Racing Development

TRD northwest

Installation Instructions For TRD's 2.2-liter I4 Turbocharger Kit

1990 – 1997 Celica
1990 – 1996 MR2
1990 – 2000 Camry

Burien Toyota 5S-FTE Turbocharger

Burien Toyota
Seattle, WA 98148

Racing Development

Installation Instructions For TRD/NW's 2.2-liter I4 Turbocharger Kit

Revised January 13, 2004

Burien Toyota 5S-FE Turbo Installation Instructions

Disclaimer: This project and related modifications are the responsibility of the vehicle owner. Alterations may be required to the engine to allow the installation of a turbo charger. Neither Toyota Motor Sales, U.S.A., Inc. nor Burien Toyota can be held responsible for changes required to install this kit. Although, rest assured we will provide support before, during and after the installation and make every attempt to work with you to make your installation a successful one.

Be sure to read and understand these entire instructions before starting your installation to be sure you have all parts and tools needed to complete the work.

Also inspect your engine before installing this kit to be aware of leaks, vacuum or fluid, loose parts or damaged parts. Be sure your engine is running well before the installation.

For technical questions or comments contact:

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Don Voeller or Ray Meek
M-F 7:30AM - 6:00PM PST

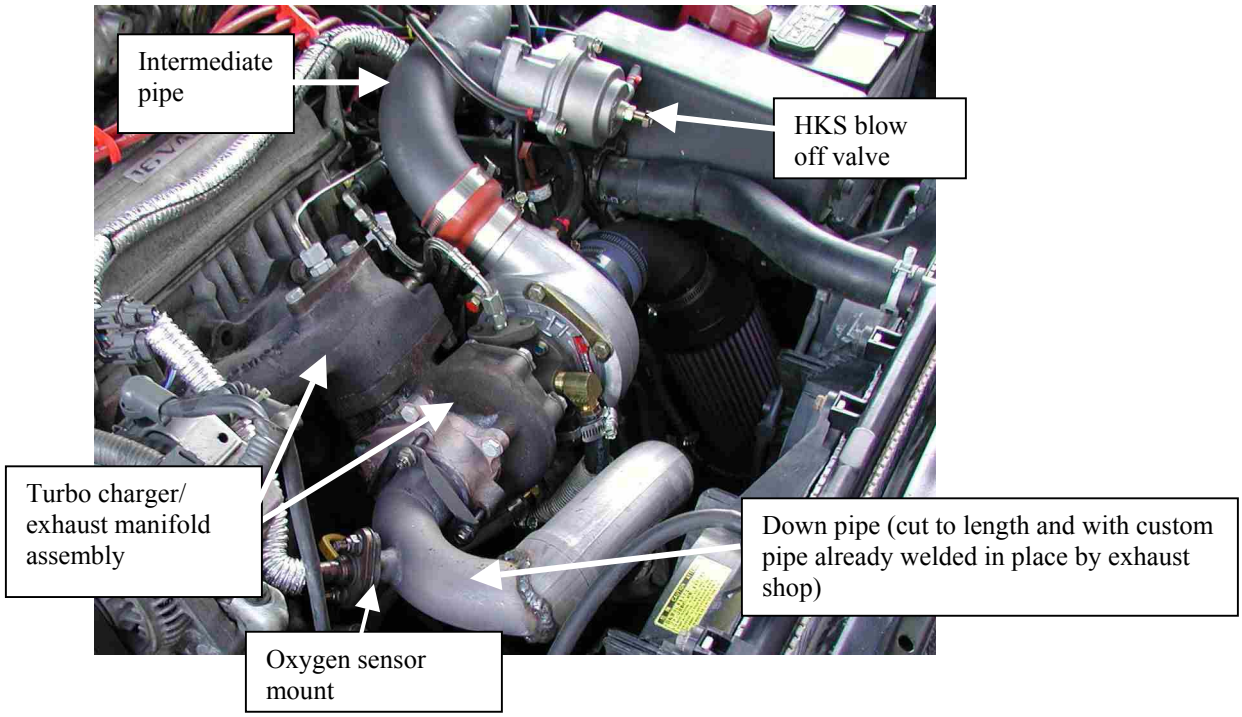
Turbocharger Kit Part Number: 00602-17620-201

The following parts are not required, but you may want to have on hand:

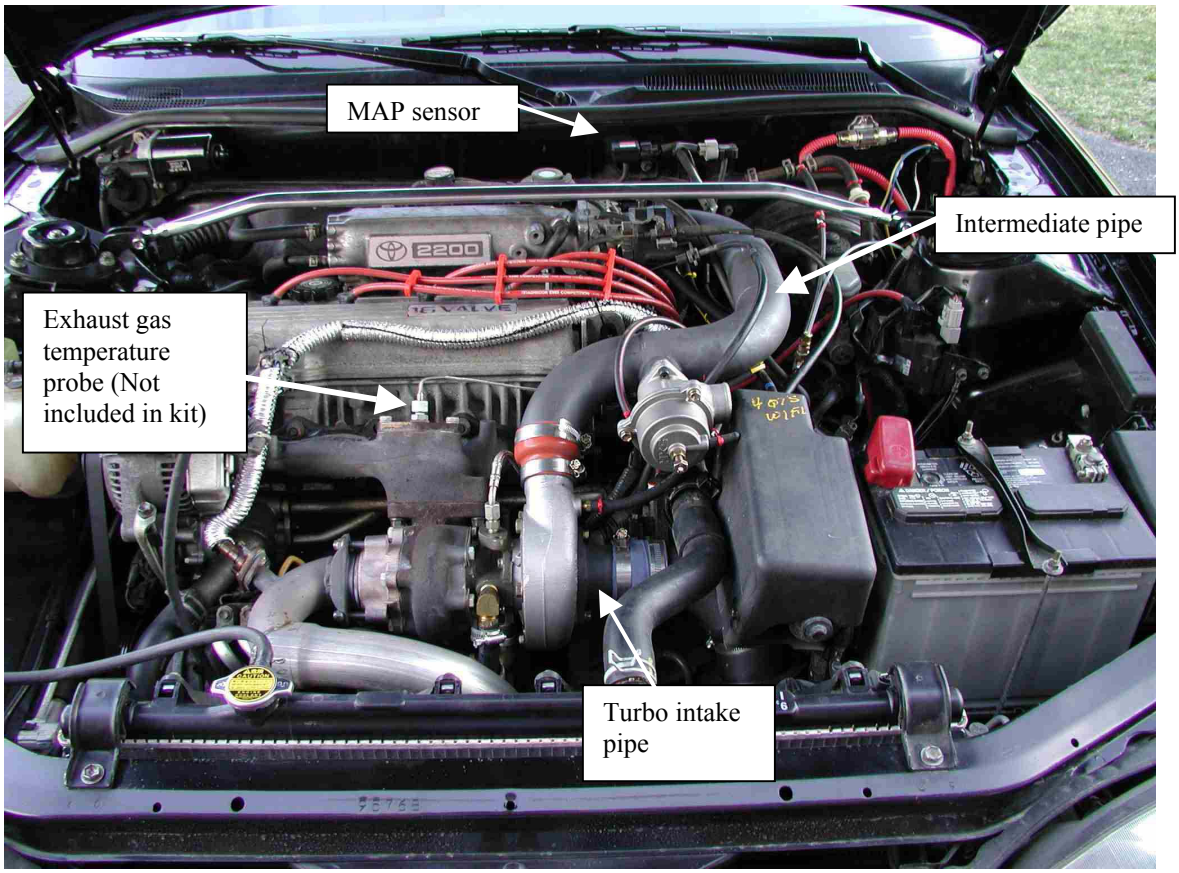
- ✓ Fresh Toyota engine coolant
- ✓ New engine oil (preferably synthetic) and new Toyota oil filter
- ✓ New parts to perform a tune-up (spark plugs, distributor cap & rotor). If you do replace your plugs, you may want to use a colder plug to reduce the chance of detonation.
- ✓ New Ignition wires, if your current wires are old
- ✓ New Toyota fuel filter (since you're replacing the expensive injectors)
- ✓ Shorter oil filter union from Toyota (See step #11)
- ✓ Tie-wraps to secure vacuum lines (See step #27)
- ✓ Shielded audio cable (See step #26.b)
- ✓ For automatic transmissions, consider replacing the transmission fluid with a good synthetic brand and installing an ATF cooler.

