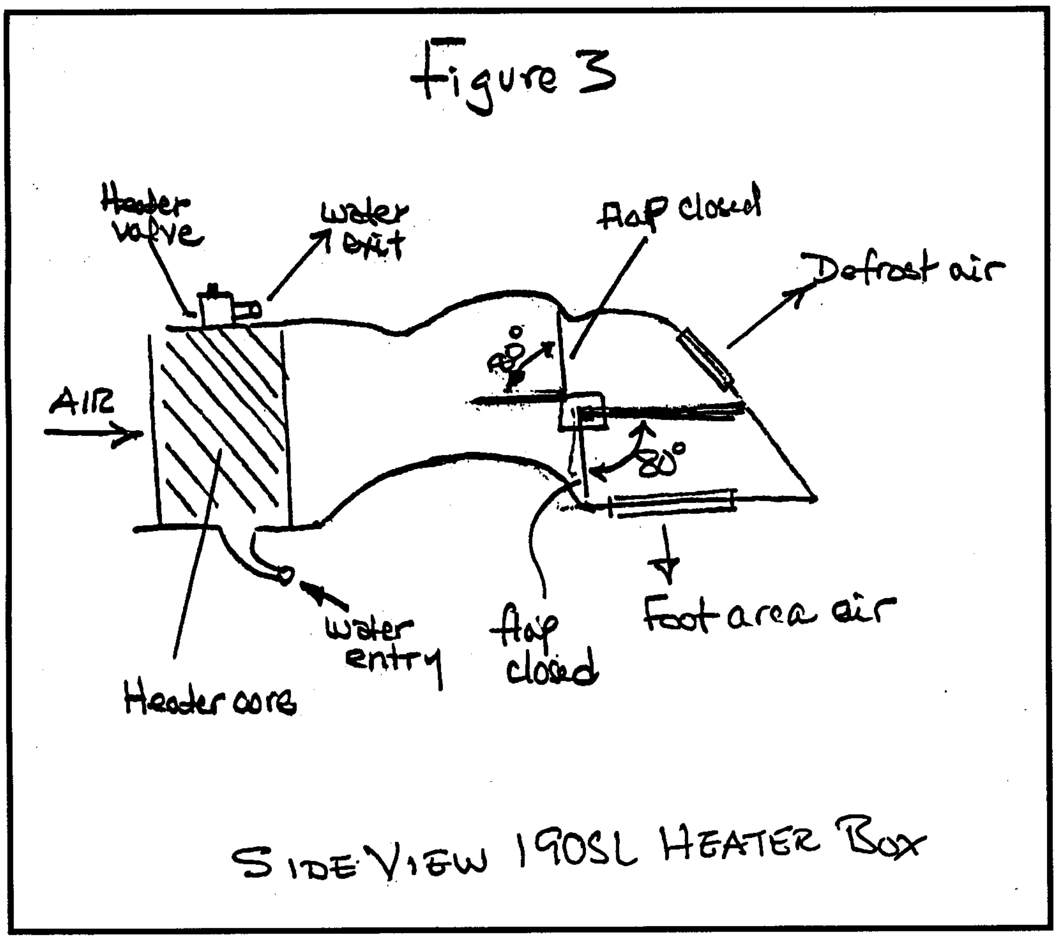
the floor. Behind the dash, the upper lever controller gets the longer cable for the defroster, and the lower lever controller gets the shorter cable for the foot area. The chrome levers themselves on the earlier cars get rubber sleeves on their necks, as original, to prevent vibration rattles after insertion through the louvre of the escutcheon. The sleeves were eliminated for the plastic levers on the later cars.

Having now hooked up the dash system, it is important to note that the blue arrow "points" to off and so moving both levers to the left will yield the closed position and will require both heater box doors to be closed. The second observation is that the shorter cable used for the foot area moves toward the firewall (in the engine bay), as you move the dash lever right to open while the longer defroster cable does the reverse and moves toward the front of the car as you open the lever on the dash. Now by inspection of the side of the heater box, there are two square keys to which cable controller arms can be attached. The bigger inner square key operates the defroster door. With the upper dash lever positioned left (shut), rotate the larger heater box key clockwise to close this door and attach the cable control arm upwards at about 1 o'clock, then, connect your cable. For the foot door, position the dash lever to the left (shut), rotate the outer smaller key on the heater box also clockwise to close the door and attach the cable control arm downwards at about 7 o'clock, then connect your cable. Now both heater box doors will operate in accordance to the arrow on the dash escutcheon. **(See figure 3)**



Well, the rain slowed a bit but did not stop as I cruised into the motel parking lot just south of Winchester. I have been in this situation before. My first question to the lobby clerk was, "where's the local car wash?" "Just across the street," she said. Now that was a stroke of luck. Actually a good restoration does not mind the rain. The engine bay, interior, and trunk are not affected. If the undercarriage, wheel wells and suspension are properly painted without undercoating, and there are no leaks, the power wash removes the light road dirt and a towel finishes the job. A good coat of wax on the outside likewise will permit an easy removal of road dirt. Two hours later I was back in shape. There was only one problem, the car wash was under cover, but it was still drizzling on and off.

In this circumstance your best bet is to save the underneath. I waited for the rain to stop and using the crown in the road, made it back to the parking lot. Installing my breathable car cover could cause me quite a headache in the morning since the car will not be dry or wet enough to wipe clean. Hence, I left the cover off for the night. In the morning I cleaned the windows, drove to the show, and toweled down. By 9:00 A.M. the car was ready for points. The day proved to be a winner. I won my class trophy. Late that day, I blitzed home up the interstate to Harrisburg and then East on the Pa. turnpike. I ran some stretches close to 100, to beat the next forecasted rain storm, even though my newly engineered heater valves would save the day.

Full of vigor from its run, the 190SL was nevertheless happy to be home again, anxiously awaiting its next outing.

Robert Platz owns and operates Precision Autoworks in E., Camden, N.J., a restoration shop for European imports.