FTO turbo Part II

Now with turbo and intercooler, it's time to tune and iron the bugs out of the beast

One of the really neat parts of the Mivec turbo conversion so far has been the way in which all of the work integrates almost perfectly with the Mitsubishi engine bay. The FTO presents a few interesting and involving, from the installer's point of view, packaging and engineering problems. Compounding that are the other attempts at FTO turbo installations we have seen that have been – put politely – far from well thought out.

Rather than just another turbo conversion to a quirky car, the FTO encompasses all that is difficult about a turbo system installation, being a highly strung (from a compression point of view) V-configuration engine, with a full variable valve-timing system and a semi-tiptronic-style automatic transmission. In addition, there is very little room under the bonnet for the turbocharger itself, so you can begin to get the picture. Think of all the nasty things you could come across when planning and developing a turbo system and the FTO has them in lashings and spades.

By **Martin Donnon**

A finished extremely neat engine bay presented to the dyno for its initial tuning

INSTALLATION WORK

When we last left the FTO, it had the turbocharger adapter being made, the intercooler dummied in position and the computer/turbo picked for installation. What we weren't able to show you though, is the professional-looking finished product.

A clever touch was the use of a turbine blanket on the exhaust housing of the turbocharger. Rather than simply deflecting heat around the engine bay, the turbine blanket literally seals the temperature into the turbine housing. This assists power production and keeps the under-bonnet temperature way down. I was even silly enough to touch the turbine blanket after a run on the dyno, and to my surprise, didn't leave any charred skin attached to it. Excellent!

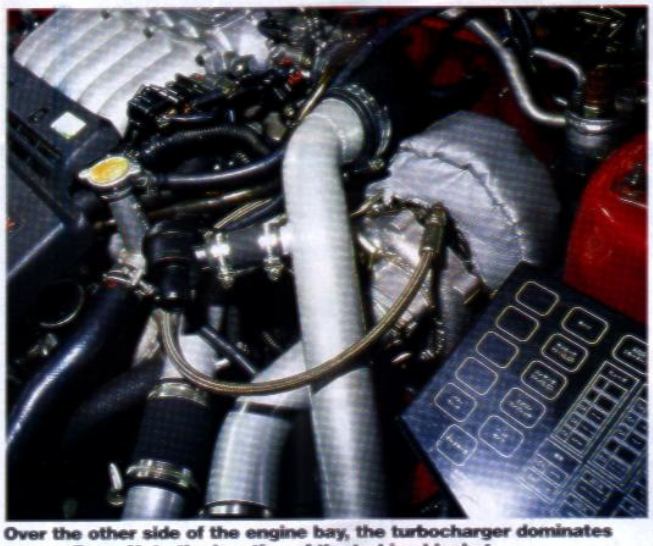
Intercooler plumbing is all fabricated from mild steel tubing and then carefully finished to remove any dags before being powder coated to a nice flat silver colour. The result is that the pipes look manufactured rather than fabricated, which gives a low key and functional finish. Even the pod-style K&N air filter should work fairly well being kept a long way from the engine, and in a position where it has a sporting chance of getting ambient air when on the move.

WIRING THE SYSTEM

With the choice of management already being locked in to a Microtech MTX12, there was little for it but to roll up the sleeves and start work in earnest. Forget about replacing the stock computer though, as it has all important communication with the transmission and body control parts. As we mentioned in the first part of this story, the concept

Rarely do you come across an engine that has an additional 50 per cent of fuel supply left in the factory fuel system

We were surprised at the speed with which the Microtech management could be tuned to the Mitsubishi engine



Over the other side of the engine bay, the turbocharger dominates proceedings. Note the location of the turbine blanket

The Microtech MTX12 laptop programmable software again proved its worth with a speedy and accurate set-up

is to get the Microtech controlling the engine from a fuel and timing point of view, leaving the original computer to do the rest.

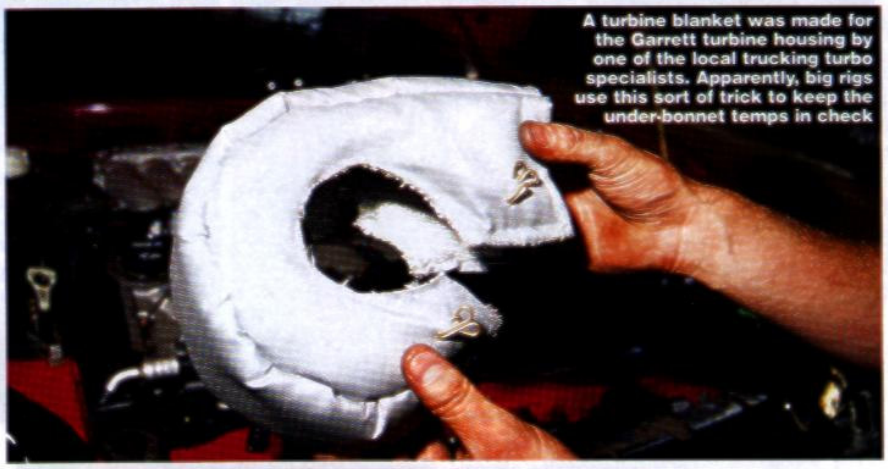
Rather than try and splice the Microtech into the loom, a complete new set of wiring is made for it. The original wiring is disconnected and run back through the hole in the firewall, where it can be neatly coiled away in case the FTO should ever need to revert back to stock. From an operational viewpoint, the stock management never knows that it isn't controlling the injectors and igniters, and as such, should work away oblivious to the presence of the turbocharger.

