

Fuel Injector Replacement

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In 2008, the most commonly asked question that I have heard about the LT5 is: “What do I need to know about replacing the fuel injectors?”

A close second common inquiry is a description of this scenario: “The engine runs okay when started cold, but the smoothness deteriorates as the engine warms up.” As the engine warms, roughness or a misfire develops. When the engine runs rough, the dual-mass flywheel may run out of control range, and it can make loud clicking sounds that come from under the car.

Another related question is: “Where can I find a flywheel?” The answer is that the flywheel is making noise due idle roughness. There is no problem with the flywheel.

In my opinion, 99% of the US '90 to '92 LT5's will need replacement of the fuel injectors. I have not heard of this problem occurring in Europe. The injectors fail because when they were designed in the mid 80s, ethanol was not expected as a fuel additive. As a result, the injectors are not compatible with US fuel.

By about 1991, ethanol was under consideration, and GM revised the fuel injector design to make them compatible with ethanol. This was documented by Graham Behan, the Lotus release engineer for the '93 LT5 engine. In an article published in the Mar-Apr '98 issue of the LT5 Registry newsletter, he wrote an article titled “'93 Model Year Changes.” In the article, he states that the fuel injectors incorporate “part changes for alcohol fuel resistance”.

I have never seen a failure of a '93 and up LT5 fuel injector, suggesting that ethanol compatibility is a limiting factor in fuel injector reliability.

The root cause of the fuel injector problem is electrical shorting of the turns of wire in the magnetic solenoid coil of the fuel injector. Fuel leaks past an internal seal into the area containing the coil and attacks the insulation on the wire. When the insulation breaks down, the turns of the solenoid coil short together. When exposed to heat, more turns short, and the electrical resistance of the injector goes down as the engine warms up.

As the first few close together turns short, the lower resistance increases the current, which opens the injector valve more for a given pulse width. During this initial failure, extra fuel is delivered. The engine tolerates the extra fuel fairly well; the overage of fuel does not get burned because the oxygen runs out during the combustion process. The unburned fuel gets dumped out in the exhaust. In scanner data, these slugs of fuel can be seen as vertical lines in the oxygen sensor voltage imposed on the normal smooth sinusoidal oxygen sensor voltage. As the current requirement goes up in the solenoid coil, the ECM can no longer drive the injector fully and it delivers less fuel than commanded. Eventually, as the resistance drops to about 6 ohms, the injector stops working and the engine exhibits a misfire.

A diagnostic test can be performed to identify shorted fuel injector solenoid coils. It is available at: <http://www.zr1specialist.com/HAT%20Web/articles/FI%20Resistance.htm>

These are four types of fuel injectors that are available for replacement

The OE AC Multec injectors are available from GM. They are very expensive, and are old production stock. They have the same problem as the original injectors, so the same failure will occur a few years down the road.

