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# MR2 Technical Knowledgebase

*All Articles in All Categories*

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## 3S-GTE ECU Pinouts (All generations)

The following diagram contains pinouts for the following 3S-GTE engine configurations:

JDM SW20 GEN 3 1994-1998  
JDM ST205 GEN 3 1994-1998  
JDM SW20 GEN 2 1993  
JDM ST185 GEN 2 1993  
USDM SW20 GEN 2 1991

### GEN3 3S-GTE PLUG ID

BA-1/EA-3(Engine Relay/Fuse Box 18 pin)  
Loc. ID Color &rsquo;91 Gen2  
18-1 TC on check connector White Same  
18-2 TS on check connector Yellow Same  
18-3 Intake Manifold Ground Wht/Blk Same  
18-4 Alternator L Terminal Yellow Same  
18-5 Igniter Black Same  
18-6 Water Temp Sensor Yel/Grn Same  
18-7 Oil Pressure Switch Yel/Blk Same  
18-8 Ignition Switch Red Same  
18-9 Not Used Brn/Blk A/C VSV  
18-10 Not Used Yel/Blu A/C VSV  
18-11 Not Used Red Oil Level Sensor  
18-12 Not Used Red/Yel AB on Check Connector  
18-13 Back-Up Light Switch Red/Blk Same  
18-14 Air box Temp Sensor Brown Not Used  
18-15 Not Used Not Used  
18-16 A/C Magnetic Clutch Blk/Wht Same  
18-17 Alternator S Terminal Wht/Red Same  
18-18 Not Used- Pink Cruise Control ECU  
Need to connect to 16-12 on engine ECU for gen3

AB-1/EA-1(Trunk Body Harness 15 pin)  
Loc. ID Color &lsquo;91 Gen2  
16-1 Tranny Speed Signal Brn Not Used (Mech. Speedo)  
16-2 Not Used Grn/Red Circuit Opening Rly to ECU 26-17  
Need to connect wire from gen2 to engine ECU 22-14 for gen3  
16-3 Eng Comp Temp Sensor Blu/Org Same/To Cooling Fan ECU #6  
16-4 Eng Comp Temp Sensor Blue Same/To Cooling Fan ECU #5  
16-5 Dash Warning Light Blu/Yel Same/To Cooling Fan ECU #2  
16-6 Not Used Not Used  
16-7 Not Used Wht/Blk Starter Relay #3  
16-8 Engine Hood Switch Red/Grn Same (TDS)  
16-9 Cat EGT Pink Not Used  
Need to connect to engine ECU 22-16 for gen3  
16-10 Tranny Speed Sensor Vio/Wht Same/To Cruise Control ECU  
16-11 Dash Boost Gauge/PIM Blu/Blk Same/From TPS  
16-12 F/P Check Connector Blu/Blk Same  
16-13 F/P Relay Blu/Red Not Used  
Need to remove wire engine ECU 22-6 from gen2 harness and connect here for gen3  
16-14 Not Used Not Used  
16-15 Check Engine Light? Grn/Wht Not Used  
No connection

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## Gen III Differences

The Gen III 3S-GTE engine was introduced on the 94+ Turbo MR2 in the Japanese Domestic Market.

Here's a list of some of the documented changes from earlier 3S-GTE versions:

- MAP sensor instead of AFM
- Different ECU
- Bosch D-Jetronic (Gen III) vs. L-Jetronic (relatively primitive) engine management
- CT20b turbo replaces CT26
- Boost raised from 10psi to 13psi
- Fuel cut raised from 12 psi to 18 psi
- 4 wire O2 sensor
- Revised Head design - Shim under bucket valve shims
- Slightly more aggressive cams - Gen 2 = 236, Gen 3=240 & 0.5mm more lift
- Revised internals (pistons, con-rods etc.)
- Revised cylinder head cooling passages/water jackets
- Revised intake manifold (8 'independent long ports' reduced to 4)
- intake manifold inlet air temperature sensor added after turbo and intercooler
- Revised exhaust manifold
- Revised gearbox with close ratio gearing
- lower compression ratio
- stainless steel head gasket
- factory 540cc injectors replace 440cc injectors
- revised fuel rail with bigger bore and relocated pressure regulator
- The fuel pressure raised from 36 PSI (2.55 bar) to 41 PSI (2.9bar)
- TVIS eliminated
- EGR eliminated (on all JDM models, not just the Gen 3)
- LSD in 80% of them
- throttle body increased from 55mm to 60mm
- inlet valve lift increased from 8.2 to 8.7
- Less restrictive exhaust elbow
- Aluminum oil pan
- more rigid alloy sump and additional oil baffles
- Factory Catch can
- Better Oil Cooler and relocated oil filter (bottom)
- 4 Channel ABS coupled with Traction Control available
- Number 1 compression ring described as "stainless steel" instead of just "steel"
- Oil ring is described as "stainless steel" instead of "a combination of steel and stainless steel"

## Gen III Part Numbers

The following is a list of common OEM Gen 3 3S-GTE parts numbers or substitutions.

Air Temp Sensor: 89424-12010 (Sensor, Inlet Air Temp for EFI)  
Alternator Assembly: 27060-74500 12V 90A  
Distributor Cap Sub Assembly: 19101-88364  
Engine Overhaul Kit 04111-74541  
Engine Overhaul Kit (&ldquo;Valve Grind&rdquo; - all of the gaskets in the head): 04112-74521 \*  
Engine Room Wiring Harness: 82111-17583, List Price is \$956.93 \*\*  
Exhaust Manifold to Head Gasket: 17173-88480  
Hose, Water By-Pass #4: 16281-88461  
Hose from Hell, Water By-Pass #5: 16282-88480  
Idler #1: 13505-88480  
Idler #2: 13503-63011 (same as USDM models)  
Igniter Coil: 90919-02209 (same as 5SFE's)  
Igniter: 89621-26010 (same as 5SFE)  
Intake Manifold Gasket: 17177-88460  
Map Sensor: 89420-17050 (Sensor, Turbo Pressure)

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O2 Sensor: 89465-29805  
Oil Pipe Joint Gasket: 15526-88480 (need 2 for the large banjo type fitting)  
Oil Pipe Outlet Gasket: 15472-88480  
Oil Pump Assembly: 15100-88460  
PCV valve is the same as the newer Camry - Part number: #PCV-301  
Rotor: 19102-74040  
Spark Plug Wires: 90919-21581 - \$74.00  
Spark Plugs, Iridium: 90919-01180-83  
Thermostat: 90916-03100  
\*\*\*Thermostat: 90916-03117 (Substitute: From Land Cruiser)  
Timing Belt: 13568-79105 - \$32.00  
Turbo oil inlet gasket: 15471-88380  
Turbo oil pipe, No1: 15481-88480  
Valve cover Grommet: 90480-18001  
Valve cover main gasket: 11213-88480  
Valve cover smaller gasket: 11214-88480  
Water Outlet Gasket: 16341-88460  
Water Outlet: 16304-88463  
Water Outlet Housing: 16303-88460  
Water Outlet O-Ring: 90301-40005  
Water Pump Assembly: 16100-79235  
Water Pump Assembly substitution: 16100-79225 (from 3SGE I think) - \$142.00

**\*Gasket Set for head**

The main differences between the Gen 2 and Gen 3 are primarily in the head so crossing to the Celica ST205 "valve-grind" or "head set" will work. The part number in the 97 EPC is accurate but it has since been subbed. Part # 04112-74521. This is the gasket set for a head job and it does not come with the block seals/gaskets. It does come with the head gasket naturally. The seals for the block (crank, rear, etc.) are the same as the USDM model so they're easy to obtain, except for the oil pump gasket, which is definitely different. Comparing the original water pump to a standard USDM unit, they are identical. So you can clean up the old housing and use the regular water pump for the Gen3 application.

**\*\*Engine Room Body Harness**

It goes from the ECU to the front kick panel (is not one that attaches to the engine). This is the one that is often cut when you get an engine or clip. It would be easier and more cost effective to simply modify your existing harness. Part # 82111-17583 - List Price is \$956.93

**\*\*\*Thermostat**

The thermostat from Land Cruiser fits and works fine in the Gen 3 3S-GTE. The temperature that the valve opens is the same. The Part number is: 90916-03117. The thermostat made for the US 3SGTE is too small in size.

## **Toyota Engine Naming Explained**

Most of us are familiar with the seven engine codes associated with the Toyota MR2.

3A-LU  
4A-GE  
4A-GZE  
3S-GE  
5S-FE  
3S-GTE  
1ZZ-FE

Have you ever wondered what these mean?

The first part of the code describes everything below the head gasket. The letter(s) designates the engine family (basic block design), and the number indicated the version (changing bore and stroke).

For example: 3S- = 3rd version of S block.

The second part of the code describes all the good stuff above the head gasket.

G = Performance Head, twin cam, at least a 45° angle between intake and exhaust valves  
F = Economy Head, narrower angle between valves T = Turbocharged  
Z = Supercharged  
E = Fuel Injected  
L = Transversely Mounted  
U = Japan Emissions  
C = California Emmissions

## Welcome to the IMOC Knowledgebase!

The IMOC Knowledgebase (KB) was created to be a repository of technical information for all years of the Toyota MR2. The articles are a direct contribution of the MR2 community and will cover all aspects of owning, maintaining, and modifying MR2s. The KB is easily searchable and can be saved for quick reference, or exported to PDF. The contents of the KB are copyrighted, but made available on a "fair use" basis. Please do not host the content contained here on other websites, however feel free to link to the information contained here. The information posted here is subject to updates and linking here ensures receiving the most up-to-date information available.

## General Mainenance

*There are no articles in this category.*

## General MR2 Information

### AC Conversion

[Written by V6'er]

The "proper" way to do a conversion is NOT the only way.

THE reason that you have to remove all traces of R-12 in a system is because the introduction of R-134 turns the R-12 traces to glue. This is in fact, a good thing, as hoses now become sealed up, instead of leaking even more like was previously believed.

It is a myth that all of the O-rings need to be replaced. Also, the oil is the one of the biggest issues, so:

1. Do NOT EVER get a new "R-134" compressor just because you had an R-12 compressor. It's the same compressor as an R12 compressor, but it has a different oil charge from the factory. It's a simple job to flush the compressor with alcohol.
2. The same applies to the condensor and all of the other parts, except the receiver/dryer - all of the system can be flushed with alcohol (denatured). It is NOT necessary to replace major parts of the system because you want to convert it. (The residual alcohol boils out when you pull a vacuum on the system - it has a high vapor pressure.)
3. Put in the required amount of Ester oil, usually about 6 oz. This is synthetic, and is THE perfect replacement for the old crappy mineral oil (R-12) and PAG (R-134).
4. Replace the Receiver/Dryer. It's cheap, and it affects performance.
5. If you put in R-134, fill with a charge equivalent to 80% of the R-12 charge, which is 28-32 oz. for '91-'93 MR2's.

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6. Your vacuum pump may not pull to 30 Inches of Mercury (not PSI). Any reasonable vacuum below 20 in. Hg. will do fine. The real trick here is to boil out any residual moisture. The greater the vacuum, the more effective the procedure.

7. Connect both manifold hoses when you get started. There's less chance of getting air into the system if you pull a vacuum through the whole system, all hoses included. (Open both manifold valves.)

8. A properly charged and functional MR2 A/C system will in fact cool pretty well with R-134. I have proof of this with a few MK2's.

9. If you really want a fluorescent dye added, get one that's Ester oil based, as it will work in almost any system.

10. Ditch the crappy R-134!!! It's molecules are smaller (so we are told) than R-12 molecules, so it leaks out faster. (This is one reason for the O-ring story - the newer O-rings are supposed to seal "better". Maybe...)

ES-12a, manufactured by EnviroSafe in Pekin, IL, is THE stuff to get. It is:

1. Non-ozone depleting
2. Non-toxic (well, not severely brain damaging like R-134)
3. Flammable (but not like propane is)
4. It's only a mail order product for most of us
5. You use less than R-12 or R-134
6. It's a petroleum product, so it's molecules are larger than R-12 and R-134 molecules, so it has less chance to leak.
7. It is compatible with almost every A/C oil out there - no need to change oil.
8. For 12 bucks, you can add a can of ProSeal to fix most small leaks.

8. COLD. No, I mean COLD. I HIGHLY recommend the Industrial ES-12a, as it gets colder than the regular version. MR2's will cycle off about 42 degrees F (measured at the center duct). My Lexus SC300 goes down to 31 degrees. The colder it gets, the more efficient it is, and the less it needs to work to get your car cold. My MR2 has will pull the duct temp up to 50 degrees below the inlet temp. R-12 and R-134 will not ever do that.

I've put this stuff in so many cars, I've gone through two cases of cans and a 30 Lb. tank.

AND, don't forget to check your heater water valve to make sure it's closing all the way. (The heater core lines should be cold to the touch.)

More information can be found in the MR2Board Forum Source Thread.

## **Basic DIY diagnostics...let's begin..**

[Written by mr2greasemonkey]

Alrighty DIY'ers time to learn how to diagnose your car problems.

To start with:

Gotta have tools. The more tools you have the better. Basic tools are essential; socket set, wrench set, screwdriver set, test light, multimeter volts/ohms, jumper wires ( make yourself a set ), timing light, set of plyers ( angled ones are a plus ), wire crimpers/strippers, spark tester, jack and stands. If you have access to better diagnostic tools or are willing to buy them they make finding your car problems a lot quicker. Ie; automotive scope, graphing meter, noid lights, pressure tester w/gauge kit, exhaust pressure kit, compression tester, leak down tester, low amp probe, injector tester, diagnostic scanner, 4-gas analyser.

Basics of making the engine run:

Ok, everyone knows that in order for the engine to run it needs compression, ignition, and fuel.

In order for your electronics to function properly you need source power, a load, and ground.

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Oil and coolant are essential for survival of moving parts.