Kit Contents

- Toyomoto exhaust manifold
- Garrett TB0344 turbo (Exhaust manifold and turbo charger come attached)
- Intermediate pipe ('S' shaped pipe with blow off valve attached)
- Down pipe ('J' shaped pipe with 90° bend and exhaust flange, also has mount for oxygen sensor)
- Turbo intake pipe (May arrive attached to turbo)
- 90º elbow with valve cover breather hose attached (Elbow used to mount air filter)
- K&N air filter
- HKS Racing Blow-off/Pop-off valve
- (4) 360cc Toyota Injectors
- Toyota Oil pan
- Toyota MAP Sensor
- All necessary hoses, clamps, nuts, bolts, fittings, studs, gaskets and such required to install the system.




90º elbow, with K&N
filter attached


MAP sensor
Intermediate pipe
Exhaust gas temperature probe (Not included in kit)
Turbo intake pipe

Preparation for Removal of Stock Components

- Before you begin, TRD recommends that you thoroughly clean the engine and engine compartment. If you don't, grease buildup on parts could become dislodged during the procedure and fall into the engine.
- Make sure the engine has cooled fully before you begin.
- To help you later, we suggest you draw diagrams of your engine's cable routing before you disconnect anything. You can do the same for the vacuum hoses; however, some of the vacuum connections on your stock manifold may not be the same as those on the turbocharger.
- The TRD turbocharger kit has been designed to reuse most of the stock nuts and bolts. Therefore, as you remove them, keep them with their components or label them for location. This will assure a faster, easier installation.

Installation instructions:

1. Identify each part listed in the parts list. Dry fit pieces to understand how they go together. Be sure all required parts (clamps, hoses, etc.) are included before starting.

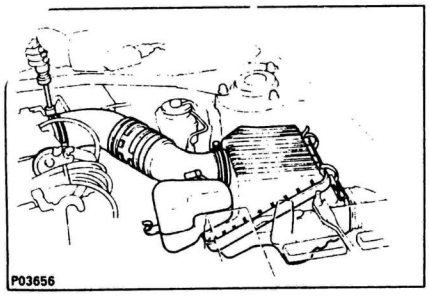
2. Inspect engine for leaks, specifically oil and coolant. If any leaks are found, try to fix these before performing the installation.

3. Disconnect negative terminal from battery.

4. Drain coolant.

5. Drain engine oil. Keep drain plug handy for reuse later in step 10.a.

6. Remove air cleaner box.
    a. Remove air temp sensor from air cleaner box.
    b. Secure temp sensor to any convenient spot using wire tie.
    c. It just has to read ambient air temperature.



6. REMOVE AIR CLEANER

(a) Disconnect the air intake temperature sensor connector.

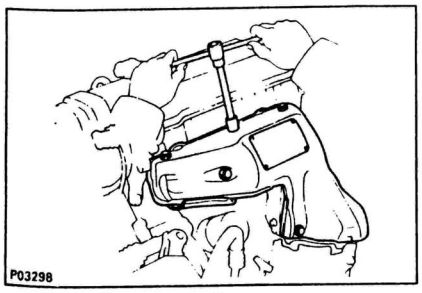
(b) Disconnect the four air cleaner cap clips.

(c) Disconnect the air cleaner hose from the throttle body, and remove the air cleaner cap and filter.

(d) Remove the three bolts and air cleaner case.

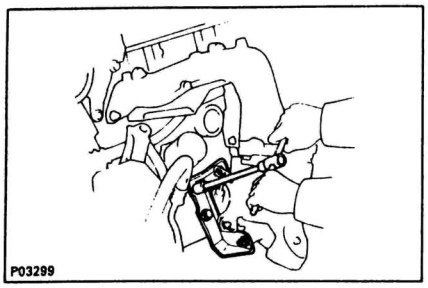
7.

7. Remove exhaust manifold assembly.
   a. Remove the six bolts and manifold upper heat insulator.
   b. Remove O2 sensor.
   c. Remove the two bolts, two nuts and three way catalytic stay.
   d. Remove the six nuts, the exhaust manifold and catalytic converter assembly.

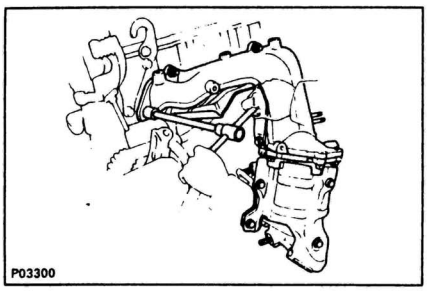


14. REMOVE EXHAUST MANIFOLD AND THREE-WAY CATALYTIC CONVERTER ASSEMBLY

(a) Remove the six bolts and manifold upper heat insulator.

