

# Turboing an LN46 Hilux

Hi all, I have just finished installing a TD04 (Subaru) Turbo on my 1983 LN46 Hilux (2.2 Litre Diesel), and it drives like a totally different car now, it can actually maintain speed up a hill!

I thought I would make a thread about it as there is very little information about Turboing these specific motors, and there's a few little differences between these motors and the other L engine Hilux motors.

I will try to be as concise as possible, however I am not very good at doing that. Please comment if you need more info.

Total time taken: 3-4 full days assuming you have all parts ready.

Total cost of parts only: \$1102

I have listed the places I go the parts from, and in the brackets are other shops you can get the same part from. The parts required are:

Turbo	\$260	eBay <a href="https://www.ebay.com.au/itm/FOR-98-03-Subaru-Impreza-WRX-2-0L-58T-EJ205-Turbo-Charger-TD04L-49377-04300/163120284790?ssPageName=STRK%3AMEBIDX%3AIT&amp;_trksid=p2060353.m2749.l2649">https://www.ebay.com.au/itm/FOR-98-03-Subaru-Impreza-WRX-2-0L-58T-EJ205-Turbo-Charger-TD04L-49377-04300/163120284790?ssPageName=STRK%3AMEBIDX%3AIT&amp;_trksid=p2060353.m2749.l2649</a>
Manifold	\$120	Gumtree
Water/Heater Hoses	\$21	Autobarn (Repco/Supercheap)
Fittings for Water Hoses	\$38	Repco (Autobarn/Supercheap)
Fittings for Oil Feed and Drain	\$42	Autobarn
Oil Sender/Feed Tee Adaptor	\$18	Autobarn (Supercheap)
Oil pan gasket (optional)	\$13	Repco
Oil and Oil filter	\$50	Any automotive shop
Silicon Intake Hose Joins	\$93	eBay (Supercheap/Autobarn)
Oil Drain Hose	\$17	Autobarn (Repco/Supercheap)
Oil Feed Braided Line	\$15	Autobarn

Dump Pipe TD04 Flange	\$49	Right Price Exhaust Slacks Creek
2 x 3inch Mild Steel Bends	\$44	Right Price Exhaust Slacks Creek
2 Feet 3inch Steel Straight pipe	\$18	Right Price Exhaust Slacks Creek
2 x 3inch flanges and gaskets	\$33	Right Price Exhaust Slacks Creek
3 inch flex pipe	\$58	Right Price Exhaust Slacks Creek
Catch can	\$33	eBay <a href="https://www.ebay.com.au/itm/292808207874">https://www.ebay.com.au/itm/292808207874</a>
Boost and EGT Gauge	\$107	eBay <a href="https://www.ebay.com.au/itm/52mm-Diesel-turbo-boost-35-PSi-EGT-Volt-Triple-digital-gauge-Autotecnica-2/163227209708?ssPageName=STRK%3AMEBIDX%3AIT&amp; trksid=p2060353.m2749.l2649">https://www.ebay.com.au/itm/52mm-Diesel-turbo-boost-35-PSi-EGT-Volt-Triple-digital-gauge-Autotecnica-2/163227209708?ssPageName=STRK%3AMEBIDX%3AIT&amp; trksid=p2060353.m2749.l2649</a>
Boost controller	\$27	eBay <a href="https://www.ebay.com.au/itm/Adjustable-Tee-Bleed-Manual-Turbo-Boost-Controller-Bleed-Valve-Petrol-Diesel/223138895375?ssPageName=STRK%3AMEBIDX%3AIT&amp; trksid=p2060353.m2749.l2649">https://www.ebay.com.au/itm/Adjustable-Tee-Bleed-Manual-Turbo-Boost-Controller-Bleed-Valve-Petrol-Diesel/223138895375?ssPageName=STRK%3AMEBIDX%3AIT&amp; trksid=p2060353.m2749.l2649</a>
Intakes Piping	\$20	Scrap metal yard in Yatala
Weld On EGT Bung	\$16	Supercheap (eBay/Autobarn)
Bolts for Exhaust	\$10	Bunnings
Mod Plate	\$160	HPE (from Facebook)

Total consumables cost: \$139

Heater Hose Hose Clamps	\$30	Supercheap
Intake Piping Hose Clamps	\$25	Bunnings
Mig Welding Wire	\$18	Bunnings
Flappy Discs and Cut off wheels	\$20	Bunnings
Gasket Goop	\$12	Supercheap
Thread selant	\$17	Supercheap
Exhaust Paint	\$17	Supercheap

### Step 1 – Choosing a Turbo

Get a TD04L (also referred to as just TD04) off of a Subaru. I did lots of research on CT20 turbos (the turbo the later model hiluxes get), and apparently they are a bit too big for this 2.2 litre engine, and they are also known to blow oil past the seals.

