

PROJECT BLURBIRD



This is an attempt to document the transplant of a SR20 turbo engine into my series 2 Nissan Bluebird TRX.

The story begins where the dashboard screwed up on me as it is a typical problem with these cars, and I was unable to read the digital temperature readout on the dash. Driving along one night, the engine overheated, fully cooked, blew a head gasket, kept driving, and eventually had an oil explosion under the bonnet.. What a MESS!!!

When I got the car home, I lifted the bonnet, and found the loveliest splattering of oil that one could see under the bonnet of their car. It was a sight. I pushed the car into my garage, and the next weekend I pulled the head off the L20 motor to examine the damage. Unfortunately it turned out that the head was warped, twisted, bent and basically fucked... The block had a crack between cylinders 2 & 3 and the gasket was melted between cylinder 1 and the water hole thingy. Ok I decided this motor was well and truly screwed as it had done 230,000 km before the Odometer died!

After shopping around, I considered all options. I was originally looking at shoving a FJ20 turbo in, but decided against that because the FJ is now getting a little bit too old these days, and perhaps something a little more modern was in order. I was on a tight budget of \$3,000 so I examined all my options, RB20 6cyl, Z18, FJ20, SR20... I found an SR20 n/a for sale and between deciding what to do and going and buying it, it was gone. I thought, naah I shall go all out this time. Get me a SR20 turbo...

I Shopped around and the best deal I could find was \$2,400 with the 5 speed gearbox, and computer and wiring loom. I went along to this place, drove to bloody whoop whoop to look at the motor, it was very neatly stashed away on some pallet racking about 15 feet off the ground and I had to climb up this mountain of parts to look at the thing. Upon inspection, there was no computer, no gearbox, no starter motor.. I asked where the

gearbox was, the guy pointed across the workshop and said “There it is mate..” I climbed down and went and looked at it, there was no gearstick... Asked him where it was. He said I’d have to find one, they are pretty common and should be easy to get. Sure thing buddy!!! Where’s the computer I asked.. He rummaged through a box of ECU’s and found one to suit the S13... Hmmmmmm... Thanks buddy, I’ll think about it and let you know when I want to buy it... Bye...

Kept shopping, and eventually found my victim, for \$1,695 with computer, 5 speed and engine. Beauty, I went and looked at it, was happy and laid my cash on the table. Got the thing home, the bloody wiring loom had been cut and about 1.5 metres of wires were missing... Also the Crank Angle Sensor was missing.. Great.. I rung the guy and he said he’d get me a CAS in about a week...

Step 1. Remove Negative Battery Terminal. (As per the Gregory’s workshop manual!)

Step 2. Remove bonnet. (Yep, 4 bolts... Easy stuff!)

Step 3. Remove blown up engine.....

Anyway, I set about removing the old engine, first I took a video camera to it just so that I could refer to any wiring & plumbing, especially the air conditioner because I don’t know much about aircons on cars and the new motor had an aircon compressor on it. The key here is to document everything and keep all the nuts and bolts and everything. Throw away NOTHING! Every bolt, nut, bracket, hose, anything at all may be useful later.. (Good tip for life in general I think!) So I eventually got it all unbolted, easy rule of thumb here is “If it’s attached to something, label it and undo it.” Remove radiator, engine, grill, charcoal canister, walk outside garage and throw charcoal canister as far as you possibly can. I unbolted and dropped the gearbox onto the floor because it seemed a bit easier at the time to do it that way. Usually I find it easier to have the back of the car up on ramps if your gunna take the gearbox and motor out all in one go, but since the car didn’t go I didn’t have much option. Anyhow, The L20 looked like a baby compared to the SR20 on my garage floor. I thought to myself, “Self, how the heck is this big mumma gunna fit inside that engine bay?” But then remembered that a lot of these engines go into 1600’s so I didn’t worry too much about that for now. I measured everything, engine mounts, gearbox mounts, all sorts of things, and duly decided that the SR and gbox were going to be about 3 inches longer at the back end, This is where I realised that I was in for cutting holes, fabricating stuff, and cutting tailshafts and all sorts of fun. I was still naïve at the time and was thinking “Ok, I’ll drop this new motor in and we’ll be hooning in no time!” Sure thing...

Next thing to do was CLEAN UP the engine bay. It was a pigsty!! It was SHIT!!! There was grease and 16 years worth of crap all over it. 3 cans of degreaser later, I had it sparkling. It is MUCH easier to work in a clean engine bay. I must admit, I was not in this for the show glory, I didn’t want people to go “Wow, nice paint job in the engine bay, and you’ve hidden all the wires too..” Yeah right. This thing is for function, not a show-stopper. I don’t want to win show & shine trophies. Probably wouldn’t with a 16 year old car anyway!!