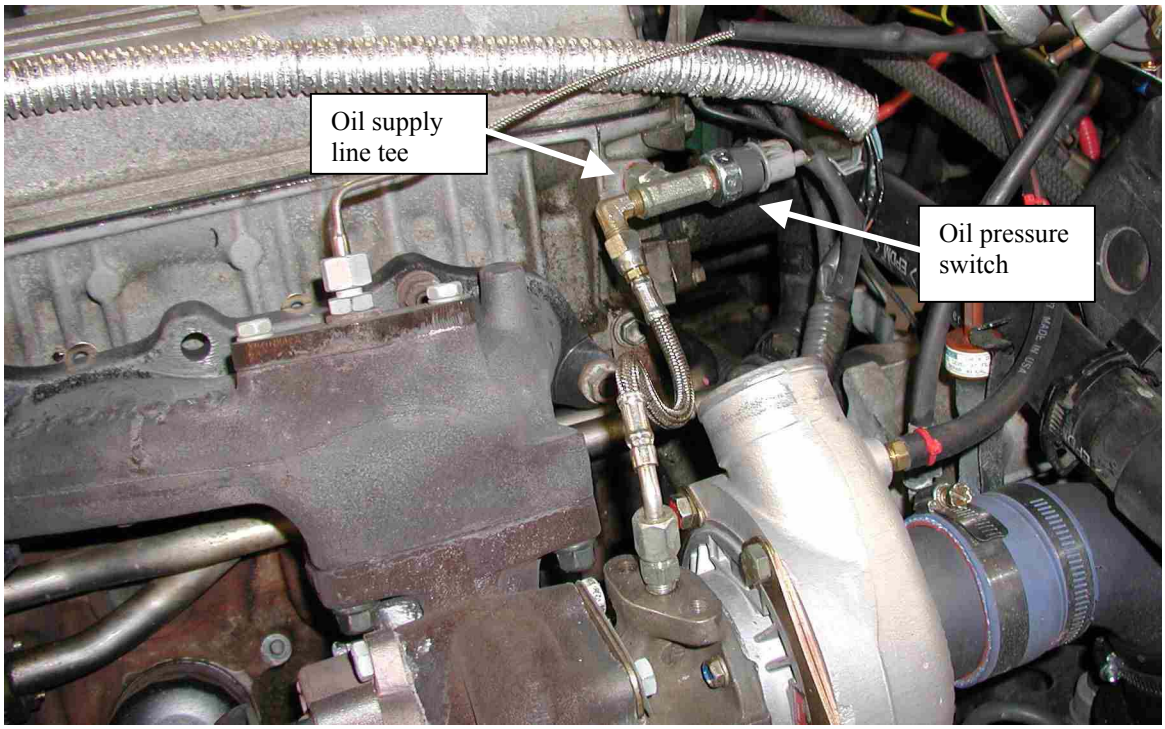


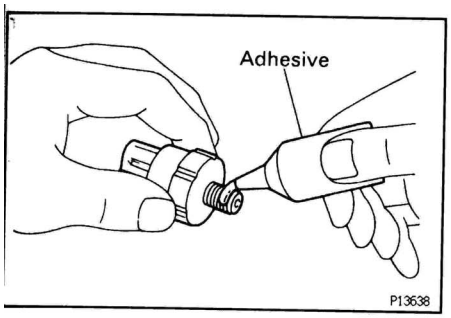
(b) Remove the two bolts, two nuts and three-way catalytic converter stay.



(c) Remove the six nuts, the exhaust manifold and three-way catalytic converter assembly.

8. Install turbo oil feed.
   a. On the drivers side, front of the cylinder head is the oil pressure sensor.
   b. Remove the oil pressure sensor.
   c. Install the oil pressure tee, in place of the oil pressure sensor.
   d. Install the oil pressure sensor into the straight side of the oil pressure tee. Be sure to use a high temperature sealant such as RTV to seal the threads on the tee and oil pressure sensor.
   e. Test fit the intermediate pipe with the tee in place. Also, be sure the oxygen sensor connectors will fit before fully tightening the tee.
   f. Reconnect the oil pressure sensor wire.





6. REMOVE OIL PRESSURE GAUGE AND REINSTALL OIL PRESSURE SWITCH

(a) Remove the oil pressure gauge.

(b) Apply adhesive to 2 or 3 threads of the oil pressure switch.

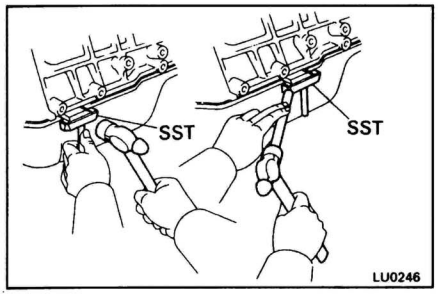
Adhesive:

Part No.08833–00080, THREE BOND 1344, LOCTITE 242 or equivalent

(c) Reinstall the oil pressure switch.

9. Remove old oil pan.

Note: The pan may be very difficult to remove since it was attached using the Form In Place Gasket (FIPG) material. It may be necessary, using a long flat head screwdriver and hammer, to try to separate the pan from the block from up above. From within the engine compartment, locate a spot where the screwdriver can be placed against the oil pan and tap with hammer to separate the two. Or the use of an SST, as illustrated below, can be used to separate the oil pan.



5. REMOVE OIL PAN

(a) Remove the dipstick.

(b) Remove the 17 bolts and the 2 nuts.

(c) Insert the blade of SST between the cylinder block and oil pan, and cut off applied sealer and remove the oil pan.

SST 09032−00100

NOTICE:

- **Do not use SST for the oil pump body side and rear oil seal retainer.**
- **Be careful not to damage the oil pan flange.**

10. Install new oil pan using the cork gasket provided instead of FIPG.
    a. Use oil drain plug from old pan.

11. Remove one (1) engine oil coolant hose.
    a. Located under the oil filter is an engine oil cooler. This cooler has 2 hoses connected to it coming from a water rail located on the front of the block.
    b. Remove one of the two hose; later we will be connecting turbo coolant hoses to these fittings.

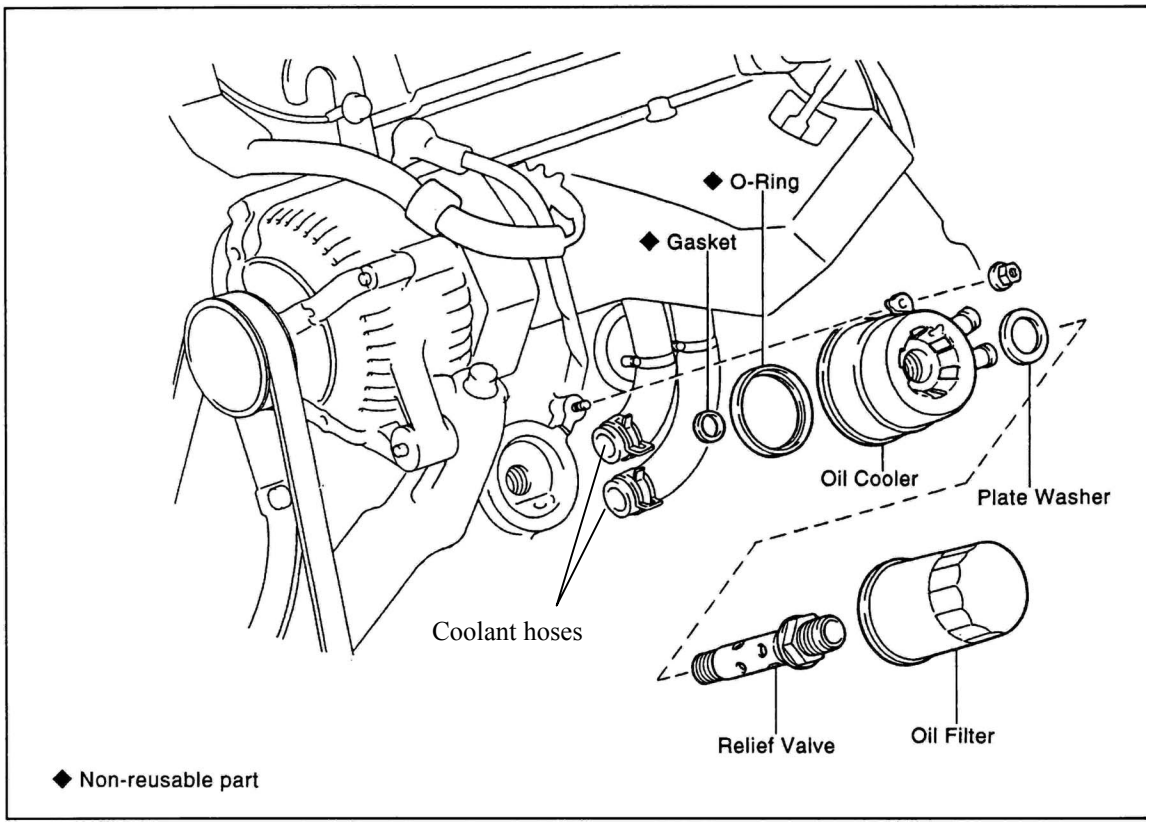
    Note: At this point you should test-fit the turbo assembly to be sure the turbo turbine housing is not interfering with access to the oil filter and the oil dipstick. If it is, removal of the oil cooler will be necessary. Also, if the dipstick does not clear the turbo, bending the tube to reorient the dipstick will be necessary. This is best left to the exhaust shop since a torch will be required to properly bend the tube without kinking it.

