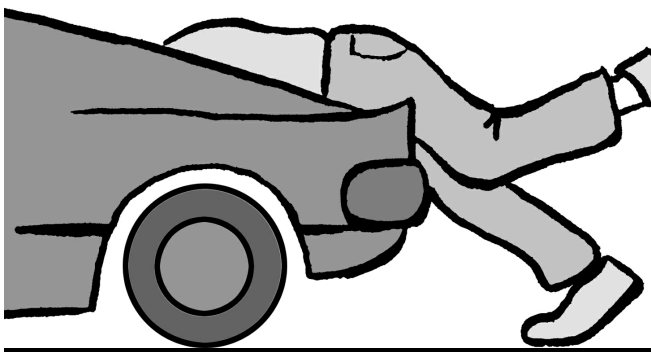
WC Engineering, Spring/04



John's Garage

Performance Parts and Advice for your Lotus Esprit or Toyota MR2

Tuning Tips: Toyota 4AGTE

The *Tuning Tips* column addresses frequently asked questions and other useful tips learned through trial and error in the WC Engineering garage. Send questions to <jwelch@wcengineering.com>.

Can the stock 4AGE ECU work with my turbo conversion?

The stock ECU on a 4AGE will not properly control the fuel needs for a boosted application. An add-on piggyback ECU or a stand-alone ECU should be considered a necessity for any turbo conversion. HKS originally offered their PFC-FCon piggyback unit for use on the 4AGE. There were two different EPROMs used with it: one for the stock injectors and another for the larger fuel injectors.

Can an ECU from a 4AGZE be used on a 4AGTE?

I suppose, but why? If you are starting with a complete car (I do mean a complete, running car) that has a 4AGZE, then you could start there. You're going to run into the same limits that the NA cars has.

If you don't have the complete car, don't even consider this option. The time and money you will lose getting all the correct sensors and wiring will make the project unbearable. Go with a standalone system.

How do I control the fuel system on a 4AGTE?

One of the keys to a successful turbo conversion is to have proper fueling system. There are many different approaches to fueling and here is the information that I have put together from my many years with a 4AGTE. If you haven't read it yet, read the technical article on fuel pressure on the website and return here after that.

The stock fuel pump and pressure regulator on an 4AGE AW11 is fine up to about 200hp. After that, a larger pump, lines, and regulator should be considered. The use of a rising rate fuel pressure regulator is good only for small boost pressures (below 5psi).

New Products: BIG Brake Kits

Introducing the ultimate in a *big brake system* for Lotus Esprits from WC Engineering:

AP Racing 6-Pot Front Brake Kit $3400

This kit is similar to our four-pot front kit, but uses a slightly larger differential bore six piston AP Racing caliper (also with dust seals). It still uses a 330mm x 28 mm rotor, but it requires the use of 17" wheels. The additional pad area gained by using this caliper allows a few more options for different pads. This kit requires the use of a rear brake upgrade. The minimum is the rear Brembo system from the 2001 or later Esprit. The recommended system is our four-pot rear AP Racing kit.

Fits 1989–1994 Lotus Esprits originally equipped with TMC front brakes.

AP Racing 4-Pot Rear Brake Kit $3300

This kit was designed to compliment our six-pot front kit. This uses a differential bore four piston caliper similar to the caliper used on the late Esprits in the front. However, due to the use of the caliper in a "leading" configuration on the rear as opposed to the "trailing" position in the front, the offset piston bores are different. For the same reason, the front caliper from a late Esprit should not be used in this rear position. Included are two calipers, pads, stainless lines, two rotors (330mm x 28mm) with hats, mounting brackets and bolts. This kit does not include a parking brake. Fits 1989–present Lotus Esprits.

IN THIS ISSUE:

Online Ordering on WCEngineering.com

Soon we will be implimenting a secure online ordering system for our website, allowing you to purchase many of our products from your personal computer. Payment will be available by credit card, electronic check, or PayPal account balance.

There will be some products, however, that can only be ordered by contacting us directly by phone or email, like the ceramic ball bearing turbo kit. Availability is so variable with this item that it is impractical to order online. But don't worry! Give us a call and tell us about your project, and we'll make sure we get you what you need.

In the meantime, while you're browsing our website and need a MEM-cal, a connector, a chargecooler pump plug, or something else, feel secure in ordering from our website.

Diagnostic Techniques: The Leakdown Test

A leak down test is more specific in pinpointing the condition of an engine and if there are problems, it can pinpoint the needed area of attention. A leak down test is performed with a special gauge and manifold set. It consists of a calibrated pressure gauge and a pressure regulator and adapters to connect it to the spark plug hole. Compressed air (or nitrogen) is fed into the gauge and the gauge is calibrated against a zero reference (no air leakage). The adapter is then screwed into the number one spark plug hole (with cylinder #1 at TDC compression) and the gauge is attached. As soon as the gauge is attached to the adapter air will begin to fill the cylinder. As this happens, the gauge will begin to indicate the amount of air flowing into the cylinder.

