770-777-4774 Sales@SpeedForSale.com

GT28R Hybrid Stock Twin Turbos Installation Manual

Article by Stu 'Stock Twins King' Hagen with revisions & organization by Jeremy Blackwell

TABLE OF CONTENTS:

Section 1: Disassembly of the turbo system

The first task is to start removing all the parts/pipes/vacuum lines to allow access to the turbochargers. BE SURE TO SOAK ALL TIGHT NUTS & BOLTS WITH 'PB BLASTER' PRIOR TO REMOVAL! This will cut down on wasted time. Take your time and follow the repair manual step-by-step until you are down to only the turbos and exhaust manifold remaining, then move on to SECTION 2.

If you need help getting to this part, or even the basics of the stock turbo system teardown, you can find step-by-step instructions here:
http://www.97supraturbo.com/1997%20Service%20Manual/Turbos.pdf

Section 2: Health check of sequential operation system

Upon removing all of the turbo system to reach the turbochargers, you need to check the health of the main components that operate the turbo's sequential system. These items include the VSVs (Vacuum Switching Valves), actuators, and pressure tank. Failure to do so may result in the turbochargers not boosting properly and you having to fully or partially disassemble the turbo system! Here is an enlarged diagram of the locations of the items noted below:

http://www.speedforsale.com/images/uploaded/2JZVacuumSystem.JPG

Here are the items to check…
1. (IACV) *Intake air control valve VSV*: 38.5 ohms – 44.5 ohms
2. (EGCV) *Exhaust gas control valve VSV*: 38.5 ohms – 44.5 ohms
3. (WG) *Wastegate control valve VSV*: 22.0 ohms – 26 ohms
4. (EBV) *Exhaust bypass control valve VSV*: 22.0 ohms – 26 ohms
5. (IACV) *Intake air control valve actuator*: Apply 7.1psi of air pressure to the nipple and ensure the valve opens.
6. (EGCV) *Exhaust gas control valve actuator*: Apply 7.1psi of air pressure to the nipple and ensure the valve opens.
7. (WG) *Wastegate control valve actuator*: Cap off one nipple, and apply 17.4psi of air pressure to the other nipple. The wastegate control valve should fully open.
8. (EBV) *Exhaust bypass control valve VSV*: Cap off one nipple, and apply 14.2psi of air pressure to the other nipple. The exhaust bypass control valve should fully open.
9. *Pressure tank*: The actual pressure tank itself is located underneath the intake manifold and is a pain to get to. So, using the picture below showing the vacuum hard lines going from the turbos over to the pressure tank, check to make sure air flows from Port A through Port B, but NOT from Port B through Port A. Also apply 18 in/hg of vacuum to Port A, and ensure that vacuum doesn't change after 1 minute. This test can also be done by putting a vacuum cap on the hard line for Port B, and then pressurizing the hard line for Port A. After 1 minute, remove the vacuum cap off Port B and listen for air to be released.

Section 3: Reinstallation of the new turbo kit

After removing all of the piping, heat shield, and oil and water lines, you have a choice of either taking off the complete stock system manifold and all, or just remove the nuts that hold the OEM turbo's onto the exhaust center section (Turbine Outlet Elbow). There are 6 bolt/nuts on each turbo section. It is highly recommended that you spray PB Blaster religiously the night before to loosen up the nuts. The same goes if you decide to remove the manifold as well. See attachments for parts description and location. Also, when tearing things down, I should mention about the parts that I expect to re-use when installing the new system.

- All 4 metal piping gaskets. 2 Inlets, 2 outlets
- Metal (EBT) Exhaust Bypass Tube gaskets (2)
- Multi Layer Turbine Outlet Elbow gaskets (2)
- 8 Hose clamps from the stock water lines. They will work with the new system.
- Oil inlet Banjo bolt 12MM from the block. The kit includes (4) new crush washers.
- Stock 1-7/8" ID IACV (Intake Air Control Valve) Rubber coupler hose. Needs to be cut down to 3-3/4" from 4-3/4"
- Stock metal Exhaust manifold gaskets. Inside and outside.
- Exhaust outlet to Down Pipe metal "O" Rings (3)

These are the basic items with the turbo charger system. All other items associated with the removal are re-used such as nuts and bolts. A list of replacement part numbers are listed below if you want to order all new metal gaskets. I have given all the Toyota PN's for these.

