

## A Look at Intake Port Mismatch on the LT5 Engine

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### Port Alignment on Factory Assembled Engines

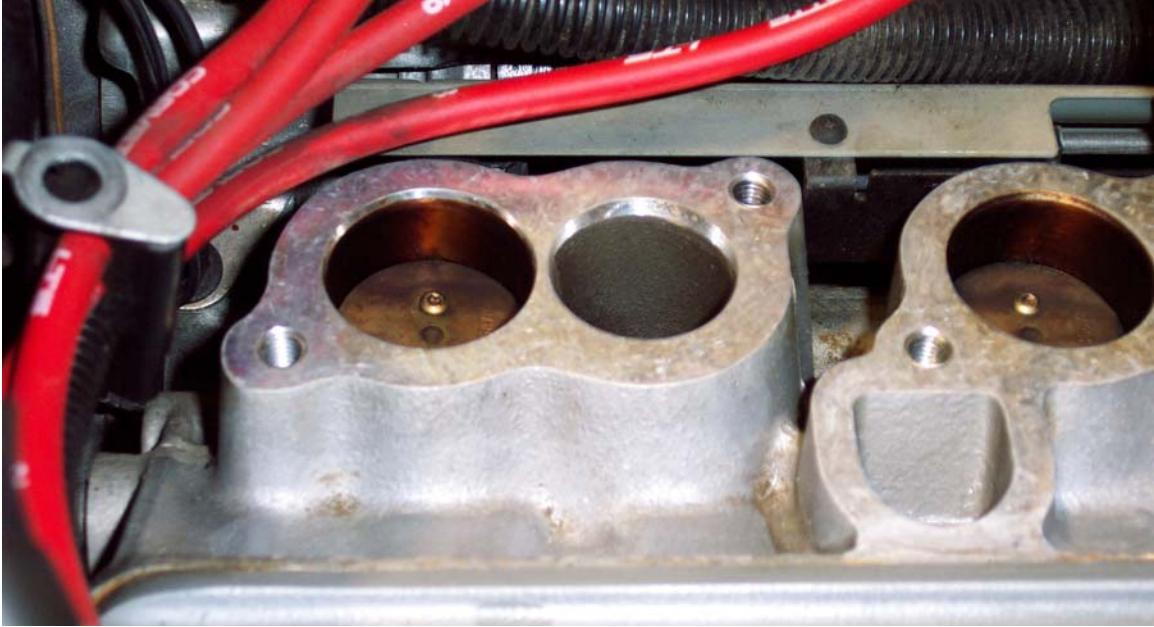
It's sort of like a family secret that's not spoken about in polite company. Anyone that has viewed under the plenum on a '90 – '92 LT5 has seen the port mismatch between the plenum and the injector housings. Honestly, on most engines, it's a severe mismatch. When the ports are out of registration by 1/16" or more, how could it be viewed as anything less. Picture A shows an extreme case. However, most early engines are misaligned to some degree.



Picture A

The manufacturing process utilized a chamfer to remove the overlapping port material. The chamfer poorly addresses the problem because its depth is roughly the same as the width. That is, if the misalignment is 1/16", the correction is over a depth of about 1/16". This is still a relatively sharp transition. The factory engineers apparently viewed it the same way. In the '93 model year engine upgrade program, the mismatch was corrected with a core boring process. The core boring tapers about an inch deep into the port for a very gradual transition area. This advanced port matching process was touted as a significant element of the '93 model year upgrades. The upgrades added a total of 30 horsepower to the factory rated power output.

The same kind of port mismatch can be found at the injector housing to cylinder head interface. An example is shown in picture B.