First trial drop in of the SR20, no gbox. Well, it fits in the engine bay, seems ok. The old engine mount rubbers were all mashed up so I took them off and sat the engine on the old L20 rubbers. It didn't sit very well at all, The sump wouldn't clear the sway bar, or the cross member, the strut thingys that the engine mounts sit on were about 2 inches too far apart and I was having a prick of a time wondering how the hell it was gunna fit in.

I decided to get outside help, joined the datto mailing lists on the internet, I rung every performance workshop I could find and they all said "Dunno mate.." Great, thanks for all your help. I had no expertise in welding and wasn't too keen on welding anything anyway, but I even went to the trouble of asking a professional welder guy to come and have a look for me. He came, he saw and said "Dunno mate.." and left... Thanks for your help. Anyway, a few days later, I found out that If I were to take a series 3 bluebird crossmember whereupon a CA20 once sat, bolt that in place of the series 2 crossmember, and change over the steering bits then the engine would bolt onto that without any fabrication. I went to the wrecker and paid \$100 for the cross member and took it home, removed the old one, took all the steering off, the sway bar, the shocks, everything.. and bolted the series 3 bluebird cross member in place, hooked up the sway bar, steering, and to get the shock absorbers back on, I had to put a jack under the wheel arm thingy, get my 120kilo brother-in-law to sit on the car while I did up the shocks. Point from before was "Don't throw away ANYTHING" Coz I had to use some parts from the s2 xmember, and some parts from the s3. Particularly for the steering and heat shield. Great stuff. I have this sorted out now. I'll have this motor running in no time....

Trial drop SR20 in number 2.... Yep, she sits on the cross member, beautiful, but not quite right somehow. Ok darn. The sump is sitting on the sway bar. Crap... I said "CRAP!" and crap again.. Unbolted the sway bar, and let it dangle for a while until I get something sorted there. Remove engine again... Pump pump pump on the hoist... I ended up ringing around a few places and the best advice I could get was to tow the car to a place that makes custom suspension components and pay around \$250 for a custom made sway bar. Naah, I thought to myself "We are on a budget, and we have less than \$1,300 left... Allow \$700 for exhaust and \$500 for an engineer.... hmm..." Ok, so I blew the budget already.. Took measurements of the sway bar and drew a picture in my head of how much further I'd like a bend in it and took myself off to the wreckers... Measured up all sorts of nissans, series 3 bluebird, series 1, dattos, everything.. \$35 later, I had in my hot little hand, a front sway bar off a Nissan Skyline 1986 model. Took the bugger home, and bolted it up in about half an hour. Nice, easy, neat and it was a LOT heavier than the bluebird item as well and it fitted like a charm and cleared the sump just perfect. The original one was 20mm diameter, the new one was 25mm diameter. Great, good front end stiffness. Should corner great!! Maybe.. I know bugger all about suspension stuff.. And airconditioners... And EFI.. And Turbos.. My forte is engines and driving like a hoon. I can disassemble an engine and put it back together, fix stuff on the side of the road so I can drive home, change the oil, basic stuff, but that's about my level of knowledge on cars. I know electronics too, so My soldering skills should come in handy later...

So, trial fit number 3 or was it number 5? drop engine in, no problem. Hey, where the hell do the usual things hook up, like alternator, starter motor. Hmm, cant... get....my.....hand...in...there... SHIT!

Remove engine... Look at alternator connections, oil temp, etc.. Right, next step, get gearbox in there. I ended up taking the cross-member off the old L20 box and it bolted up to the SR20 box nicely. Great. The other thing was that there is a speed sensor thing where the normal speedo cable hooks up. I multi-meter'd it and spun it round and it gave me an AC voltage between 0 and 12 volts when it spun really fast.. Ok.. Sure.. I threw this thing into my box of parts. Removed the speedo cog thingy from the L20 gbox and it fits perfectly into the hole in the SR gearbox. Great. Gearbox is sorted now. Bolt it onto the motor. With starter motor. Then, insert motor into car.... :)

So I then removed the gearstick, popped the motor into the car, gearbox and all, in one foul swoop. Only problem with that was, that there is a bit on top of the gear shifter and it doesn't sit too well in the old gearstick hole, so Engine half in half out, I climbed inside the car with the angle grinder, unbolted the plate that covers the hole up, and cut it a little larger than normal towards the back. I ended up cutting it into a square shape at back of the hole which went right back to the bracket that holds it all in. If you had it all apart, you'd know what I meant. I took about ½ an inch off it. With that sorted out, the shifter was in place, great stuff... Bolted up the engine mounts, climb underneath, bolt up gearbox mounts.... NOT! The bloody gearbox cross member sat a little further back than the old one, nowhere near the 3 inches that I thought it would be, but about ½ an inch. So I removed the gbox x-member and filed all the holes into an oval shape approximately ½ an inch further forward than they were, climb back underneath and it bolted up beautiful. So I would recommend to anyone doing this conversion to do this first, before they stick the gearbox in!! The old saying "Use whatever you already have" applies here. Fabrication is a pain in the ass!!!