If you're not sure whether to go second hand genuine or brand new eBay one, I would recommend looking around for a reasonably priced (under \$200) second hand genuine turbo with no shaft play

and blades that are in good nick. Otherwise an eBay turbo is a pretty decent option assuming you're not chasing huge power figures. I would highly recommend getting an eBay turbo that comes with the piping for the water cooling and oil return, as it will cost a fair bit more if you have to use Speedflow fittings to connect it all up.

## Step 2 – Exhaust Manifold

No factory Hilux manifolds (that I have seen) will fit the LN46 engine. Period. I got a lot of mixed information on this, and ended up buying the wrong parts because people said things would fit when they didn't. **You must get one that has been custom made.** You can get a manifold that is custom made for the 2.4 or 2.8 litre hiluxes, however you must make sure the bolt pattern matches your engine. And you must make sure the manifold has elongated holes (like the picture) as this is what enables it to fit on both the LN46 and the later model L engines. The later model hiluxes actually have additional bolt holes in the head which allows two different types of manifolds to be bolted on, however the LN46 only has one set of bolt holes, so be sure to get the one where the holes are all angled in the same direction. I found a custom made manifold that was for a 2.8 liter. I had to grind down the bolt holes on my manifold as the tops were hitting the top of the head.

The safest option, would be to buy a manifold off Rock Solid Engineering (RSE) on Facebook. They make turbo manifolds specifically for the LN46 and they can fit a variety of different turbos. However they are about \$500.

## Process

### Step 1 – Verify your manifold and turbo clears

Start by stripping off your old exhaust manifold and cleaning up the mating surfaces. I would then recommend you loosely bolt on your manifold and turbo to make sure all your clearances are okay. Make sure it clears the bonnet, and make sure you've got about 100mm from the back on the turbo to the Clutch Master cylinder for the dump pipe.

### Step 2 – Turbo Oil Drain

Some people tee off the oil drain on the back of the alternator for the turbo drain, however after a lot of research the consensus is that tapping into the Oil pan for the drain is the safest and preferred way.

With the oil pan still on, start by roughly marking where you want the bung to go on the pan. It should be positioned as high as possible on the pan, and be positioned slightly set back from the alternator oil drain so that the hose doesn't interfere. You pretty much want the bung to be in the middle of the arch in the oil pan, just like the image. You don't want it too close to the edge of the oil pan, as it might make it tricky to weld or tighten up the bung.

In terms of what to weld to the sump, you can either weld on a Male AN Weld on fitting from speedflow, or you could weld on a thread so that you can screw in a barb for a rubber hose. Since the oil drain is low pressure, some heat and oil resistant rubber hose is sufficient, hence why I went with the barb route.

The fitting I welded on was a Stainless Steel 1/2" x 3/8" BSP Reducing Bush (like picture) (steel for easy welding). This then allowed me to screw in a brass 90 degree 3/8" barb elbow. I'd recommend a 45 degree elbow, the hoses would fit nicer.

Once happy with bung position. Drain the oil. Then clean up the areas around the oil pan mating surface so no crud flies up into your engine when you take the pan off. I decided to put a sheet of

plastic over the bottom of the engine, as I had to leave it overnight. With the pan off, mockup where your bung will sit and ensure you can weld all the way around it. Then punch a hole and start drilling. I drilled a hole slightly undersized so that I have to screw in the bung for a nicer fit. If using a 90 degree barb, before welding, screw the barb into the bung and check the clearance between the barb and edge of the pan, because if you weld the bung too deep into the pan, the barb will hit the edge and you won't be able to get a hose on. Also, screw the barb into the bung until tight, then position the bung on the pan so that the barb is point almost straight up (leaning towards the front of the car ever so slightly), then mark the position of the bung and weld it in that spot. You don't want to weld it on only to realise the barb is facing downward when it's tight.