OEM Replacement Parts			
#1 Turbo Housing Gasket	1	Toyota	17279-46020
#2 Turbo Housing Gasket	1	Toyota	17287-46020
12mm Banjo Bolt	2	Toyota	90401-12009
12mm crush washer	4	Toyota	90430-12026
12mm nuts	2	Toyota	90179-
Hose Clamps	6	Toyota	9047-28007
Compressor pipe gasket-out	2	Toyota	17378-40010
Compressor pipe gasket-in	2	Toyota	17376-46010
Pipe coupler-Rubber	2	Toyota	17341-46070
Manifold gasket-Front	1	Toyota	17173-46040
Manifold gasket-Rear	1	Toyota	17198-46010
Manifold gasket-O ring	2	Toyota	17278-46011

These new GT28 turbo's use mostly Banjo style bolts. The oil and water inlets and the water outlets are banjo style. The Oil drain is a flange that incorporates a male -10AN for use with the metal braided -10AN lines. All of the necessary parts are included.

INCLUDED PART LIST

- (2) -4AN Oil Inlet Braided Teflon hose. Female/Female. One 11" and one 12" long.
- (2) -10MM-Banjo Fitting with a -4AN male connection (for Oil Inlets)
- (2) -10MM x 1.25MM Banjo Bolt with (4) Crush Washers. (for Oil Inlets)
- (2) -4AN Swivel adapters-90 degree for Hose to 12MM Banjo adapter
- (2) -12MM-Banjo with -4AN male connection and (4) 12MM Crush Washers. You will be re-using the OEM 12MM Banjo Bolt.
- (4) -14MM Banjo to 3/8" Barb water drain. (16) Crush Washers (4) 14MM x 1.5MM Banjo Bolts.
- 72" 3/8" Black Hi-Temp water hose line and (2) ½" hose clamps for water neck.
- (2) Custom Oil Drain adapters with -10AN Male fitting.
- (2) Paper Flange Gaskets

- (4) M6 x 1.00 - 22mm long Stainless Steel Hex bolts and washers. (for attaching the Flange)
- (1) -10AN Braided Teflon hose, 45*/45* ends, 10” Long for the #1 Turbo Drain to Block
- (1) -10AN Braided Teflon hose, 90*/Straight ends, 18” Long for the #2 Turbo Drain to Block
- (1) Custom Block flange with ½” NPT threaded insert. (Re-use OEM bolts)
- (1) Paper Flange Gasket
- (1) Earl’s 923110ERL -10AN to ½” NPT swivel adapter
- (1) 3-Way -10AN “Y” Adapter
- (2) New 2-1/4” Diameter Hi-Temp black silicone couplers and (2) new band clamps to replace the OEM corrugated ones that are too short to re-use. (Intake Air Connector)
- (2) ½” x 1-1/4” Metal loom extensions (2) M6x1.0 bolts/washers/nuts
- Lengths of two different hose diameters for vacuum hoses

After assembling the new GT turbo’s onto the Turbine Outlet Elbow, you’re ready to install the complete unit onto the engine or Manifold. But before you do this, you need to install all of the turbo fittings first. Install the (2) Oil inlets (on top of the turbo). First the Crush washer, then the banjo, then the 2nd crush washer, then the Banjo bolt. Torque accordingly (see attached). Then attach the -4AN Oil line to the -4AN fitting on the Banjo. Tighten it down. These will just “dangle” until the Turbo’s are installed onto the Head/motor.