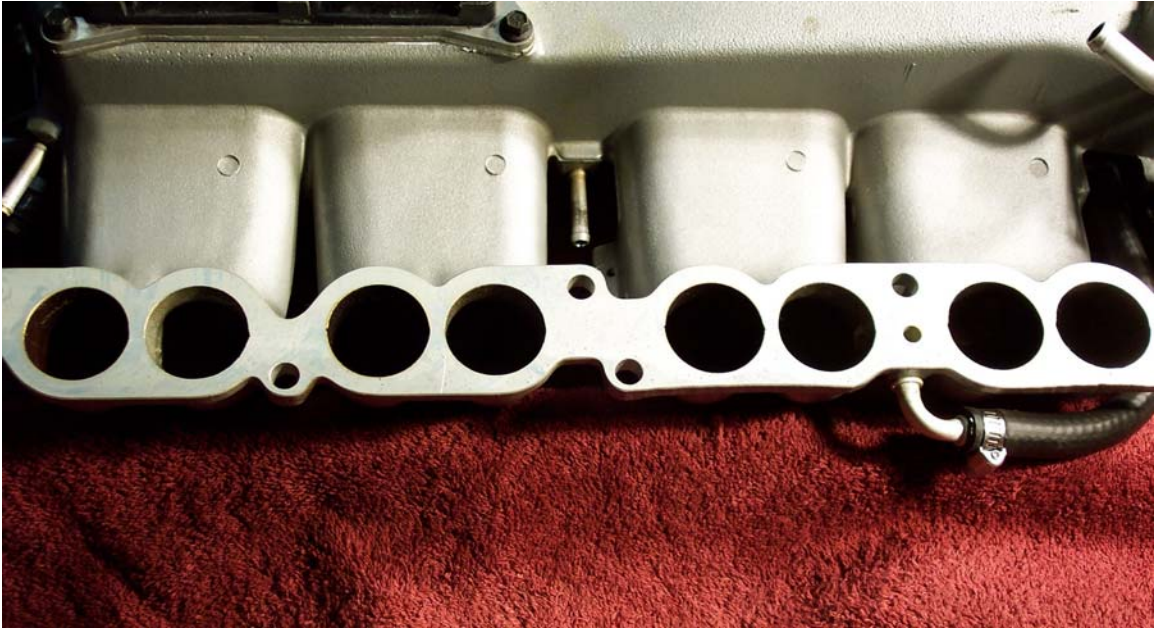


Picture B

The port mismatch is typically of a lesser magnitude on the cylinder head side of the injector housing. Here, it's usually the greatest on the primary ports and less on the secondary ports. This is good, because the secondary port needs to flow more than the primary port for full power production. The secondary port has a greater flow demand because the secondary camshaft lobe has 20 degrees more duration. This duration specification is at a zero lift checking height.

#### **Improving the Port Alignment**

The plenum can be considered to be the master port alignment guide. Since the airflow originates from the plenum, the rest of the tract should follow the lead of the plenum ports. Picture C shows how the factory left the plenum ports as cast on the port flange. The factory port matching efforts never involved modifications to the plenum ports.



Picture C

The ultimate in port matching occurs when a properly executed top end porting upgrade is performed. When done correctly, the porting opens the plenum ports evenly about the centerlines of the ports. This centerline should be carried into the injector housings. The correct centerline of an injector housing port will then be aligned closely to the center of the entry of the port. It will coincide with the top edge of the factory machined chamfer. *Not* the center of the as cast injector housing port.

The '93 model year engine upgrade program addressed the port matching on the cylinder head side with the addition of dowel pins to precisely align the injector housing to the cylinder head. The '90-'92 engines don't really need to be upgraded with dowel pins. It's easy to sight down the ports during assembly. The injector housing can be shifted about for best port alignment before tightening the bolts.

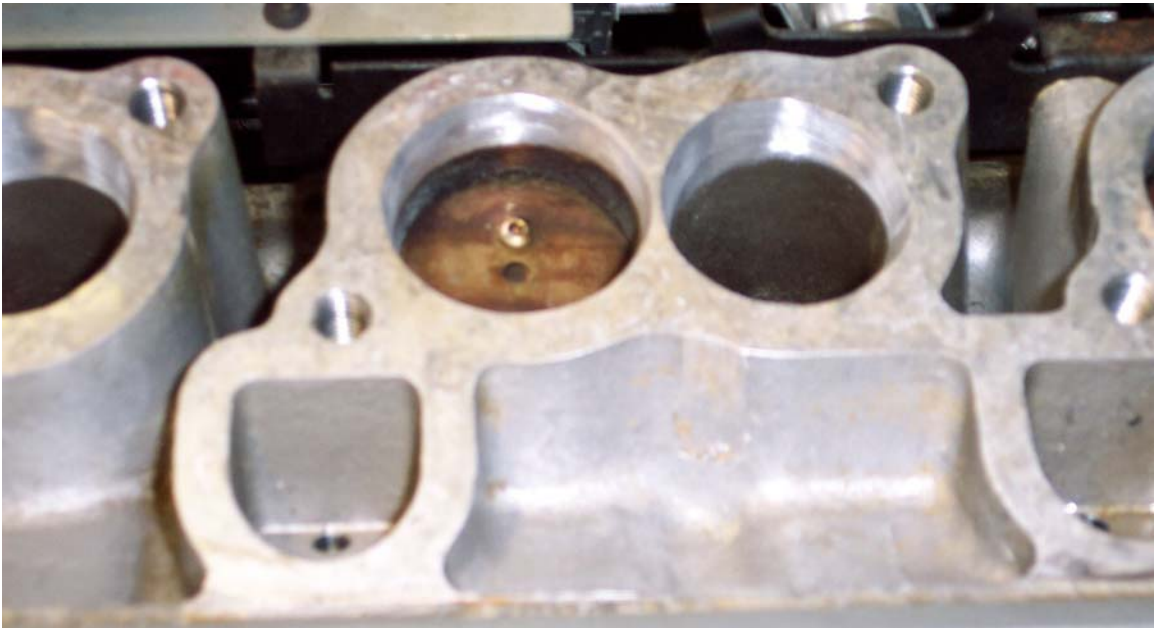
Top end porting can include tapered cylinder head port matching. In this process the engine is masked off with a tarp and the ports are blocked with foam plugs. This is shown in picture D.