I try to star the car and nothing happens?

No start diagnosis:

If you have access to a VAT machine then you can simple perform and amp/voltage draw test on the battery. 300+ amps is excessive, and anything lower than 9.6 volts mean you should recharge the battery and re-test.

If you dont happen to have a VAT machine in your garage, use your multimeter to check voltage when cranking. Dont hold the starter in the crank position for more than 15 seconds, you could burn up your stator windings. You just want to see if there is actually a voltage "drop", or the system is trying to use the battery. As before, anything below 9.6 is considered weak source voltage.

But you say, hey my dash lights work and my idiot lights come on. The radio seems to work but it still doesn't crank over the engine.

Now that you've confirmed the source power (battery) is in proper working condition we move on to the starting circuit. Battery terminals must be clean and properly fastened. Even slight corrosion between the post and the terminal will be enough to keep the electronics from working properly. Battery post cleaners are cheap, pick one up and keep it handy.

Check for power at the starter, the big wire on the side of the starter. It is source power all the time, unless you forget to hook it up. Test light is quick and easy for checking. If you suspect a bad wire you can do a voltage drop test with your multimeter by checking voltage from the wire at the batter and then again at the starter. The difference in voltage, is what is called the "drop". It should be very minimal, less than .25 volts , most of the time it reads the same.

The next wire to check is the ignition start terminal, the connector located right next to the big power wire. That is power that comes from the ignition switch (key switch). Someone will need to turn the key in the crank position while you unplug the connector and check it with the test light. It should light the test light every time the key is in the crank position. If it does not, then your problem lies in the ignition start circuit; key in crank position power, clutch switch/or park/neutral position switch, starter relay, or ground. Now the simplest thing to do is find your starter relay and make sure it has power, key power , ground and load. Unplug the relay, it should have power at one terminal, power at another when the key is in the crank position, a good ground at one terminal, and the load side should be the same as the wire that goes to the starter. Now before you put a wire across the relay to bypass the starter ( will need the electrical diagram or else you smoke fuses ) you could also use a remote starter (also cheap tool you can buy) and hook it right up to the starter to see if it actually works. The remote starter is basically a switch with long wires terminated with clips so you can pull power and apply it directly to the ignition terminal on the starter to see if it actually engages and spins. I suggest making sure the vehicle is in neutral/park with parking brake set, or the rear wheels are off the ground. Nothing like standing next to your car and hittin the button just to see it take off on you, heeh. If you have igntion crank power then that means the ignition switch works and the clutch or park neutral switch works. If you dont have power than check your fuses ( the BGB or a decent repair manula will come in handy ). If you suspect a bad ground from the relay you can always use a jumper wire to ground ( radio shack is gonna be your best friend, heh.). Or as mentioned before, if you know how to read a wiring diagram then you can jumper the relay connector and completely bypass the relay.

Now keep in mind so far all we've really checked is power through the system. You must have a dedicated engine ground. That big black wire that runs from your tranny or block straight to the body. The starter pulls lots of amperage and a thin wire will not be enough. Make sure grounds are clean and properly secured.

Fuel system basics

Ok, now that we've made the engine spin we need the basics to make it run. Let's first start off with fuel. Wether or not you have a stock daily driver or a gas guzzling money pit you still need basic fuel system operation.

Fuel system requirements: Alright, no matter what type of fuel you are using you need volume and pressure. Since we are doing diagnostics and not tuning we are going to skip AFR's for the moment and go to requirements and delivery. A fuel pressure test will be handy, they're relatively inexpensive for what they can tell you so buying one is a good investment. Since there are no schraders you are going to have to get a kit that will allow you to tap into the fuel filter or cold start banjo fitting. The proper place to test for line pressure is before the fuel rail. You are looking for

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about 40 or more psi when the system is primed and at least 36 with the engine running. Think of the injectors as gates, they don't make the pressure. You need the pressure for a proper spray pattern. Modern day engines run higher pressure but with about 40 psi it should try and run. With the gauge you can also see if you have an excessive drop in fuel pressure with the engine running or if an injector is bleeding off. Volume is a little tricky. You could use a graduated beaker and see how much volume is pumped at a certain interval. A quick test for the DIY'er is to use a bottle and plumb the fuel delivery hose into it. A quick prime or start should fill the bottle quickly. Now would be a good time to tell your smoking buddies to put out their cig's , hehe.

The injectors not only need to fire electronically but mechanically. A quick probe with your test light or meter will tell you if the injectors are powered. A noid light or inductive injector tester will pulse the light when the injectors fired. Even a long extension on the injector body and your ear up to it will make a noise when the injector fires and the pintel contacts its seat. If you have a low amp inductive probe you can actually see the pintel come off its seat and fire on a graphing meter. They should all react the same. A silent injector or one that does not pulse has issues. Even though it works electronically don't assume that the injector is delivering fuel correctly. A leaky injector or one that is partially clogged will cause troublesome driveability issues that will be hard to track down.

Now assuming that the injectors are the suspect problem. You can pull the rail out with the injectors intact and do a quick test fire to check spray pattern. An electronic injector tester has a pigtail connector and is independently powered so you can fire the injector manually. Being able to physically see the injector work connected to the system is sometimes a pain in the ass to do but well worth it when chasing driveability issues. Don't assume that a wet spark plug means the injectors are working properly. When in doubt, take them out and have them tested. It's cheap insurance and in some cases remanufactured ones are cheap enough that it'll save you time instead of chasing all the possibilities.

It's always a good rule of thumb to replace the fuel filter when you replace injectors. If something got by the filter to mess up the injector, then it'll do it again to the new ones. Don't forget to get new o-rings and grommets.

## Compression

Compression is the result of the cylinder's ability to seal the chamber and compress the mixture. A good quality compression test is a necessity when you are doing a compression test. When purchasing any test equipment that relies on a gauge I suggest one with a big face so you can see small changes.

When performing a compression test make sure that the ignition and fuel system are defeated. I like to use a remote starter when the starter is easily accessed. That way the key does not need to be on and the electronics are not powered. If you plan on just cranking the car you can pull the relays or main fuses.

Testing is best done with the engine warm, near operating temp, to get the best results. General rule of thumb is 5 complete cranks. You should see 150-175 on most engines. In performance application the range will change. Around 130 is the breaking point for decent compression. Once it drops below that it starts affecting the the cylinder's ability to produce power without some sort of induction.

A wet test is where a little oil is added to the cylinder to see if the piston rings are adequately sealing the chamber. You can do a regular test and then a wet test to compare the difference. I find a little plastic syringe with a vacuum hose on the end of it works pretty good. You can see how much oil you are adding and it doesn't make a mess.

The first compression stroke on the gauge should be a quick solid jump followed by shorter jumps until you stop cranking. You may notice a little drop when the gauge stops, especially with a big gauge, but what you are looking for is peak numbers. Rule of thumb is 15 percent variation between all cylinders.

Keep in mind compression happens rather quickly. You are only checking to see if there is enough compression for the engine to run mechanically. A leak down test is the best way to determine the condition of the parts exposed in the chamber. If you have access to a borescope, handy little self powered inspection camera, you can take a look inside the chamber.

## Ignition/spark

Ignition system basics:

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The basic components to the ignition system: igniter, coil, distributor, distributor cap, distributor rotor, spark plug wires, spark plugs. Now if the system is coil on plug or distributorless than you won't have some of the parts. The igniter needs a signal to fire the coil. On vehicles with distributors the sensors ( or pick-ups as we like to call them) are located inside the distributor.

The first test is to see if we have spark. A spark tester is a handy cheap tool that generally plugs into the end of the spark plug wire and then is grounded. You are looking for a nice sharp blue spark. If you don't have a spark tester you can use a screw driver in the end of the plug wire and hold it a couple millimeters from a good ground and crank on the engine to see if there is a spark.

If there is NO SPARK generally the first thing we check is power at the coil and if the igniter is controlling it. The simplest quick test to do is ground the secondary side of the coil ( so you don't burn it up) and then crank on the engine with a test light on the negative side of the coil. The light should be nice and bright with the key on and then flicker quickly when the engine is cranking. If you don't know what the secondary side of the coil is, it's the contact that goes to the center of the distributor rotor. If the light flickers, that will tell you that the pick-up is generating a signal and the igniter is grounding the primary side of the coil.

Now if you have a coil on plug system it gets more complicated because you need an inductive device to check the coil operation. You can try pulling the coil packs and using a spark tester.

So let's say you have power at the coil and still no spark, but the test light only dims on the negative side of the coil when you crank the engine. That's usually a sign of a bad igniter that can no longer properly ground the primary side of the coil. If you get no change at all then you need to check the signal from the pick-ups. Since most MR2s are distributor systems we will only discuss this particular application. The pick-ups are inside the distributor so take a good visual inspection to make sure they are not damaged or coated with oil. You will need the BGB for wiring diagrams and a good multimeter to check the signals. Unless you have a good graphing meter to check pick-up wave forms the best that you can do with a digital meter is checking power and resistance across the sensor. This is generally about the time when most people start looking for a "known good part" to swap in for testing. I generally keep a few good spare parts like distributors and airflow meter and oxygen sensors and ecu's around for testing purposes.

Let's assume that you've done all the basic tests and the coil/igniter/sensors all come out good but still no spark. Now you will have to test resistance/continuity through the distributor cap and wires. That white crusty stuff that grows inside the distributor cap can be enough to stop the spark from traveling across it. High resistance, like worn out spark plugs or chafed wires can cause the spark to prematurely jump to ground before it gets across the spark plug. A couple of quick tests for random ignition misfires are a light water mist with a spray bottle over secondary ignition components. You can actually see the spark jump sometimes or the engine misfire increases. You can also run a jumper wire along the secondary components with one side grounded. If there is a weak point then you're supplying a great ground path and the spark will go to your jumper wire. Snapping noise generated when an errant spark jumps to ground. Even a decent timing light will show intermittent flashes on a bad wire.

## Timing

Timing of fuel/spark/compression are essential to a good running engine. We are going to discuss the two basic functions of timing. You need mechanical timing and electronic timing.

**Mechanical timing:** The relationship of the crankshaft to the camshaft(s). There is a TDC mark on the crank pulley and crank sprocket. There is also a timing mark on the cam sprocket(s). A quick check is to line up the crank pulley mark on zero and then take the distributor cap off to see if the distributor rotor is pointing at cyl #1. On a 4 cylinder you can be 180 degrees off so if the rotor can also be pointing at #4. It is best to use cylinder #1 since that's what's going to start the whole process, so rotate the crank till the rotor come around to point at it. Now is a good time to see if the rotor actually moves, in case you suspect a broken timing belt. On a dual cam cylinder head, it is best to remove the top cover so you can verify that both cams are in the proper position. If you have a chain driven engine or one without a distributor you can use a compression tester. Install the compression tester and rotate the engine till you see the gauge move. That will tell you that the valves are closed and the piston is moving upwards ( which is the compression stroke). On an engine like the 4a you can stick a long screwdriver down the spark plug hole and turn the crank till the screwdriver stops moving upwards, that's pretty close to TDC.

**Electronic timing:** This is where sensors take mechanical timing and use it to fire the spark plugs and fuel injectors. Base timing is what the computer uses as a baseline for ignition advance/retard and injector pulse. If you're base timing ( mechanical timing ) is off then every action there after will be off. This is where a timing light and more sophisticated diagnostic tools come in handy. Always start

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off with checking base timing. On the MR2's that is accomplished by jumpering terminal E1 and Te1 in the diagnostic box. With the timing light hooked up you should see the advanced timing mark jump back to zero. You should also be able to notice a change in how the engine runs when you jumper it to base timing. It is very important for the computer to see that the engine is at normal operating temperature and is idling. Otherwise you may not be at true base timing. If your engine is stock then use the base timing specs in the BGB ( or the sticker under the engine compartment lid). If you have a performance engine then you will need to make sure that base timing is where you want it to be at.

If you don't have a timing light I suggest getting one that will show you degrees and rpms. One that is compact is better since it can be hard to get a good look at the crank pulley. I generally try to clean the mark off and paint it. Anytime I have the timing cover off I always paint the crank pulley mark and the degree marks on the cover. It looks good and it makes it easier to see later. My timing light is a black light, makes white paint glow so it's easier to see even on bright days or a well lit shop.

Driveability: Engine performance.

The biggest complaint in the automotive world is driveability. Now that you've figured out how to make the engine start and run we are moving on to making it driveable.

The first thing we'll start off with is engine performance. The engine must be able to rev smoothly in neutral and in gear. There are all sorts of engine performance driveability complaints so we will begin with the basic diagnostic terms.

stumble/misfire on acceleration = it seems like it jerks and bucks when starting from a stop or accelerating from a lower speed. May not be as noticeable in neutral as when in gear. Typically an ignition misfire when it is not limited to a certain rpm. Do the ignition/spark system basic tests. If it always seems like it happens at the same rpm's then check the throttle position or map/afm sensors.

Hesitation = it seems like it takes more time for the engine to pull at certain rpms. This can be a result of improper timing or not enough fuel/air delivery. Depending on how long the duration it is in the rpm range or if its at the top or at the bottom will point you in which system to check first. Typically at the bottom of the rpm range you should be checking: tps, afm/map, timing, vacuum leaks. In the middle rpm range: tps, afm/map, timing, egr. At the upper rpm range: tps, afm/map, timing, egr, fuel.

Lack of power = when you step on the pedal and it seems like the engine doesn't pull like it's suppose to. Check the basics. An engine that pulls slowly at the bottom rpm range and then seems to "pick up" at the top is generally a sign of retarded timing( now is a good time to use that new timing light you just bought). If it seems to start pulling but then just flat lines like it's out of breath, suspect restricted exhaust or lack of fuel. Holding your hand a few inches from the tailpipe while someone revs on the engine, there should be a nice flow. Sometimes removing the O2 sensor from before the catalytic convertor can be enough to make a noticeable change with a plugged cat. A basic fuel system test will determine if you are supplying enough fuel to the rail. Give the spark plugs a good visual to see if they are running lean. Even a partially open EGR valve can return enough exhaust to bog the engine down.