Once the bung is welded on, clean out your sump and the mating surface, give the grinded parts a lick of paint, then clean up the mating surface on your engine and pop your sump back on with the rubber gasket and some black gasket goop.

Then you can fit on the Oil drain hose, which in my case was 400 Series Speedflow Oil Hose, and cut it to length. I only ended up needing about 500mm of hose for my oil drain.

### Step 3 – Turbo Oil Feed

This one took me a while to determine the best setup, and I ended out going with a Tee adaptor off the Oil Pressure Switch/Sensor. You can also Tee off the Alternator, or you could use the spare Oil bung that's located at the back of the engine, near where it mounts to the tranny. I ended out going with a Tee off the Oil sender as you can buy the adaptor off the shelf at Supercheap or Autobarn for \$18. (see image). Best to use thread sealant on all of these threads.

The oil feed line is a dash 3 (-3) 200 Series Speedflow Braided Line (part no. T200-03, about 50cm). On the Tee adaptor end of the hose there is a 1/8" NPT Male to -3 Male fitting (380-03) going into a -3 Straight Hose end (201-03). On the other end is a 3/8" M10 Banjo hose end (201-03).

### Step 4 – Water Lines

For the water, you are going to be Teeing off the heater hoses that come out from the Firewall. For the actual heater hose, you have two options. The cheapest option is to buy 2.5 Meters of 5/8" heater hose off the roll, or if you want a neater fitment (with bends in the right places), you can buy these two hoses instead (Mackay CH2155, Mackay CH1325). You will also need about 0.5 meters of 1/2" heater hose.

Next is the tee adaptors and reducers. You will need the following parts:

5/8" Three way Brass Tee Barb (Brasspack HC13)

5/8" to 1/2" straight Barb Reducer (I braised together two bits of copper pipe for now)

1/4" BSP Female Brass Tee (Brasspack HC49)

2 x 5/8" Barb to 1/4" BSP Mail tailpiece (Brasspack HC23)

1/2" Barb to 1/4" BSP Mail tailpiece (Brasspack HC22)

Then it is a simple matter of cutting all the hoses to size and fittings the adaptors. Note, that it does not matter which heater hose goes to which hole on the turbo, there is not specific direction in the turbo.

### Step 5 - Dump pipe

Making a custom dump pipe was probably the trickiest part. If I were to do it again I would recommend trying to buy one that will fit your application. A company called DTS who make Turbo Kits, they sell a TD04 dump pipe for \$270, however they are for the 2L to 5L hiluxes, so I cannot

confirm if they fit the LN46 engine. However, if they would fit, then \$270 would be well worth it for a premade dump pipe, unless you're a wizard with the welder and can get cheap metal.

I won't explain the whole process of making the dump pipe, if you want more details feel free to comment. I will just note the points of interest.

- Cost of all metals was \$202 from a local exhaust shop. eBay was not much cheaper. This includes 2 x 3" 90 degree bends, 2 feet of 3" straight, TD04 Flange, 8" flexy pipe, Other flanges and gaskets.
- Depending on the exhaust manifold you chose, you may not have much clearance between back of turbo and clutch cylinder (I had 90mm), so make sure you test fit before welding.
- 3" pipe is probably the largest you can go, otherwise it won't fit through the cross member. Mine hits the chassis and cross member if the motor shakes enough. I had to hammer big dents into the exhaust pipe so that it would clear my manifold, spring hanger bolts, and drive shaft protector. I would probably recommend using 2.5" pipe unless you're chasing max power. 3" pipe in my case caused a lot of fitment issues when bolting the dump pipe to the turbo. I wasn't able to use the bottom bolt hole on the TD04 flange as the pipe came out at such an angle there was no room for a bolt to fit (SHOW PHOTO). This didn't seem to cause any leaks, however it could become a problem down the track. Also, expect the TD04 flange to not be a perfect fit on your eBay TD04 and so you may need to grind out some of the bolt holes.
- If you're building a custom dump pipe, be sure to consider the location for your EGT sensor. I positioned mine just at the top of the dump pipe facing outwards to the wheel arc. I installed it by buying an EGT sensor bung from supercheap (INSERT PART NO.), drilling a hole in the pipe, and mig welding it in. (SHOW PHOTO). The EGT Sensor itself I bought from eBay (INSERT LINK).