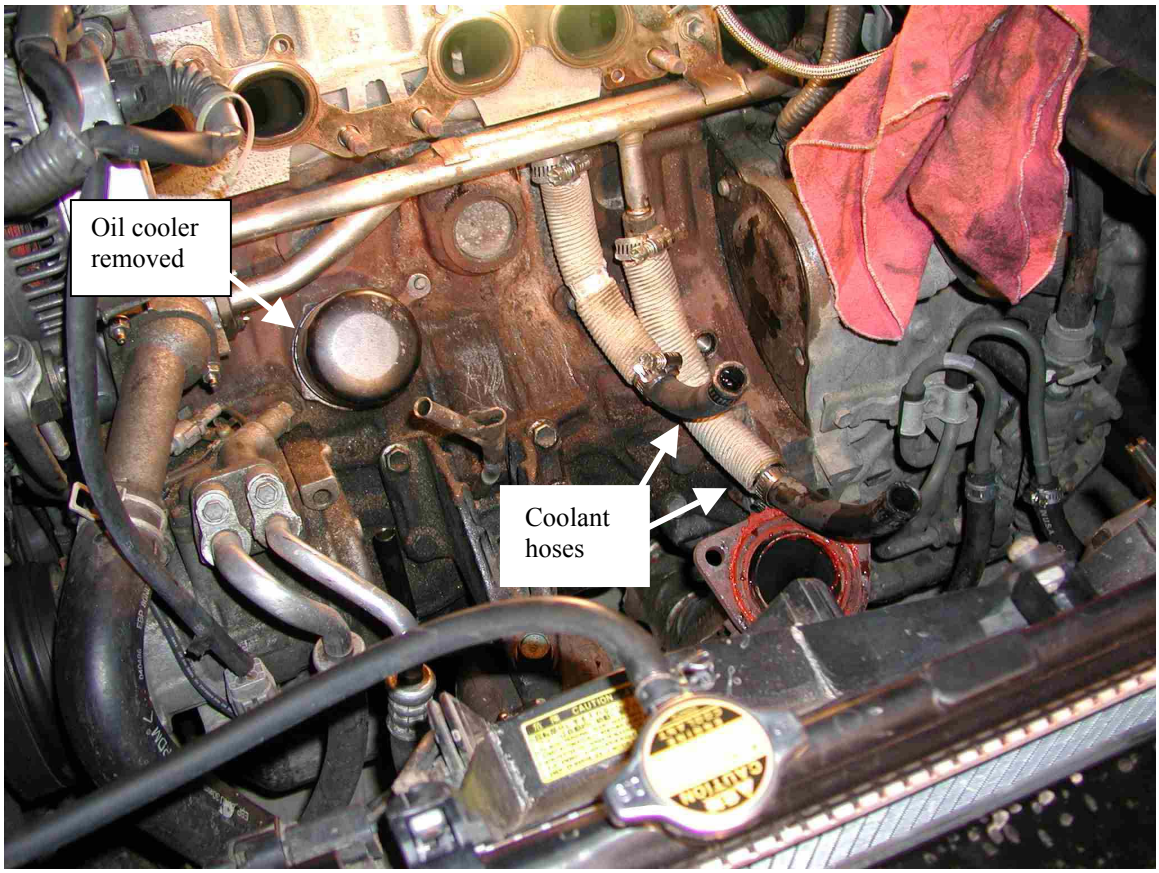
    If the oil cooler does need to be removed to provide the clearance, the following steps will replace step #11 above:
        i. Remove the small nut holding the oil cooler to the engine block.
        ii. Remove the tube the oil filter is mounted to (also called a union or relief valve).
        iii. Order the Toyota part 90404-19002 to replace the original union or relief valve. These are readily available from many Toyota dealers since people

often cross-thread their oil filters during oil changes. They are also inexpensive (less than $10USD)

iv. Install this piece in place of the original union and tighten properly.

v. Later, the coolant lines originally used for the oil cooler will be routed to the turbo.

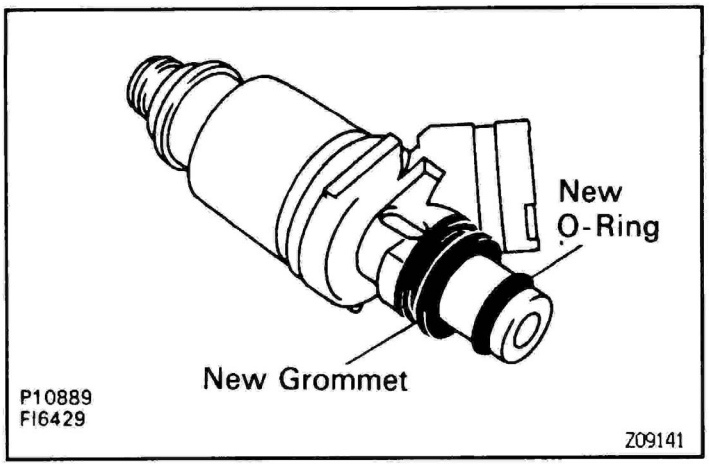




12. Remove valve cover.
    a. Disconnect PCV hose.
    b. Remove 4 spark plug wires from valve cover.
    c. Remove 4 valve cover retaining nuts (30 mm socket)
    d. Pull valve cover.

13. Remove and install injectors.
    a. Remove gas cap, to relieve pressure.
    b. Unplug wires from all 4 injectors.
    c. Unbolt fuel rail, 2 bolts
    d. Hold fuel rail back and remove injectors from cylinder head.
    e. Install new o-rings and grommets on injectors. Apply a light coat of gasoline onto the new O-ring before installing onto each injector
    f. Install new injectors into cylinder head.
    - Hint: If injectors do not rotate smoothly, the probable cause is incorrect installation of O-rings.
    g. Install fuel rail onto injectors
    h. Install fuel rail bolts, torque to specs. (9 ft-lb)

i. Reconnect fuel injector wiring.
- Hint: The No.1 & No.3 injector connectors are brown and the No.2 & No. 4 injector connectors are gray.



