Nissan Silvia S14 SR20DE – Turbo Conversion

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Photos not included in current version

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Introduction

So, you have a S13,14,15 with a SR20DE and its time for some more oomph! So you have though about slapping a hairdryer…I mean turbo on it, and your looking for a how to.

If that sounds like you, then you have downloaded the right PDF! Welcome to my humble guide to slapping a turbo on a SR20DE, with minor support mods to get it going. Now if your looking for a jaw dropping number on a Dyno sheet, then buy a SR20DET. With all the mods detailed in this guide you can expect up to 160Kw at the wheels, and best of all it will be reliable, I know two people who have done it, and both cars have had no problems for years.

This guide details how I turbocharged my S14 Silvia. I went for the most cost effective way of doing it and spent months gathering parts for as cheap as possible. My entire conversion cost just over NZ$2000, where a turbo engine would cost $4000, which doesn't even include Labour!

Getting Started

Ok so you want to go ahead and turbo your Silvia. As you can expect, this is not just some bolt on modifications and off you go. It requires planning and a very good understanding of how engines and turbochargers work.

Some suggested reading before going further:

How Engines Work – http://auto.howstuffworks.com/engine.htm
How Turbochargers Work - http://auto.howstuffworks.com/turbo.htm
More - http://auto.howstuffworks.com/under-the-hood-channel.htm

Important Engine Safety Information

The SR20DE runs at a Compression ratio of 10.0:1 (S13 SR20DE is lower). That means that on the compression stroke, when the piston is at the bottom moving up, the air/fuel mixture gets compressed from 10 units to 1. Due to the high compression ratio, its very easy to blow the engine up with the addition of a turbo, if not done properly.

Useful Advice Before Starting

If you didn't read the warning on the previous page, then slap yourself on the wrist, that's your first mistake. If you did read it then you will understand why you need to make sure your engine can handle boost, we don't want to blow it up now do we?

All engines are different depending on how they have been treated and how regularly they have been serviced. Make sure the engine have been serviced regularly, and that it has no faults like compression problems.

And last but not least: GET YOUR VEHICLE SERVICE MANUAL. I am not going to instruct you on which bolts to remove, I am way too lazy for that.

Parts List

Here you will find a list of parts needed to convert your SR20DE to a boosting beast. Please note that this guide does not cover ECU change! I am running a standard DE ECU!

First we will start off with the bare essentials, you can't go without these:

* **Garrett T28 Turbo** with internal wastegate
* **Exhaust manifold**
* **Dump pipe**
* **Exhaust front pipe** (DE exhaust doesn't bolt up)
* **Intercooler and piping**
* **Adaptor** for mounting intercooler piping to turbo
* **SR20DET fuel injectors** (no need for fuel pump as DE and DET are the same)
* **Oil lines** (feed from oil filter sandwich plate, return to sump)
* **Blow off valve**
* **gaskets** (engine-manifold, manifold-turbo, turbo-dump pipe, dump pipe-front pipe)
* **Boost controller**
* **Vaccuum hose** - lots of it
* **Boost gauge**

Optional Parts:

* **Front Mount Intercooler kit**
* **Adjustable fuel pressure regulator** (since I am running the DE ECU)
* **Apexi SAFC II** (also due to DE ECU)
* **Battery cable** (to extend positive lead due to battery relocation for front mount)

Stage 1: Stripping and Preparing

Basic Removals

Removing these parts are simple enough so I won't delve into too many small details:

Intake piping

The intake piping removal is easy peasy. Just undo the hose clamps all the way from the Throttle body to the air filter and pull the whole lot out.

Intake Manifold and fuel Rail

This part sucks, really. This will really make you hate Nissan for giving you such a limited amount of space to work in, but that's all good because the "psssh" you'll hear when changing gear will make it all worth it.

First, remove the Throttle Body (TB), its held in place with 4 large Allen Screws. Disconnect the Throttle cable and pull the TB away from the manifold…do not remove the hoses connected to the TB, unless you want to drain your radiator and guess where all the hoses go 3 weeks from now.

Removal of the intake manifold is easy if you know where to find all the bolts, refer to the workshop manual. Once the manifold is loose, just pull it away slightly so you can get to the fuel rail.

Exhaust

The bolts on the exhaust gets hot and rusty, I recommend spraying some WD40 on all the bolts around the manifold, CAT etc the night before.

Undo the bolts that connects the manifold to the front pipe of the exhaust, there are 3 bolts to undo.

Once the manifold is free from the rest of the exhaust system, undo the bolts that hold the manifold to the engine. Don't forget to remove the oxygen sensor and keep it in a safe place.