Now install the bottom Oil Return Flange with the (2) M6x1.00-22mmBolts and (2) Washers. Make sure to install the paper gasket first. Tighten down the M6 bolts. Screw on the -10AN Lines to the bottom of each turbo. Install the angled side of the hose to the turbo. The straight end goes to the block. Otherwise you won’t clear the EGCV or the Rear Exhaust housing. The 10” Long hose (45 degree ends) is for the #1 Turbo, and the 18” Long hose (90 degree end goes to Turbo, Straight end goes to drain Y-block) is for the #2 Turbo. Finger tighten both of them down, and leave them to “dangle” down. Make sure that the #1 Turbo hose is angled toward the engine and somewhat “over” the EGCV actuator. Position the #2 Turbo hose so it is pointed a little toward the EBV actuator-> block. Also, make sure that these two are finger tight to the -10AN Flanges. You’re going to need to move these just a little later when you install the block flange to line up the hoses.

Now install all (4) 14MM-3/8” Barb water line flanges. Crush washer, then the Banjo, then the other crush washer, then the bolt. Tighten down. Try to point them straight down.

Now you're ready to install the whole unit back on the Head/Engine. If you took the approach of just removing and replacing the turbo sections only, rather than the manifold and all, then all of the above would still apply. By installing all the lines prior, you will save time, and it will be much easier than trying to reach upside down if already installed on the car.

First thing to do is to LOOSELY install both the Oil Inlet 12mm Banjo's to the block (Washer, then Banjo, then the 2nd washer, then the bolt.) Then LOOSELY attach the 90 degree -4AN swivel adapter's female end to the 12mm Banjo's male end. Then LOOSELY attach the (2) -4AN Hoses' female fittings to the 90 degree -4AN swivel adapters. Once you have all of these oil feed fittings mocked up and in the correct positions for proper clearance, TORQUE the oil feed banjo bolts to OEM spec, and firmly tighten all other connections. This completes the Oil Inlets.

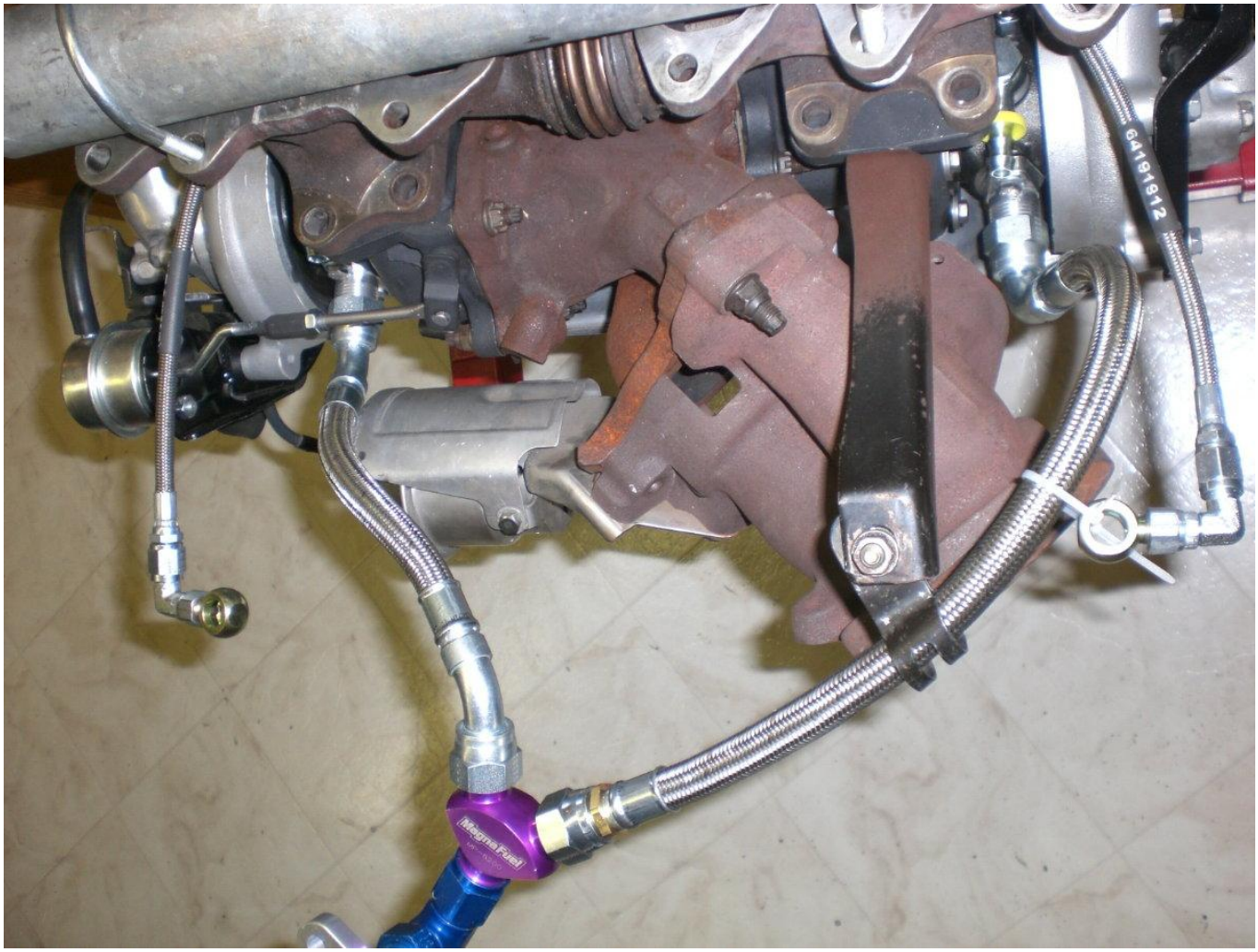
Remove the Oil Return Oil Tube bracket 'stay' from the OEM set up. This is the piece that held the OEM return hose to the #2 Turbo 'stay'. Wrap it around the -10AN line coming off the #2 turbo. Then later when finishing the install, use the OEM Bolt and Nut to re-affix the bracket to the 'stay' and to the block. This holds the hose so it doesn't move around and keeps it somewhat in the OEM fashion.

