MR2 Technical Knowledgebase

MKII (1990 - 1999) Category

Technical information for 90-99 SW20 MR2.

Contents

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Technical information for 90-99 SW20 MR2.

Mk II Automatic to Manual Transmission Swap

[Written by TomsMR2 - Tom Hayes]

Yup.. got it done!

I found this is asked semi frequently over time and everyone always gives these BS inexperienced hopeless answers.

I think thats just not fair so heres the truth about the auto swap

Honestly, its not that bad. How many times did I have to break out my welder? Hole saw? Special fabricating tools?Zero times, it's a factory swap.

Everything fits just as toyota intended it and pretty much glides right into place except the damn fuel tank; that IS a pain! No tricks, real surprises, fabbing, cutting, grinding, welding or force fitting. The whole auto car is setup for the manual running gear.

You'll need the obvious parts; clutch pedal, hydrolic lines, manual trans and clutch assy. That's pretty much it.

You don't need the 5spd harness. I wasted hours trying to get it to work and in the end I ended up removing the harness, again, and reinstalling the auto harness.

You will need to either trick the ecu into thinking its in park or just put the very small gear selector switch back in the car. Set it to park, plug it in then secure it out of the way. The ECU doesnt care what the tranny is doing, it just wants to see the park signal to run your starting system.

Starts and runs, no CEL!

It took roughly 35-40 hours of in-garage work. Keep in mind this was figuring it out the whole way. Installing a new motor; including resealing, regasketing, installing new oil and water pumps, belts (accessory and timing), AND screwing up and swapping harnesses 3 times. If I do it again, I'm confident I could pull it off in ~20hrs; less if the old motor was reused. Even if it was 40 hours just for the transmission swap it isnt to bad to remove said offending sportscar-mudering autotragic and bless you car with the proper 5spd it deserves!

So thats the real deal guys. You dont have to sell your car for a 5spd, just collect your parts, and have at it!

MR2Board Forum Source Thread

Toyota MR2 SW20 Engine Lid Fan Install - N8s way

[Written by N8s93Turbo]

For those of you thinking about installing engine lid fans or those of you who have them and just aren't sure how you want to go about wiring them this may be helpful. There are more than way wire you fan setup. The following way is how I chose to do it.

There are many fancy fan shrouds out there made of carbon fiber, polished aluminum etc. For my setup i used a simple 7.5 pusher spal fan. I tucked it up between the shroud and engine lid and used a heavy duty construction glue, drys clear and holds strong. You can pick the engine lid up by the fan and it holds fine. Looks very discrete and clean, the cheapest way to go. Very nice if your on a

budget like myself.

How It Works: I chose to wire my fan directly to the Intercooler power wire, rather than to the relay. This way the engine lid fan will only come on when the engine temp sensor is tripped. Then I wired the IC fan (also a 7.5 spal fan) to the relay. Now when you turn the car on, the IC fan and engine lid fan both run once the engine heats up and trips the sensor.

Parts:

- 4 or 5 pin auto relay
- inline fuse
- wire connectors
- 12-16ga wire
- spal fan

Wiring: Now we are ready to begin setting up the relay. We will be using a simple 4 or 5 pin auto relay(with the 5pin you will not use the center pin). You can get them at radio shack for around $3. You will also need an inline fuse, some wire connectors, and a roll of 12-16ga wire. Everything should be purchased for under $15 minus the cost of the fan. I chose to remove the engine lid (5min) to mount the fan easier and hide the wire. You'll need to extend the wires on the spal fan so that it can reach the ic fan wire plug and ground.

Using the following diagram you will set the relay up as followed:
1. TOP HORIZONAL - Attach wire from pin #1 to the ic fan
2. LEFT VERTICAL - Attach wire from pin #2 to a switched ignition wire. Easiest place is inside the fuse box located on the drivers side rear corner of the engine bay. Use a test light you'll need to find a wire that is only hot when the ignition is on.
3. RIGHT VERTICAL - Attach wire from pin#3 to a ground.
4. BOTTOM VERTICAL - Attach wire from pin#4 to a wire that has constant power. Easiest place is in the same fuse box listed above. I also recommend you use and inline fue for this wire.

Now your relay is all connected and ready to go. The last thing you will need to do is ground the ic fans other wire. The one fan wire goes to the relay, stated above, and the other wire is the ground. To test the fan you can simply unplug the engine temp sensor located on the engine lid. Turn the ignition on and both fans, engine lid and ic, should kick on. Make sure they are both blowing air the right direction. If one or both fans are blowing the wrong way you just have the fan power and ground wires crossed.

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EDIT: Format and content

General Maintenance

There are no articles in this category.

Braking, Suspension and Wheels

There are no articles in this category.

Naturally Aspirated Engines

Adding a Turbo to a 5SFE

[Written by MrTurrari]

Modifying your 5S-FE

There are a lot of nay-sayers out there that say the 5S-FE motor is a weak non-performance economy motor and can't handle the boost. I don't agree with this assumption and feel that many setups are not so much limited by the motor itself but by their owner's understanding of how it works. The 5S-FE like any other motor has it weaknesses and strengths but overall is a very sturdy platform for modification. When planning modifications to a motor, I believe it should be thought of as a series of obstacles to be overcome. As you remove one big obstacle you find yourself facing another one but in general the overall system will become more efficient. In addition, upgrading one component can overstress another that was within it's operating limits before the upgrade. To safely build a performance motor you need to understand what the limits of your motor are so you can know how far to push the envelope and what components need to work together to get the desired result. Here are some of the limits of the 5S-FE platform as I see them.

Basic Strengths of the 5sfe:
- Solid block - High powered 500+rwhp MR2s often use these blocks.
- Stroked crank - The 5S-FE is a stroker motor from the factory. Also used in 500+rwhp MR2s.
- Displacement - 2.164 liters which is great for spooling a turbo.
- Long intake runners - Although not as good for high revs this gives the air more velocty at low RPMs for torque down low.
- 9.5:1 compression - Good for NA power and low boost power but lowers the maximum boost you can safely run.
- Fuel rail - The fuel rail on the 5S-FE is a top feed rail which is capable of supporting 850cc injectors, maybe larger

Limitations:
- 6300rpm redline - Valve springs and connecting rod bolts are not strong enough to be reliable past this.
- Short duration cams - ~220? and 8mm lift. The 3S-GTE has 236 advertised duration and 8.5mm lift.
- Small valves - 32.5mm intake and 28mm exhaust. The 3S-GTE has 33.5mm and 29mm exhaust.
- Linked intake and exhaust cams - There is a drive gear that keeps them synced so an adjustable cam gear can only be put on the intake cam and it also effects the exhaust.
- Fuel pump - Only good to ~235rwhp at stock pressure.
- 5S-FE Computer - Runs a little rich and is made for the stock NA injectors.
- Injectors - Made for max 150rwhp maybe less. 91-92 injectors are 205cc (yellow) and 93+ are 225cc (Dark green) from what I have read.
- Intake manifold - I don't know the limits of the 5S-FE intake manifold but most people shooting for

high power replace it with a custom one. If you are looking for power in a higher RPM range you will want to replace this with one that has shorter, wider runners.
- Throttlebody - I also don't know the limits of the stock throttlebody but it is only 2" in diameter which is a little small. If you need to move a lot more air then stock you will want something begger

What can you expect from your turbo 5S-FE?

A stock 5S-FE in good condition will easily handle boost of up to 9-10psi with as much as 180rwhp. An MR2 with a 5S-FTE is an absolute blast to drive and is a little faster then a stock turbo MR2. There is a missconception that the S54 transmision in the NA MR2 has shorter gears then an E153 turbo transmission. It is partially true but only the 4th and 5th gears are shorter. 1st through 3rd are almost identical when factoring in final drive gears. So why is a 5S-FTE MR2 faster? Because the turbo spools faster, the compression is higher and it's a bigger engine.