With all that done, it was time to start hooking stuff up. I hooked up the alternator, the starter. This was quite easy as the old wires all just plugged or screwed on/into where the new ones are.. Really easy stuff!! I got hold of some wiring diagrams for the ECU and set about joining up all the wires. Most of them were the same colour at each end, so it wasn't that bad, but there seemed to be a LOT of black wires.. and red ones.. and blue ones, and orange.. There ended up being more wires on the engine than there were on the ECU. I eventually gave up and went and bought a Microtech MT8 computer which turned out to be a piece of cake. They gave me all the diagrams, set the computer up, gave me a new loom, and they even labeled everything on the loom for me. Twas EASSY!!!! Moral here is when you buy your engine, if it's got a complete loom and you wanna use the standard ECU, your in luck.. If you wanna get an aftermarket ECU then it doesn't matter whether the loom is cut or not! But be prepared, coz I ended up spending an extra \$1100 buying this. It was not part of my budget!

Got it all wired up, great, let's hook up the fuel.

My dad gave me a old Toyota fuel pump which I rigged up to the computer, fuel system, engine.. blah blah. Fuel pumps are pretty simple stuff, you have 4 things to hook up, +12v, earth, fuel in and fuel out. Now for the test, switched the ignition on. Yep, pumping fuel, but it isn't going through the fuel rail... Little did I know at the time that the SR20 has a pressure regulator on the end of the fuel rail which means you can't push any fuel through the rail until the pressure is up to 40 psi. This little Toyota pump was only pushing 10 psi.. pretty tacky!! It's do one or two pumps and stop.. No good. You have to use a EFI pump. They are expensive!! Around \$250 for a decent one. I finally found out that one from a VL commodore would do nicely as these units pump 50 psi of fuel. Difference is that EFI pumps are a rotary pump and the normal pumps are not, therefore not capable of pumping and great amount of pressure. Another thing is, the VL pump takes a 1/2" input and presses it down to a 3/8" output so therefore you can't take the fuel from a 1/4" fuel line from the tank. You need to have it pumped into a surge tank first. If you look at any decent surge tank, the output at the bottom is a 1/2" anyway, so this is the way you gotta do it. You have to be able to supply the EFI pump or you are in poop from the start! Anyway, I set this system up with a surge tank, and a 1/2" filter between the pump and the surge tank. Surge tank was mounted in front of the radiator, but later moved to the boot where it should be!!!

With that bit sorted out, I put the radiator in, and began plumbing it up. I used a 200b bottom hose and cut it down at the engine end. At the top I used the old bluebird hose and cut about 1/2 an inch off each end. It fitted great, and cleared the blades of the electric thermo fan. No problem. Fill it up with water.....

And water came pissing out from the back of the motor... One thing I forgot was that cars have a heater inside the cabin... This needs to hook up somewhere. Ahh huh.. I found where it hooks up.... My car has a hole in the heating system in the cabin anyway, so I thought I'd go without that creature comfort for now. So I hooked the two heater hoses on the engine together so the water could flow through. Nice and easy.. Right? Wrong.... Started filling it up again and still water all over the floor. Unfortunately the heater hose had split somewhere behind the motor, so I had a cow of a job replacing the hoses across the back of the motor. I should have done this before I put the motor in!!! Tip for the wise there.! Anyway, fixed that bit up. No problem.

Right, got fuel, got water. Fill her up with oil and let's give the motor a test run... Turn key.. The motor cranks.. No go... Arrgh..

Go and look up on internet, and with frustration, I discover that the ignition system required something called a Power Transistor. Which is basically 4 ignition modules. These are to isolate the power of the coils from the ECU while still taking a signal from the ecu to tell the coils to fire... Simple in theory... Try and find one!! There was ONE in Australia for sale... Nissan will sell you one for \$750. This thing is just a little black chip that would probably fit inside a match box if you ever wanted to put one in a match box!! Basically it has 9-10 wires, 4 in from the ECU, and 4 out to each coil and 1 or 2 for ground. I dug around a bit with a few suppliers, and found out that one from a EMS fuel

injection system would work fine. This thing was \$120. I got one and rigged it up. Tried to start the motor, no go!!!... I pulled the coils out and discover that there was no spark.. Anyway, it turned out that I blew up the ecu by not having a module there in the first place. This is a fairly common dumb thing to do and Microtech quite kindly agreed to fix it for me under warranty. Thank guys!!