Vacuum leaks, low manifold pressure

This is where a decent vacuum gauge comes in handy. Even a cheap one from a retail parts store will get you by. Vacuum (manifold pressure) is a very good indication of how well the cylinders are drawing in air and sealing the chamber off. You should have a nice smooth reading on the gauge at idle ( assuming you don't have a lumpy cam) that changes quickly when the throttle is blipped and recovers quickly. If you've ever had a misfiring engine and had the chance to use a vacuum gauge on it you can see the change in manifold pressure as a bouncing needle. Anything that leaks air in the intake will show low engine vacuum. You generally want to see 18-24 in. vacuum on an NA engine. If you have enough vacuum hose you can take the car for a spin with the gauge hooked up to see how well the engine is "pumping".

Intake leaks are a whistling sound that goes away when the engine is revved. A 2 foot long piece of heater hose and your ear is almost as good as any electronic listening device. Just put one end to your ear and move the hose around to gaskets/seals on the intake that you suspect may be leaking. If you like to party, a party fogger is a cheap alternative to a nitrogen leak detection system. All you need is a bunch of vacuum tees in different sizes and a good place to tap into the system. Let the machine warm up, push the button and look for whiffs of smoke.

## Buying a Modified MR2

[Written by RickyB]

Are you thinking of buying a modified MR2 Turbo? It may be a fast way to get the power you always wanted without going through the effort of building one for yourself. It may also turn out to be a major case of buyer's remorse. Here is a short checklist for power modifications (I don't need to tell you about rust, salvage titles and all the other gotchas that come with buying any used car). It's not complete by any means, but it might just keep you out of trouble.

If the owner claims that it is making gobs of power, don't believe it unless you see a recent dyno chart from a reputable shop. Make sure the car is exactly in the same trim it was dynoed. It's too easy for the seller to pull a few critical pieces off and replace them with parts that aren't up to the task. Find out the fuel and boost level it was dynoed at. If you want 300rwhp all the time, don't purchase a setup that made 310rwhp at 25psi on race gas. Better yet, pay a good local shop for a baseline and remove all doubts.

Check the wiring thoroughly. I cannot stress this enough. Pull out the trunk liner, look under the engine lid, look under the dash, pull off the center console the kick panels and inspect the inside of all the fuse boxes. Deduct big money for every T-tap you see. Be particularly wary of S-AFC, boost controller, EMS and piggyback installations that cut and splice into the stock wiring. People have paid me for tons of hours of wiring work just to get badly hacked up wiring removed and the original Toyota harnesses put back to a reliable state. Also pay close attention to how the wires are routed. In many cases inexperienced installers wire a boost controller so the only way to pull the engine harness out of the trunk to drop the engine is to cut the wires. Of course, these same installers use a single color wire so you cannot easily tell one from the other. If you see loose, naked wires running around all over the engine bay and/or the trunk, stay away from the car. Speaker wire in the engine bay? God forbid! What about unused connectors for removed stock equipment? These should all have been carefully taped up with electrical tape to prevent unwanted shorts or water damage. Inspect aftermarked fan and pump wiring carefully. Are they getting their power supply from the right place? Are there fuses close to the power source or is the entire setup ready to light off like a dry christmas tree tossed in a bonfire?

Look for missing bolts or bolts that don't look OEM. You can expect to see non-Toyota bolts on aftermarket kits, but having these all over the motor is a sure sign of shoddy work done by an inexperienced or inattentive person. Are the bolts on the exhaust system stainless or are they rusting in place? Is the distributor or fuel rail held on with just one bolt? Are any nuts or studs on the manifolds missing? If yes, you might want to give the car a pass.

Are there missing parts? Is the timing belt cover missing? If so, I'll bet the idler pulleys are rusted to hell. What about one or more of the engine grounds? Are the heat shields between the turbo and the gas tank missing? What about the battery? Is that puppy strapped down with the stock bar or is it ready to keep you off the track at your first track event? Are all the plastic undercovers on the car there and are they all held by more than one or two bolts? Missing parts are a sure sign that the car was not modified by somebody who paid attention to details. Some parts should be missing (like the cruise control--both units, not just the actuator) but other things should be there regardless. At the very least, make a list of the missing parts, get a quote for them deduct the cost of replacing them from the asking price.

Were holes made through the firewalls to get fuel or water lines routed? Obviously somebody never heard of bulkhead connectors or was too cheap or lazy to use them. You should deduct big time, especially if the holes were made with a sawzall.

Do the modifications make sense? If they are making 350rwhp on a stock IC, you need to be moving right along. Unfortunately, unless you trust the guy who built the car like a brother, you need to do your homework or at the very least run the mods list past someone who knows what they are doing to have it critiqued.

Is there a turbo kit? You better take a very close look. Is the center section properly clocked? Most turbo manufacturers specify that the oil feed must be no more than 5-10 degrees off vertical. If the oil feed is visibly clocked to one side, the turbo is probably already damaged. Start the car and warm it up. Do you see any visible signs of smoke? Do you smell any oil in the exhaust? Pull off the

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downpipe and see if there is any oil there. Check the shaft for play. What about the quality of the lines and the installation? Are there bolts or fasteners missing? Are the welds good? Did they clamp stainless steel braided lines on with hose clamps? Are any of the fittings loose or visibly leaking? All these point at a poorly assembled kit or an inexperienced installation job. Proceed with caution.

Take a close look at the vacuum lines, clamps and hoses. Are they in good shape or rotted and ready to pop off and either strand you or cause the overboost event that starts a new motor build? Are there clamps on all the vacuum lines that might see boost? What kind of shape are the turbo hoses in? Do the intercooler pipes and their routing look well thought out? My favorite was the car that came in with a silicone hose clamped right onto a smaller diameter silicone hose. Are there strange transitions between different diameters in places where they don't need to be? Are there more turns in the pipes than you encountered at your last hill climbing event?

A leak down test is a good idea on a used car, but it is essential before you put down big money on a modified turbo setup. The 3S motor may be non-interference, but with higher lift aftermarket cams the possibility of bent valves is there and too many shops simply don't know what they are doing when they try to degree cams. Pull off the valve cover and check valve clearances. A well built motor will be on the tight end of the spec. A loopy-goopy set of measurements within spec but all over the map are a sign of either an older setup way past its prime or a poorly built head.

If the seller doesn't allow you to perform these tests on the setup then take a pass. Don't pay top dollar for somebody else's mistakes. It's better to pass up a deal than to get stuck with your next living nightmare.

If everything looks good, ask yourself honestly if the car is going to be enjoyable to drive for more than a few minutes. Is the fuel pump or the air-to-water intercooler pump so loud that you can hear it over the motor? Does the motor shake your seat so hard that you see blood on your next visit to the urinal? Is the car going to attract unwanted attention from law enforcement in your area even when you are granny driving? Is the clutch so hard that you end up with a left leg twice as strong as the right one after a couple weeks of driving it? These things may be expected on a 600rwhp setup, but hardly warranted at the 300rwhp level.

<http://www.mr2.com/forums/turbo-3s-gte/Toyota-MR2-14833-modified-mr2-buyers-checklist.html>

## **MK1/MK2 OEM & short shifter comparisons**

I was organizing some parts today and decided to do a side-by-side comparison of the various shifters I've come across over the years. I'm a big fan of the B & M shifters, although they are getting hard to find these days. Here's my experience with the various shifters listed below. Please reference the image at the bottom of the article for a visual comparison. Sorry for not having a metric tape measure available.

As you can see, the shifter from the 89 SC MR2 I had was quite long. As far as I know, all of the MK1 shifters are the same from 85 to 89. The shift knob was also quite long and I was very annoyed with it after having a B & M in one of my MK2 MR2s for several years now. I swapped in one of the B & M replica shifters without the drop-plate which worked out well. The OEM shift knob would not work on the B & M replica, but it was rather phallic anyway, so I was quite happy to ditch it.

The OEM shifter from the 91 MR2 is only slightly shorter than the MK1 shifter and has a similarly phallic shift knob. I recommend upgrading to a B & M or at least a 93 OEM version if possible.

The 93 OEM shifter is a good bit shorter and much nicer than the versions from the prior years. The shifter is quite a bit shorter installed and the knob was revised on the 93-95 USDM models.

The TRD version is slightly shorter than the 93 OEM counterpart and the shift linkage has a slight adjustment making it mount higher. The shifter works flawlessly and is well engineered as would be expected with the entire TRD product line. The TRD short shifters were shipped with a drop-plate similar to the B & M and the knob with the TRD shifter is superb.

The B & M replica shifters (in some cases labeled as a Fidanza shifter) are quite short. Although it visibly looks to be the same length as the authentic B & M, it is considerably shorter when installed for some reason and is almost too short to be usable if you use the drop plate. It was so short that I was unable to shift to 2nd gear if the shift boot was still installed. It is tolerable if you bypass installing the drop-plate and it did work quite well in the MK1 without the drop-plate. Another option since these replica shifters are fairly inexpensive is simply using the drop-plate from the kit

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with your 93 version shifter. All of the replica B & M shifters I've seen have been polished aluminum.

The B & M shifter kit is by far the best version available for the MR2 in my opinion. It has the most complete kit and works the best out of all the models available in my experience. The kit included the shifter, drop plate and mounting hardware, tube of grease, a billet extension, and detailed instructions. The authentic version is easily identifiable by the anodized blue components and the brushed aluminum finish. Old versions of the shifter included a nice, heavy shift knob, but those were phased out in the later kits available for the MR2. B & M ended production for the MR2 short shift kit sometime around the 2005-6 time frame. When it was available, it was approximately \$170. The B & M installation instructions can be found [here](#).

Article written by Ncturnal.

## MR2 For a First Car

[Written by DavidV]

In response to the threads that tend to pop up every so often with 16/17/18 years olds asking if it is a good idea to get an MR2 as a first car, I would like to offer the following.

Short Answer: No

Long Answer:

The MR2 is a special and unique car. That is what so many of us spend so much time fixated on this message board, mailing lists, club events, etc. The reason you are here reading about the MR2, researching it, considering it is very likely that you have recognized the MR2 provides some features that set it apart from your run-of-the-mill VW/Honda/Acura/BMW/Toyota. Aside from its striking looks, you've probably observed that the MR2 has:

- 1) Mid Engine
- 2) Rear Wheel Drive
- 3) Short Wheelbase
- 4) McPherson Struts
- 5) On some models, Turbo

All of these attributes make the MR2 a tuner's delight. While the car has tremendous bang for the buck right out of the box, with a little tuning and tweaking, all of the fundamentals are there for it to compete with true super cars like the 911, NSX, Lotus Esprit/Elise etc. That's why we are all here, after all.

Invariably, posts come up with someone asking whether an MR2 would make a good first car. They can be bought fairly cheap these days, there's a decent supply of aftermarket cosmetic and performance upgrades, and the idea of driving one around when all of your friends have Civics/Integrals/GTIs/Celicas has a certain appeal. Thing is, you are far more likely to keep yourself and a Civic/Integral/GTI/Celica in one piece than an MR2. This should be a critical factor in selecting one's first car. The fact that the MR2 is a highly impractical car (limited storage space, little to no wet weather and winter usability, higher servicing costs) don't require any input from me or any of the other board/list members. This is a judgment call each of us is capable of making regardless of age/experience level.

However, the other more performance-oriented factors are worth some input from the older crowd. I'll preface what I'm about to say by pointing out that these threads almost always follow the same pattern. 16/17/18 year old asks about MR2 as first car, older owner cautions that it might not be a great idea, other MR2 owners both old and young jump in and contradict this advice saying they got their MR2s at 16/17/18 and never wrecked it (despite having spun it 8 times in the first month they owned it). Original poster walks away with lots of contradictory feedback.

Without getting too philosophical, we all need to take responsibility for the choices we make in life. Buying an MR2 at 16/17/18 is one of them. Lots of people do it, love it, and have no regrets. That said, the MR2 is one of the most challenging cars to drive on the market, at any price. Seriously. It

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has enormous potential, but this is only true in very experienced hands. If you are not driving this car to its potential, you'd be just as happy in a Civic/Integra/GTI/Celica. If you are driving this car to the point where it is out performing your buddy's Civic/Integra/GTI/Celica, you better have a whole lot of experience and/or natural talent.

Let's look at the list of MR2 attributes above and why the car's designers made a point of including them:

- 1) Mid Engine: Knife like precision handling. Transitions faster and sharper than a front or rear engined car. (Drag racing: launches hard)
- 2) Rear Wheel Drive: Ability to modulate the car's cornering attitude with the throttle (Drag racing: Hooks up)
- 3) Short Wheel Base: Nimble
- 4) McPherson Struts: Lightweight.
- 5) Turbo: Power/Engine tuning potential

So, you have all the makings of a super car at a fraction of the price, with greater tunability, riding on the wheelbase of a VW GTI. Sounds like fun -- and it is!

However, let's look at the list again:

- 1) Mid Engine: When it starts to spin, exceptionally tricky to recover. When it lets go, it gets ugly really fast.
- 2) Rear Wheel Drive: Go into a corner too fast and you can't brake or lift off the throttle to save it. In fact, you have to either keep a steady foot on the gas, or even give it more throttle to keep the car from spinning. This means you actually have to try to go faster when you are about to lose it from going too fast in order to keep the car from spinning.
- 3) Short Wheel Base: Little to no warning when you have exceeded the car's limits.
- 4) McPherson struts: Car does not like bumps or surface irregularities mid corner. Hit a pothole or uneven surface and watch the tail step out of line.
- 5) Turbo: Lag/Boost is very tricky to modulate -- especially on a modified car. If you need extra power to exit a corner and the turbo is not spooled because you let the revs drop or are in the wrong gear = you're screwed. Hit boost early to mid corner when you're close to the tire's limits of adhesion = bye-bye.