A simple, bare minimum setup for a 5S-FTE includes the following:

Turbo Components
- Factory 3s-gte Turbo CT26 with wastegate actuator
- Factory 3s-gte Elbow and Primary Catalytic converter
- Factory 3s-gte Exhaust Manifold
- Factory 3s-gte Intercooler w/ fan
- Factory 3s-gte Oil Pan
- Factory 3s-gte Oil/Water Coolant Lines to and from Turbo w/oil drain hose and clamps
- Factory 3s-gte turbo to intercooler Pipe
- Custom intercooler to throttlebody pipe (mine is 2.5" diameter)
- Factory 3s-gte Blow Off Valve with the VTV valve
- 4 MkIII Supra NA 315cc Injectors (light green top) part # 23250-70080
- 4 NGK BKR6E or BKR7E Spark Plugs (BKR7E is the colder plug for higher boost)
- Factory 3s-gte 2bar MAP Sensor part # 89420-17030
- 30 amp relay for intercooler fan
- Boost Gauge
- MSD-BTM # 5462
- MSD Tach Adapter #8910eis
- Oil and water send/return fitings (Many other ways possible or you can use JIC fittings)

Oil
- 1/8 BSPT to 1/8 NPT male to male (For the oil feed at the head)
- 1/8 NPT female T or plus
- 1/8 NPT to 3/8 barbed hose
- 1/8 NPT to female 1/8 BSPT (To keep your oil preasure sender)

Water
- Coolant Gooseneck from a 91 NA MR2 (The 91-92 has a removable plug while the 93+ does not)
- M16x1.5 to 3/8 NPT (For the water return by the thermistat. I had to buy a M16x1.5 to 1/8, drill and tap it to 3/8)
- 3/8 male BSPT to 3/8 female NPT (For the water send at the coolant gooseneck.)
- 2 x 3/8 NPT to 3/8 hose barb 90 degree bends (The bends allow you to point the hose away from the downpipe or other obstacles.)
- 6 - 3/8" hose clamps for oil and water lines
- Misc nuts and bolts for the turbo and manifold if you are missing any
- gaskets - Turbo to downpipe and exhaust manifold
- Misc Hoses and clamps

Hoses
- 12"long by 2"diam hose (IC pipe to IC)
- 2"diam coupler (Turbo to IC pipe)
- 2 to 2.5"diam transition coupler (IC to TB pipe)
- 2.5"diam coupler (TB pipe to TB)

Clamps
- 2 x 2.25" clamps
- 3 x 2.5" clamps
- 3 x 2.75" clamps
- 4 feet of 3/8" oil/coolant hose
- 10 feet 5/32" vacuum hose
- 18 gauge wire and crimp connectors

- 2-1/8" exhaust pipe coupler and two pipe clamps to join the down pipe to the NA exhaust if you cut your NA exhaust to fit
- Zip ties and misc hose clamps to secure vacuum lines under boost.

Upgrades from the basic 5S-FTE could include:
- KO or other Downpipe
- Turbo exhaust system
- Boost Controller
- EGT Gauge
- Air/Fuel Ratio Guage (Modify for WOT reading from www.gadgetseller.com)
- Oil Pressure Gauge
- Oil Temp Gauge
- Pilar pod and/or steering column pod
- SPAL intercooler pull fan
- Silicon hoses for turbo/IC pipes
- T-Bolt clamps instead of screw type clamps
- SAFC with ajustable FPR for fuel tuning (Requires spending time on a dyno)
- J&S Safeguard instead of MSD-BTM
- SMT6 instead of MSD-BTM/SAFC (Requires spending time on a dyno)
- CT-20b or larger turbo. (Be very careful here. 9psi on a CT-26 is not the same as 9psi on a TD06. You'll need more fuel per pound of boost with a bigger turbo and you will get more power at lower boost. The stock fuel maps may not match up very well to the VE curve of your motor with a larger turbo on it.)

Many people ask if they can substitute different injectors or MAP sensors. The answer is yes but you will require some advanced way to tune your WOT fuel maps and it will get a whole lot more expensive. Call it the magic square of the 5S-FTE: 5S-FE Computer, 315cc injectors, ct-26 and 2 bar stock turbo MAP sensor. It's a balanced equation and anything else can throw it off. The combination of CT-26, turbo MAP sensor, stock fuel pump, 315cc injectors and 5S-FE computer is only good up to about 9-10psi of boost. At this point the injectors are probably over 90% duty cycle. With some kind of fuel tuning or an AFPR you could possibly go higher but be careful, use a wideband and take slow steps up. If you go too lean you risk detonation and damaging your engine.
Something else that is nessesary to keep your motor safe is a device to retard timing according to boost level. You need this because you are tricking the stock ECU into thinking that less air is going into the engine and it advances timing past what is safe at boost. I chose to use the MSD-BTM and Tach Adapter because it was the most economical solution. A J&S Safeguard or SMT6 or SMT7 will also work but are more expensive with more features. Most people have it set to retard 1/5 to 1/2 degree per pound of boost. If you have a 93+ 5S-FE it will also have a knock sensor which is an added level of safety.

If 10psi and 180rwhp aren't enough for you then there is still hope. Toyota only planned for the 5S-FE to have 135hp at the crank but it is still the sister engine of the 3S-GTE and in some ways, as I mentioned above, the stronger of the two. All of the weaknesses of the 5S-FE can be overcome but not all of the solutions are cheap.

Here are some of the limits and what you can do to get past them:

- Cams - Webcams and others make cams that will increase duration and lift. Webcam grinds of 294, 577 and 101 should increase performance and still be streetable. Welded cams like Webcams are easier to fit then cams that are only ground because the base circle is kept the same so stock shims can be used. Also they will be able to create a more aggresive profile then on a ground cam. You will need an EMS to idle really aggressive cams like 256 degree and above. Remember that cams shift your torque curve to the right so buy cams to suite where you want your torque peak. An bad example would be buying 306 degree cams. They would be almost useless in a motor that has a 6300rpm redline.

Also high lift or ground cams may require underbucket shims or shimless buckets to keep the shims from popping out and keep in mind that valve springs have a point at which they coil bind. I found the stock 93 springs to bind at about .360". Just FYI the difference between 91-92 cams and 93+ cams is the diameter of the base circle and the width of the lobes (smaller base circle on the 91-92 with narrower lobes). Otherwise they would be interchangable.

- Valves - 1mm or 2mm oversized valves will do wonders for volumeteric efficiency. 2mm oversized valves will require larger seats, porting and deshrouding of the combustion chamber. Use valves

from a 3S-GTE for 91-92 5S-FE and valves from a 2JZ-GTE for the 93+ 5S-FE for 1mm oversized. The +1mm version of these valves will be +2mm in a 5S-FE.
- Ports - Port matching and cleaning up the intake and exhaust ports will improve VE and may be required to see gains from oversized valves. When porting you will always get the best results from a shop that can flow test the head. Many people recommend Chris Katthage of Engine Logics because he deals almost exclusively in MR2 performance motors and will document gains in flow when doing head work.

- Fuel Pump - Good to 235rwhp with stock pressure. Replace with a Walbro 255lph or supra pump if you want more.

- 5S-FE Computer - Runs rich and fires the injectors in batches. Also it can't idle a set of aggressive cams because of reversion . Replace with a standalone or add an advanced piggyback. An SMT6 or SMT7 will allow you to get past your fuel and timing issues but still has limits. Personally I would go with stand alone ECU because it will remove all the limitations of the 5S-FE ECU.

- Injectors - With a standalone or advanced piggyback and a big fuel pump you can run much larger injectors. They may have to be custom though because top feed injectors are not as common as the side feed injectors found on the 3S-GTE.

- 6300rpm redline - To safely go above this you need upgraded valve springs (3S-GTE springs for 91/92 or 2JZ-GTE springs for 93+), forged or 3S-GTE rods because they will have bigger bolts (3S-GTE and 5S-FE rods are almost identical except for the rod bolts) and a stand alone computer to raise the rev limiter. 3S-GTE rods can be made to fit by grinding the crank journals down but they are also a few thousandths shorter then the 5S-FE rods so that can slightly lower compression.

- Compression - Custom Forged pistons can be installed for just about any compression ratio. Remember that overboring and oversized valves can change your compression ratio. For high boost you may want to shoot for 9.0:1 or less. Aggressive cams can also let you run higher compression and higher boost because with teh right tuning they reduce the propensity for detonation.

- Cam Gears - An adjustable intake cam gear can be made from a 2JZ-GTE adjustable cam gear with the center machined to fit. As for the exhaust, it will move with the intake in the same direction. This is probably the hardest limit to get past on a 5S-FE but it may be possible with some custom machine work to one of the internal cam gears to make it adjustable (Future project?).

- Intake Manifold - Just like any stock manifold there is only so much air that can flow through it and choosing the correct runner length and plenum volume in a custom manifold can add some extra velocity at different rpms. Most of the custom manifolds I have seen for the 5S-FE are side feed to keep air flow as even as possible between the cylinders and have shorter runners then stock to increase velocity at higher RPMs.
- Throttlebody - You could use a 4A-GZE or Mustang throttlebody to get a bigger bore and get more air flow. This requires a custom intake manifold and possibly some custom work for the TPS and IAC. With a stand alone this should be easier to get working.