While that was out getting fixed, I set about tidying up my wiring mess in my engine bay. A few points here: Always use Heat Shrink when joining wires together. Always put the heat shrink on BEFORE you solder the wires together... Have plenty of electrical tape on hand... I was not too keen on cutting big holes in my firewall, so I ended up running the wiring loom across the firewall, and through a hole in the side of the engine bay which was already there, through to the inside of the front quarter panel, and poked the wires through a hole that was already there near the door for the speaker wire and into the passenger footwell area. No problem!!! Cool!

Got my computer back, plugged it in, turned the key and viola... NOTHING!! Crap!!!! You were expecting that weren't you.? This is turning into a comedy of errors. Actually, I got it to go pop pop pop and make a lot of smoke in my garage as it didn't have an exhaust on it yet, and I know that an exhaust system is vital when hooking up a turbo engine. Hmm... Ok, stuff it.. Let's get the exhaust put on.

Before we tow the car, it's a good idea to have a tail shaft on it so we can drive it home if luck goes our way? So put the tail shaft in... I discovered that the two-piece tail shaft was about 2cm too long for the new gearbox, although the spline was the right size, the tailshaft was too long. No cheating here... I got a quote to have it cut and shut. \$170 to take 2cm off it and re-balance... Naah. I've already blown my budget... Took the tailshaft to the wreckers, measured it up, and after about an hour of hunting through piles of tailshafts for nissans and datsuns, I found that a datsun 180b one-piece tailshaft was exactly the right length if I were to cut the silly looking flange off the outside of the flange. Angle grinder out, chop it off, and viola it fits perfectly.

Tow the car to the exhaust place.. They installed a 2.5" cat converter, 2.5" system all the way through, and hooked all the mandrel bends and shit up for the intercooler and that's where I'm up to.....

6/11/00

Wow, it's been a while since I left off on this document... ☺ OK..

At the exhaust place, It took them a week to finish all the plumbing and stuff. They did a fantastic job and it looks really neat. The car still wasn't running at this point and since the car had been sitting there with a dry battery in it for 3 months I figured it was time for a new battery. Fortunately, there was a auto electrician across the road from the exhaust shop so I bought me a new battery and set about installing it. It turns out that the plumbing for the intercooler had to come through the radiator surround bit and the bend couldn't be made sharp enough so I had to install the new battery hard up against the side of the engine bay. Even more fortunately for me, it fitted just perfectly and I hooked it up ready to rock & roll. I then finished wiring up the ignition and just generally bodgying it

up so that the car would run. There were wires and crap everywhere at this point.. I still hadn't figured out the crank angle sensor position, coz apparently this isn't as easy as setting a distributor. Just a note to everyone. DON'T remove the CAS if you can avoid it.. They are a bum to get right... What I eventually worked out after much stuffing around... Was that you have to set the engine to TDC#1. To do this without taking the rocker cover off, you take out #1 spark plug, and put in a compression tester. Turn the motor over by hand till you get the compression tester to start building pressure and look at the notches on the pulley on the front of the engine. The notches are in 5 degree increments starting from the left of the pulley as being 5deg ATDC, then 0deg TDC is the second notch from the left and then 5deg BTDC is the third and so on. So you set it to 10deg, then take the CAS and have it so that the plug is facing up and about 45deg to the front of the car, you turn it over until the red dot is lined up with the notch and you will notice that there is a notch near the red dot and that is the real marking. Since when you insert the CAS it turns on the spigot gear thingy then you will find that as it goes in, the large notch on the light sensor disc lines up with the light sensor and your in business... Bolt it in place loosely, timing light in hand and hooked up ready... Turn the key and listen to the motor turn and turn and turn and not fire... ☺ What to do next... BLOCK all the vacuum hoses on the throttle inlet. These totally root your idle so anything that's not hooked up, block it off... Otherwise you'll be there all day trying to start the engine. Anyway, I sprayed some aerostart in the throttle and hopped in.. Turned the key and VROOM.. The sweetest bloody sound I have ever heard in my life... The car blew SHITLOADS of smoke and all sorts of crap out the exhaust for around 5 minutes or so... It was GROSE what I saw... And... All the cleaning solvents and fingerprints and shit all over the turbo and exhaust had to burn off, and that took a good hour or so of running before the burning smell stopped... I took the car for a gentle drive up the road, but it turns out that I'd blown the #1 on the EMS ignition module, so it was only running on 3 cyls. Easy fix and for anyone who gets caught out on the road with a half-dead ignition module.. Use a short wire and some alligator clips. Join 1 & 4 together in the wires that come from the computer and same for 2 & 3 since these fire together anyhow. Just like a twin-coil setup... After I did that, turn the car back on and the thing ran beautifully. I still hadn't hooked the wastegate actuator up so I was probably running on about 11psi boost.. Took the car for a boot up the road and I nearly shit myself.. It was so fast... The power it put down in first gear was incredible. My first impressions were.. "Holy moly... This is winding up pretty damn quickly" The funny thing was, it kept pulling and pulling.. If it weren't for 7000rpm I wouldn't have backed off, so I threw it into second gear and booted it again.. It saw 7000rpm again within a few seconds.. By this time my vision had gone blurry each time I put my foot down on the throttle and I was having a bad dose of the shakes... sweaty palms, etc... 3 months and nearly \$4000 later has all been paid back within 20 seconds... Was I happy or what. There is nothing like driving a car for the first time when you have just worked so hard on it. I'm sure you all know the feeling.