Next is to insert the Earl's -10AN to ½" NPT adapter into the custom Block flange. Warp the ½" NPT threaded end with Teflon Tape. Tighten the Earl's adapter down into the female ½" NPT block adapter. On the -10AN Side of the Earl's adapter, screw on the -10AN "Y" adapter. Now you're ready in insert the (2) -10AN Lines to this "Y" adapter. Keep all of the lines a little loose so you can line up everything. Once everything is properly lined up you can start to tighten down all of the hose connections. The #2 Turbo hose will be nearly parallel to the ground as it enters the "Y" adapter. The #1 turbo hose will be almost straight down into the "Y" adapter.

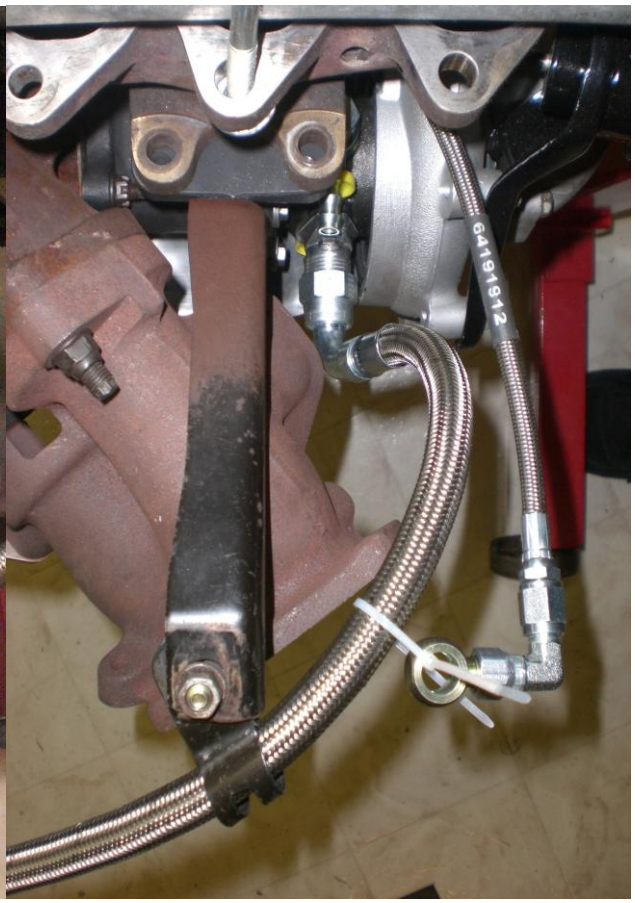
Once the turbo's are on, you should install the water lines. The 2 metal water line tubes up front coming off the water neck elbow are the water "IN" lines. One goes to the #1 turbo "outside" barb, and the other wraps down and along the heat shield area to the #2 turbo barb on the "outside" of the turbo. The "Inside" barb on both the turbo's are connected to water "return" metal tubes. The one up front off the #1 turbo will be within a few inches away from the barb. Same with the rear turbo drain. It will also be just a few inches away. Affix one end, then route the hose until you reach the other connection point, and cut the hose to the appropriate length. Attach the OEM clamps to the hose ends; one on the barb end and the other on the metal OEM line. The only issue in all 4 lines is getting the water "Inlet" from the front water line all the way back to the #2 turbo routed in such a way that it doesn't get in contact with any hot spots. Try snaking the hose through the Vacuum lines that come off the metal loom down to the VSV's. There is enough room there to slide it in between and hold it in place so it routes back to the #2 turbo tightly. You can play around in finding the best method. Now you can install the heat shield.