- Oil Pump - Replace with a 98 5S-FE pump and shim the relief valve 1-1.5mm to get a higher pressure. If you do this you may have to put a restrictor on your turbo oil feed line to keep from blowing oil past your seals. You might need to do that anyway if you find oil pushing past the turbo oil seals.

Original Article

MR2Board Forum Source Thread

Turbo Engines

3SGTE HOW TO: Change distributor cap and rotor

[Written by N8s93turbo]

Here is a quick write up on how to change your distributor cap and rotor. This was done on a 93T with no egr system which may make it a little easier than those of you who still have your egr.

You will need:
8mm socket
philips screwdriver
rag
new dist cap
new rotor
I chose oem toyota replacement parts

Approx cost: $40

Approx time: 15-30min

1. First off remove all the spark plug wires from the distributor cap.

2. Unhook and slide up the plastic cap and the wires will just pop out.

A. No need to mark them seeing as how the distributor cap and the wires should be numbered. (Verify this before disconnecting wires. Mark with tape/marker if they are not.)
B. You may need to unhook the one vacuum hose to give you some more room.

3. Once the plug wires are out remove the ignition wire the same way.

4. Next take your 8mm socket and remove the two bolts on the distributor cap. They should be directly across from each other.

5. Once those two bolts are removed set them aside as you will be reusing them.

6. Ok, so you are now ready to remove the rotor. Take a good look at it, remembering exactly how it is positioned as it will only go on one way. This will make the reassembly go much smoother. There are two philips head screws located in the centerish of the rotor, they are less than an inch a part and are recessed. I was unable to get the one with a philips screwdriver but a flathead got it right out. Save these screws as well. Your rotor should now pop right off.

7. Reassembly is pretty much self explanatory, just reverse the process. Wipe off any oil or dirt before putting it back together.

A. If there is a bunch of oil, chances are you need to replace the seals in your distributor which is a whole differant deal.

After replacing my cap and rotor I noticed better idle and acceleration immediately. I was delightfuly surprised and happy with the result.

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EDITED: Formatting and content

V6 Engine Swaps

Why the 3vz-fe is the best Toyota v6

[Written by Toyrsrme]

This doesn't include the newest v6's coming. I.E. the new onslaught from the Lexi, or the 4.0L v6. Comparing 2vz-fe, 3vz-e, 3vz-fe, 5vz-fe, 1mz-fe

(For the purpose of the discussion 1mz-fe = all 1mz-fe's, 1mz-fe1 = non vvt-i 1mz-fe's, 1mz-fe2= vvt-i 1mz-fe's)
2vz-fe - has the weakest parts & should be avoided. 90-91 have o2 sensors.
3vz-e - can make good power, but have parts equal in strength to a 1mz-fe, with less power to begin with.
1mz-fe - have weaker parts than 3vz-fe's, and have bad tuning problems with OBD-II that have proven very hard to correct. Powerband past 4000rpm is better tha a 3vz-fe's, powerband under 3000rpm falls under 50% of a 3vz-fe's at some points.
1mz-fe2's - vvt-i provides the best powerband of any of the v6's, start to finish

The 5vz-fe has proven strong parts, when the TRD supercharger is used, good power can be made. Even safely if you add fuel!

Why the 3vz-fe is superior

Mostly ECU reasons:

It's OBD-I ECU is the least trouble code throwing, least caring ECU in the line-up. I have tuned 720cc injectors to run on an N/A 3vz-fe acceptibly.

It does not throw/store codes from o2 sensor feedback - even if it is massively different. Black smoke rich to engine melting lean. It doesn't care.

1mz-fe's have horrible over sensitive knock sensor problems. 3vz-fe's do not.

Like running a mild turbo, or N/A without much in the way of fuel/ignition tuning? The 3vz-fe has the large Denso AFM, and a distributor. Stock, off the bat leaning the AFM cog & adding 7* of timing (17*btdc base) advance puts the 92-93 3vz-fe 185bhp to the 94-97.5 3vz-fe's 200bhp.

200cc stock injectors are Bleh. But with a combination of a walbro 190+, FPR, and either an extra injector, or larger injectors (330cc @ 41/43psi), you can run up to 300bhp out of one without touching the ECU if you don't want.

Yes... You can install a FPR, 550cc's, and a Walbro 255 & use the AFM cog to tune over 350bhp... All without a piggyback. it has been done. You will need lots of money, as you will rich so ungodly rich you'll get stuck at the gas pump.

The 3vz-fe ECU is very accommodating when it comes to closed loop changes. Don't like the fact that a normal ECU likes to run stoich under boost until open loop? 3vz-fe's are not prone to tuning such changes out. If they do, we have it covered with $10. A relay +wire
3vz-fe also has a neat ability, transforming it into what essentially stand alone.
Run the TPS's output (VTA) through one side of a double pole double throw (DPDT) relay. Take the 5v TPS/AFM supply (VC). Run this through the other side of the DPDT relay.
Trigger the relay however you want, when you want to enter open loop mode. Be that all the time, a $3 ebay boost pressure switch, or an output for your piggyback.
Because of it's ability to run massive size injectors compared to stock, it doesn't care!
OBD-I > OBD-II
1)easy tuning
2)the one fuel trim change do not continue through open-loop

Afraid you'll miss OBD-II's anal retentiveness for troubleshooting?
The 3vz-fe has you covered. Tho the '94 1mz-fe had the world's first complaint engine/ECU, the 3vz-fe's do have an ace up their sleeve.
Diagnostic mode II. Yes... The 3vz-fe is the only v6, and one of two OBD-II Toyota's with DIAG2! This can't even be entered with the ECU OFF! It has to be done with the engine running! It will throw every code possible instantly. Guess what happens when you trigger it & you're not moving more than 6mph? Yep, wheel speed sensor code. All your temp & o2 sensors haven't warmed up? Ya - count all them too. Along with a half dozen other codes.
Anything triggers anything in DIAG2.

All MZ block engine's have a 139mph hard speed limit.
All 3vz-fe's have no limit... You need power VS Aerodynamics to do 190mph.

Mechanical side:

The 3vz-fe itself is *highly* resistant to detonation. Many times more than a 3vz-e, 1mz-fe, or 5vz-fe

is. The most resistant to detonation of any of the v6's. I have personally run 22* of maximum advance over 6000rpm with my SMT-6 with no pinging. On Chevron 87.
Another ported & polished 3vz-fe went to a drag strip to test ignition timing. A base timing of 20* (stock is 10* universal to all v6's/normal Toyota engines) produced no pinging, but poor performance. On 87 octane.

The 3vz-fe has the strongest stock rods used on any v6. They are massive.
Huge... Iron... Block... We don't need sleeves, we don't need block work to lay down 600whp. It's too similar in construction to a 3000GT's v6 not to say maybe even 900bhp+.
Other than the cast pistons, the 3vz-fe is stronger part for part than any other v6. It has yet to be seen if the biggest stock 3vz-fe can take down the biggest stock 5vz-fe. Why?

Because Neither Sean, nor I have set out to do it yet.

Like oil? 3vz-fe's don't. Yes, even 3psi at a cold idle is in spec... If you're not on the gas, they don't have a ton of oil pressure. This is great for turbo life.
FYI Camry 3vz-fe's have no oil pressure sensor installed while ES 300/Windom's do.
As long as the red light of death is off - you don't have an oil problem, no matter HOW bright the yellow low oil level light is! (That's an inside joke. I killed my OLS when I installed my turbo oil return somehow.)

3vz-fe redlines a 6850rpm, and the fuel cut is at 7100rpm.
Toyota RPM gauges read very, very slow I have logged my engine at 7400rpm on my SMT6... A 5vz-fe would come apart at that rpm without cams, valve springs & other work. Not us. (We have very diminishing power on stock cams after 6000rpm, however it's best to shift at 6500-6900rpm to stay in powerband)

We don't waste money on cams... Our engine has the biggest powerband (except maybe a 5vz-fe) under 3000rpm. We have OVER 100whp at 2000rpm. Yes... That's right... Only a 3vz-fe has the power to spin tires on the Camry platform!

We get HUGE gains from head porting!!!
Seam McElligott got 30-35bhp.
I did my MYSELF and got 25-30.
A Camry owner had his done and got 25, possibly 30.
What do cams do on a 3vz-fe? Turn it into a 1mz-fe! A cammed 3vz-fe made 220bhp on an MR2 with zero powerband.
We make 220bhp off P&P light N/A tuning, & a y-pipe... And still have the massive low rpm powerband.