Next, remove the front pipe from the exhaust by undoing the bolts around the front of the CAT.

Preparing the engine for a turbo

Oil Feed Line

The Oil Feed line can be taken from the Oil Pressure Sending unit. Its located by the oil filter. I did mine using a Oil Filter Sandwich plate (The kind that allows the connection of a oil pressure gauge etc) and just ran a hose to the turbo, works a treat.

I used ¼" copper hose and brass fitting for the oil feed.

- Drain the engine oil, remove the oil filter (what a pain in the ass), connect the copper/braided hose to the sandwich plate.
- Install the sandwich plate to the engine so the hose sit on the bottom (not enough space anywhere else)
- Then install the oil filter on top of the plate.
- Run the oil line behind the engine towards the exhaust side.

Oil Return Line

This part is by far the hardest and most nerve wrecking. Basically because your about to drill a nice hold in the side of your engine… sounds fun doesn't it?

The arrow points out the location for drilling the hole for the oil drain. Just drill a nice hole big enough to not restrict the oil flow from the turbo.

Tap it and install a hose connector in the hole.

Battery Relocation and Intercooler piping hole

You will need to move the batter out of the way in order to make way for the intercooler piping.

I have a nice small battery so all I did was turn it 90° and extend the positive lead, while tucking the battery as far into the corner as I could.

Now grab a drill with a hole saw attachment and drill a nice 3” hole into the battery tray. The location should be that the edge of the hole sits flush with the bumer support, (without damaging it of course) I suggest you trial fit the piping before drilling the hole to get a good idea of where you need to drill.

Modifying the Wastegate Actuator

Now since replacing the actuator spring is too difficult and costs too much to have done, how do we get a 7psi actuator to run 4psi?

Easy…

Make the actuator arm adjustable. Some actuators already have these, but lets assume yours don’t.

- Cut the actuator arm in ½
- Use a tap set to thread one ½ of the actuator arm
- Then weld a piece with internal thread the same as the actuator arm onto the other ½

Refer to this image, since its hard to describe in words:

NOTE the Actuator arm.

Stage 2: Installation

Turbocharger

Installing the turbocharger itself is rather easy. The turbo I installed is a T28 Garrett that came off another Silvia.

DO not forget the gaskets!

- Bolt the turbo to the manifold
- Bolt the dump pipe to the manifold
- Bolt the wastegate actuator back onto the turbo

Trial fit everything to the engine, then connect the oil feed and drail lines to the turbo (once its bolted to the engine you won't have enough space for this.)

Bolt the whole lot onto the engine and install the turbo front pipe between the dump pipe and the CAT.

Fuel Injectors

This is another pain in the ass. Refer to the workshop manual for a complete run-down on the removal and installation process.

Basically, you remove the old ones, and fit the new ones.

Fuel Pressure regulator

- Remove the stock FPR from the fuel rail (it's the object bolted to the end of the fuel rail towards the front of the car).
- Install the Adaptor place onto the fuel rail in place of the old FPR.
- Mount the Fuel pressure regulator to the engine bay
- Connect a fuel hose from the FPR to the fuel rail
- Connect the original fuel hose to the FPR
- Connect a vacuum hose from the FPR to the intake manifold

Now, re-install the intake manifold and Throttle body. Refer to the manual for installation.

Front Mount Intercooler and boost controller

- Remove the front bumper
- Remove the standard cold air box
- Connect the Intake pipe for the air filter to the turbo
- Connect the air flow meter and air filter to the intake pipe
- Bolt on the adaptor for the intercooler piping to the turbo compressor
- Using silicone joiners, connect the piping onto the turbo compressor housing and the throttle body
- Run the piping down through the hole you drilled, and the stock hole where the cold air box used to be
- Using the brackets provided with the FMIC kit, mount the intercooler to the front of the car, make sure you mount it as high up as possible
- Connect the intercooler piping to the intercooler.
- Connect a vacuum hose from the piping to the boost controller.

Remember to tighten the hose clamps.

- I used a manual boost controller
- Connect the hose from the intercooler piping to the boost controller
- Connect the other side to the wastegate actuator

Most manual boost controllers have an arrow to indicate airflow.

Blow off Valve

- Connect the blow off valve to the intercooler piping
- If the blow off valve vents to atmosphere, block up the pipe on the intake pipe between the air filter and the turbo. If not the run a hose from the BOV to the intake pipe.
- Connect a vacuum hose from the BOV to the intake manifold.

Finishing Off

OK, all the bolt on work is done.

Now you will need to install the following:

Boost gauge, SAFC (optional)

All these parts come with their own instructions. The boost gauge should be connected to a vacuum line off the intake manifold.

Now go get it tuned!