When you go to install the piping, this is where you're going to need to cut down the IACV coupler hose to 3-3/4". Otherwise it will be too long. Re-use the clamps. Included in the kit are the 2 new black silicone pipe couplers and clamps. You will now install these when you assembling the pipes back. These are shorter than the stock ones, and the stock ones cannot be re-used or cut down. Make sure the clamps are facing up, and on the fender side of the pipes. This way you can tighten them up where they won't interfere with anything.

Once everything is back in place and when you go to install the metal Vacuum lines you will notice the bolt holes will not line up. This is because these new turbo's are about 3/8" shorter than the OEM ones (which is why you are getting new rubber couplers and cutting down the IACV hose.) It is important that you line up the rear bolt hole, but not the front two. This hole is by the IACV . If you do not line this hole up, then the vacuum lines that go to the EBV in the rear will be too close to the fire wall and will not line up with the 2 vacuum hoses. Where the other two mounting holes are located (up front by the "Y" pipe) you will be off by about ¾". One on the outside and another just behind and closer to the valve cover. You will need to install the small plate adapters, which are about an inch long x ½" wide with 2 holes (supplied in the kit). One plate to attach to the Loom with a bolt/nut/washer, and the other end for the OEM Bolt hole locations. This acts as a "bridge" between the gap where they don't line up. That should be sufficient to hold the loom in place. You will need to cut a few vacuum lines shorter as well. This might be a good opportunity to install all new silicone lines. The front 2 hard vacuum hoses around the "Y" front pipe will need cutting. The rear line going to the IACV and to the rear metal line will also need a little cutting. All of which will be easy and self explanatory.