The fully built N/A 3vz-e's made 320bhp.
A fully built N/A 3vz-fe should then make 370bhp. Hey... If two extra valves are good for 50bhps tock, they should be worth it built too!

The downside is that the 3vz-fe has stock cast pistons. Not a problem when you run the correct amount of fuel, however 1mz-fe's ahve cast pistons WITH a coating. They are minutely stronger (I say minutely because no 3vz-fe has hurt it's bottom end, stock 1mz-fe's have melted rings & pistons by running slightly lean at lower power levels than have been achieved by 3vz-fe's)

Despite what anyone says, the 5vz-fe has one important edge. Displacement... 11.7% displacement advantage will ALWAYS equal an 11.7% power advantage when comparing the same basic setup.
If you have money, this doesn't matter. A source once had a machinist calculate how far you could possibly stroke a 3vz-fe. 3.7L. The supposed kit that was coming from that was going to cost $4000+, and stroke to 3.5-3.6L.

I've worked on them all. Had a hand in one turbo 3vz-e, then turboed another from scratch. Turboed mine a few different odd ways so far. Rebuilt my 3vz-fe more times than you will ever want to know. Worked with 1mz-fe's & worked on 5vz-fe's.

3vz-fe JDM's have no EGR. US's can be throw away & blocked off. 1mz-fe1's? Nopers!
3vz-fe's have EVAP, but don't care if you throw it away. 1mz-fe's? Nope!
3vz-fe loose their 5-10bhp from carbon over a few years. 1mz-fe1's have HORRIBLY over used EGR systems. What a 3vz-fe builds up over a few years, a 1mz-fe1 builds up in 9 months. Guess what, that new 1mz-fe you bought? if the entire intake track hasn't been cleaned in the last 9-12 months, you can subtract 10bhp.

3vz-fe's are non-interference. 1mz-fe1's are also, 1mz-fe2's are not.
My 2 favorite demonstration pictures of all time.

Don't think that's important? I destroyed my first OEM timing belt doing a top speed run when I got to 143mph, but still made it home.

I split my second within min of if running the first time. Shutup. They were installed correctly...

Is a 3vz-fe perfect? No. is it more perfect than everything else? Yes.
It's the pinnacle of old & new engine design & controls when it comes to tuning.
SMT-6, or SMT-7's kick other piggybacks's asses.

Lastly, I like them & own them, so they're instantly 36.8427545% better than what anyone else owns!

MR2Board Forum Source Thread

A V6 Swap Primer

[Written by Brad Bedell]

Photos of V6 projects can be found here: (email me with links and I'll add your photos to the list)

http://bedellracing.home.comcast.net/

Engines: Compatiblity / Grocery List
1997+: 1MZ-FE
Best choice for swap.

1992-1996: 1MZ-FE
Compatible, but not recommended.
Early 90's 3vz is proven to work also*

Source Cars:
Avalon
Solara
Lexus ES300
Camry

What to Buy / Get with Engine:
"remember to get a 97+ manual motor w/ ecu or you will have drama"

-- Engine Long Block -dugh
-- Transmission (97+ recommended, not required for Turbo owners)
-- AC Compressor
--Alternator*
-- AC Lines to compressor (cut)
-- Alternator
-- Engine Mounts
-- Intake Tube w/ top of Airbox (ensure sensors are there)
-- ECU
-- ECU Harness (uncut)
-- Dash Plugs that go to ECU
-- Tachometer from 97+ 1MZ-FE Car (only if you started with a NA tach
-- Fuel Rails (94-95 1MZ-FE with return system)*optional
-- 94+ V6 Intermediate Shaft (with 6 bolts on CV joint) *must be modified
Credits -derek2000GT

Weight / Space Issues: Quick Read
There aren't really any weight issues when using a 1MZ-FE engine, in fact the stock engine is about 30lbs. lighter than a 3S-GTE. So don't worry about upsetting your balance.

Throwing a Supercharger/Turbo system on will add a few more pounds though, but it is definitely not an overbearing monster. (Credits: derek2000GT)

There is also the issue of space, which is another thing not to be worried about. The 1MZ-FE fits easily into the engine bay, and actually increases the space available on the passenger side for whatever performance part you'd like to stuff there. (Credits: Turbo Magazine, January 2003)

Engine Mounts: General
Someone should definitely post some blueprints here.

"In total there are 5 possible mounts--3 for the tranny and 2 for the engine (anterior and posterior). The passenger side 3S-GTE/5S-FE engine mount must be abandoned if you anticipate putting a supercharger on (and who doesn't)." -chall

I have built two motor mounts that use the pass side mount. Complete fabrication of all mounts is not necessary but recommended if you want a mount to absorb any engine noise.

Fuel Return: Adapting Properly
The MR2 comes stock with a fuel return system, which must be addressed by either installing the pump from the source car into the gas tank, tapping the fuel rail to accomodate the return line, or obtaining a fuel rail from a 3VZ-FE which is a direct fit.

3VZ-FE Option
"This is old news to Camry guys but a 3VZ-FE return fuel rail system will bolt right on to 1MZ-FE. this set up gives you the regulator, lines etc.. just bolt on. you can probably get one from junk /core motor at a yard for cheap. ...if you have a turbo and still have fuel line it will bolt right up. otherwise (non-Turbo owners) you will have to have new hose crimped on. The rails from a 94-96 1MZ-FE will have full return style system and your MR2 return line plugs right in.

...if you are a little unsure about tapping stock 1MZ-FE rail i would highly reccommend the 3VZ-FE rail install...save time and will be 100% OEM." -derek2000GT

Tapping the Rail Option
"The fuel rails are fine if you do not want a return system, but you will have to have a fuel pump with a FPR or an in tank FPR like a Camry, as the 3S-GTE has an FPR on the fuel rail in the return system. I have an adjustable FPR (AEM) on one of my fuel rails for when I go to larger injectors. I bored out the end of the stock rails, threaded them on the outside, and connected them with NPT fittings to the MR2 system." -chall

I have used the earlier fuel rails and also welded -6 lines with an adjustable regulator for my two cars.

Tachometer: Get it Working
"You will need to buy a tach from a 97+ 1MZ-FE equipped car. (AVALON, CAMRY, SOLARA, SEINNA, ES300) The tachs are the same on all models and will bolt right into cluster w/ no mods at all." -derek2000GT

"It is almost scary how plug and play most Toyota parts are, at least in this swap. The tach looks virtually identical to the stock MR2 tach (the mechanical part that attaches to the back of the face). ...we found that the tach slips right in and, thud, no tach adaptor needed." -chall

"You will need the tach overlay for an NA MKII MR2. It has a 180 deg sweep with a 6300 redline. As oppesed to a 180 deg sweep 7000 redline/ 7250 revlimit Turbo gauge. Without it your tach will be completely inaccurate. It fits and has the same font/ look as other MR2 gauges." -Luke

I have also used a 1k ohm resistor and diode hooked to two of the negative sides of the coils and used the stock tach. If I've not updated the link, I will shortly.
Using V6 Transmission: Shift Linkage
"You will have to drill hole on front side for rod for MR2 linkage
and buy a cover (has 4 bolts on other side of linkage)" -derek2000GT

BUT:
"The block-transmission bolt patterns on the 5S-FE, 3S-GTE, and the 1MZ-FE are the same. Any

transmission that works with one engine should work with any of them." -chall
(This includes manual transmissions)

Some Info About VVT-I
VVT-I Engines availble only in automatic, until 2003. (Manual Tranny bolts on though)
Wiring / ECU issues will need to be addressed, due to automatic transmission errors
TRD is developing piggyback VVT-I ECU, available 2003

A piggyback VVT-I controller is neccessary to properly run. (Wolf EMS: http://www.wolfems.com.au) - derek2000GT

Driveshafts: Adaption and Conversion
"The V6 intermediate shaft (A) bolt right to MR2 CV joint on passenger side. ....Use a V6 intermediate shaft that has 6 bolts on CV joint which is same a MR2 so you can bolt to outer MR2 axle" - derek2000GT

The 93+ Turbo drivers side driveshafts should fit properly, without any adjustments.

EDIT

Please see the FAQ on this, you will have to machine a new C-clip for the driveshaft to work. No one has successfully found a shaft that will correctly fit the V6 mount and MR2 tranny. Someone please update me once you find the correct part. (I want specific model and year info along with a quick photo if possible)

Radiator hoses I used
(1)71704 Hose to connect to the factory pipe in the engine bay, left side.
(2) 80413 Heater hoses 90 degree bend on the end.

