1986 GM 'F' BODY LB9
INTAKE AIR FLOW RATES

It has become common practice to remove protective screens from mass air flow sensors on these engines, in the hope of improving intake air flow. Analysis of the air intake system indicates the greatest areas of concern, none of which are this sensor unless other significant modifications have occurred first. The air ducts and air resonator box have minimum opening sizes of 11.05 in^2 and 10.42in^2 at their most restrictive points. The largest available throttle body is at least 3 in^2 smaller than either of those, so their flow rates are not a concern.

AIR FILTER HOUSING

The following data was calculated from measurements taken with dial calipers, with the measurements calculated to indicate free area. Given are the resultant areas for comparison:

OEM 48mm throttle body = 2.3323786 in^2 per bore, minus plate and shaft area 4.6648 in^2 TOTAL

52mm throttle body = 2.7799564 in^2 per bore, minus plate and shaft area 5.5600 in^2 TOTAL

58mm throttle body = 3.5243652 in^2 per bore, minus plate and shaft area 7.0487 in^2 TOTAL

Air cleaner housing cover slot = 6.8398 in^2

Air cleaner housing top filter opening = 5.7724 in^2
8mm drain hole on base of housing = 0.076699 in^2
TOTAL air cleaner housing opening = 5.849099 in^2

Since the incoming air enters the center of the filter and flows outward, any additional fresh air openings must be made in the ends of the housing, at the center of the filter. The photo shows the most restrictive part of the system - the air filter housing cover. The outer slot in the cover has more than adequate free area, but the braces and center at the internal opening are restrictive. Since little can be done to improve the cover without making it substantially weaker, the lower end of the housing can be modified.

The process is relatively easy and does not alter any of the body structure of the vehicle. Remove the air filter cover, filter element, and housing outer shell. Remove the two 10mm screws holding the evaporative emissions canister to the base, and tip the canister up and over toward the rear of the engine compartment. None of the hoses or connectors will have to be removed from the canister.

The base should be removed and cleaned. There is one 8mm drain hole in the base. The hole provides an additional 0.076699 in^2 of free area. The photo shows the base (upside down) removed from the vehicle, and the long stud removed from the base.

Two additional holes can be drilled at 120° intervals, to form a relative triangle of holes. These three holes can be punched to 7/8" (0.875") without interfering with the stud mounting or the perimeter seal of the base. Any larger hole might break through the perimeter and weaken the base. The photo shows one hole drilled and punched, one drilled, and one spot-punched.

This photo shows the three additional holes punched in the base. The holes can be punched cleanly with a ½" trade size conduit punch. (shown)

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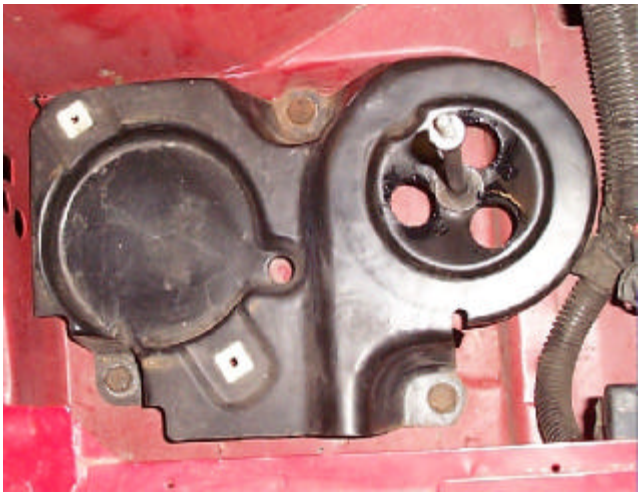
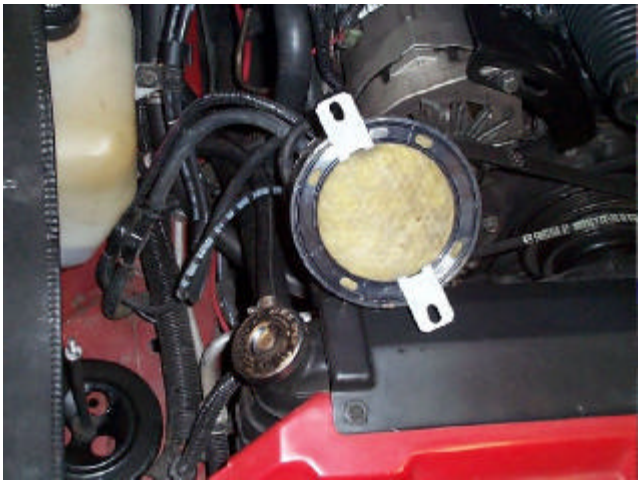


The edges of the holes should be dabbed with paint to prevent the onset of rust on the bare metal. Notice the close proximity to the stud weld nut and the perimeter of the base which locates the filter element. This is the reason for the 7/8" maximum holes size. Four holes would leave very little material to support the stud and remainder of the filter. Three holes, 0.875" in diameter, provide enough additional air to equal the area of a 58mm throttle body.



While you have everything apart, it would be a good idea to replace the filter pad in the evaporative emissions canister. It rarely gets done, but is a recommended service procedure every 36,000 miles. As you reassemble, a new air filter element may be a good also.

MASS AIR FLOW SENSORS

Measurements on the mass air flow sensors were from numerous measurements taken with dial calipers, with the measurements calculated to indicate free area. The screen wire alone occupies over seven percent of the possible total free area of the sensor openings. The results were checked against a graphical image of each sensor. After matching the image sizes of the sensors, the photos were gray-scaled, then converted to two-color graphics. The pixel counts of each of the colors indicated comparative numbers for obstruction and free areas. The results were amazingly close to the calculated numbers (in percentages).

Actual flow rates will vary from what these free area numbers indicate due to turbulence created around each obstruction. The flow numbers indicated were garnered from published figures. The Bosch sensor uses round wire to form the protective screens, while the Wells sensor uses a honeycomb matrix of flat material to minimize restriction. This is the same material used in the Hitachi-type sensor on later LT1 engines. Some published results indicate a *loss* in power output after removing the matrix from the sensor on an LT1.

Bosch 14094712 MAF = 5.965111 in^2 Flow tested and rated at 544 SCFM @0.01"SP
Wells SU145 MAF = 7.036153 in^2 Flow tested and rated at 750 SCFM @0.01"SP

The data reveals that after the stock throttle body, the air cleaner box is the single greatest source of restriction in the system. Even with the largest available throttle body, the Wells MAF is larger than the wide-open throttle. The stock Bosch MAF provides an area greater than a 52mm throttle body. There seems to be no reason to alter the MAF unless you have a 58mm throttle body. Even at that, the 58mm opening quickly tapers down to a maximum of 55mm just inside the plenum openings. The benefits of removing MAF screens are not so apparent as previously believed.

The OEM Bosch MAF sensor has round wire screens mounted in each end of the sensor body. The screens are mounted in metal rings which actually reduce the diameter of the sensor to 70mm. These screens protect the fragile hot wire from debris and sonic wave shock from lean backfire and wide-open throttle “howl”. These sonic pulses could significantly shorten the life of the platinum wire if not deflected. This sensor has an air sampling tube and heat sink fins in the air stream, further impeding air flow. Flow is rated at 544 SCFM.

The Wells MAF has a honeycomb matrix insert on the incoming end only. The primary purpose is to create straight air flow across the sensor array. Notice the significantly reduced frontal area of components in the air stream. The thick-film sensor mounted to the front of the card replaces the fragile hot wire sensor in the original unit. The inside diameter of the sensor body is a full 78mm. Flow is rated at 750 SCFM.