Next thing on the agenda.. Fix up the wiring, the fuel system (The surge tank was in the front bumper bar..), ignition system, dyno tune, a hole in the floor where the gearstick was moved from.. etc.

I did as best as I could, but I had to take it somewhere anyhow to get it dyno tuned.. I figured I may as well tune it and get that out of the way first... Bad decision... I took the car to Tony Rigoli at Fairfield who is notorious for making FAST 2 litre cars.. His sons race a datsun 1200 ute with a 2 litre fiat engine.. High 8's down the ¼ mile... You'd know it if you saw it... anyhow. I get there and he says "Oh no... You-a cannot-a do-a this-a... Your-a fuel-a tank-a system-a gotta be-a in-a the boot-a... And-a your-a wiring-a is-a shit-a.. I will-a fix-a it-a for-a you-a for-a lot-a money-a.. I-a cannot-a dyno-tun-a this-a like it is-a..." So I get a quote.. \$600 to replace the whole ignition system, fix the fuel system, fix all my shithouse wiring up and 2 dyno tunes. (2 dyno tune is because the Microtech ECU has two programs. I used one for normal use (rich mix) and one for the emission test (lean mix). Since a dyno tune is \$250 I figured it was good value.) So I let him do it... A week later, I went back and helped him finish off a few things with the fuel system and wiring and set about watching the dyno tune.. What a thing to see for the first time if you've never seen it before... My car was second off the rank for the day.. The first car was a LT celica which Tony had put an SR20det in. It was set up with larger injectors and a T3/T4 hybrid turbo and 3" exhaust.. DROOOL! ☺ (For a price though..I asked the dude who owned it how much he had spent on it and he said "Too much mate" as he shook his head.) They hooked it up to the dyno by strapping the diff to the floor of the workshop and just sitting the wheels on the rollers.. Pretty standard.. Chock the wheels at the front. This is what I expected... Then the dyno tune began... first some basic tuning, then a bit more heavy stuff... Then came time for the power run.. See how much boost we can make at what horsepower... They drive the car up to 4th gear and then let it idle... Then they just boot the thing until it redlines.. And I have never seen anything so spectacular.. The car lifted so high as he booted it, I could only speculate what it would be like to drive this car.. This thing went in 4th gear like my car goes in 1st gear... Pulling out 235hp at the wheels.. It made my little \$4000 effort look like fairy floss. Anyhow, they finished this thing off and it was my turn. My car was loaded onto the dyno and the tuning was started... It was a real shit, it kept pinging and farting around coz I was trying to run it on ULP and you gotta tune a turbo engine on PULP. My engine pinged too much, so we drained the tank to half and filled it up with PULP. What a waste.. Oh well... Anyhow, we tuned it up as best as possible with what juice we had and the best we could get from it was 135hp at the rear wheels at 4000rpm 7psi before it pinged too much and the dyno was stopped.. Never mind... Since then, I have worked out how to tune the thing myself and I figured out the the injection relies on how much manifold pressure or suction there is as to how long to leave the injectors open. I worked out that the ping occurs at 3000-4000rpm which is 00hg to 2psi in that range and then added an extra 10% injector time and the ping mysteriously disappeared... Gotta be happy with that..

I drove the car around for a while before I figured out how to work the MT8 ecu, but since I had the handset and I am a bit of a tinkerer with both cars and computers then I thought I may as well figure it out.. One day I had to change the program over to the lean program so that I could have the RTA emission test done. I figured that since it was free and I had nothing to lose, went and had the test done. When I got there, I changed the car over to lean and the test went great. The guy at the RTA just runs it on a dyno for about 10 minutes and drives the car over different speeds which are indicated on a screen which

sits in front of the car. Easy stuff... They have a rubber funnel over the exhaust which sucks up all the gases and analyses them. The results were as thus:

THC g/km = 0.41	ADR limit = 2.1
Nox g/km = 3.67	ADR limit = 1.9 (High reading indicated LEAN mixture!)
CO g/km = 2.8	ADR limit = 24.2
CO2 g/km = 209.3	ADR has no specs on this, but indicated that the higher this number the better the combustion and fuel economy.