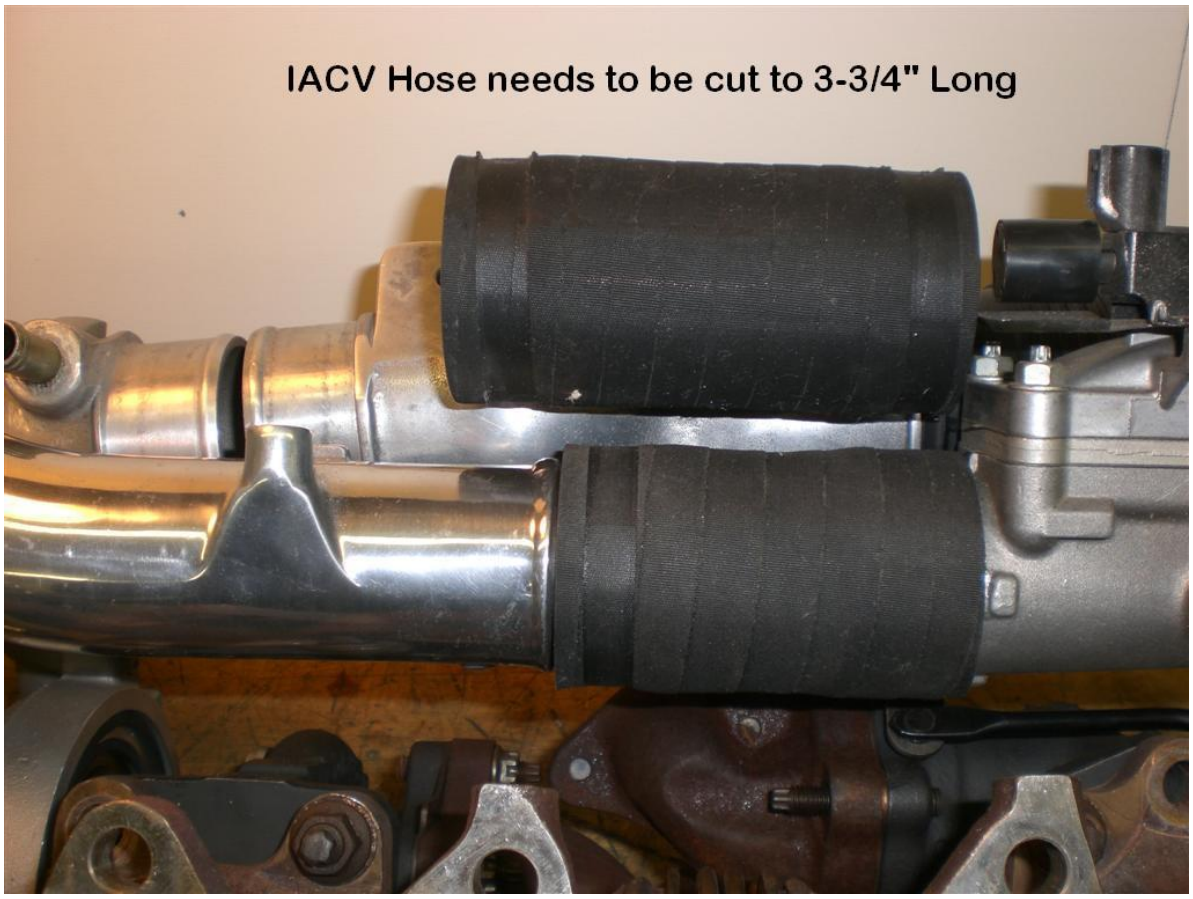


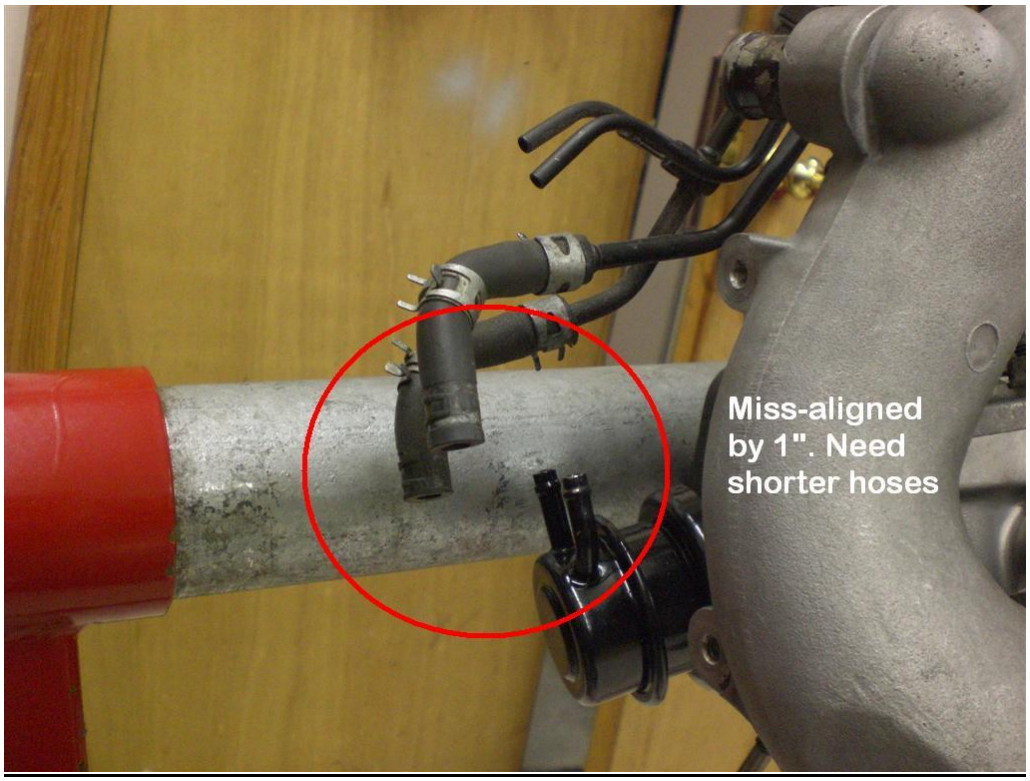
This is the overall view of both the -10AN Return lines and the two -4AN Oil inlet lines. The two oil inlets bolt to the block with the stock 12mm banjo bolt. The kit includes 4 new Toyota crush washers.