So why did Toyota release this car on the market if it is so dangerous? Well, remember, when the MKII ('91-95) MR2 was released, you were not the target demographic. Toyota was selling this car as to 30-40 year olds with a large discretionary income looking to buy a 2nd or 3rd car for weekend drives. The MR2 was not a cheap car when new, and Toyota may not have anticipated the import tuner boom so popular with teenagers some 10 years after the MKII was launched. Also, look at what the Toyota designers changed with the MKIII MR2: no rear trunk (so owners wouldn't screw up the handling balance by adding weight behind the engine), no turbo, stretched wheelbase relative to size/weight of the car.

Also, while the above list is true for MR2s generally, certain MR2s have a reputation for being more dangerous than others. Driving a '91-92 turbo model (pre '93 suspension tuning revisions) tops the list of car's requiring vast amounts of experience to drive at the limit. Professional drivers have walked away from lapping sessions with red faces from having spun these cars. An '85 MKI model is less likely than a MKII turbo to allow an inexperienced driver to get in over his/her head, but also lacks the safety equipment (airbags, ABS, etc.) and sheer mass of later cars. The MKIII is probably the safest of the bunch, but most 16/17/18 year olds are looking at hopping up the older cars, not buying a new MKIII. Also, without installing an aftermarket roll bar, the MKIII is likely the least safe in a rollover.

None of this means a 16/17/18 year old should never get an MR2 as a first car. I'm sure there were 16/17/18 year olds who had a Corvair or Porsche 930 turbo as a first car and lived to tell about it. Those guys and gals are probably truly kick-ass drivers by now. However, unless you have the wisdom of Yoda, the patience of Gandhi and have been kart racing competitively since you were in diapers, the MR2 is probably not a responsible choice as a first car. There are always exceptions to the rule, but they are few and far between.

Anyway, as your parents will/have already told you, at 16/17/18 there are other things to focus on besides fixing up an MR2 (dating/school/etc.) Likewise, despite what your friends may have told you, fixing up an MR2 is nowhere near as inexpensive as a Honda/Acura/VW etc. While there is a healthy tuning market for these cars, most 16/17/18 year olds are not going to be able to recreate the fantasy MR2s they see or hear about without a large amount of discretionary income greatly exceeding the value of the car as well as a lot of time and dedication (neither of which is conducive

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to a balanced social/professional life -- at any age!). There is a pervasive myth of the 400rwhp with simple bolt-ons MR2, and the board and list members are in part to blame for perpetuating this myth since we all think so highly of the MR2. That said, the percentage of 300rwhp cars, let alone 400 is very, very small &ndash; even among the rabid enthusiasts who post on this board.

Bottom line: If the only way you will be happy with is if you have an MR2 as your first car, then nothing I or anyone else will say is likely to discourage you. However, keep in mind that many of us have owned and wrecked GTIs, Integras and (gasp) Civics before graduating to an MR2 later in life. If you are going to buy one, at 16/17/18 -- or any age -- make sure that the car is in a decent state of tune, with a proper alignment, good performance tires (in particular, never let the rear tires go bald), and brakes and spend some time learning how to drive the car. This does not mean going out by yourself in an empty parking lot (although this can be helpful for fine tuning technique and learning the car's reactions at the limit). Instead, sign up for a performance driving school at your local road course and make a point of going back at least once a year to freshen and improve on your skills. Sign up for a weekend autocross and ask the fastest drivers for ride-alongs to compare what they do differently out there than you. In particular, try to ride along in several different types of cars on the same course (front engine, mid engine, rear engine, FWD, RWD, AWD, turbo, NA, etc). Compare notes.

Above all, stay safe! As enthusiasts, we would all like to see MR2s stay on the road and our insurance premiums remain affordable.

-- DavidV

MR2Board Forum Source Thread

## MR2 VIN Decoder

Here is what we have come up with so far with decoding the Toyota MR2 VIN for the 1985 to 1995 USDM models. If you have corrections to what we have listed here, please post them in the General MR2 forum. The method seems to have changed after the 1995 model years.

1  
Country of Origin  
J  
1=USA:NUMMI  
2=Canada:TMMC  
4=USA:TMM & NUMMI  
J=Japan  
Toyota Motor Manufacturing  
TMM Canada  
New Unified Motor Manufacturing Inc

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2

Manufacturer

T

T=Toyota

N=NUMMI

3

Vehicle Type

2

1=Passenger Car

2=Passenger Car

3=Multipurpose Passenger Vehicle

B=Truck

D=Passenger Car

E=Multipurpose Passenger Vehicle

K=Passenger Car

L=Multipurpose Passenger Vehicle

X=Passenger Car

4

Engine

S

A=4AG

F=1ZZ-FE

J=2JZ

S=3SGE, 3SGTE, 5SFE

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5

Model  
W  
A=Supra  
R=Spyder  
W=MR2

6

Revision  
2  
1=MK1  
2=MK2  
3=MK3

7

Series  
2  
1=NA  
2=Turbo

8

Body Type  
or Passenger  
Restraint System  
N  
J=Sport Roof  
L=Hardtop  
M=Hardtop/Sunroof (MR2)  
N=T-Top (MR2)

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9

Check Digit - Ignore  
0

10

Year

R

F=1985

G=1986

H=1987

J=1988

K=1989

M=1991

N=1992

P=1993

R=1994

S=1995

T=1996

V=1997

W=1998

X=1999

Y=2000

1=2001

2=2002

3=2003

4=2004

5=2005

11

Assembly Plant

0

0-9 = TMC, Japan

C = TMMC, Ontario, Canada

U = TMM, Georgetown, KY

Z = NUMMI, Fremont, CA

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12

Seq. Number  
0

13

Seq. Number  
9

14

Seq. Number  
0

15

Seq. Number  
1

16

Seq. Number  
2

17

Seq. Number  
3

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The following diagram contains the VIN information for all 2000+ Toyota models.

## **So, you just bought an MR2..... (AKA, some things to check before you buy)**

[Written by mr2greasemonkey]

" So, you just bought an MR2", generally what i say when someone new comes down to the workshop after they've just purchased their first 2. Then they ask me to put it up on the lift and " look it over ". Which always makes me wonder, cause they bought the thing didn't they look it over!? But of course not, they just drove it and took the guys word that it was all good. Now most people that know car stuff (just quietly nod yr heads) already know that there are general things to look for when doing a visual inspection.

Visual inspection (general inspection engine and drivetrain ):

Fluids:

1) Does it have coolant? What color is the coolant, green is usually the most common, but then there's red and blue and pink and orange and off yellow. To which i've noticed is almost like how many different flavors of cool aide there is, interesting eh? Is the coolant clean , not cloudy or lumpy. If you can't see through it or it sticks like peanut butter that's a good indication it wasn't properly serviced. Check yr coolant at the fill port in the engine compartment. Driver's side on MKII and pass side on MKI, cant remember where it is in the MKIII, but if its' an MKIII you better damned well still have yr owners manual. Now dont just except that since there is coolant at the fill port that the system is full, if you've ever had to bleed the system then you already know. There is the air bleed port on the radiator and the air bleed port at the hot water valve. If the heater hoses are routed back into themselves at the hot water valve it has a heater core problem. If there is no signs of coolant then you have a problem. Where did it go? Lots of places where there are potential leaks, but this is the visual inspection. So take a good look at all the hoses, heater bypass and radiator. You may not be able to see the tubes, but if there is a sizeable leak there will be puddles drippin from the plastic underpanels. Common leak that is hard to pinpoint sometimes is from the weep-hole in the water pump, generally there will be a trail underneath the timing cover above the oil pan at the front of the engine. The "hose from hell" will be more on the left side of the engine. While you have the cap off dont forget to inspect the rubber seal inside of it. Then the heater pipes tend to crack right at the tabs where they fasten to the body. Take a good look in the resivior, see if there is sludge in it, kinda hard to do sometimes, but you can get an indication by the level indicator stick or the brown clump that stick to the end of the tube when you pull the cap off. Make sure that yr radiator isnt just zip tied to yr core support cause it cant do much cooling when it's bouncing around.

2) Engine oil, sure it may be clean and it may be full, but we are more interested in what it smells like and where it isnt suppose to be. Fuel smell from the engine oil is a bad thing, think piston rings and injectors. Engine oil that looks like chocolate milk is a sign of water/coolant in the oil, think headgasket. It may be a little tricky gettin the dipstick in and out, damned engineers, but take more than one reading and take note of what the wet end looks like, carbon build up on the stick means carbon build up in the engine. Sure there are a lot of possible places oil can leak. Valve cover gaskets, main seals, oil pump seals, turbo lines, oil pan gasket, head gasket, distributor o-ring, cooler. Front seals will definitely need to be replaced and while yr at it the oil pump o-ring and seal. Knocking noise on start up and quick accel is a sign of low oil pressure. Moist is acceptable for high mileage, wet and dripping is not.

3) Transmission fluid, no you cant see it unless you have an automatic, so it shouldnt be anywhere. If you see wet around the axle seals you should wiggle the CV joints to make sure they arent worn out.

4) Power steering fluid, if you cant find it, then you prob dont have power steering, haha. It should

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be relatively clean and full in the reservoir. Fluid at the steering rack boots is a sign of the internal seals in the rack leaking.

5) A/C , does it even work? Freon evaporates very quickly, but there will be traces of refrigerant oil in places that leak, like where all the fittings are.

6) Fuel, there better not be any fuel leaks, haha. Do a visual on the lines and injectors. Dont be shy bout stickin yr nose down there and taking a whiff in case the leak is too small to see.

Drive belts and timing belt:

Have to be able to run the A/C and alternator. Squeaky belts are either loose or worn out. Generally visible from above in the engine compartment with a flashlight. Timing belt is not visible, unless the cover isn't there. Flappin noise from behind the cover is generally from a stretched belt. Oil leaks from the front seal will deteriorate the timing belt.

Air filter:

Is it clean, is there a mouse nest underneath the filter in the air box?

MR2Board Forum Source Thread

## MK1 (1985 - 1989)

Technical information for 84-89 AW10 & AW11 MR2. 3A-LU, 4A-GE, 4A-GZE.

### 4age cooling system 101

[Written by yikes]

The water pump pumps water into the block, it circulates into the head and comes out of the head on the passenger side above the water pump. The water travels passed the cap and forward to the radiator, entering at the top. The water comes out the bottom of the radiator and travels rearward to the thermostat housing. When the thermostat is open the water travels through the pipe under the intake manifold to the water pump. This water travel is backwards of what it looks like it should be in the car. This also means that almost all of the water in the system must be heated before the thermostat opens. This helps the motor to get to operating temps quicker, but also means that if there is a delay in the thermostat opening, the block and head can overheat very quickly. It is for this reason that the system MUST be bled correctly. An air bubble by the thermostat would cause it not to open. I guess that is why there is a bleed valve there.

I have also heard that the flow of water through the head goes from #1 cyl through to #4 cyl. Therefore #4 cyl gets preheated water, gets less cooling effect and is the normal cyl to have head gasket problems and the exhaust manifold crack.

There is also an opening on the drivers side of the head. If the heater is on, water travels to the heater directly from the head and comes back to the back side of the thermostat housing. Therefore the heater does not need to wait for the thermostat to open to be able to provide heat. Also, if your car is overheating, turning on the heater can really help your motor. After all, if you are going to continue to drive, you deserve to be as uncomfortable as your motor.

When installing a thermostat, put the nipple (the triangle) into the side with the bleeder valve. The spring goes in the side with the heater hose on top (the hose that is returning from the heater).

There is also a hose on the backside of the thermostat housing that goes to the throttle body. When the water is hot enough it melts a bead of wax. This is what causes your idle to drop form 1500 to 800. Because of the age of our cars, this unit is starting to develope problems, though I have not had any.

There is a long and involved process for bleeding the cooling system. I have never done it. I park on a hill with the back end up after refilling the system and go to bed. Then I open the valve by the thermostat and close it. I do this for a couple of days or until I'm bored. But for your own piece of mind, go by the book.

## Electrical Problems 101

[Written by Yikes, Canadam, NightRider88, Sam1]

1. The alternator came with a plastic "hat" on the top post. If yours is gone, the wire harness will sit on the post and the post will dig into the wire harness. The result will be various malfunctions. It happened to me. The harness had a deep hole in it. I filled the hole with rtv and cured the problem.
2. The large white connector to the rear of the battery gets moisture. Pull apart (clean where necessary) and put it back together. This connector is associated with many electrical problems.
3. Remove the ground strap at the top of the tranny, Clean very well. Replace. Also remove the ground connection on the same cable where it connects to the body and clean. Best bet=replace the cable.
4. Starter electrical problems. Replace the positive cable. Most are corroded badly by now. Replace the smaller wire on the starter (ignition wire). This wire is also corroded badly and gets overheated by the exhaust. Don't fix, replace.
5. Remove and clean the ground wire close to the alternator. Adding additional ground straps is always a good idea.
6. Replacing the connector for the alternator top post is a good idea. Through the years of replacing alt. the wires tend to break at the connector.
7. The smaller wire on the battery positive cable is a fusible link. It should be replaced as age and corrosion can create all manner of problems.
8. Rule of thumb for electrical problems=it's the ground connection
9. Use a volt meter on the battery. Ignition off=12v engine running=13.5 to 14v.
10. Injector wire connectors sometimes pop off. A carefully placed dab of rtv between the connectors will hold them on.
11. If your car doesn't start after you washed it, there is likely water in the valley of the valve cover causing a short. Clean it out and try again.
- 11.1. Do the same thing with the Distributor cap, remove, dry and put back into place.
12. If three of your dash lights(just the engine cooling fan, charge, and brake) flash on or stay on while the car is turned on or while driving then test your alternator because it usually means it's bad!