14. Re-install valve cover. Torque 30mm nuts to17ft-lb.

15. Install new Manifold Absolute Pressure (MAP) sensor.
    a. Located on the firewall behind the engine, near the throttle body, is a MAP sensor.
    b. Locate the brown box with part number 89420-17030.
    c. Remove the existing MAP sensor.
    d. Replace with the new pressure sensor.
    e. Hook up hoses and wiring.

16. Install turbo/manifold assembly
    a. Install new manifold gasket
    b. Slide manifold/turbo assembly onto studs
    c. Install nuts and torque to specs. (36 ft-lb)

17. Connect turbo oil feed line to 90° elbow on oil pressure tee.

18. Install turbo oil drain hose.
    a. The **gray** hose is the oil drain hose
    b. Attach it to the center brass fitting on the lower side of the turbo.
    c. Attach the other end to the tube coming from oil pan.
    d. Secure with hose clamps provided.

19. Install turbo coolant hoses. (**Black** hose)

Note: In step #11, if you needed to remove the oil cooler, skip steps a through d below and instead perform the following:

- Using the new **black** coolant hose, run cut-to-length hoses from each of the fittings on the water rail to the turbo. Proceed to step 19.e below.

a. Under the turbo are two brass fittings for coolant.
b. Run a length of **black** coolant hose from one fitting to the engine oil cooler, under the oil filter.
c. Run another length of **black** hose from the other fitting to the water rail.
d. Hoses will have to be cut to fit.
e. Secure with hose clamps provided.

20. Connect turbo intake pipe to the turbo and secure to turbo.

Note: This pipe is left long while manufacturing to provide enough length for various installations. Vehicles with cruise control may have a problem with this pipe hitting it. The intake pipe can be cut back, just be sure to leave enough so the 90º elbow has enough pipe to clamp on to.

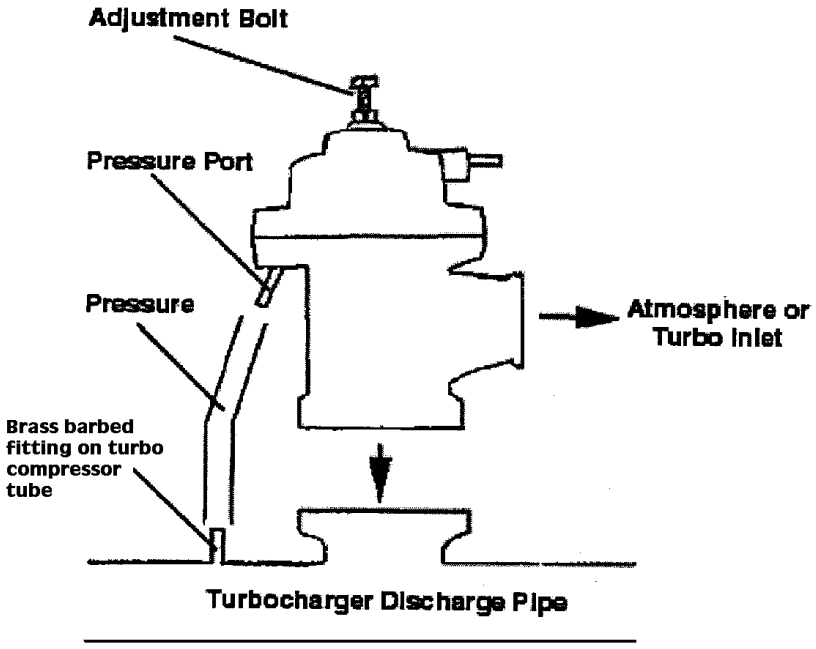
21. Install the included K&N air cleaner attached to the 90º elbow. Attach the filter and the elbow (with the clamps) before installing onto turbo. Tighten the clamp to attach the elbow to the turbo intake pipe.

Note: The air cleaner is positioned behind the radiator. If this position is prone to water being splashed up at it, custom-piping work may be needed to relocate the filter to where the OE air box used to be. Or, a shield could be installed to protect the filter from pulling in water.

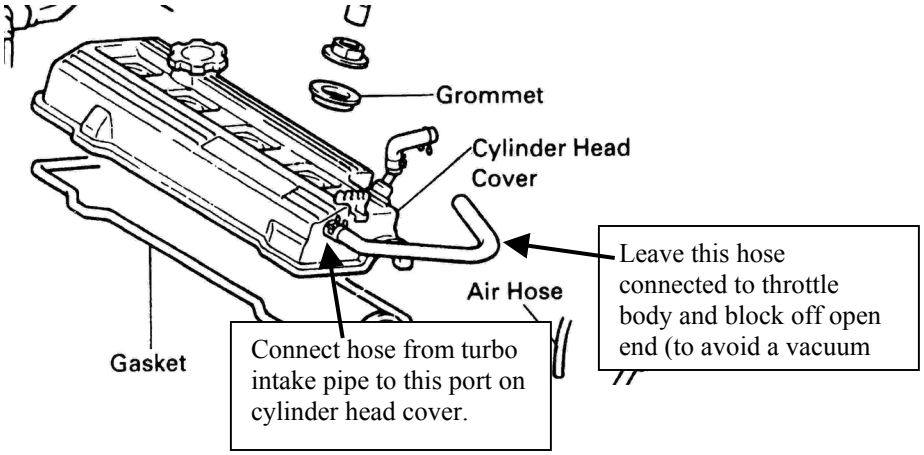
22. Connect intermediate pipe.
a. Locate S shaped pipe with blow off valve on it.
b. With pipe clamps in place, slide one end onto throttle body and the other to the turbo. Note: Installing in this order is easier than the reverse.
c. Secure using clamps.

d. If the vehicle has an automatic transmission, check for necessary clearance for the ATF dipstick. If needed, the dipstick tube can be bent back slightly.

23. Hook up vacuum hoses from HKS Racing blow off valve.
    a. See diagram below
    b. Run vacuum hose from lower port on blow-off valve to brass barbed fitting on turbo housing.
    c. The upper port on the blow-off valve can be left open or capped.



24. Connect valve cover breather hose to intake pipe.
    a. Using 10mm braided black hose (normally comes pre-attached to the intake pipe).
    b. Run from valve cover breather port to port on intake pipe (if not already connected).
    c. This hose must be connected to the intake pipe before the compressor side of the turbocharger. This will guarantee a constant vacuum to prevent pressurizing the crankcase.
    d. Use a vacuum cap to block port on throttle body to avoid a vacuum leak.



25. Attach exhaust down pipe to turbo assembly using nuts provided, no gasket is necessary.

    This pipe is left intentionally long to allow a cut-to-fit installation by the exhaust shop. But this may also cause installation problems. If necessary, cut this pipe to allow a temporary installation until the exhaust shop can complete the work.