The only thing you need to be careful of here is the shared signals, with it being possible to 'load down' low-impedance signals, such as the air temp and water temp inputs, and cause problems that way.

If the signal sharing causes the engine check light to illuminate, then the quick fix is to remove the globe. Crude, but highly effective. If more serious problems occur, perhaps disrupting the vehicle security or shift patterns, then the only solution is to fit dedicated sensors for the aftermarket ECU.

In this case, a test start of the FTO showed that there were no nasties caused by sharing the management signals. Phew. The only other part of the system that needed sorting out was the firing order of the coils, something that Craig from RPM made short work of. Within a few minutes, the turbo FTO was sitting there idling away quite happily.

A finished (from a fabrication viewpoint) turbine discharge pipe shows the smooth integration of the wastegate exit gasses



A turbine blanket was made for the Garrett turbine housing by one of the local trucking turbo specialists. Apparently, big rigs use this sort of trick to keep the under-bonnet temps in check

After a bit of mucking around with the MAP sensor, a sloppy shifting Tiptronic-style transmission was turned into something much more acceptable ... even nice!

THE TUNING

Being a budget conversion (really!), the concept was to get as much power as possible from the engine before a major fuel system upgrade was required. Even though the Microtech is quite capable of handling big injectors, the owner of the car didn't want to go the expense of six big injectors and possibly a matching fuel pump. That's pretty fair when this sort of hardware installed would probably add another $1500 to the bill.

The only limiting factor to the output of the FTO would (in this case, anyway) be the fuel system. Tim's approach was to allow the engine to have as much boost as possible before the magic 100 per cent duty cycle mark was reached on the injectors, and then back the whole lot off a little to get a margin of safety.

The stock wastegate setting proved to be right on the money too, with a maximum of 6psi (at the manifold) being generated, which had the injectors right on their limit. After a fairly straightforward tuning process, the FTO's 121kW at the front wheels is testament to the sizing of the stock Mitsubishi fuel hardware. Rarely do you come across an engine that has an additional 50 per cent of fuel supply left in the factory fuel system.

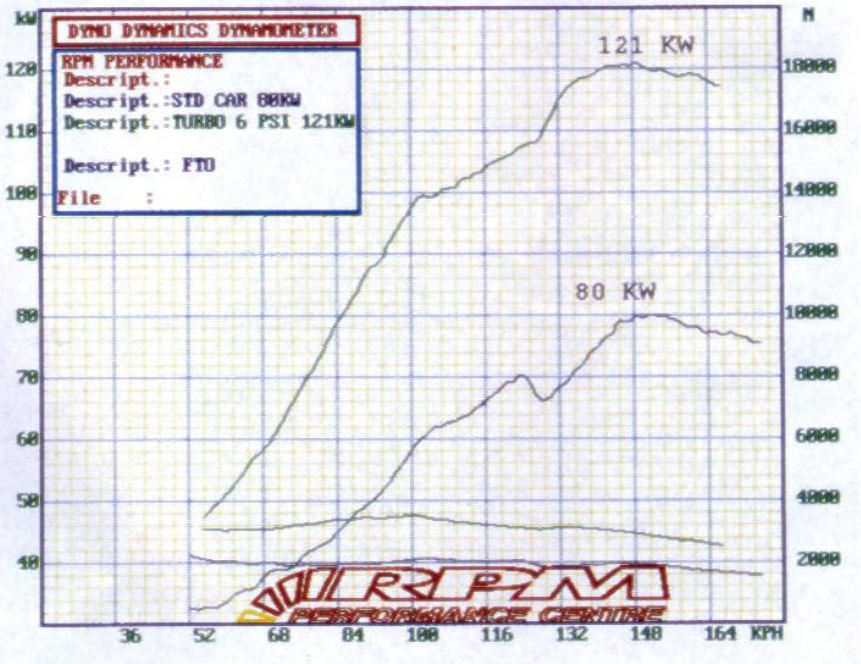
Tim also took the opportunity to try different points of Mivec activation. Perhaps the change in volumetric efficiency from the turbocharger would allow different camshaft timing switchover points. However, Tim witnessed the same thing I have found with Hondas over the years – any change away from the factory VTEC/MIVEC setting results in an instantaneous loss of power. In the end, the Mivec switchover point was left in its most powerful and stock position.

TIPS AND TRICKS

As soon as the FTO made it out onto the road, there was evidence that something was amiss. At part throttle conditions, the transmission behaved perfectly, but once some load (boost) was placed on it, the auto simply refused to properly shift gears. It wasn't the transmission itself slipping, it was an electronic bug – a bug that took Tim some time to track down.

The initial thought was to put a one-way valve in line with the MAP sensor for the factory computer, so no matter what happened, it could never receive a boost pressure signal. With this being the only sensor that could 'tell' whether the FTO engine was making boost or not, it's only logical that a sudden influx of pressure would cause a problem. The only drama here was that the one-way valve did little to fix the problem.

It was only when Tim fully disconnected the factory MAP sensor (not a problem, since the Microtech has its own internal MAP sensor) that the problem disappeared. The flaring shifts were replaced with good solid gear engagement. The miracle is that disconnecting the sensor didn't affect anything else, such as the idle control, or even set a 'check engine' condition – you would at least have expected it to do that. Still, for the budget-style approach to this conversion and the neat 50 per cent power upgrade that it produced, who's arguing?



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