MR2Board Forum Source Thread

## 1985-1986 Mk I Automatic to Manual Transmission Swap

[Posted by blakecj7]

These are not my steps they are from another AW11 owner.

Automatic transmission to manual transmission (1985 -86 MkI)

Extra tools I had to buy in addition to my normal hand tools:

- Toyota Repair Manual or Haynes manual
- 10 mm deep socket
- 12 mm deep socket
- 14 mm deep socket
- 30 mm socket ½-inch drive (for axle nuts)
- 10 mm and 12 mm hydraulic nut wrenches

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Drill bit (5/16)  
A second hydraulic jack

PARTS I REMOVED FROM THE PARTS CAR Two 1985s, and one 1987) :

1. 5-speed transmission (which includes the shift lever on the transmission [selecting bell crank assembly: #3590F & control shift lever: # 33527] and reverse switch: # 84210) (Note: Use a transmission from an 85 or 86 if you have a 85 or 86 MR2. Sometime in 1987 they changed the transmission and I think the mounting point for the rear transmission mount may have changed.). Also need clutch release fork: #31240, clutch release bearing assembly: #31230, release fork ball: # 31236, and clutch release fork boot: # 31126.
2. Flywheel (may need resurfacing) (Note the early 1985 MR2s have a smaller diameter flywheel and clutch)
3. Master cylinder assembly: # 31410 (consider purchasing a new one)
4. Slave cylinder assembly: # 31470 (consider purchasing a new one)
5. There are five sections of hydraulic lines from master cylinder to slave cylinder and one section for the slave cylinder bleeder.
  - A. Hydraulic line from the master cylinder to the 90 degree angle fitting: # 31481
  - B. 90 degree angle fitting between the "L-shaped" line and the long hydraulic line that's beneath the car: # 31481B
  - C. Clips between long hydraulic line and the line near the slave cylinder that attach the line to the body
  - D. Flexible hydraulic line: # 31481A
  - E. Short hydraulic line between flexible line and slave cylinder: # 31482
  - F. Hydraulic line for slave cylinder bleeder: # 31407
6. Transmission control cable/Slave cylinder mounting bracket for shift cables that bolts onto the transmission: # 33823 & 33826A
7. Rear transmission mounting bracket (May be the same used on the auto(?)).
8. Left and right drive shafts from a car with manual transmission (the drive shafts on the automatic transmission has a smaller constant velocity joint hub and the bolt pattern of the hub won't fit the manual transmission)
9. Shift lever, knob and mounting bracket
10. Shift lever boot (including the rectangular wire)
11. Shift cables (check for wear)
12. Rubber seal for shift cables through firewall (Grommet: # 33821A, Dust retainer: # 33574F)
13. Brake pedal from manual transmission car
14. Clutch pedal assembly: # 31301, and mounting bracket: # 31305
15. All the nuts, bolts, and clips that held all this stuff together
16. Instrument panel and plastic part around it to get rid of the ECT switch (Although you might want to keep the switch for other purposes) and add the volt meter that's on the M/T car's instrument panel
17. ECU from the same year M/T car (1985 and 1986 are the same. I kept getting error codes when I used an ECU from a 1987 MKI.) NOTE: I have been informed that the A/T ECU will work with the manual transmission without any problems

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#### NEW PARTS I BOUGHT:

1. Clutch pressure plate
2. Clutch disc
3. Throwout bearing
4. Transmission fluid
5. Hydraulic brake fluid
6. Electrical connectors
7. Cotter pins for the drive shafts
8. Rear transmission rubber isolator (Good time to inspect/replace all isolators for wear/tears)

The auto MR2 has almost all the attachment points for the conversion already in place. All you have to drill is two holes to mount the clutch pedal bracket and the larger hole for the master cylinder. Fortunately, one of the two panels that make up the firewall already has the master cylinder hole punched out. You just have to drill out the second panel to the same diameter.

You need to do a little rewiring to connect the back up light and bypass the start-in-neutral/park wiring used in the auto transmission. I strongly recommend that you take the parts off a parts car or remove the parts yourself from a pick-your-own-parts place. It's difficult for me to describe how to install the hydraulic lines. You have to do it yourself to figure out how to remove them (and replace them on your car) without unbolting and removing a lot of other components. There are four sections of hydraulic lines. The line that connects to the master cylinder and the long section that travels beneath the car take a lot of manipulation to install.

1. Disconnect and remove battery.
2. Remove spare tire, spare tire support tubing (10 mm bolts) steel hoop and plastic that covers the hydraulic lines in front trunk.
3. Drain antifreeze.
4. Drain transmission fluid (optional).
5. Remove driver's seat.
6. Remove steering wheel (one screw holds the center section to the wheel and a 17 mm nut holds the steering wheel to the steering column)
7. Remove paneling beneath steering wheel and triangular panel next to door hinge.
8. Loosen rear wheel nuts.
9. Place car on jack stands (? inches) The higher the better, but remember that you have to work on the car from the top and the bottom.
10. Remove brake pedal and install pedal from the manual transmission car (hard to do because of limited access)
11. Drill three holes through fire wall (2 for the mounting bracket, one large one for the master cylinder).
12. Install clutch pedal and mounting bracket (two nuts and one bolt 12 mm?) (hard to do because of limited access)
  - a. Electrical connection? (Cruise control switch/starter switch - I didn't hook mine up because I don't use the cruise control).
13. Install master cylinder.

- 
14. Connect master cylinder to clutch pedal.
  
  15. Install short metal hydraulic line (with rubber seal and fittings) (hard).
    - a. Disconnect bracket for air conditioning tubing
    - b. Disconnect hydraulic brake line (top to front left brake)
    - c. "90 degree" connector for hydraulic lines (10 mm bolt)
  
  16. Remove front suspension bracket
  
  17. Remove plastic covers beneath car
  
  18. Install the long metal hydraulic line (hard)
    - a. Unbolt water line bracket
    - b. Unbolt air conditioner line bracket
    - c. Remove brake line bracket
    - d. Remove cross bracket under car
    - e. Support gas tank with a floor jack
    - f. Unbolt clips holding the brake line (10 mm)
    - g. Remove cotter pins holding gas tank
    - h. Start long hydraulic line at the front near the left suspension (tape up ends of the lines to protect the threads.
    - i. Gently bend/bow line downward at the center to create enough clearance for the line to rear frame member and rear portion of gas tank.
  
  19. Reconnect clips that hold the brake and clutch lines.
  
  20. Connect hydraulic line to "90 degree" connector.
  
  21. Reattach water and air conditioner brackets.
  22. Replace gas tank cotter pins, tighten bolts holding brackets
  
  23. Reattach brake brackets
  
  24. Replace two middle plastic shielding (leave last section off)
  25. Remove Automatic shift cable bracket
  26. Remove center console and rear cubbyholes
  
  27. Remove four plastic plug holding carpet behind seats
  
  28. Remove bracket that supports center console rear trays and hold down carpet.
  29. Unbolt shift lever bracket.
  30. Unplug electrical connector.
  
  31. Unbolt plastic shielding on engine side of firewall (10 mm nut, 10 mm bolt, 10 mm screw)
  
  32. Disconnect shifter cable from transmission.
  33. Unbolt metal cap (two 10 mm bolts) bolted to firewall.
  34. Pull rubber seal towards engine compartment.

- 
35. Push out shifter cable and rubber seal into driver compartment.
  
  36. Remove exhaust system
    - a. Unbolt three nuts that bolts the exhaust manifold to flexible downpipe
    - b. Unbolt two bolts holding exhaust assembly
    - c. Unbolt two bolts holding muffler near tailpipe
    - d. Push exhaust assembly towards left rear to detach from the car
  
  37. Install left drive shaft and Right drive shaft
    - a. Remove rear wheels
    - b. Remove 10 mm nuts holding drive shafts to transmission
    - c. Remove cotter pins from nuts on end of drive shaft
    - d. Remove serrated cap
    - e. Remove drive shaft nut (30 mm)
    - f. Wire drive shaft upwards out of the way
    - g. With a rubber mallet, tap on drive shaft ends to remove the drive shafts
  
  38. Remove Air Intake and AFM
  
  39. Emission controls removal
    - a. Remove thermostat body
  
  40. Unbolt transmission from engine
    - a. Use two floor jacks; one under engine pan and one under the transmission
  
  41. Unplug electrical connectors to transmission
  
  42. Unbolt the three transmission mounts
  
  43. Lower Transmission/engine
    - a. The transmission should separate and slide off (Be careful! the auto transmission is heavy)
    - b. Unbolt starter gear and other items used for the auto transmission
  
  44. Install flywheel, clutch, and pressure plate
    - a. flywheel and (new) bolts
    - b. clutch plate (new)
    - c. pressure plate (new) and bolts
    - d. throw-out bearing (new)
  
  45. Install manual transmission
  
  46. Install rear Transmission/frame rubber mount (new)
  
  47. Seal transmission fluid cooler lines. There are two lines from the cooling system to the automatic transmission that can be plugged.
  
  48. Install slave cylinder and bracket
    - a. slave cylinder
    - b. short flexible hydraulic line
    - c. two short metal hydraulic lines (from flexible line to slave cylinder/slave cylinder to bleeder)
  
  49. Electrical connections
    - a. rewire cruise control
    - b. wire clutch start switch
    - c. rewire backup light
  
  50. Install manual shift system
    - a. Sifter plus bracket
    - b. shift knob
    - c. two shifter cables
    - d. shift boot
    - e. center console
  
  51. Remove and replace combination meter (instrument panel)
    - a. Remove steering wheel hub (one screw)
    - b. Remove steering wheel (17 mm nut)

- c. Remove triangular panel near dead pedal (10 mm nut)
  - d. Unscrew hood release latch (screw)
  - e. Remove lower panel beneath steering wheel (unplug mirror switch)
  - f. Remove headlight and wiper levers and unscrew aluminum nuts (17 mm?)
  - g. Remove screws to combination meter frame
  - h. Remove top cover
  - i. Slowly pull frame away from meter and carefully unplug connectors
- Unscrew \_\_\_\_\_  
Wiper indicator light  
Door open indicator light (hardest to remove)
- j. Unplug speedometer cable
  - k. Unplug the three electrical connectors
  - l. Unplug ECT switch

52. Remove A/T ECU and replace with M/T ECU (Optional as the A/T ECU will work for the manual transmission)

53. Refill fluids (coolant, transmission, etc.)

54. Replace battery and hook up power

This is how I rewired a 1986 AT engine bay harness. I used connectors to preserve the wiring just in case I wanted to convert back to the automatic transmission.

MR2Board Forum Source Thread

```
vbmenu_register("postmenu_282544", true);
```

## Do It Yourself Write-ups

*There are no articles in this category.*

## General Maintenance

### **Mk I Replacing Starter 101**

[Written by Yikes]

To replace the starter on a mk1:

1. Disconnect the ground cable from the battery.
2. Jack the car and use stands.
3. Under the car use a 14mm socket a short extension and 3/8 ratchet to loosen the 2 bolts

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holding the starter to the tranny.

4. Pull starter, spin starter.
5. Take off nut and remove positive cable.
6. Use small screwdriver, insert in small recess in plastic connector which will unlock connector and pull, separating connectors.
7. Spin starter to take off heat shield using 10 mm socket. Remove shield.
8. Using 10 mm socket remove the bolt holding the under car plastic shield so that the shield will flex.
9. Flip starter so that the larger end is down. Wiggle starter through and out.
10. Clean mounting area for starter so that it will make good contact. Check the ends of the wires to make sure they are not corroded.
11. Reverse to install making sure the wires are not stressed.
12. Reconnect battery ground.

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## **MK I Speedometer cable 101**

[Written by yikes]

Just replaced my speedometer cable today. It ended up being pretty easy, but as always whenever you're doing something for the first time, it takes longer.

1. disconnect the cable from the tranny. It's a garden hose type of screw on connector. Small vise grips helped to turn it. Then just pull it out.
2. take out 7 screws on the dash, 5 up and 2 on the side. Take off top dash plate. Take off 2 nuts (10mm socket) and take off the metal bracket (just pull it up and out).
3. Now you can get to the speedo connector. Use a small screwdriver to pry the white plastic tab on the right out a little and at the same time push in the longer tab on the left and with your third hand pull the connector out.
4. In the fronk take off the plastic shield and pop out the two rubber grommets on the cable, then just pull the cable out into the fronk.
5. under the car pull the cable down and after taking off the plastic protectors unclip the cable from the three clips. Pull the cable out and you're half way done.
6. Shove the new cable down from the fronk and route it back, pay attention going over the tranny, but everything is easy.
7. Shove the front of the cable into the hole. Get under the dash with a light and after three tries you will find where it is supposed to go. Just shove it onto the connector at the speedo and button up the dash.
8. The tranny has a slot and the cable has a tit on the side, make sure the tit slides in and screw on the cap and you are done.

If you can get your old inner cable out of the old sheath, then all you have to do is pull the cable out at the tranny end. Grease the new cable and slide it all the way in. You may have to twist it some and you may have to lightly use vise grips to shove it in, but it will go. My cable was broken 2 feet from the tranny end and no amount of twisting and pulling would allow it to come out the front. The cable can be had for \$60 and the whole thing can be had for \$120. Luckily, my parts car had a perfect one.

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You can use a drill on the cable to test if the speedometer is working.

If you need to pull out the speedo "sub-assembly" from the tranny, use a 12mm socket on the bolt next to the speedo cable. The bolt holds a flat piece of metal that fits into a slot in the sub-assembly. Once those are out of the way, just wobble the sub around and it will come out. There is an o-ring on it and it has been setting in there for 20 years, so yep it may be tough to pull out. Mine however came out easily.