These hoses work real well. I had to cut them to fit,but have the correct bends and are reasonably priced.

The right side hose will be a little harder, but consists of cutting the pipe under the car, rotating the bend roughly 90 degrees, and routing the hose up the firewall just on the outside of the Belt. I will post pics of this when I'm finished later this week.

Exhaust manifolds will need to be modified, see SCC's how to install a V6 for the most simple solution.

Pete94t

IF you don't want cruise, you can re-route the main line under the car to the driver's side and it's the perfect length to the throttle body, with no junction boxes the pedal feel is better.

Edit

This works well, I have this done on my Yellow 91.

Chall
Technically speaking, the solara/camry transmission is the E351, not the E153, and I think this denotes the difference in drive gear ratios and final drive. Also, the synchros are much better than in the '91-'93 turbo transmission. If you have the turbo transmission it will work, but you run out of first gear more quickly. Also, you can make the diode change that Brad discovered but you are going to have to use an electronic speedo with the solara tranny and so you might as well pick up a guage cluster and use both the speedo and the tach for your swap. this lets you get rid of the speedo cable, which removes one of the major hassles of taking the MR2 guage cluster out. Of course, you will need the linkage from an MR2 transmission and also need to drill a hole to use this linkage on the solara tranny--easy to do.

The half shafts are turbo on the driver's side, and solara on the passenger side only because there is a 1/8" or 3mm*** difference in the carrier bearing position. Turbo shafts will fit nicely in the solara transmission. I had the bearing ring machined so that I could use the turbo passenger side shaft. It is impossible to combine the two shafts to make one as the type of CV joint on the solara shaft is enclosed and the diameter of the shaft in the CV joint is smaller.

Personally, I think that the passenger side mount for the engine should be abandoned altogether because you cannont add the supercharger and you will definitely want to add the supercharger.

Front and rear engine mounts are not hard to fabricate and I have autocad diagrams of one design, but not the only design by any means.

--I have lowered my compression ratio by using 8.5:1 JE pistons and Eagle 22R rods but the rods take machining to thin them for the 1MZ (by .135 per side) and they are about .012 different in their C-C. But you can get them on Ebay and they are an initial $350 investment plus whatever it costs in your area to machine them. When and if you order pistons, let them know so that you can get pistons with the piston pin positon correct.

--I would use the 1MZ alternator. What Luke and I did was to attach the wires to the alternator using simple electrical connections and pouring epoxy around the connections so that now we have an alternator that has the long wires attached.

Claire

*** Edit by Brad, Original was 1cm

Chall
If I am understanding correctly, you are asking whether the turbo transmission without LSD uses the same axles as the LSD E153 and the Solara 351. I put a Toyota MR2 LSD into a Camry 5 speed (year 2000) and it uses the MR2 axles that I had machined to move the carrier bearing retainer groove. Of course, the differential defines which axles are used in these transaxles, so using an MR2 LSD (which fits exactly) guarantees that the turbo axles will work.

I don't have succesful experience with mixing axles. I tried it but perhaps I used a too new axle to try to change the intermediate shaft, as the newer axles from the Solara/Camry are entirely different from the '90/'95 US MR2 axles. It cost me $50 to have the turbo axle machined, and I thing that was kind of a rip-off.

Here is what I think about the swap:

--Not much needs to be done to the 1MZ-FE itself unless you are going to more than 4 PSI of boost. Derek has found that the return fuel system from other engines works well, or you can simply drill and tap both ends of the fuel rail and make a U-shape out of it to make a return system.

--You can use the stock Solara/Camry ECU, auto or manual, with the wiring diagrams that Luke worked out.

--I would abandon the passenger mount and make front and rear engine mounts for the 1MZ-FE so that you can supercharge later.

--I would abandon the turbo/NA water system after the main pipes beneath the gas tank, and connect more directly with a couple of pipe bends.

--I would get rid of the brake booster line across the firewall.

--I would move the oil filter with a remote kit.

--I would have the passenger axle machined.

--If you want A/C, have the MR2 lines tig welded to the 1MZ-FE lines. There may be much better solutions; I don't know.

--You can direct connect the cruise control to the throttle and the throttle body very simply, but you have to move the throttle cable to the drivers' side.

--I prefer the ratios of the Camry/Solara transmission E351 over those of the MR2 E153.

Overall, this is a simple process and should not take long if you prepare for it.

SBCelicaGT

1MZFE engine debuted in 1992. in 1997 it was updated with among other small changes, a returnless fuel system. later on it had VVTi as an option. all 3 generations of engine are aluminum. the 92-96 return fuel rails will bolt to the gen2 engines. or you can make your own returnless fuel system and it doesnt require any drilling or tapping.

axles: all the solara/avalon/sienna/ etc. axles I have seen arent rebuildable. I.E. they dont have the bolts in the middle to attach the inner and outer sections.

the mr2 turbo inner axles work just fine with the Solara tranny. the only mod you need to do is to slot the carrier bearing mount ever so slightly as it will be off by a few millimeters. For the celicas, you can then bolt outer alltrac axles to the inner turbo axles. for you mr2 guys, you can just use the whole turbo axles.

ecu: auto tranny ecu will work but you will have ECU codes till you find a way to fool the ECU into thinking there is an A/T in your engine bay by way of wiring resistors to the ends of the solonoid plug. Easy fix.

ARP main studs:

16 300-8343 7/16 12pt Nut
16 200-8519 .750 od washer
16 AM4.125-1lb M10x4.125 1.25/1.50 Broach (Stud)

These studs fit the motor with no modifications. Torque them to 65lbs with the ARP lube.

Rod update

Eagle rods for the 22R will work. You will need to do the following:

Mill down the big and small end of the rod .270 (.135 on each side)
Modify either a set of 22R rod bearings so that they fit the new rod width, or modify the bearing locator slots in the rods.
You'll have to radius the big end to get it to fit into the cylinder bore. *OR* I think boring the motor .040 would do the trick.
Also, be advised that you are adding close to 100 grams of weight to each cylinder. Adding metal to the counter weights on the crank will be necessary.

Good news, the Eagle rods will be tons of overkill on this engine. I suspect the block will fail before the new rods.

-Brad

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V6 How To-A Visual Aid

[Written by Node]

Removal of the stock motor 3S or 5S. Keep the parts organized, you will be using many on the V6 motor.

Things to remember:
Cap off coolent hoses
Protect fuel lines from contaminants and dont loose the banjo bolts and crush washers.
DONT CUT your wire harness, if your using a stock ECU you will be grafting the old MR2 harness into your V6 harness.

Keep the stock starter relay, you may remove the fan control and the stock ECU

The following is exactly the same for 3s or 5s swaps.

When your engine arrives check it over for sludge. Keep in mind some of the V6'es have been in grandmas car and may not have seen much attention.

This motor is a 5VZ but the swap is nearly identical to all other swaps. Notice the complete lack of motor mount on the front of the engine.

This is the 3S flywheel sitting on the 5VZ crank. I suggest replacing the 5VZ flywheel with a 1MZ wheel rather than modifying the 3s wheel.

The 3S-GTE pully fits right onto the 5VZ crank, the 5S pully should too. Remember to RE-mark the 4cly crank pully, the timing marks are in a different location than on the v6

You can not use the 5VZ spacer plate because the starter is on the opposite side. You will need to "modify" the 3S or 5S plate.

1MZ flywheel with MR2 TURBO pressure plate and disk

Here you can see an issue with the axel from the turbo transmission and the 5VZ block. There is no mount location for the axel holder. You will need to make an adapter that will bolt into the motor mount location.

Yes you CAN drop the motor and transaxel in from the top, by yourself

I would say even the 4.0 v6 should fit through the top.

Here you can see a prototype adapter for the turbo axel. This should give you a good idea of how everything could bolt up without needing to machine the axel

.

This is the coolant outlet on the 5VZ. Since its from a truck it faces the wrong way and needs to be cut and reshaped. I used an angle grinder, torch and bigass hammer. EDIT: the plastic 3VZ-FE coolant outlet bolts up and requires no moddification

Here is the Cummings turbo coolant F pipe that works perfectly as a coolant fill pipe and heater core hose.

Sorry these are blurry but it serves as a warning to everyone planning a swap. You should get your ECU, harness and, engine from the same year. Toyota was nice enough to move some pins around between 96 and 98 so I had to MAKE my own ECU connector with DB25 computer pins and hot glue. Can you say "GHETTO" I think I can

You can swap all the mount plates from your 5s ECU or 3s to the OBDII ecu and it will mount in the stock location. I have an intercooler pipe running through there so I mounted it on the trunk floor.