If air is leaking past the rings, or the valves, or the head gasket, we can directly read the amount of leakage and can easily find the leak. If there is air blowing out the PCV, we have a ring leak, if it's coming out of the exhaust, we have an exhaust valve leak, and so on…

FYI: All Lotus 907 engines with 25,000 miles or more that I have worked on have had an exhaust valve leak on cylinder #4 and sometimes #3.

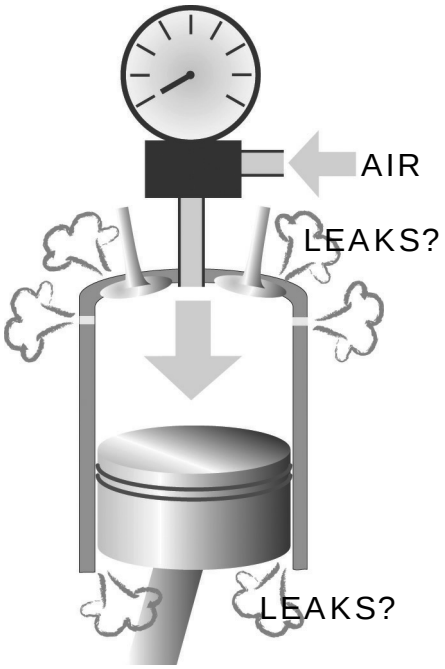
A leak down test is especially good at discovering leaky valves. We use much less pressure (about 80 psi) than is normally in the combustion chamber (several hundred psi). If there is a valve that is slightly off its seat, the actual combustion pressure may have helped close it, but the lower testing pressure won't exert as much force and the leak will be apparent.

This test is very time-consuming with the engine in the car. To do the test, each cylinder must be tested one at a time, they must be at TDC compression, and the crank must be held in place to prevent rotation. A freshly rebuilt engine should have less that 4% leak down on each cylinder and if leak down is above 10%, service should be performed. All cylinders should be within two points of each other. NOTE: These figures are for performance engines. Stock production engines may have as much as 10% right off the assembly line.

If you ask your shop to do a leak down test, they may offer to do a compression test or may hesitate or quote a high price for the work. This is not uncommon—it is not a simple task. If the shop that you use doesn't know what a leak down test is, then you should leave quickly and politely and never return. I don't care if they are ASE certified, BMW certified, college educated, graduated from a technical college, or have just "been working on cars for years"—if they do not know what a leak down test is, then they do not have the proper diagnostics knowledge to be working on any internal combustion engine.

I will add that every engine that I have done a leak down test on has been on an engine stand. The Lotus 4-cylinder 907 engine is very easy to test this way. If you pull the cam towers, then all of the valves are closed, making every cylinder in compression. The Toyota engines can be done similarly by removing the camshafts, others can be done by removing the rocker shafts. Removing the camshafts, rocker shafts, or cam towers is typically required to remove the head anyway, so during a tear down and rebuild, a leak down test is a simple task to perform.

Leakdown Testing



Benefits:
- Direct reading of each cylinder's condition
- Pinpoints any problem areas

Drawbacks:
- Difficult to perform
- Time consuming
- Requires source of steady air pressure

Lotus Esprit SE 89–95 Renault Transaxle Services

We offer rebuild services as needed for the Renault UN1 as used in the 1989-1995 Lotus Esprit SE. Our rebuilds meet stringent specifications with a 12-month, 12,000-mile warranty. We can also install most limited slip differentials.

The Renault transaxle used in the Lotus Esprit can handle more power than most people give it credit for. Unfortunately, most first-time Esprit owners are also first-time manual transmission drivers, have limited experience with a manual transaxle, or their Esprit is the only car they currently own with a manual transmission. This leaves us (the second, third, or fourth owners) dealing with transmission issues from previous owners.

Supply and Install LSD in Renault UN1 Transaxle: $2000

WC Engineering supplies and installs the correct LSD in customer's Renault transaxle. Includes the proper bearing preload set. No additional parts are included in this price.

Install LSD in Renault UN1 Transaxle: $600

The customer supplies the transaxle and the correct LSD. If the differential does not fit the case or has the incorrect axle splines, no work will be performed. No additional parts are included in this price. If new differential bearings are needed the parts would be extra.

Service for the Renault transaxles is available at standard shop rates plus parts. WC Engineering welcomes you to supply your own parts if you desire, but please contact us to insure the correct parts are sourced.

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