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## Braking, Suspension and Wheels

*There are no articles in this category.*

## Engine

*There are no articles in this category.*

## Engine Swaps

### **1986 Mk1 4A-GE to GZE Engine Swap**

[Written by 86mister2]

This is my engine swap write-up for a 1988 USDM 4A-GZE into a 1986 USDM Mk1. This swap is straight forward mechanically but the difficulty of wiring varies depending on model year. If you use your N/A model's transaxle it is 100% bolt in. If you want the S/C model's transaxle you will need to do engine mount modifications not discussed here. I hope that this write up will help others discouraged by the false conception of extreme difficulty.

All wiring references written here are for 86 model year only. If you use this guide to swap into a different model year be prepared to do wiring diagram research to make sure you have it wired correctly. Due to my inexperience with other model years, I will not be able to provide much assistance if you run into issues. However, I am told by others who have done the swap that all 87+ Mk1's are compatible with any USDM Mk1 4A-GZE. This means the engine harness and body harness are Plug 'n Play.

The following information covers my engine swap. I started on the last Monday of April 2004. I was finished and cruising the streets the following Monday. I only worked several hours a day. I wanted to pace myself to make sure all went to plan.

OK! After months of procrastination I finally began my engine swap today. My goal for the day was to have the 4AGE and the fuel tank out of the car. Well, things didn't go as planned. The damned car just doesn't want to come apart!!! So after many hours of fighting and bitching with it, I finally closed shop for the day, the factor being that the only socket I had that remotely fit the 30mm axle nuts stripped out and cracked down the side. My monster 400 lb/ft air impact couldn't break the damned nut loose before it literally ate up the socket!

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So here is what was accomplished today.

Below you see the engine compartment is starting to look empty. The battery, airfilter with AFM are out. All wiring, hoses and cables are disconnected from the engine. The engine wiring harness will remain plugged into the motor and will stay with the engine as it's removed. You can see it draped over the engine.

Not much to see down here. The entire exhaust system, except manifold, has been removed because everything after the manifold was welded together. On the '88 SC that I stripped, the exhaust was all stock so I was able to unbolt it piece by piece and leave the B pipe on. It was a bit awkward to remove in one piece, but not that difficult. The hardest part was getting to the nuts that hold the B pipe to the manifold.

That's all I was able to accomplish without removing the axles. They're soaked with Liquid Wrench right now to help penetrate and break them free. I'll give them another spray down before I'm off to the car parts store in the morning for a bigger socket.

OK, so I got my engine out on Tuesday, but was in a really bad mood so I didn't post the updates...

I started first thing by going to Kragen's Auto Parts and getting the proper 30mm axle nut socket. \$17 dollars later, the axles are out.

The magic socket:

After the axles were out I hooked up the cherry picker removed the engine mounts. As I was lowering the engine down to the ground it kept getting caught on something and was getting stuck crooked.

After some finagling I was able to drop it out nice and smooth. I just had to sit up on the fire wall

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between the engine compartment and the trunk to pull the engine over towards the left while I dropped it down.

After I got the engine out I hooked up the cherry picker to the chassis and lifted the ass end up to clear the engine. I then dragged that sucker out from underneath. I rested the chassis on jackstands way up in the air so I can get under there to drop out the fuel tank. I then put the engine back on the cherry picker and split off the tranny.

I was hoping to be able to re-use my old clutch since I'm on a tight budget, but of course that was not possible. I split off the pressure plate from the flywheel and found this:  
Pressure Plate:

Disc:

Flywheel:

As you can see, the flywheel and pressure plate have a lot of heat discoloration on them. What you can't see is the warpage and raised spots on the surfaces. Also you can kind of see the uneven wear on the disc's friction material. This clutch was on its way out.

Here's the end of Tuesday, ass end up on jackstands and everything put away:

New clutch and pressure plate:

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New throw-out bearing, clutch alignment tool, and white lithium input shaft grease:

This clutch, though OEM spec, appears to be a beefier design than the Toyota clutch, so we'll see how it handles the GZE.

That's all for now, I plan on dropping the fuel tank tomorrow to change the pump and getting it back in, as well as getting the engine and tranny mated again and back into the car.

I woke up this morning and tackled the fuel pump. For the most part this was a pain in the butt but not as bad as I had thought it would be from other's testimonials. When dropping out the tank, you should start by removing the rear storage binnacle and the center armrest console cover to expose the wires for the fuel pump and the fuel level sender. After the wires were disconnected I had to remove the coverings on the bottom of the chassis to expose the tank, the radiator piping and A/C lines and such.

I disconnected the e-brake system to get it out of the way as well as a few other lines. If you look, you can see everything dangling off the bottom of the car:

After all cables and what-not are out of the way you can undo the metal straps that hold the tank in. More than these straps hold the tank in it seems, as after the straps are undone the tank won't just fall to the ground. I had to massage it out from inside the tunnel. When it finally comes loose, just be ready for it to drop. I also noted that the small lines that are difficult to disconnect and reconnect don't need to be disconnected at all! There is this weird metal tube with other hoses that connect to it that runs up the middle of the cab-to-engine compartment firewall, normally under the plastic cover. This is the piece I'm talking about with all the little pipes going into it. You can unbolt it from the car with most of the hoses still intact (the ones in the back that are really hard to get on and off can be left on for this procedure) and just drop it out with the tank. In this pic, you can see it still attached to the tank out of the car.

This made re-installation 1000 times easier! Installation was reverse removal. I tied some string to the wires for the fuel pump and fuel level sender so I could easily pull them back up through the chassis tunnel.

While I was reinstalling the tank, the car parts store called and told me that my flywheel was in so I went to pick it up after I finished with the tank. So I get the new flywheel on no problems. While I was torquing down the pressure plate one of the studs snaps INSIDE THE NEW FLYWHEEL! I was very angry, needless to say, but some slow gentle persuasion was able to back it out. I then recalled seeing an almost identical bolt that holds a cable sleeve thingy for the e-brake. This became my replacement. The whole dilemma took about an hour to solve. So after I get the clutch assembly back together I work on mating the tranny back up to the block which was not an easy task.

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Clutch alignment wasn't an issue after I got some help. It was just too awkward for me to get everything lined up properly to get the tranny on by myself. About 45 minutes later I was finally able to get them together. So far this was the hardest part of this whole ordeal.

A concern I'm having is the amount of free play in the clutch release fork. It seems at stationary position that the slave cylinder is already pretty far extended. I'm not sure how much this clutch is going to be able to release. If I have to pull this engine out again I'm going to be very unhappy. Here's the engine mated to its new 5 speed C50 gearbox. I say new because this engine came with an auto.

That's all I did today. Tomorrow I'm going to start off by lengthening the wires on the harness for the starter and the O2 sensor then the engine goes in. After I get the engine in and supported on its mounts I'll get everything that needs to be hooked up from underneath back on and put Mister 2 back on the ground. Once that's done I'll roll him out to swap out the 86 wiring harness for the 88 so I shouldn't have too many crazy wiring issues to deal with. I'm hoping to get that all done tomorrow. If I have extra time I'll get all the fuel hoses and coolant hoses and everything hooked back up then try to get the air ducting and intercooler seated. I also have to go back to the store to pick up fluids and some serpentine belts. If everything goes well, I'll be running by Monday!

I started this morning by going straight for the engine. I was going to lengthen some wires but decided to put that off until I do all the wiring. Instead I concentrated on getting the engine in and let me tell you, this was NOT easy. It took me about 3 hours to get the engine raised into position then bolted in. I had everything you can imagine go wrong today from broken tools to broken vacuum switching valves. It was a long hard battle, but it's finally in!

After the engine was mounted in I worked on getting my axles back in, and getting A/C lines, oil cooler lines, clutch slave line, and coolant lines hooked back up. I wanted to get everything on the bottom hooked back up before I set Mister 2 down and rolled him out. I'll still need to get back under there to bleed the clutch and hook up the shifter lines as well as install the starter and hook the exhaust system up.

Mister 2's new powerplant installed, waiting for the finishing touches.

Aside from what I said needs to be hooked up down below, up top I still need to hook up the fuel lines, swap all the 86 electronics (coil, ignitor, injector resistor pack, etc.), and install the air ducting. I also need to run the 88 SC's body harness up into the cab. I also need to get two new accessory fan belts, oil and coolant. On top of all that I need to figure out a replacement for this VSV I broke which controls the supercharger's air bypass valve:

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I also need to find some crush washers to finish up the fuel lines.

Getting the engine installed and mounted took most of my energy today. I'm very tired and sore after what I had to go through to get that sonofab!tch in. If health permits. I'll finish it up tomorrow.

All I did today was work on modifying the 86 body harness to accept the 88 SC GZE harness. I got it back in and all hooked up, but the ECU isn't getting power it seems, and the fuel gauge drops to empty, even though there's half a tank....

I'll spend tomorrow trying to work out the bugs. And if I get it figured out, I'll put the belts on and fluids in, and see if she wants to start up!

OK, I'm proud to say that as of yesterday evening, the swap is complete and the engine runs like nobody's business! This will be my final write-up to finish this up.

I spent the whole weekend working on the wiring harness. At about 8:00 Sunday evening, I got all the wiring gremlins worked out with the help of a fellow board member's write-up found [HERE](#) and the car was ready for final assembly starting early Monday morning. This pic shows the harness in the cabin, no changes were made to any of this:

You can see some long stray wires coming from the kick panel fuse area. These are wires left from the old aftermarket alarm which is long gone. I ended up cutting out these wires and using them to extend the wires for my O2 sensor. I also took the starter main feed wire out of the 86's harness as it was longer to reach the starter in the back, and I used heavy 10 gauge wire to extend the starter's solenoid power. You DO NOT need to extend these wires if you have a C-52 with the starter mount under the intake and use the SC's exhaust system pieces. My C-50 transmission has the starter mount under the exhaust manifold where stock auto GZE's had it under the intake. That's why those wires were extended. And I had to extend the O2 wires because I kept my 86 exhaust system, which mounts the O2 at the bottom of the manifold, as opposed to the GZE's stock system which placed it right before the flex pipe. Below you see the modifications to the 86's body harness. There were some big changes that were explained in the procedure I posted a few lines above. Note that there were many wiring harness changes over the years, and even several for the same model years. His write-up did not work 100% for me, but it put me pretty damn close. I had to figure the starter circuit out for myself, but everything else was spot on according to the write-up.

The few stray wires you see are for a few accessories like the octane selector switch (Red Wire), the SC on indicator light (Yellow Wire), and for the center high mounted stop light (Yellow with Red Stripe).

In the above pic, you can see the 3 wires I had to add. The black wire runs from the ECU to the Check Engine light, the green one is for the engine bay cooling fan, and the red one controls the injector relay, and had to be spliced into the wires for the injector relay's pin 4.

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Here is all the modules and the ECU plugged in inside the trunk. You can't see the voltage regulator, cooling fan computer, or speed controller (cruise control controller) in this pic but they're there. The green box is the 86's speed controller. I used the 88's which is a lighter shade of green which is just out of the picture. The modules still need to be mounted to the rear firewall. I might take care of that tomorrow.

**SOLDER ALL YOUR WIRE SPLICES! IT IS THE ONLY WAY TO DO IT!**

You don't want cheap butt connectors and the like falling apart on you leaving loose ends everywhere and possibly causing the demise of your wiring and/or electronics.

After the wiring was done I spent the rest of the day putting all the little things like fuel line crush washers and vacuum lines back on. Once everything was tip-top up top I concentrated on the bottom where I still needed to install the oil drain plug, accessory fan belts, exhaust system and clutch bleeding.

Clutch bleeding was a breeze, so was getting the exhaust back on. I had to go to the car parts store like 4 times to figure out the right belts since the exact ones the computer listed were out of stock and would have taken months to get.

After those were taken care of I put the oil plug in and filled 'er up! I also started bleeding the coolant out and double checked all my wiring and components while it was burping.

After everything was done I got in the cab and unplugged the fuel pump. I wanted to turn over the engine to circulate some oil since the engine sat for about 8 months dry. A few hours prior I was testing the fuel system by running the pump with the engine off just to check for leaks, of which there were none! Some extra pressure from the leak test shot some fuel into the engine while I was cranking for oil pressure and it sputtered a little bit. At that time I knew it was gonna fire right up! It was trying to with what little fuel that was in the rail! After about 10 seconds of oil priming I plugged in the pump and turned the key.

First shot, sputter and die... OK, still some air in the fuel lines...

Second shot, VVRRRRRRROOOOOOOOOOMMMMMMMM!!!

I was so stoked that I just wailed on my horn for a few seconds! All my supporting neighbors came out to give me the thumbs up!

Let me tell you, this car runs! And it runs well! The C-50 is a close-ratio gearbox designed to help the low torque 4A-GE accelerate. When you mate it to a GZE, it'll put out some respectable numbers! The C-50 redlines 2nd gear at 59 miles per hour, and with that SC pumping, it got there VERY fast. We're talking under 7 seconds, like 6.5-6.8. This car is definately a runner! It really puts the power down well, but if you're not careful, it'll smoke up the tires without breaking a sweat!

So I finish up by saying THANK YOU to all who offered me their advice and support. I COULD NOT have done it without all of the kind words and advice given to me during the hardest times of the process. I owe it all to the wonderful MR2 community!

Here is the finished product!

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And my custom fuel selector switch and SC light:

Good luck to any who do this swap! It's not too difficult, just take your time and make sure you do it right! Working at a leisurely pace, I accomplished this in 7 days and 4 hours

Edited for formatting and content.

MR2Board Forum Source Thread

## Installing 2ZZ-GE With C-60 into MK1

[Written by blown59]

Write up for installing 2ZZ-GE with C-60 into MK1. If you choose to use an alternate transaxle, you will encounter other variables. I'll try my best to remember everything and add part #'s where applicable.