Good luck.

Jim

[AndrewMcG]

I thought I would add a couple picks to this thread since I have yet to see any real good pictures of Jim's motor mount actually mounted on the engine. I had a hard time picturing it until I had one in my hand so I hope this helps somebody.

MR2Board Forum Source Thread

Solving The Valve Cover Gaskets, Permanently

[Written by Toysrme]

I didn't write this for yall, as most of you guys have obviously not experienced leaking valve cover gaskets. (yet) I figured maybe some of you guys doing your swaps could save a lot of trouble for yourself down the road.

This is a "your thoughts" thread. I'm not saying this is how to do it (Tho This is what I've done).
(For the remainder of the thread VCG - Valve Cover Gasket. RVCG - Specifying the REAR Valve Cover Gasket, FVCG - You are a moron if you need this definition)
It's obvious Toyota's implementation for the v6's doesn't work. Blame whatever you want, but there is no arguing the fact that it simply does not work. Worse, nearly every engine has a VCG leaking to some extinct, almost EVER engine will have the RVCG leaking over time.

IMHO it's from a culmination of two things:
1) I don't like the groove style VCG. The flat engine's use corker, rubber"ish", or rubber/steel core gaskets & have less problems. Not only that, but it is advantageous in that if it is ever replaced (for any reason) you simply use a tube of gasket maker & the seal is nearly indefinite. When applied correctly, they won't leak until you break the seal!
2) Improper valve cover gasket bolt torque. Even tho the rubber gasket provides some tension on the cylinder head bolts, the spec is 4.3-5.75ft-lb. They easily get loose, or are extremely over tightened when repaired.
3) 1 & 2 are compounded by the huge rearward angle the v6's are tilted at.

So I'm sick of it. Sick of hearing about it. Sick of most of us considering it a "routine maintenance" item that should be replaced every time someone is going near them. "Oh well you're getting X done, Have them do the VCG's before they start to leak!" etc.

Here's how I think we deal with it once & solve it for the last damn time.

Supply list:

Ultra Black RTV. RTV is *the* gasket "brand" of choice by everyone. Ultra Black is a premium line, and Permatex's most oil resistant RTV gasket. Even better. It is apply & go. (Non-premium RTV's need time to setup when mounted & some need to be re-torqued.) It could take 2 tubes. I used 1.
Thread Locker (Medium - Loc-tite & Permatex Blue)
M7-1 Tap
Acetone, Paper towels, Q-tips. (Ya, ya Alcohol works, Acetone just eats oil so much faster tho!
Ventilated area for both)
Scraper (or something with a flat edge you can level with)

1) Clean the gasket mating surfaces with Acetone. I find you can push paper towels through the groove, but a few Q-tips make very short work of it & you can be sure you've cleaned it thoroughly.
2) Completely fill the groove with RTV & scrape it flat so that it's a flush surface.
3) Run your tap down the threads of the valve cover bolt holes. This will clean the threads up.
4) (After the RTV has cured - 24 hours) Apply your "normal" 1/4" bead of RTV as a normal application.
5) (IMMEDIATELY) Put valve cover on & bolt it down. Since we're no longer using a "light pressure to seal" gasket. Torque the valve covers down to say 18-20ft-lb.
Using online calculators: The stock bolt & hole threads have a Recommended Torque of 15.2 ft-lb & Maximum Torque of 20.2 ft-lb (Not freaking 4-5ft-lb!?)

I don't think it would be wise to drill & tap for a larger size, though someone could. It'd be hard to drill large enough to have good threads, without having some huge bolt running down it. (I just don't think there is any reason for like an M10. Those would hold 40-50ft-lb! That's above the head gasket range!)

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How to Build an Oil Filter Relocator... For cheap

Needed:

Four - 3/8" barbs (3/8" = 9.5mm)
Four 3/8" hose clamps
6' 3/8" Fuel/Oil hose
Ultra Black RTV
You will need a tap for your barbs if you don't have one. $2.50 shipped - ebay

Instructions:
There isn't anything to say that isn't obvious. Take the stock Toyota oil filter stand- off & cut it in half. Tap (& drill if needed) the channels to accept your hose barbs. Put your sealant around the threads & tighten (15ft-lb, or pretty hand tight is good enough).
From there you have the one end that bolts to the block & the other that has the oil filter. You can relocate it anywhere you want. You can easily add dual filters, and/or an auxiliary oil cooler.
The half where the oil filter goes is pre-tapped with two plugs at the ends of the oil channels. One can be removed to install an oil pressure fitting, or a hose barb (1/4", or 3AN) if you need a turbo / supercharger oil supply.

****

For people not able to drill out their own channels, it may be hard to find 3/8" barbs that do not require drilling holes out before tapping them. I had my local Nut & Bolt house order me some to my

specification. (9/16"-18 NPT w' 3/8" barb)

Note If you're not afraid of under sizing the , 5/16" barbs are very common. The thread size is generally 9/16"-18 thread. The tap will fit straight into the oil channels without drilling.
So if 3/8" barbs are unavailable, you can always try common 5/16" barbs. (0.375" VS 0.3125"). I wouldn't add a cooler on 5/16" lines, but otherwise there shouldn't be a problem.

This part is used only on the 3.0L Camry platform as far as I know. The reason for the part is because the y-pipe does not give clearance for the oil filter.
This will bolt to any 3vz-fe, 1mz-fe, 3vz-e, and 5vz-fe. Possibly other VZ/MZ v6's.

Here's the 3vz block - (3vz-e picture)

MR2Board Forum Source Thread

Toyota V6 Swap Candidates

[Written by Oteck]

Engine: There are too many to count as toyota used them in alot of vehicles

3VZ-FE toysrme?
4VZ-FE JDM?
5VZ-FE Found in 1995.5-2004 Tacomas, 96-02 4runner, 95 T100(Rumor has it this was a Disti 5vz),00-03 Tundra -Weasy2k

1MZ-FE 94-99 Avalon, 94-02 Camry, 99-02 Solara, 98-03 Sienna
1MZ-FE*^ 03-04 Camry/Solara
1MZ-FE* 98-99 es300/rx300, 00-04 avalon/sienna 01-04 highlander
2MZ-FE* JDM?
3MZ-FE*^ 03-05 highlander, 04-05 Sienna, 05 camry/solara, 03-05 RX/ES 330

1GR-FE*^ 05 Tacoma
2GR-FE*^ 05 Avalon, 05 Rav4
3GR-FE*^
4GR-FE*^

2GRS-FE* IS350!!! i want!

* vvti equip
^ Drive by wire

Note: a Supra engine WILL NOT FIT!! it's an inline6 get with the program!!

Drive by wire:
Out of all the new v6's only the vvti 1mz never had it. the 3mz and gr series are all equip with it. There is also the +03 camry/solara too but they don't have vvti. I wouldn't suggest anyone to use these unless you plan to use a gr engine. Other wise you'll have to deal lag; the pedal is designed for fuel economy in mind....

Transmission: The following transmission will work with some modification
E153 - although big compared to the s54 it's much stronger and can take a beating. Mr2 transmission may need to have it's dowel pins remove to fit on the block. I didn't document the number of bolts used in a mr2T bellhousing as im using a v6 bellhousing w/ internals. but from my understanding it will cover more than the s54. Theres also a plus to using this tranny since some

comes with LSD.

S54 - Opposite from the tranny above the mounting holes need to be enlarge.

note: if using an e153 on a n/a chasis you need the rear turbo hubs, axles and shifter cables

Clutch/Flywheel:
You need a v6 flywheel from any of the engine listed above that came with a manual transmission. With the exception of the vz's truck flywheel. The MR2T flywheel will not work as the crank pattern is different; you can weld/redrill it but that will just compromise the strenght of the flywheel. Using a e153 you can use a stock turbo cluch setup but if using a s54 you need a E153 pressure plate and a s54 clutch combo (splines on the tranny is different)

Carrier bearing:
Every v6 from my understanding has one except for the longitudinal mounted ones like the 5vz's. BUt if your using an S54 the axle doesnt need it. This is only for those using the E153. The bearing on Mr2T axle needs to be moved about 1/4" left or right im not sure anymore it's been too long.

Motor Mount:
In an Mr2 setup there are 4 mounts; 3 sits on the transmission and the other sits on the waterpump bracket (passenger side). You only need to make one mount for the passenger side. I suggest buying a spare driver side mount from the transmission and shaving off the plating and build a mount around it. You also need to reinforce the metal cylinder around the rubber mount because it has a weak spot. Mitch has a draft for the plate that goes ontop of the water pump bracket.