The resulting fuel economy from this program should be 9.2 litres per 100 KM. I am getting approx 14 litres per 100km or ~14 cents per km with today's fuel prices using the rich/normal program. This is quite ok for a high performance 2 litre I think.

The RTA have really no pass or fail on this test, they are really only gathering information and providing you with the information to do whatever the hell you like with. If it is for an engineer's report then that is it. If you are doing some economy tuning then it is a slow way of trial and error dyno tuning for free. ☺

Before I went for any of these tests stuff, I finished off doing the little things. I added a EFI fuel filter to the engine bay, I put some rubber insulation around the fuel lines in the boot, I have tidied up the wiring a bit, I hooked up the temp gauge (But I had to bring the level down on the gauge by installing a 40 ohm resistor in the line between the sensor and the dashboard. This cost me 14 cents from Dick Smith electronics..!), I hid all the wiring in the flexi-duct stuff that Tony put all through the engine bay to hide the EFI wiring. I did have the BOV/wastegate activator hooked up to the throttle but I am told that this give negative and positive pressure to the wastegate actuator and doesn't work properly ever, especially when the throttle is closed it can't receive the high boost that is required to activate it anyhow so is thoroughly useless there. Instead, I hooked the wastegate up to the intercooler/turbo pipes by making a small slash in the rubber hose join between the pipes, then I installed a 1/4" T-piece in the slit in the rubber hose so that the two ends were in the hose and the connector was sticking out of the hose and then I use d a hot glue gun to hold it in place. I then hooked this up to the wastegate and it works VERY well. I am happy with my handywork. I have also changed the oil and oil filter. For the record, a Z145a filter on the SR20 is the ryco part number.. It's not listed in any Australian parts books but this is the filter to use. Also the oil I am running is Mobil 1.. Works great, nice stuff. The Dyno tune was done using the original N26 filter (ex-japan!) and Castrol GTX2 standard oil (Stupid idea that was!!)... As soon as I put the new filter on, the idle went from 1000rpm to 1500rpm.. The engine probably felt a lot better about that and an dI probably gained 50 horsepower!! I set the idle back to 1000 with the idle adjust screw on the manifold which is located between cyl 2 and 3 inlets. Just do up the screw until it idles smoothly at 1000rpm.. Easy shit.. ☺

Last thing was the engineers report. This was an easy thing. He was happy to pass the emission test as it was, he said that considering the engine was 8 years old when I got it and it's in a 16 year old car then it is running better and cleaner than original and it has got to be better than it was so he was happy with that and said he'd pass it. So he then made his report on the car, he went from front to back, asked me LOTS of questions about what parts I have used where and things like that, and he seemed to be quite happy

that I had used a lot of OEM parts and mounts and stuff. Anything fabricated is generally looked over very thoroughly, but anything made by Nissan that is off another car he was quite happy about. The noted brand names of stuff like filters and surge tank and everything. Eventually I got a 4 page report on the car which I will scan into PDF format and attach to this file. It is very thorough and in case I ever get harassed by the cops, I can pull out this report and say "ner ner" it's all good engineered work and is 100% legal.. ☺

The only thing he was adamant about was that I should have a unleaded fuel filler neck and cap. I went to the wrecker and found me one off a 87 Hyundai excel, chopped the neck off it 2 inches from the cap and installed it within about half an hour. The hole in the body had to be made larger with a file, but only a few millimeters and it was fine. Bolted it in and went back to the engineer and he was happy as.

The other thing he had to test was the sound pressure from the exhaust pipe... How damn loud it is. The 2.5" exhaust made a whopping 86 decibels and the legal limit for a 1997+ car is 89db so mine was quite acceptable. The limit for drag racing a street car at Eastern Creek raceway is 96db, so there's a bit of room to move with the exhaust system if I ever want to tinker some more.

2nd January, 2001

The saga continues...

After nearly 6 months of having the mighty blurbird running and back on the road and road legal for nearly 2 months now.. ☺ I finally blew my first diff 2 weeks ago. Not only that, but prior to that, 2 weeks earlier I seized a thrust bearing in the clutch and it took me about 4 hours to replace the sucker. It had gotten so hot that it had cooked the bearing blue and the balls rattle around inside it. Also, the bearing was welded to the bearing holder plunger thing so I had to use the one off the old TRX box to stick the new bearing in. Total cost of that exercise was \$38 for the bearing.. It would've been \$338 if I had it done by a professional, but I managed to do it and saved me \$300..