26. Install O2 sensor into down pipe.
    a. Bolts will need to be used to attach O2 sensor to the flange on the down pipe.
    b. In most cases O2 sensor wire will be long enough, if not, cut O2 sensor wire and lengthen.
    c. The O2 sensor is a device that generates a small amount of electricity and therefore, it is a good idea to use shielded cable to protect the low voltage from any engine interference. If you need to extend this wire, use shielded wire (such as microphone audio cable available at local electronics stores) and be sure to connect the shields between the original wire and the new wire you install. These connections should be soldered. Some exhaust shops can do this when they do the custom work in step #31.
    d. The shielding at the end nearest the sensor is left unattached.

27. All vacuum lines should be tie-wrapped to avoid blowing off. This is due to the fact that these lines that used to only see vacuum will now be exposed to pressure (during boost). To hold the hoses in place, use short tie-wraps.

28. Refill coolant. This is a good opportunity to refill the coolant with fresh Toyota coolant.

29. Refill oil. If you do not have a Toyota filter installed, replace it. You must use a Toyota oil filter to achieve the required clearance.

30. Reconnect battery

31. Visit your local exhaust shop to mate the down pipe to your exhaust system and install new catalytic converter. The question you want to ask the exhaust shop is, "Can you build a custom pipe with a catalytic converter to attach a turbo charger dump pipe to a stock head pipe?" If they can do the work, they should say that they cannot give an accurate estimate without seeing it, but it is work they have done.

    Note: In some situations, the addition of the turbo charger my not allow the addition of a new catalytic converter in the same place as the OE. In this case, the front pipe of the exhaust system will need to be reworked to allow room for the new catalytic converter.

Changes in maintenance/General suggestions to consider:

- ✓ Be sure to always change your oil before the recommended 3,000-mile/3 month intervals. Your oil is critical in keeping your turbo charger cool and lubricated. If your oil fails, your turbo will also. Using synthetic oil will stand up much better than the petroleum-based oil.
- ✓ Always be aware of any leaks. Due to higher temperatures related to turbo charging, your coolant also becomes critical. Be sure to change this with high quality coolant *before it needs to be*. Remember; do not mix different colored coolants. If you have the Toyota red, always use the same Toyota red coolant to top it off.
- ✓ Timing belts should now be changed every 40,000 to 50,000 miles. This is due to the additional strain the engine will endure.
- ✓ Running a higher-octane fuel will help reduce the chance of detonation.
- ✓ The new K&N air filter included with the kit should be serviced every 50,000 miles as per manufacturer instructions. To service, use the K&N filter cleaning kit that is available at many auto parts stores. Follow the directions to clean and re-oil the filter. This is a serviceable filter – not a short-life disposable filter. Do not discard the filter when it is time to service it.

For technical questions or comments contact:

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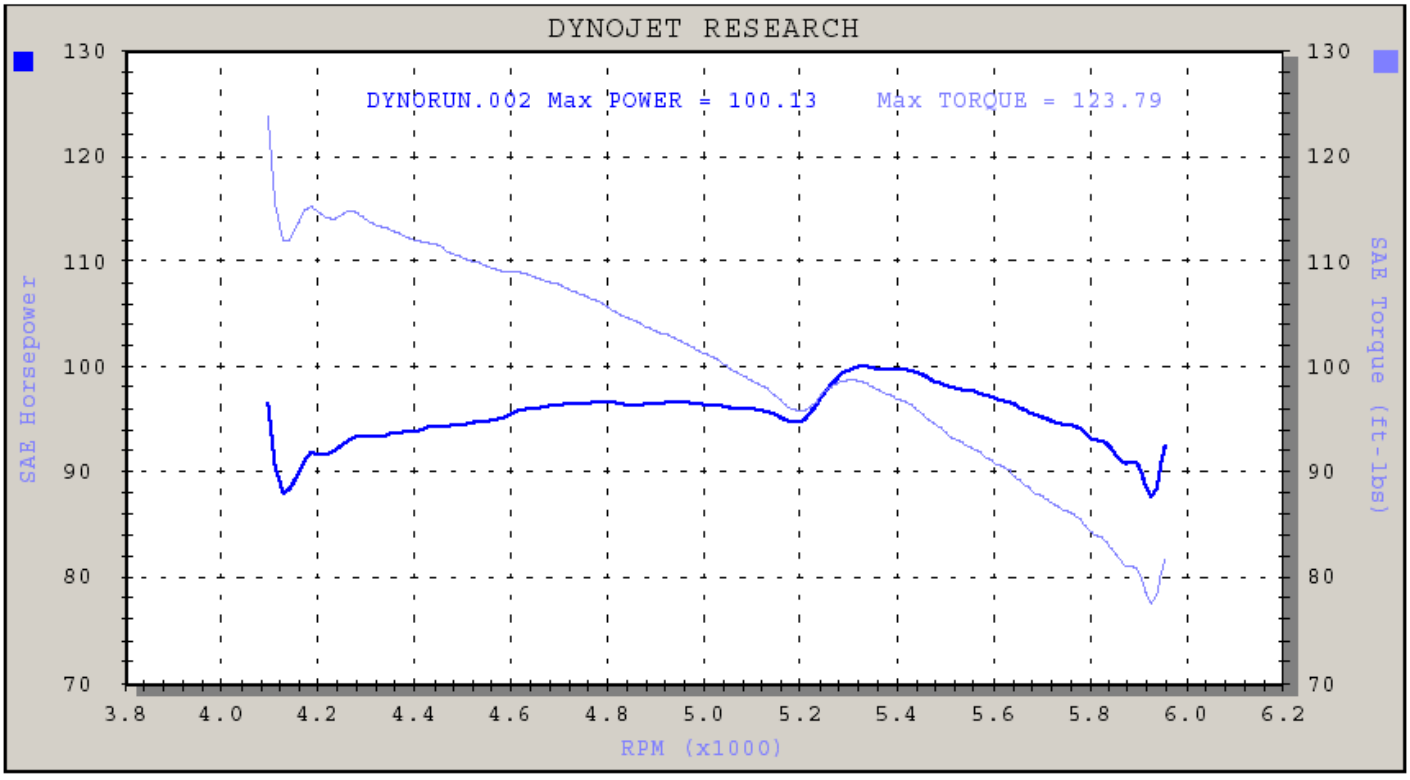
Miscellaneous resources:

Online sites to find more information:

http://www.poweredbytoyota.com/ssfeturbo.html : Burien Toyota's Website
http://www.meisners.net/camry : User that installed kit
http://www.knfilters.com : K&N web site

Example dynamometer runs:

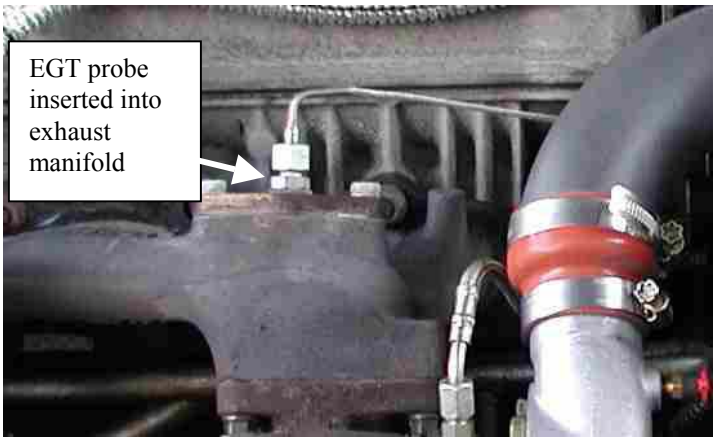
Prior to turbocharger:



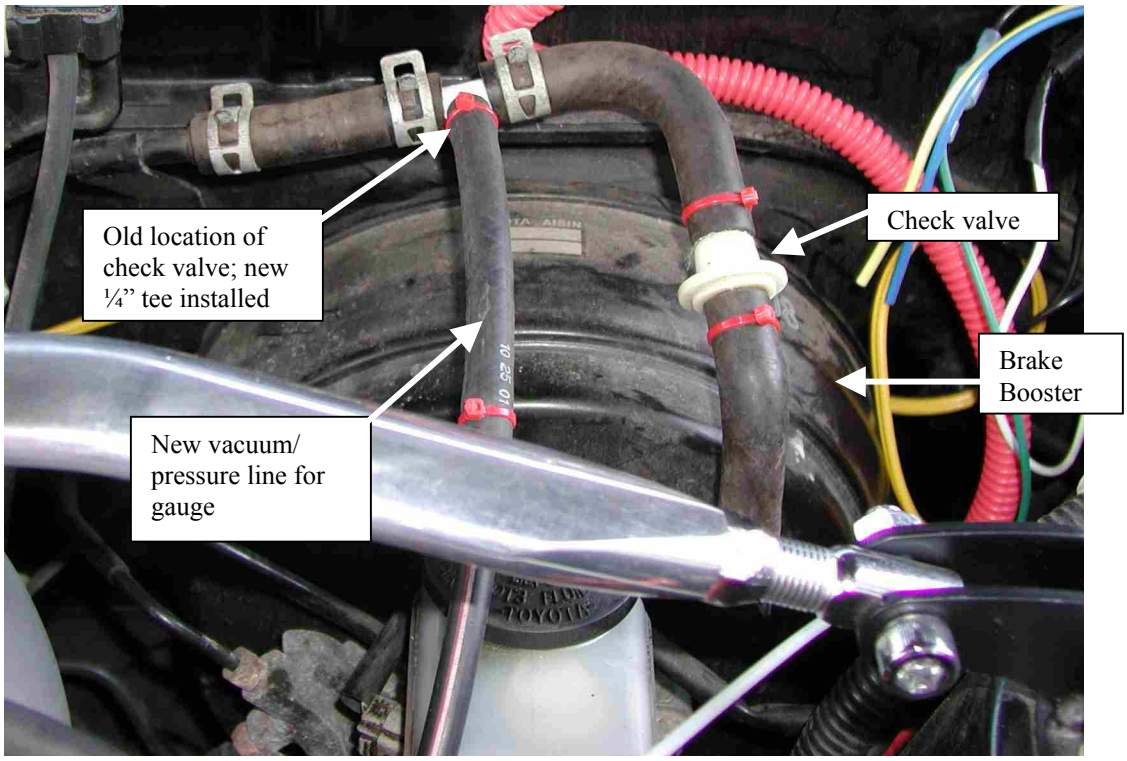
<< Insert dyno run after turbo >>

Extra information:

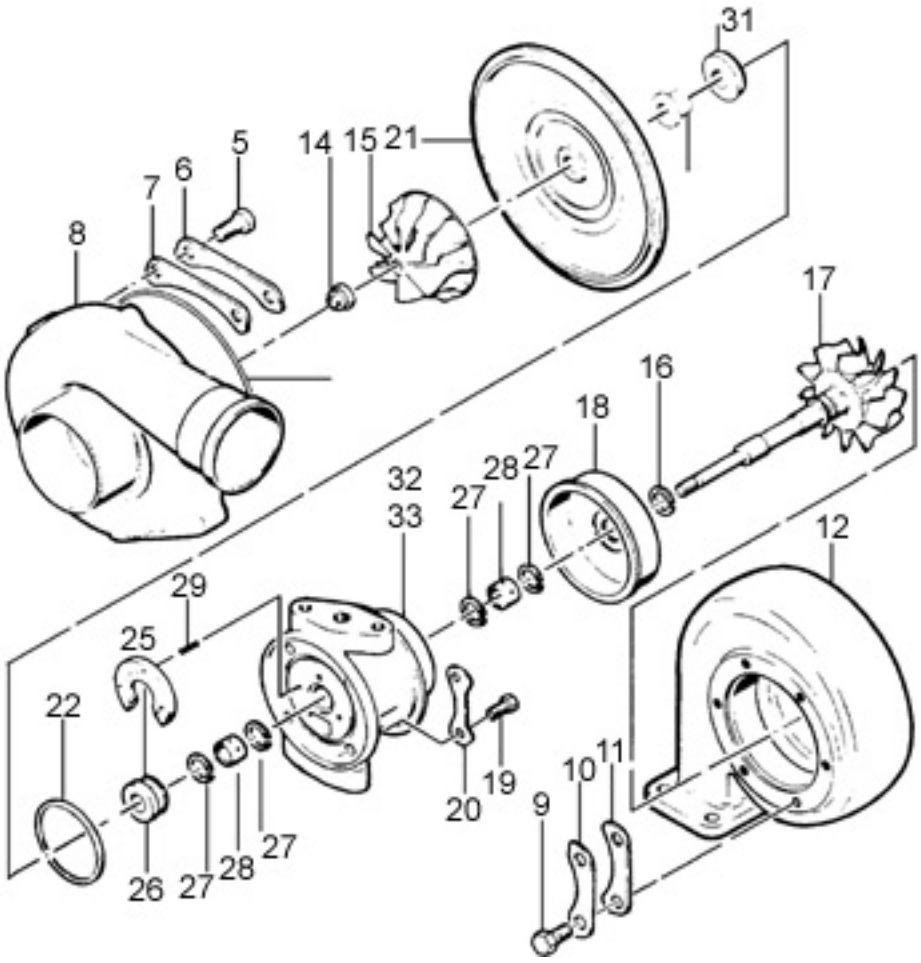
1. To connect an exhaust gas temperature (EGT) gauge, there is a plate on the Toyomoto exhaust manifold that can be used to provide a mounting location for the probe. This plate can be removed, drilled and tapped to provide a threaded fitting for the EGT probe.