1. Mounting Points- All 3 transaxle mounts can be used from the C-52. Some fab work is necessary for the passenger motor mount.
2. Evap/Fuel system - make returnless, somewhat extensive  
\*check the other board for write-up with pics on making a return system returnless\*
3. Slave cylinder - minor requires 3/16 female to male M12 coupling (brake fitting) From the firewall chassis fitting to 3/16" aluminum brake line. Use tube bender to make custom bends. Attach to the C-60's slave.
4. Header - reweld flange or contact David Lea (LittleRocket) who sells Brad Bedell's header. I custom fabricated my own B-Pipe. Bedell may eventually have a B-Pipe available.
5. Axles - 91+ MR2 N/A non-ABS
6. Power Steering Pump removed - 1ZZ Idler pulley PN:13570-22010
7. Coolant/Heater hose - custom setup, many ways to do this.
8. Clutch selector cable bracket - Modified C-52 bracket to sit higher on the C-60
9. Transaxle Mod - Note: I used a transaxle from a JDM Fielder which is like that of the Matrix/Vibe. I had to reverse the select lever to exit the front of the housing. Using the Celica version does not require this mod. PapoJ rotated the selector lever 180\* to match the cables, but used a C-52 bellhousing. This allowed for him to use the C-52 cable bracket in the factory location. I modified my C-52 bracket to sit higher like it did on the original transaxle. All internal springs, clips, select levers, etc. were swapped from the Fielder's select lever shaft to the Celica's version select lever shaft.  
Celica select lever shaft. PN: 33261-20080
9. Dipstick and Tube - MRS 1ZZ  
- some minor tweaking was required to get it to fit.  
Dipstick PN: 15301-22040  
Guide(tube) PN: 11452-22040

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10. Fuel Line - filter to fuel rail. I cut banjo fitting from the fuel line of the 4AGE where it mates to the filter and the quick-connect from the 2ZZ fuel line where it attaches to the fuel rail. These fittings were already barbed and inserted into 5/15" fuel injection hose. \*Dont Use Fuel/Evap Hose\* Its not rated for the higher PSI. Hose clamps should be used as well. 1 hose to connect the 4AGE filter to the 2ZZ rail.

I still have my notes and the JDM Pinouts(wiring diagram), Connector Chart and Fuse/Relay Box for the early version of the Fielder/RunX/Alan in PDF format. Extensive...

This is how I have wired mine thus far.

I used the molex(N1) in the trunk and M1 and M2. I picked up mating connectors from the salvage yard. These were mated to coresponding wires of 2 of the ECU connectors, engine harness connectors and the added fuse box.

I used the fuse box from the Fielder to incorporate other fuses and relays. One of the relays was made the C/Open and also used the EFI relay and fuse for the EFI system. Unused fuses, relays and associated wiring were scrapped.

I basically used the MR2's fusebox to run some of the components intended. The Fielder's box was used to supply power to parts of the system I didnt think I could reconfigure. I was basicly trying to wire the 2ZZ as the engine would have originally been wired, basicly for OBD2 purposes.

The two systems are wired differently and being that I am no expert tried to do this in the most simple fashion for my understanding. The principles between the two systems are similar, but routing is different.

On a cpl of other notes, this being an OBD2 system, it only has one O2 sensor. I found this suprising, but I guess there are different regulations in Japan.

The Celica's pinout indicates 2 O2's where this system only has wiring for 1, which splices into the OBD2 port. I also have the Fielder's exhaust and only 1 4-wire O2 sensor came with it.

The OBD2 port will be in my trunk as opposed to under the dash.

The only thing I havent figured out how to wire up are my oil sending wire, water temp wire and the VSV for the evap. (4age sending unit tee'd into the oil pressure selinoid for VVTL-i. Coolant temp sending unit yet to be installed. I have thought about the blocks drain-cock, but unsure.) I have one plug in the new system I dont have all the pinouts for and Im sure it mates to the oil and water. (I Found this to be incorrect. This connector had wires for the charging system) Im also under the impression that the Celi evap I purchased may be different than that of the JDM version as this schematic doesnt cover that VSV. The Celi's did cover the wiring for it. This is something Ill have to work around or reconfigure once Im up and running.

Brief summery...

I had a hesitation issue with cam-changeover shortly after the swap. I had thought it was a fuel issue, but wasnt sure. Problem seemed to self correct as the seasons changed and temp dropped. On cooler days, changeover was great, no problems. Warmer (humid) weather and it was back...????

These results were on a Dynojet.

Mods:

- CAI
- Brad Bedell header
- My custom 2-1 collector B-Pipe
- Factory Cat with CherryBomb "turbo style" muffler
- B-pipe Collector merges to a 2.5" into the cat and 2" from cat exit back

All are SAE: 1.00 corrected, Max HP @ 7400, Max TQ @ 6800

Pull 1 - 158.64 HP 6:19pm  
116.07 ft/lb  
63.55 deg.  
46% Humidity

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Pull 2 - 158.29 HP 6:22pm  
114.31 ft/lb  
63.42 deg.  
46% Humidity

Pull 3 - 161.35 HP 6:44pm  
117.13 ft/lb  
64.72 deg.  
46% Humidity

I had originally thought the factory pump may have been limiting the fuel. Not the case... I'm running FAT!!! In all of the runs I was rich, down about 9 something.

The difference on the last run was the motor cooled a bit and we ran a fan for the radiator. It appears the fan also helped with the rich condition. The cooler air may have helped the air/fuel because on the last run I saw a low of about 10.5.

Im thinking if I can get my air/fuel into the 13.5-14.5 area I should be putting down about 169-173 HP. Time to fix some A/F ratios.

Im not sure if its the 4age's fuel pump combined with the 2ZZ's pressure regulator making for the wrong combo of parts. Should try the other pump. Or if its the cold air intake that the computer is over compensating for. It seems as if it hesitates more on hot days and not at all on the cooler days.

Im thinking this could also be due in part to a faulty O2 sensor. The one that came with 2ZZ's downpipe was slightly damaged, though I still used it. It could be that the O2 isnt properly reading the signal.

\*\*It is my understanding that the O2 only monitors in closed loop. I also understand that when under W.O.T. the system goes into open loop, at which time the computer just dumps fuel. ...so this may not be my issue. I have considered using an Apex'i VAFC-II piggy-back to help lean it out. Some ppl say that the piggy-back will be over ridden by the factory ECU. I understand this as true, when in the closed loop. But, when under open throttle, your in open loop... At this time the piggy-back will kick in and run your engine at the parameters which you have set. Now some of this is just my theory, but really would like to try and correctly resolve the issue before going piggy-back.

<http://www.cardomain.com/ride/2255550>

MR2Board Forum Source Thread.

## **All You Need to Know About Swapping a 20v by System**

[Written by mr220v]

Changes that need to be made to accommodate the 20v by system

### 1. Exhaust

-Silvertop

The complete 16v exhaust system can be used with the 20v silvertop. The only needed modification will be to the outermost flanges of the stock 16v header (pictures are of an ae86 header, but the bolt patern is the same)

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Incidentally, the egr hole on the 16v header can be blocked with a transmission fill or drain bolt.

The 20v header can also be used, but will require either a custom bpipe, or modifications to an existing 20v bpipe. The 20v silvertop header also has clearance issues with any exhaust side mounted starter. Clearance between the ST header and starter will only be a few millimeters.

The diameter of the 20v header pipes is identical to those on the 16v. The 20v header may have a slight advantage due to the use of theta plates, but dimensionally, the headers are the same or similar.

-Blacktop

The 16v header can also be used with the blacktop, but will result in power loss due to the Blacktop's larger exhaust ports. A typical 16v header/manifold will be a bit constricting. 16v manifolds have been used with blacktops, so it is possible. Larger diameter 16v headers may be available.

For best results, use the blacktop header (or exhaust header that has the same exhaust port dimensions) when possible.

The exhaust mounted starter will not clear the larger diameter blacktop header. This will be an issue with any 1985-1987.5 20v conversions where the original c50 transmission is to be used since these transmissions lack the intake side mounting position. You really have 3 options in this situation.

- a. Use the 16v setup, and take the performance hit
- b. Use a later c52 transmission (or bellhousing) that does have the intake starter mounting position
- c. Modify the 20v header to clear the starter.

Once again, a custom bpipe will have to be made, or an existing bpipe modified

Keep in mind that 87+ mr2's used a larger diameter bpipe, cat, and muffler, so this is your best choice for the 20v. The 4age equipped mr2's used the same exhaust setup as the NA cars did.

## 2. Transmission

All mk1 mr2 transmission will physically bolt up to the 4age 20v. There are considerations you must make though.

-A series motors used 2 different sizes of flywheel. Early mr2's, up till around 1986, used a 200mm flywheel. From 86 on, a 212mm flywheel was used. (200mm and 212mm pertains to the gripping area of the flywheel. The actual diameter of the flywheels was the same). The 20v came with the later size flywheel, so when ordering a replacement clutch and pressureplate, just ask for a clutch kit for a 1989 mr2. If using the smaller flywheel, ask for a set from an 85 mr2. Either clutch set will be sufficient for the stock 4age 20v.

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-Early c50 transmissions only had one mounting position for the starter. With this transmission, you are limited to mounting the starter on the exhaust side of the motor. These transmissions are on the 85-87.5 mr2's. Later mr2's had the c52 transmission. This transmission had a secondary starter mounting position on the intake side of the motor, just like the stock 20v transmissions. If you plan on using your 16v exhaust manifold, which is perfectly fine with a silvertop, you can mount the starter on either side. If you plan on using a 20v header, especially the blacktop's, the header will not clear the exhaust mounted starter. If you must use the exhaust mounted starter in this case, the header will have to be modified for clearance.

-The c52 and c56 that comes with a 20v can also be used with modification and transferring a few parts from the original mr2 transmission, namely your mr2 selector shaft, and the entire mr2 shifter assembly. On the silvertop c52, a hole will have to be drilled for the selector shaft and the oil seal. On the C56 however, there is no casting for the oil seal. One of 3 approaches has to be taken.

-Add the additional aluminum casting, and drill as you normally would

-Fab an adapter or a makeshift casting (this has been done with JB weld, not the ideal way, but seems to be holding up in this case)

-Reuse the center transmission casing from your original mr2 transmission. This requires taking both transmissions apart

Here are some pics of the problem area:

-6speed transmissions are available for the 20v, known as the c60. Some blacktops came with a 6speed stock, although it was not a real common option. The same considerations must be made for the oil seal casting that have to be made when using a blacktop c56 5 speed. Getting a blacktop with a 6speed is usually somewhat pricey.

One other option is to use a 00+ Celica 6speed. The bellhousings are different, but can be swapped somewhat easily. All that holds the bellhousing to the central casing are the external 12mm bolts, and two 12mm bolts on the inside of the bellhousing that are attached to a reverse lockout arm. Once the external bolts are removed, the internal ones can be removed and installed through the 1-2 inch resulting gap. It's a little bit tricky, but is much easier than taking the transmission apart. Once apart, remove the old differential bearing races and shims from the 4age bellhousing and replace them with the ones from the original 6speed bellhousing. It is very important that the differential stay with all of its original races and shims. This is the only way to keep the tension on the differential somewhat within spec. Too much or too little tension, and you will burn your differential bearings.

The celica 6speed will also require the use of 1991+ mr2 NA axles. No drilling is required since the Celica's selector shaft is already on the correct side of the motor. Just add the mr2 selector shaft and shift assembly.

### 3. Cooling

The 20v does require hoses to be run differently. It is very straight forward, and one of the easiest parts of the swap. Rather than draw up a detailed explanation, here are some detailed pictures:

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The rule of thumb that I use is link the driver's side hard line that runs under the center of the car to the driver's side water outlet on the 20v motor. Same for the passenger side. The passenger side hardline (the one with the oil cooler) goes to the water inlet on the back of the head next to the exhaust manifold. I usually try to incorporate my filler neck into this side of the cooling system. The needed hose stock can be purchased at Napa along with any flexible hoses you might want to use.

The heater hoses are also very straight forward. The 16v hoses can be used, but it is better just to buy the correct diameter tubing, and simply cut new hoses to length.

#### 4. Throttle cable

My preferred method for dealing with the 16v cable being too short for the 20v is to simply reroute it. I drill a second hole in the fire wall about 6 inches to the passenger side of the original throttle cable hole (be careful not to hit anything under the dash when you do this). I then route the cable under the dash, under the center console, behind the rear firewall and out the trunk release cable hole in the rear firewall (if you want to keep your trunk release, a second hole can be drilled). This puts the throttle cable in the perfect position with more than enough length.

#### 5. Wiring

This is the heart of this conversion. Many 20v swaps have failed due to installers being unable to master the wiring. To make this part of the swap go more smoothly, I offer a complete plug and play solution. Here is a picture of the finished product:

It is perfectly fitted for the aw11. The air conditioning works along with the enginebay cooling fan. The 20v ecu will mount in the stock aw11 location. I test every harness on my own vehicle so that it is know to be operational and defect free before I ship it. The harness is loomed and ready to run.

The whole concept is to offer a harness that looks and fits like it was oem. Its as if you went to the Toyota dealership and ordered a stock harness, although my harness is cheaper than a dealership replacement harness. The cost is \$350 and has a 100% success rate.

It's a superior product compared to other offerings on the internet that claim to be plug and play. Competitive offerings ship mostly unloomed (ie you get a barewire harness), totally untested and have been known to contain defects. You as the end user get to sort through all the issues. Far from a hook it up in 20 minutes and turn the key proposition.

If you decide to do the wiring yourself, it is best to get an uncut 20v harness. There will be plenty to modify and change to make it work with the aw11 bodyharness, but is much easier than trying to get a cut harness to work. With a typical cut harness, you end up reconstructing a good portion of the harness. Not good if you are not pretty advanced at automotive wiring. Either way, there is a lot of soldering involved.

Here is a link to a good step by step on how to get an uncut 20v harness to work in the aw11.