### Step 6 – Intake piping

For intake piping, my setup was made up of a 500mm piece (VERIFY LENGTH) of 2" stainless pipe (got from a scrap yard). And a 2.25" piece of stainless intake piping that was off a 2.8 turbo diesel setup that I purchase and then later sold when I found out CT20's are rubbish. The rest is silicon bends from eBay. eBay is probably the cheapest option that I have found, although they are still quite expensive (\$100 total). These were the silicon bits I needed. Yours may vary depending on the steel pipe size you're using. From my research around 2.5" is ideal. 2" is a tad small, and 3" you'll have troubles fitting it:

- 1 x [2.25" to 2.5" 90 degree Bend](#)
- 1 x [2" 90 degree Bend](#)
- 1 x [2.25" 90 degree Bend](#)
- 1 x [2" to 2.25" 90 degree Bend](#)
- 1 x [2" Straight joiner hose](#)

In addition to fitting the intake piping, I decided to secure the piping to the engine to minimise movement in the pipes. So I made a little bracket and welded it to each pipe, this allowed me to bolts both pipes together to another bracket that bolted to the top of the intake manifold (SEE PHOTOS).

### Step 7 – Guages

For my boost/EGT gauge setup I went with an Autotecnica Boost + EGT + Voltmeter gauge. I would not recommend this gauge. It works just fine, however the digital needle steps up in weird intervals

(like 2 and a half PSI at a time), and it looks real tacky compared to an analogue setup. Also, the EGT gauge starts at 300 degrees Celsius, so most of the time the EGT does even show any readings as the temp is less than 300.

For mounting everything, I made a small bracket that bolts to the wheel arch in the engine bay. This houses the Boost sensor and the Boost controller. From here it's just a matter of plumbing it all to the turbo and waste gate. If you're going with the Autotecnica gauge, I recommend NOT using the little air filter supplied (you don't need one), and don't use the shitty see-through tubing.

### Final point of interest.

Here are some things I learnt the hard way. Most of which are pretty stupid mistakes on my behalf, but I will mention them anyway so you guys do make the same mistakes.

- Do not leave the crankcase breather attached to the top of the intake manifold, this will cause a lot of positive pressure in the crankcase and sump and will stop your turbo from draining properly, and in turn blow oil past the turbo seals (lots of white smoke). You must block off the inlet on the intake manifold (I used a pipe cover and a hose clamp), and you must route the crankcase breather through a catch can and back into the intake pipe, or out to atmosphere (technically illegal). I route mine through a catch can and then into my chassis rails as I used to run it into the intake pipe and even with the catch can I still found lots of oil in the intake.
- Make sure to have proper gaskets on your exhaust manifold and dump pipe. Initially I didn't have a gasket on the exhaust manifold because my old manifold never had one. The turbo lasted a few hundred kms without a gasket before I got a big exhaust leak. It was a huge job to take everything off just to put a \$15 gasket on.
- To adjust the waste gate you actually have to pull the rod on the actuator out quite hard and slip it on the gate otherwise you will make NO boost. This is assuming you're waste gate isn't already adjusted to a set boost level (my eBay one wasn't).

### Boost and EGT figures

I am running 12PSI max. I can only reach 12PSI if flat foot, up a hill in third gear, revving at about 3000rpms. I have been told mixed opinions about safe boost levels, however the majority of people say around 12PSI is safe. I could probably run a bit higher, considering it only ever reaches about 8 – 10 around town.

Sitting on flat highway at 80: Boost is about 4 – 6PSI, EGTs are less than 300 (gauge doesn't show anything lower).

Sitting on a flat highway at 100: Boost is 6 - 8PSI, EGTs are at about 300 - 350C

Going up a moderate hill maintaining 80 for 30 seconds or more: Boost is 8 – 10 PSI, EGTs climb up to 400 – 450C. After about a minute and a half up a hill EGTs will get to around 500.

Soft sand driving, 2<sup>nd</sup> gear, almost flat foot, maintaining 30 km/h: Boost 8 – 10 PSI, EGTs get up to 450 - 500

### Review

So far I have driven with the eBay turbo for (xxx kms) and I haven't had any problems. I am however very light on the foot, and never let EGTs sit over 450 for less than 10 seconds, which does mean I am still stuck in 1<sup>st</sup> gear in soft sand, unfortunately. Overall, it has much better around town performance, and I can actually maintain above 80 on the highway, even when climbing the odd hill!