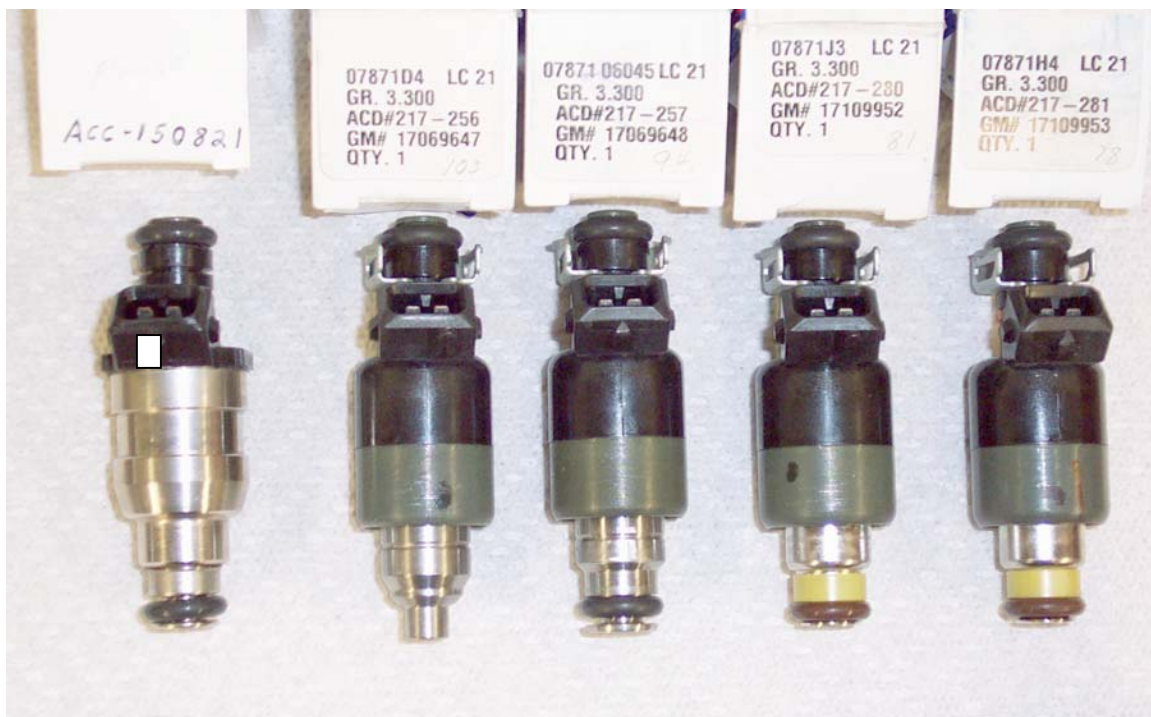
The '93 - '95 injectors might be interesting to some people. They can be adapted to fit the early engines. They are still available from GM and are very expensive. The lower body on the primary injectors is 0.027" smaller. They can be adapted to fit the injector housing with larger lower o-rings in the injector housing. They look the same as the early OE injectors. However, a very close look will reveal '93 part numbers and date codes.

RC Engineering supplies Lucas injectors that are flow matched to within +/- 0.5% of the flow rating. They are a drop-in replacement and are quite expensive.

Accel supplies Lucas injectors that work perfectly. They are a disk valve design like all of the injectors described above. They are not the same as the RC injectors. They exactly match the flow of the OE injectors. I have found them to flow +/-1% of the flow rating. A healthy engine will have Block Learn fuel trim values in the 126 to 130 range. On a flow machine these injectors have slightly less atomization than the OE injectors, which have outstanding atomization. I have installed many sets of these injectors with excellent results. They are available from www.SummitRacing.com as part number ACC-150821.

Notes on installing Accel fuel injectors

The Accel injectors are an exact replacement for the secondary injectors. For the primary injectors two modifications are necessary.



The LT5 uses an offset alignment tab for the electrical connector on the primary injector. The connector will fit if the tab is removed from the fuel injector with a bench grinder or file. The alignment tab is marked with the white box on the Accel injector in the picture.

Remove the lower o-ring since it is not needed on an early LT5. The LT5 has the o-ring mounted in the injector housing. The lower end of the body of the Accel injector is exactly the same size as the OE injector so it fits the LT5 injector housing o-ring perfectly. The OE injector housing o-rings normally seal well to the new injectors so replacement is not required. Just inspect them for smoothness on the inside of the ring.

Two new fuel rail hose connector o-rings GM PN 14104675 (discontinued by GM) will be needed as well as two plenum gaskets GM PN 10168684. Before starting the engine, the engine control system's learned fuel trim data for the old injectors must be erased. Remove the negative battery cable for 10 seconds to accomplish the reset.

When the plenum is off there is an opportunity to fix vacuum leaks and oil leaks. Also, the secondary throttle vacuum system can be functionally tested. Additional information is available on my Under the Plenum Service DVD, which is available at www.zr1specialist.com.