Exhaust:
Other than the 5vz where the exhaust joins ontop of the tranny, they will merge under the oilpan. Headers that come with precat are not usable as they will hit the motor mounts. Theres too many variants but i'll just leave it for the exhaust shop to deal with

1988-1991 2.5 L 2VZ-FE V6, 158 hp (118 kW) at 5800 rpm with 152 ft·lbf (206 N·m) at 4600 rpm
1988-1995 3.0 L 3VZ-E V6, 150 hp (112 kW) at 4800 rpm with 180 ft·lbf (244 N·m) at 3600 rpm
1992-1993 3.0 L 3VZ-FE V6, 185 hp (138 kW) at 5800 rpm with 189 ft·lbf (256 N·m) at 4600 rpm
1994-1995 3.0 L 3VZ-FE V6, 200 hp (149 kW) at 5800 rpm with 204 ft·lbf (277 N·m) at 4600 rpm
1995-2004 3.4 L 5VZ-FE V6, 190 hp (142 kW) at 4800 rpm with 220 ft·lbf (298 N.m) at 3600 rpm

1992-1996 3.0 L 1MZ-FE V6, 185 hp (137 kW)
1997-2001 3.0 L 1MZ-FE V6, 194 hp (145 kW)
2001-2003 3.0 L 1MZ-FE* V6, 220 hp (164 kW)
1997-2001 2.5 L 2MZ-FE V6, 200 hp (149 kw) at 6000 rpm with 180 ft·lbf (244 N·m) at 4600 RPM
2004-2005 3.3 L 3MZ-FE* V6, 230 hp (172 kW)

1GR-FE* 236 hp (183 kW) at 5200 rpm with 266 ft.lbf (382 Nm) of torque at 3800 rpm
2GR-FE* 268 hp (200 kW) at 6200 rpm with 248 ft.lbf (336 Nm) of torque at 4700 rpm
2GR-FSE** 315 hp (232 kW) at 6400 rpm and 377 Nm (277 ft.lbf) at 4800 rpm
3GR-FE* ???
3GR-FSE** ???
4GR-FSE** 204 hp at 6400 rpm with 265Nm of torque at 4800 rpm

*single vvt-I
** dual vvt-I

[Jason.MZW20]

SAE J1349 specs:

MZ, VVT-i, 2000+

3.0L 1MZ - 190hp @ 5600rpm, 197lb-ft @ 4400rpm (87 octane)
3.0L 1MZ - 198hp @ 5600rpm, 211lb-ft @ 4400rpm (91 octane)#
3.3L 3MZ - 210hp @ 5600rpm, 220lb-ft @ 3600rpm (87 octane)
3.3L 3MZ - 218hp @ 5600rpm, 236lb-ft @ 3600rpm (91 octane)

Estimation - engine was not tested with 91 octane

Note the loss in performance by using 87 octane.

GR, VVT-i/DVVT-i, 2003+

4.0L 1GR - 236hp @ 5200rpm, 266lb-ft @ 4000rpm (87 octane)*
4.0L 1GR - 239hp @ 5200rpm, 278lb-ft @ 3700rpm (91 octane)*
3.5L 2GR - 268hp @ 6200rpm, 248lb-ft @ 4700rpm (87 octane)**
3.5L 2GR - 272hp @ 6200rpm, 254lb-ft @ 4700rpm (91 octane)**

Direct injected, RWD versions
3.5L 2GR - 306hp @ 6400rpm, 277lb-ft @ 4800rpm (91 octane, IS350)^**
3.5L 2GR - 303hp @ 6200rpm, 274lb-ft @ 3600rpm (91 octane, GS350)^**
3.0L 3GR - 245hp @ 6200rpm, 230lb-ft @ 3600rpm (91 octane)**
2.5L 4GR - 204hp @ 6400rpm, 185lb-ft @ 4400rpm (91 octane)**

* Single VVT-i, roller rockers
** Dual VVT-i, roller rockers
^ Dual fuel injection or D-4S, port and direct

Also:

The 1MZ had two variants in non VVT-i form, based off of the 1997 returnless fuel system model.

Camry, 1997-2003
3.0L 1MZ - 194hp @ 5200rpm, 209lb-ft @ 4400rpm

Solara, 1999-2003
3.0L 1MZ - 200hp @ 5200rpm, 214lb-ft @ 4400rpm

According to official Toyota papers, engineers changed the intake and exhaust plumbing to enhance the 1MZ's performance specifically for the Solara.

MR2Board Forum Source Thread

How I did my V6 swap-A Stock 2001 1MZ

[Written by DaveMush]

5sfe swap to 1mz wiring diagrams

1991 5sfe to 1997 1mz Swap Wiring Diagrams

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Beams Engine Swaps

GUIDE: Cost Effective Beams Swap

[Written by Roman]

Well... This seems to come up every now and then.

People complaining that the beams engine is too rare/expensive.

So here's my guide, on how to go about getting a 200+hp 3SGE, for the least amount of money!

Firstly, the gearbox: Your standard gearbox is more than fine. LSD is fun, but definitely not needed. Standard hubs/axles/etc are fine too.

Clutch: You cant use a 5SFE clutch/flywheel.
One from a gen 2 or gen 3 3SGE is fine. (note: gen 1 3S clutch will not work!)
The PCD of the flywheel bolts/crank is slightly larger on the 3S.

You can use a 3SGTE clutch cover plate and flywheel, but you need the clutch disk from a certain type of Hilux to make it work. As the input shaft spline diameter is different between turbo and NA gearboxes.
Although of course if you're running a turbo gearbox (Which I dont reccomend) You need a clutch disc to suit an E153 gearbox.

Engine:
Alright this is a big call, but: Screw the redtop!
Basically, you're paying a premium for an engine that isnt as rare as people make it out to be, and, according to CelicaRA45, who has had one of each and pulled them apart, the ONLY DIFFERENCE to a caldina 'greytop' engine, is the fact that the rocker covers arent red.

Worth an extra $3k? I dont think so!
UPDATE: I've now learnt, that there is a difference between the redtop and greytop models... The greytops have the catalytic converter built into the headers! As opposed to near the muffler for the SW20 and Celica. Which probably accounts for the 10hp difference. So get a decent set of headers, and you'll more than likely get your 10hp back.

Caldina GTs are fairly common, definitely a lot moreso than SS2 celicas, or gen 5 SW20s! I see one at least once a day here in NZ.
Look to get one imported from a country like New Zealand, I think you'll pay less of a premium for the engine/shipping than from Japan.
Also Caldina GTs are getting to the age where they are no longer in Japan all that much, so countries like NZ are getting flooded with them.

Wiring/ECU.
Okay, now here's the biggest problem with running a Caldina engine.
Basically, they're all autos.

I dont know how expensive a wiring loom is to suit an SW20 from toyota, but I'd imagine it's prohibitively expensive.
I'm not sure how hard it is to run it with a manual transmission, as I've never tried. I believe there's a way you can fool the auto trans computer with resistors or some such thing.

UPDATE: The way to go about this, is to earth out the pin that leads to the auto trans, which makes it think that the car is in neutral.

I'm not sure which pin exactly this is, but that's how you do it. There's a guy in oz running a caldina beams auto engine in his AW11, and this is what he did.

The biggest advantage of getting a beams engine from an SW20 to swap into an SW20, is that the wiring is all virtually plug and play, barring one or two small items which are easy to solve. (Well it may be more complicated, if your car started life with a 5SFE)
Using a caldina loom, may take a significant amount of time tracing wiring etc.
I wouldnt reccomend using this engine, to someone that isnt familiar with wiring etc... You'd end up spending more than the cost of a redtop, just getting the wiring redone, etc.

I dont know for sure, but it's possible that the auto ECU is tuned for 190HP instead of 200hp.
I would imagine because it's got to pull around a lardy 4WD wagon instead of a light sports car, perhaps they have to retard the ignition or some such thing.
I've also heard that compression ratio is 10.5:1 instead of 11:1, but I cant say for sure. CelicaRA45 says they are Identical, and he knows what he's talking about.

UPDATE: See above... 10hp difference is more than likely thanks to the catalytic converter being built into the headers.

Tacho signal/speedo signal.

Two ways to go about this. If you have a gen 2+ car, use the electric speedo signal from your existing gearbox.
If you have a gen 1, you can either use the cable, or convert it to electric. No problems either way! I'm using a cable, and the ECU still gets the speedo signal.. As I've still got the 180ish KPH speed cut in place.