Anyhow, the diff blew while I was out on my usual Friday night drive.. The back right wheel just locked up and that's it, it was stuffed. Oh well, next day, inspect the damage, decide that it's time for the series 3 diff, chuck the series 2 diff. I went to the local wreckers who know me by name now and even remember what car I have and the engine I have, everything.. Pick up a s3 diff for \$120, get it home and realize that it's a drum brake diff and the TRX has discs. No worries, pull the axles out, and they are a different size spline.. So what I did was cut the old bearings off all 4 axles with the oxy torch, buy some new bearings and got my local friendly mechanic to put them on the s3 axles, put diff back together, put diff back on the car, I Used nolathane bushes on this sucker, coz they are much nicer than the standard ones. Rear disc calipers are not working. I had to blow the whole brake line out with compressed air and get them all working again.. No worries. Ahhh, the joys of owning an old car. Anyhow, got it all working and it's LUSH!! Smooth as, feels strong and it's quiet..

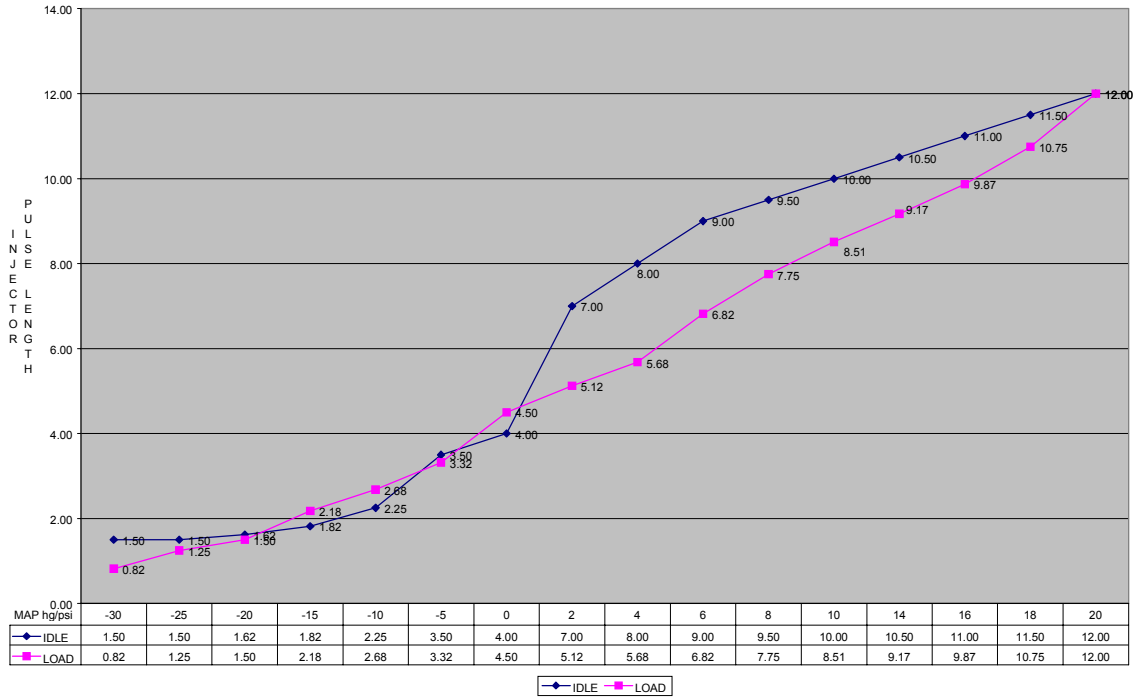
Got me a MAC solenoid activated valve about a week ago... Interesting device... What it does is it has 3 screw threads for brass fittings for rubber hose. Add 12 volts to this thing

and it sends air from port 1 to 3, remove 12 volts and port 1 is blocked and 2 & 3 are opened up. This is an incredibly useful device.. Add ¼" fittings and connect it up between the intercooler plumbing and the wastegate actuator hose. You get the drift? Essentially, I have only ever run 7psi boost on this engine. Bummer really, coz that's the way it was dyno tuned. Nothing over 7psi was dyno'd, hence It only clocked 135Hp on it's first dyno run. Bummer eh?