2. A good place to connect a vacuum/boost gauge is the brake booster vacuum line. Using a ¼" vacuum tee, the brake booster can be cut into and provide a source of manifold vacuum & pressure. But be sure to position the tee before the check valve used in the booster's line. See following picture:



ILLUSTRATED PARTS LIST-T03/T04B SERIES TURBOCHARGERS



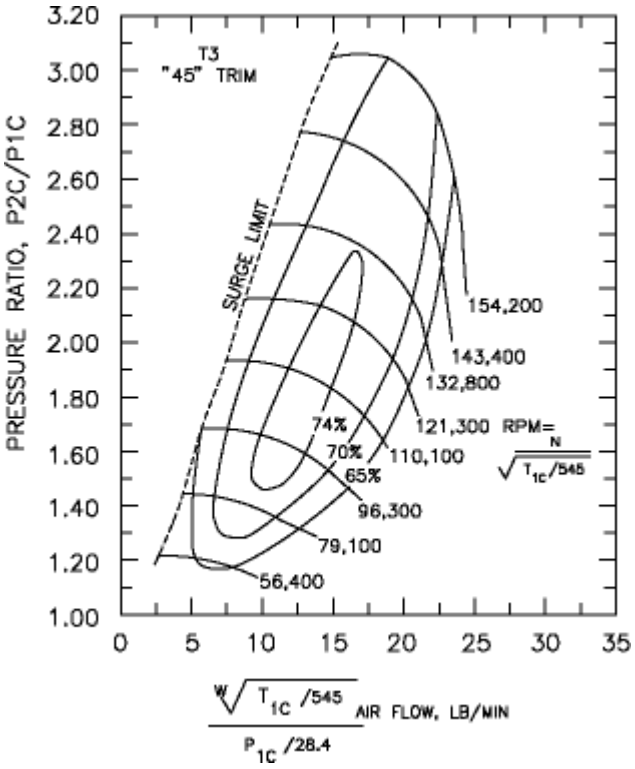
IPL NO.	TURBONETICS P/N	GARRETT P/N	DESCRIPTION	QTY. REQ.	PRICE EA
*28	20256-2	405919-0002	Shaft Bearing (Std.OD-.010ID)	2	5.58
*28	20256-4	405919-0004	Shaft Bearing (.010 OD-.010 ID)	2	5.58

*28	20256-6	405919-0006	Shaft Bearing (.010 OD-Std ID)	2	5.58
*29	30236	400624-0000	Thrust Pin	2	.25
*30	20275	407516-0004	Thrust Spacer - Carbon Seal	1	7.29
*31	30209	409695-0000	Carbon Seal	1	15.39
32	20327	430027-0025	Bearing Housing - Dry	1	85.29
32	20234	430027-0047	Bearing Housing - Wet	1	85.29
*NI	20314	406765-0002	Thrust Spring - Backplate	1	.77
Dynamic Seal Components - Not Illustrated					
*NI	20320	408045-0034	Backplate - Dynamic	1	40.12
*NI	20243	406906-0000	Thrust Collar - Dynamic	1	31.24
*NI	30239	403818-0009	Piston Ring - Dynamic	1	4.37
*TO4B Component Parts Common To T3 Series Turbochargers					
T3 Component Parts - Not Shown					
5	20208	400724-0810	Bolt - Compressor Hsg. Metric	6	.64
7	20198	410218-0001	Clamp - Compressor Hsg.	3	.48
9	20206	400677-0816	Bolt - Turbine Hsg. Metric	6	.46
13	20236	409248-0000	Gasket - Compressor Hsg.	1	.59
13	30243	403069-0060	O-ring - Compressor Hsg.	1	2.13
18	30264-72	409639-0000	Wheel Shroud - Std Wheel	1	3.76
18	30264-03	409627-0000	Wheel Shroud - Stage II & III	1	3.76
19	30237	400764-0616	Locking Flang Bolt - Bearing Hsg.	4	.22
21	20270	430108-0003	Backplate - Carbon Seal	1	40.12
21	20317	409629-0001	Backplate - Dynamic	1	29.01
NI	10419	N/A	Carbon Seal Kit - Late Style	1	11.92

IPL NO.	TURBONETICS P/N	GARRETT P/N	DESCRIPTION	QTY. REQ.	PRICE EA.
5	20209	400450-0001	Bolt - Compressor Hsg.	6	.45
5	20207	N/A	Locking Flange Bolt-Comp Hsg.	6	.64
6	30246	407876-0000	Lockplate - Comp. Hsg.	3	.46
7	20193	407875-0000	Clamp - Comp. Hsg.	3	.54
8	See Table	Page 12	Compressor Housing	1	
9	20209	400450-0001	Bolt - Turbine Hsg.	6	.45
*10	30247	406909-0000	Lockplate- Turbine Hsg	3	.48
*11	20194	406908-0002	Clamp - Turbine Hsg. (2 bolt)	3	.95
*11	20195	408848-0002	Clamp - Turbine Hsg. (3 bolt)	2	1.15
12	See Table	Page 14 & 15	Turbine Housing	1	
13	30229	403069-0064	O-ring - Compressor Hsg.	1	5.29
*14	30233	400768-0011	Locknut - Compressor	1	2.61
15	See Table	Page 12	Compressor Wheel	1	
*16	30234	403818-0034	Piston Ring - Turbine End	1	5.06
17	See Table	Page 14	Turbine Wheel / Shaft	1	
18	20297	407565-0000	Wheel Shroud	1	19.28
19	30248	400805-0202	Bolt - Bearing Hsg.	4	.15

19	30226	N/A	Locking Flange Bolt - Bearing Hsg.	4	.22
20	30249	407684-0000	Lockplate - Bearing Hsg.	2	.18
21	20196	408206-0002	Backplate Ass'y - Carbon Seal	1	40.12
*22	20304	400424-0000	Ring Seal - Backplate	1	.94
*25	20219	407634-0000	Thrust Bearing - Bronze (3 hole)	1	15.64
*25	20219-S	448110-0001	Thrust Bearing - Steel (3 hole)	1	15.64
*26	20262	409558-0000	Thrust Collar - Carbon Seal	1	14.63
*27	30235	400568-0000	Retaining Ring	4	.25
*28	20256-0	408056-0000	Shaft Bearing (Std.OD-Std.ID)	2	5.04

Garrett/AiResearch TB03-44 Compressor Map



Symptom	Possible Causes	Corrective Action
Idles rough, "pings" (Trouble Code PO171—Lean Code)	Lean condition—vacuum leak	Check vacuum line connections for leaks and cracked ends. Review factory service manual for proper factory vacuum routing. Review instructions for proper vacuum line routing. Check installation of the TRD throttle body gasket. If gasket is installed improperly, a vacuum leak will occur. Recheck torque on throttle body bolts. Leak at manifold gasket. Recheck torque on intake manifold bolts.
Pings during acceleration	Low octane fuel Computer has yet to adjust to turbocharger Insufficient fuel delivery	Fill tank with premium fuel. **BE SURE TO USE 92 OCTANE FUEL.** Drive several hundred miles in different driving modes (Not all steady-state highway cruising, for example). Fuel filter old—replace. Follow factory diagnosis and replacement procedures. Fuel pressure low. Follow factory diagnosis and replacement procedures. Injector(s) clogged. Follow factory repair/replacement procedures.
Low boost	Air filter dirty Throttle not fully opened	Check/replace air filter. A dirty filter restricts the air intake. TRD dyno tests have shown that the TRD air filter is among the best on the market for flow and filtering characteristics. Recheck and adjust the throttle cable and transmission cable. Be sure that full depression on the gas pedal achieves full throttle opening at the throttle body.
Makes a moderately loud noise under full throttle—intake noise	Normal turbocharger sound	No remedy. Turbochargers are an air pump and the pumping action is impossible without some noise. Call TRD for further diagnosis.

Racing Development

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Installation Instructions For TRD/NW's 2.2-liter I4 Turbocharger Kit

00602-05100-221