For the tacho signal, you can either get a rev counter mechanism from a 1997+ toyota that has the same rev counter scale, or alternatively, get a tacho signal adaptor, to make your existing tacho work.

Basically, the problem is that the beams engine runs coil pack ignition, and the gen 2 or 3 3SGE or 5SFE doesnt.
So the 'old' signal runs at 20 volts or so, as it comes straight from the distributor.
The 'new' signal runs at either 5 volts or 12 volts, as it comes straight from the ECU or coils.

I've done a few things the hard way along the way with mine, so I thought I'd compile a list of things that might make it easier for someone else.

MR2Board Forum Source Thread

Writeup: RWD beams to transverse (Or vice versa)

[Written by Roman]

Okay, so this seems to come up every now and then, usually people wanting to know if they can fit an Altezza engine into their MR2.
A few people have fitted FWD engines in a RWD setup, which is easier on some regards, but has it's own set of problems too.

Okay, so what are the main differences between the two engines, and how/why are relevant to wedging a dual VVTI engine into that MR2 engine bay?

(Note... any time I say 'fwd', I mean 'transverse', as in east west configuration. Any time I say 'RWD' I mean north/south)

engine power/benefits
Firstly, I think that this is the most important thing to consider here.
To put a RWD engine into a FWD car, you need FWD beams bits anyway (Which arent cheap/easy to get!), will have a lot harder time with wiring etc, will be hugely more expensive. For what gains? A measly 10hp, and exhaust side VVTI which is more trouble than it's worth.

Adjusting the cam profile on the exhaust side has a negligible effect on power output... It's primary function is to increase fuel efficiency.
So what other benefits does the RWD engine get, that make it worth all of the hassle?
It's got 11.5:1 compression; FWD engine has 11:1
The Altezza dual VVTI engine has Titanium valves on the intake side, sodium filled valves on the exhaust side.
The FWD engine has the sodium cooled exhaust valves, but not the titanium valves on the intake side.
The cam profiles are more than likely different too, but I cant confirm that.
Higher rev limit: RWD engine goes to 7800, FWD goes to 7400.

So the million dollar question still remains: Are these features worth all of the extra struggle and pain, compared to fitting a FWD engine instead?
Not in my opinion, but some disagree.

I'm doing exactly the opposite to this; fitting a FWD engine into a RWD setup.
I'd rather have the RWD engine; but I've already got a rebuilt redtop sitting in the garage that's looking for a home, and the RWD engines are still expensive and hard to come by. It's far more economical, for me to convert the FWD engine to RWD instead.
Which is how I've come across most of this information, as I need to know which RWD bits I need to buy/steal/make/etc.

At this point, I'd just like to say a huge thanks to Glenn AKA CelicaRA45, who has been a huge help, and has shared with me the majority of this information.

Okay, so here's the basic differences that you need to know about:

Sump/dipstick
On the Altezza engine, the sump is waaay at the front of the engine, to clear the RWD cross member. It's also on the wrong angle, as the RWD engine stands upright, instead of leaned over. To make this work in a transverse setup, you'll need a FWD sump, dipstick, and oil pickup. These bolt straight on either engine, so no problems there.

Intake manifold.
A RWD intake manifold faces away from the engine; the FWD one wraps over the top.
A FWD intake manifold on a RWD car will want to stick through the top of the bonnet;
A RWD manifold on a FWD car will want to stick through the firewall. (Into the boot on the MR2)
It's also worth noting, that the throttle body is on the other end of the plenum... The FWD one faces the gearbox, and will basically be touching the firewall in a RWD setup, and the RWD one in a FWD setup will point into the right rear corner of the engine bay, (Or more to the point, into the boot!) Where it isnt really practical to have an air intake setup.
So you really need the correct manifold for either situation.
They are interchangable, but you'll definitely want to run the throttle body to suit the ECU that you're using, if factory. You'll need to make custom mounts to fit the altezza throttle body onto the FWD intake manifold, or vice versa.

Exhaust Manifold
The FWD exhaust manifold faces directly down, and goes under the sump, and out the back. Whereas the RWD one runs down the length of the engine, and exits at the bottom rear. Obviously not suitable for a FWD setup.
The redtop exhaust manifold will bolt directly onto an Altezza engine, or vice versa.

Cam covers, RHS/front engine mount
The Altezza engine only uses two engine mounts, which are on either side of the engine block. In a FWD setup, the only mount that's on the engine is at the 'front'. I dont know for sure if the FWD engine mount will fit to the Altezza block, from memory I believe that the Altezza cam belt setup interferes with the FWD mount position. I believe that using the FWD cam belt tensioner, and a few other FWD bits alleviates this problem, but I cant comment for sure.
Also, the RWD cam belt cover sticks a considerable distance further away from the engine block than the FWD one, and wont physically fit inside the engine bay. It's often said that the exhaust side VVTI clashes with the strut tower, this isnt true. The exhaust side VVTI wheel is strangely huge, but it is actually clear of the tower. It's the cam belt cover that's bigger, on account of the exhaust side VVTI.
The intake side VVTI wheel appears identical to the FWD equivilent, and therefore shouldnt be problematic to fit.
From personal experience, my cam belt cover is HARD up against the strut tower running a FWD engine, so I know that you'd have no chance of fitting a RWD cam belt cover on it. I'd imagine that using a FWD cover and notching the exhaust side for the oversized wheel would be the way to go.
Running a FWD in RWD configuration gives no problems here, using the FWD covers etc is fine.

Water lines/galleries/etc
The FWD rear water outlet is different between the MR2 and Celica. The MR2 one has two hoses on it, one for the radiator hose to the radiator, and one for the filler cap. The Celica one obviously only needs one hose, as the filler is on the radiator itself.
I've studied the RWD water lines a little so far, and I'd say that you wont have much of a problem running them in a FWD configuration with some creative running of waterlines.
If you want to run the FWD waterlines, you need to run a FWD headgasket. The Altezza gasket has the water outlet at the other end of the engine, so it has different holes in it for the galleries.
Conversely, you need to run a RWD gasket to suit the RWD water outlet etc.
It's a bit harder the other way around though, as the FWD outlet wants to stick through your firewall.
It's also worth noting, that despite what I thought earlier, the RWD engine only has one oil gallery from the block through to the head for VVTI, despite having dual VVTI. It's in the same place as the FWD one, but is a larger diameter. If you wanted to run the FWD head gasket on the RWD engine, you'd want to oversize the hole on the gasket there, or at least check it to see what size it is.
I cant see why you couldnt run a dual VVTI head on the FWD engine, however you'd need a stand alone ECU to do it.

Oil drain from the head

The Altezza engine runs an oil drain down from the head, that the FWD engine doesnt have.
The FWD engine has something similar, but it's at the top of the rocker cover; the RWD one is down lower.
The FWD engine obviously uses gravity to drain the oil back out of the head, as it's on a lean.
If you wish to use a FWD engine in a RWD setup, this is potentially important. You could get oil drain back issues, where the head fills up with oil, and the oil pickup sucks dry, which usually results in your bearings giving up.
If you use the Altezza rear water outlet, (Which has the oil drain integrated) and tap a hole into the FWD head to suit, you can run this oil return to the sump.
The FWD engine has a big pipe running from the rear of the rocker cover back down to the sump, it leads to the same place in the sump as the RWD one.
You'd want to block this off, if you're using the RWD oil drainback.

Wiring issues
Well... I cant comment too much here, as I have never attempted this.
All I can say, is that someone got as far as getting the engine in with all of the FWD bits needed, and ground to a halt when they got to the wiring required.
One thing I can say for sure, is that running the Altezza dash unit is necessary. The FWD beams computer outputs the signal to the dash unit in the traditional way...
One wire for water temperature, one wire for speedo, one wire for tacho, etc.
However the Altezza system runs differently. It only runs one wire to the dash for all of these, called 'MMC' or 'MMX' if I recall.
I cant remember what it stands for, but basically it sends this one signal to the dash with all of the information imbedded in it; this signal is interpreted by the circuitry in the altezza dash; and sent to the appropriate gauges etc.
I dont know if it's possible to split the MMX signal back into traditional ones, you could probably get the factory MR2 dash working, using the circuitry from the Altezza dash as the inputs. I'm not sure about that one.
I'll be trying to wire an Automatic Celica loom into my Carina, which since it currently has a carby engine, doesnt have much wiring to integrate to at all. So it should be an interesting (read: nightmarish) experience.

MR2Board Forum Source Thread

Part Numbers

There are no articles in this category.