Anyhow, the Microtech ECU allows you to earth out an auxillary device based upon certain engine conditions, ie RPM < or > XXXX level, or manifold pressure <> whatever, or temperature greater than XX degrees.. So, I rig up my mac valve to the AUX on the ECU and the other end to key-switched 12 volts. Viola, I have a device that is allowing boost to climb VERY rapidly to XX dial up pressure and then activate the wastegate on and off until boost is below the specified level. Since doing this, I can adjust the boost from anything from 7psi (standard wastegate setting) to 18psi which is incredibly large for a standard turbo on this motor.. I do not know why this is... but it goes like stink now!! The MAC valve was a good investment for performance, I paid 70 bucks for it and connected it up myself.. Only drama is, the engine is still making boost upon deceleration.. Makes a hell of a racket of a noise.. Not good for the turbo either I believe. So what I did was purchase a mercury switch from jaycar electronics, and stuck it on the throttle lever at approx 30 degree angle to horizontal and wired it on with fence wire. Put one wire to chassis earth and connected the other side to the earth side of the MAC valve. What this does is holds the mac valve open for boost to flow through to the wastegate actuator to hold it open while the throttle is at or below 30% WOT. This allows the boost to build as normal under flat-foot acceleration, but when I take my foot off the accelerator to change gear or decelerate the wastegate goes full open and stops boost being made.. This is good... fast... and responsive. It works well.. Instead of a flutter on gearchange, I hear a pssssshhhhhhhhhhhhhhh sound and it's quite a nice sound... Cost of mercury switch = \$5... I had a spare 12 volt globe from an old dashboard I rigged up to the mac valve to see when it is open and when it's shut... It works like a charm..

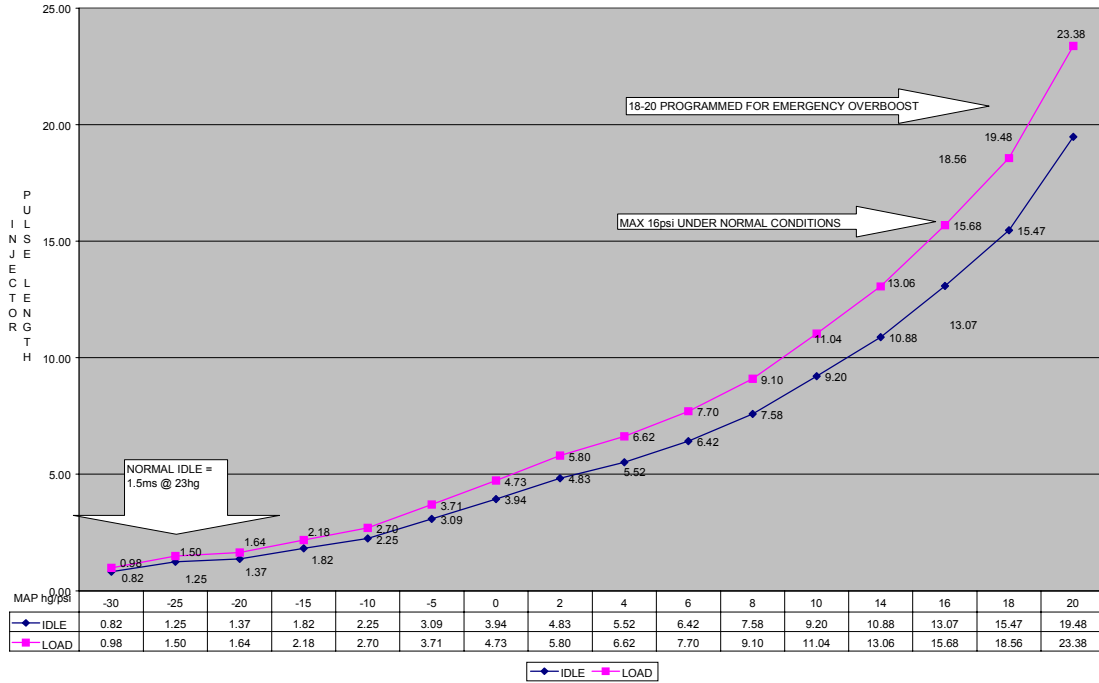
The only problem with changing a MAP sensed engine from 7psi dyno tuned to 14, 16 or 18psi is that the range from 7 to 18psi is not tuned. Yep, the engine pings like a diesel truck on HIGH boost, like 16-18psi type of thing. This is BAD.. VERY BAD.. I would say you could almost get away with a engine that pings on vacuum, but on high boost it is a piston launcher, rod-through-engine block type of arrangement, so my advice is.. Get that bit fixed... ASAP...

Have a look at my original EFI MAP from the dyno tune.



Study it carefully... Bear in mind that the IDLE (blue) is the injector pulse time at 0% throttle, and the purple is the I.P.T. at 100% throttle.. I do not wonder why the car ping'd on anything over 7psi before I richened everything up over 6psi. Think about it, Why would you want your engine to provide more fuel under boost when your foot is off the throttle than when your foot is on the floor. Looks to me like an idiot programmed this thing.. Hmmm, Apparently the guy who I paid \$250 to tune it is a bit of a racing legend on the drag strip and he knows these engines well.. What was he thinking that day?

This is how I think the fuel map should look like:



Load settings are based upon a formula which is:
 $Load = Idle * 1.2$ or (120% of idle time)

This is what logic tells me, and YES, I will be dialing in all these settings and YES, if they don't work, I'll be going back to the drawing board. I will keep you all posted.