Picture D

The injector housing port transitions are then blended deep into the cylinder head. I have never dyno tested this modification but I believe that it is worth about five horsepower. The finished port matching is shown in picture E. This treatment could also be applied to the inlet of the injector housing as an improved port matching if porting is not performed. Never allow abrasive material to go into the cylinder.



Picture E

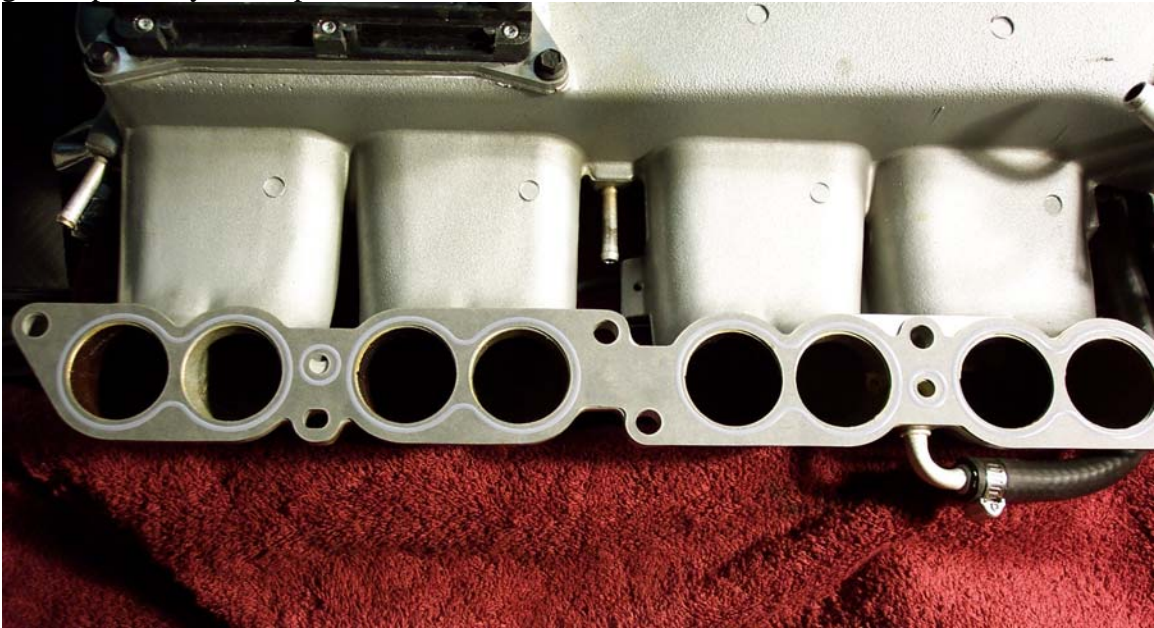
#### **Proper Positioning of Plenum to Injector Housing Gasket**

Naturally, the plenum gasket should not hang into the port. The gasket has a provision that aligns the gasket on selected bolts as the bolts are inserted. This method loosely controls the positioning of the gasket. The gasket usually does not align perfectly with the

ports. The installer cannot tell how well the gasket is aligned because there is no way to observe the final positioning of the gasket.

Alignment of the gasket to the injector housing would also be somewhat uncertain because the chamfers are made in awkward offset cuts that do not cover the full circumference of the port.

The gasket will be located in ideal alignment if it is positioned centered on the plenum port. As stated previously, the plenum determines the ideal position of the port centers. Picture F shows a gasket that is in perfect and verifiable alignment. This is accomplished by cementing the gasket to the plenum with a contact adhesive. With this procedure, the gasket will match the ports of the plenum perfectly and remain that way while the plenum is installed. Also with this method, it is not necessary to do any trimming to match the gasket perfectly to the ports.



Picture F

I hope that this information can help to add or avoid losing a few horsepower for your amazing LT5.