<http://www.padandwheels.com/mr2/blac...ng/wiring.html>

Swapping a 20v 4age for a 16v 4age has become a very common practice. Aside from significant performance advantages, you will be getting a newer engine typically with much lower mileage. Parts availability for the 20v has improved over the years as well. There are a number of Toyota dealerships that specialize in JDM parts. Champion Toyota comes to mind. Almost all the parts can be purchased easily and are priced like normal USDM dealership replacement parts. Considering many mr2 replacement parts have to be ordered anyway, getting 20v parts is not much more of a hassle.

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The 20v conversion is a fairly easy bolt-in swap. Perfect for those looking for a high revving engine with a wonderfully broad powerband who also want stock reliability.

More information in the MR2Board Forum Source Thread.

**i have an 86 mk1 and am wanting to put a 20v silvertop in it. i have can get a 20v with 53000 on it out of a carrola with tranny, ecu, harness, a/c, powersteering pump, halfshafts, shifter and linkage, and some other stuff i can\'t think of, basicly everything, besides the mounts, needed for the engine to run. how hard will the swap be, can i just fab mounts and have shafts cut, remove the old wiring, and use the wiring out of the corrola? or is it eaisier just to use the old tranny? thanks for the help, nate.**

There are many members on the forums who have completed that swap that can help out. Contact the forum member mr220v for some of his wiring setups. He does a perfect job creating 20v harness. <http://www.mr2.com/forums/20v-swaps/>

**Hi this is Mike Neibauer in MT I have a 1986 Toyota MR2 ☐  
and I would like to put a 3sgte motor in my car ,☐  
The engine is coming from JDM motors it comes complelte ☐  
My question is will this work .Iam not afraid of alittle work or  
faborcation.**

That swap has been done quite a few times and is referred to in the community as the Mk 1.5. Feel free to check out the forums, specifically the MK 1 section for more information. <http://www.mr2.com/forums/mk-1-mr2-aw11/>

## Part Numbers

*There are no articles in this category.*

### MKII (1990 - 1999)

Technical information for 90-99 SW20 MR2.

## Mk II Automatic to Manual Transmission Swap

[Written by TomsMR2 - Tom Hayes]

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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

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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 5 pin 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 HORIZONTAL - 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 an inline fuse 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.

MR2Board Forum Source Thread

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 its 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 its 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 velocity 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 affects 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 than stock you will want something bigger

### 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-FE is an absolute blast to drive and is a little faster than a stock turbo MR2. There is a misconception that the S54 transmission in the NA MR2 has shorter gears than 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-FE MR2 faster? Because the turbo spools faster, the compression is higher and it's a bigger engine.

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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 fittings (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 pressure 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 Gauge (Modify for WOT reading from [www.gadgetseller.com](http://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 adjustable 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 necessary 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 than 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 aggressive profile than 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. A 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 interchangeable.

- Valves - 1mm or 2mm oversized valves will do wonders for volumetric 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

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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 than 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 the 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 than 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 delightfully surprised and happy with the result.

MR2Board Forum Source Thread

EDITED: Formatting and content

## V6 Engine Swaps

### Why the 3vz-fe is the best Toyota v6

[Written by Toysrme]

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

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The 3vz-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 acceptably.

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+.

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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/Window'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 have 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.

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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: Compatibility / 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)

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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

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A piggyback VVT-I controller is necessary 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 gauge 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 gauge 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 cannot 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 position 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 successful 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 think 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 doesn't require any drilling or tapping.

axles: all the Solara/Avalon/Sienna/etc. axles I have seen aren't rebuildable. I.E. they don't 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

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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 solenoid 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

MR2Board Forum Source Thread

## **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 coolant 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 pulley fits right onto the 5VZ crank, the 5S pulley should too. Remember to RE-mark the 4cyl crank pulley, 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 extent, 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!)

MR2Board Forum Source Thread

## 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)

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\*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-l  
\*\* dual vvt-l

[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)

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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](#)

1991 5sfe Charging Circuit  
1997 1mz Charging System Circuit  
1991 5sfe Starting and Ignition Circuit 1  
1991 5sfe Starting and Ignition Circuit 2  
1997 1mz Starting and Ignition Circuit 1

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1997 1mz Starting and Ignition Circuit 2  
1991 5sfe Back Up Light Circuit  
1997 1mz Back Up Light Circuit  
1991 5sfe Engine Compartment Connector Location  
1991 5sfe Engine Compartment Connectors  
1991 5sfe Engine Management 1  
1991 5sfe Engine Management 2  
1991 5sfe Engine Management 3  
1991 5sfe Engine Management 4  
1991 5sfe Instrument Cluster Circuit 1  
1991 5sfe Instrument Cluster Circuit 2  
1991 5sfe Instrument Cluster Circuit 3  
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1991 5sfe Manual ECU  
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1997 1mz Combination Meter  
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1997 1mz Connector Joining Wiring Harness 4  
1997 1mz Connector Joining Wiring Harness 5  
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1997 1mz Starting and Ignition Circuit 1

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1997 1mz Diagnostic Code Chart 1

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1997 Powertrain Electrical Diagram 6

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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.

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Caldina GTs are fairly common, definitely a lot more so 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 don't 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 wouldn't recommend using this engine, to someone that isn't familiar with wiring etc... You'd end up spending more than the cost of a redtop, just getting the wiring redone, etc.

I don't 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 can't 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

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or 5SFE doesn't.

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 its 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 aren't 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 can't 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

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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 isn't really practical to have an air intake setup.

So you really need the correct manifold for either situation.

They are interchangeable, 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 don't 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 can't comment for sure.

Also, the RWD cam belt cover sticks a considerable distance further away from the engine block than the FWD one, and won't physically fit inside the engine bay. It's often said that the exhaust side VVTI clashes with the strut tower, this isn't 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 equivalent, and therefore shouldn't 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 won't 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

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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.*

MkIII (2000 - 2007)

**VVTL-I and TVIS explained!**

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[Written by Sirc]

I'm explaining this to you under the assumption that you understand how a Valvetrain works. If not this will mean absolutely nothing to you.

There are a couple different names of Variable valve timing when it comes to Toyota's VVT, but I'll just do the basics because it's just easier. Using what I've learned from a lot of Toyota literature I've adapted their explanation to the best of my abilities in order to summate it for the people who can't understand their explanations... because I barely could.

VVTL-i = Varial Valve Timing with lift and intelligence

VVT-i continuously varies the intake valve timing throughout the whole RPM range by using an oil pin to hydraulically rotate the camshaft in accordance to the drive gear, while VVTL-I has that cool lift mechanism.

VVTL-I works like this: There is a needle bearing roller on the arm follows the low-rpm, shorter-duration, low-lift lobe forcing both valves to open and close on that cam profile. We'll call this lobe, little johnny.

The roller bearings and design of the roller itself on the rocker arm pivot around to reduce the amount of valvetrain friction, which is good because that means less wear on the valvetrain and will only delay the inevitable of having to buy a new head .

The high-rpm, higher-duration lobe with a longer lift rubs on a hardened steel "slipper follower" mounted to the rocker arm that has a spring on it. We'll call this profile, Timothy. Even though Timothy is taller and pushes down further than little Johnny, the spring absorbs the extra movement and all is well within the kingdom, because Johnny isn't working quite yet.

This would be like if little Johnny and Timothy were jumping on Fat albert and Johnny was jumping on his face and Timothy is jumping on his stomach. Even though Timothy is taller and bigger, his weight is being absorbed by fat albert's soft and squishy stomach. So in this case Timothy doesn't receive the same amount of feedback as Johnny would.

Usually at around 6000 rpms (this is true for the 2zzge) the ECU will send a signal to an oil control valve at the end of the camshaft that pressurizes and engages a locking pin in the rocker arm, sliding the pin under the spring-loaded slipper follower.

So to put it into perspective... let's say Johnny and Timothy were jumping on fat albert and all of a sudden they started jumping faster and faster until they hit 6000 jumps a minute. At that point Fat Albert would tense up his stomach and Timothy would be hitting the same amount of feedback as Johnny would. Now both Timothy and Johnny would be equally hitting Fat Albert at the same time with the same amount of force being fed back into the rebound of the jump.

Once the pin locks in place this forces the rocker arm to follow the high cam profile (timothy) instead of the low-cam profile (johnny). And thus Fat Albert becomes squished at a higher impact rate causing him to inhale more air and expediate it quicker. Just like the 2zzge!

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TVIS = Toyota Variable Iduction System.

There's this stupid myth that goes around where people think that the TVIS is Toyota's "VTEC." Where in fact it is not.

I'm explaining this to you under the assumption that you know how Intake manifolds work. At one point there is a Throttle body. Inside the throttle body is a little plate that opens and closes when you press on the "Gas pedal" or the "accelerator" or the "Go thingy." Funny that the "gas pedal" doesn't actually control the gas, but rather a plate that opens or closes. Air is vacuum pressured into the intake manifold and spread throughout the runners that go into the head of the motor.

The TVIS is very very very easily explained. All it is is that there are two pathways for the air to go

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in. At low rpms the plates are closed and thus making the air velocity flow faster for a little bit more "umph." As we all should know air velocity = better performance because of volumetric efficiency. At high RPMS the plate is opened and thus lets more air in at higher RPMs... because the engine probably wouldn't survive without it.

This is like as if you breathed through your nose only at "low-rpms" or walking speeds. Let's say you start running REALLY fast into the "higher-rpms" now you start breathing through your mouth. Why? because at "low-rpms" you only need a little bit of air to achieve the same results. At the "high-rpms" you need to breathe like a mofo when officer skinny is on your case after you've just robbed the Dodge dealership of it's SRT4 parts... or you know training for the olympics. Whatever.

More information can be found in the MR2Board Forum Source Thread.

## General Maintenance

*There are no articles in this category.*

## Do It Yourself Write-Ups

*There are no articles in this category.*

## Braking, Suspension and Wheels

*There are no articles in this category.*

## Engine

*There are no articles in this category.*

## Engine Swaps

*There are no articles in this category.*

## Part Numbers

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*There are no articles in this category.*

## Sponsor Articles

Technical documents specific to our sponsors product offerings.

*There are no articles in this category.*

## ATS Racing

### **ATS Racing TD0 5/6 kit installation tips**

I thought I'd post some pictures I took while unpacking and installing my personal ATS TD06 kit, as well as some useful pointers.

(note: these pictures are over a year old, and there have been some subtle changes to the kit, so your kit may not appear EXACTLY the same as the one pictured)

Here is a picture of the kit in it's packaging, after I removed it from the box:

Here is the kit unpacked:

(note: the turbine housing ceramic coating is optional. All adapters come ceramic barrier coated as a standard feature of the kit)

Here is a close-up of the turbocharger:

Here is the turbo after I spent an hour or so, polishing the compressor housing:

Here is a picture of the kit after I polished the turbo, down pipe, and dump tube. The down pipe and dump tube have a fine, semi-polished finish, so it only took a couple of minutes to bring the shine up by hand.

The Install

First install the adapter to the manifold:

Next, install the turbo to the adapter:

Next, install the down pipe to the turbo:

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Install the oil feed line to the block, using the supplied fitting. (note, the fitting pictured is different on my kit, because I had a 5S block, which was drilled and tapped for 1/8 BSPT)

Now bolt the oil drain line to the turbo, using the flanged connection. After that, you can install the manifold, turbo, and down pipe into the car as a unit, which I feel is one of the strengths of this kit. The complete assembly is quite heavy, so get a friend to help with this part if you can.

Once the assembly is in the car, reinstall the exhaust manifold nuts. After they are secure, you can attach the oil feed and return lines. The return line attaches to the stock rubber elbow that comes off the oil pan, and normally attaches to the metal CT26 oil return pipe:

This is a good time to install the down pipe support bracket to the block:

Now you will measure the distance and routing for your water feed and return lines, and cut them to length. We leave this part for the end user, in case they have custom requirements, due to a 5S block and water lines, etc. Here is how I routed my lines, using the 3S water pipes:

Note: if you've never cut SS hose, the easiest way is to wrap black electrical tape around the diameter of the hose where you are going to cut, then use either a hacksaw, or an air powered cutoff wheel to make the cut. Rinse the hoses out well afterward.

You can go ahead and reinstall your b-pipe, if you haven't already, and you are finished underneath the car.

Now that all the lines are installed, assemble the dump tube to the wastegate, and then install them as a unit to the manifold adapter. [b]Do NOT use the gaskets supplied with the Tial wastegate. The flanges have a smooth enough finish to seal without the gaskets, and the gaskets invariably blow out within 48 hours of install.[/b]

Go ahead and install the O2 sensor, and your hot pipe, intake, etc. The rest of the install is a piece of cake.

Here are some more pictures:

#### Boost Control and wastegate line routing

If you are using an MBC, leave the port on top of the wastegate open to atmosphere. Route a vacuum line from the hose barb on the compressor to the "In" on the boost controller. Run another line from the "Out" on the boost controller to the side port on the wastegate.

If you are using an EBC, you can either connect it as above, or if it has a switch to change the logic to control an external gate, like the Blitz DSBC and SBC-iD, you run a line from the barb on the compressor, to the side port on the wastegate. Install a T in this line and run a line from the 3rd leg of the T to the "In" on the boost control solenoid. Run a line from the "Out" on the solenoid to the top port on the wastegate. Be sure to set the head unit to "Wastegate".

(on the DSBC, this is accomplished via a dip switch on the rear of the head unit)

All in all, this is the easiest turbo kit install I have ever performed. Being able to almost completely assemble the kit outside the car REALLY makes it easy, as opposed to other kits I've installed, where you had to install the turbo to the adapter, and down pipe to the turbo while lying underneath the car, working in the confined space of the engine bay.

Feel free to post any questions you may have about the kit, or the install.

Best regards,

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Ken Blake

MR2 forum reference thread

## KO Racing

*There are no articles in this category.*