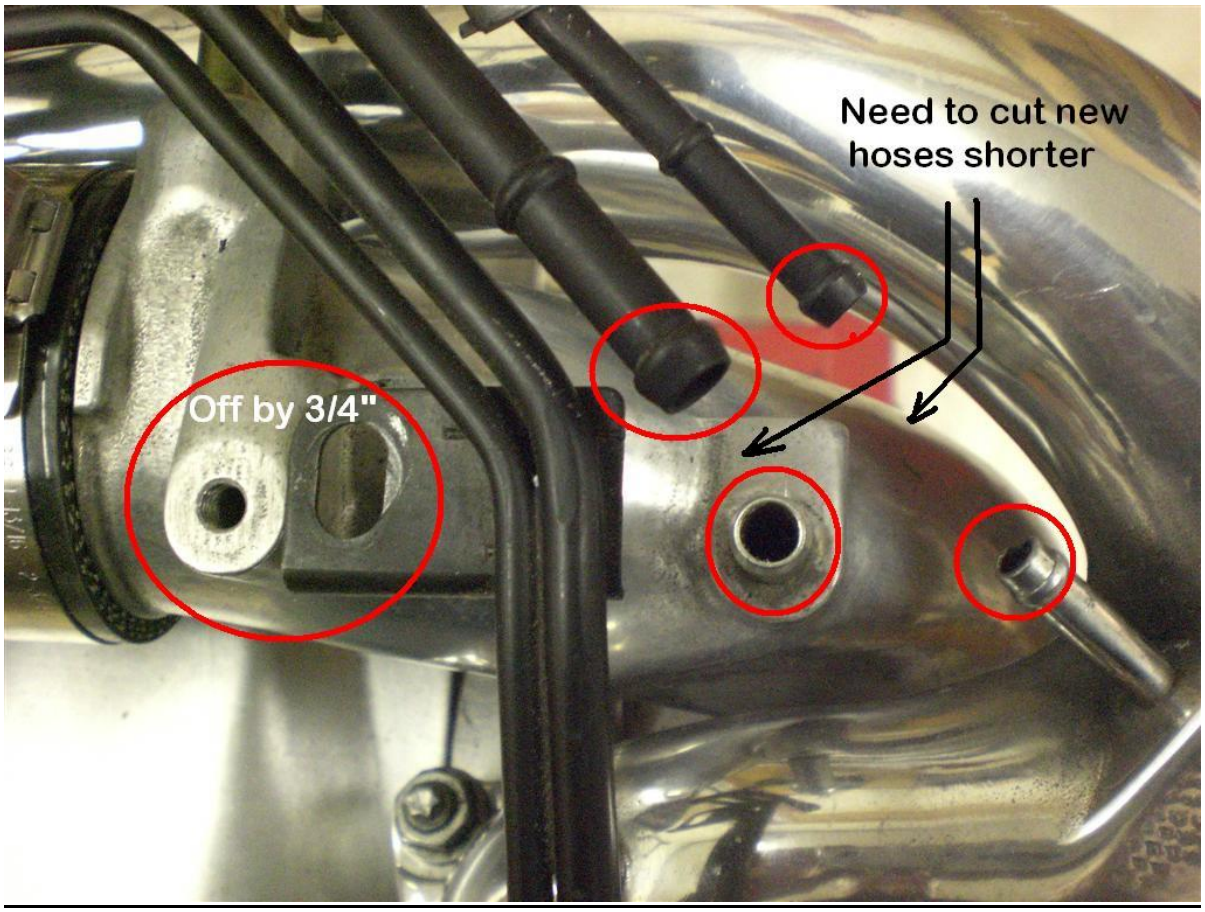


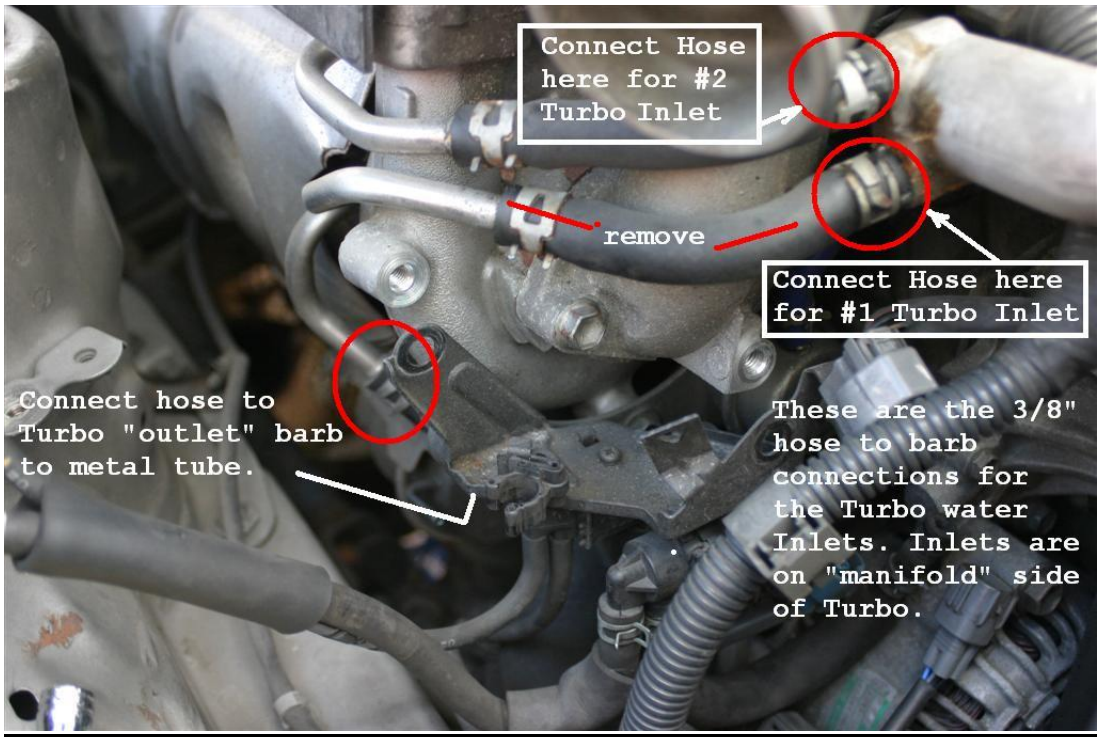
The picture on the Right is the #2 Turbo oil drain line. It has a 90 degree on the turbo side and a straight on the other. Notice how the stock hose C-Clamp (which is attached to the 'stay') is holding the hose in place. The small hose to the right is the -4AN oil inlet for the #2 turbo.

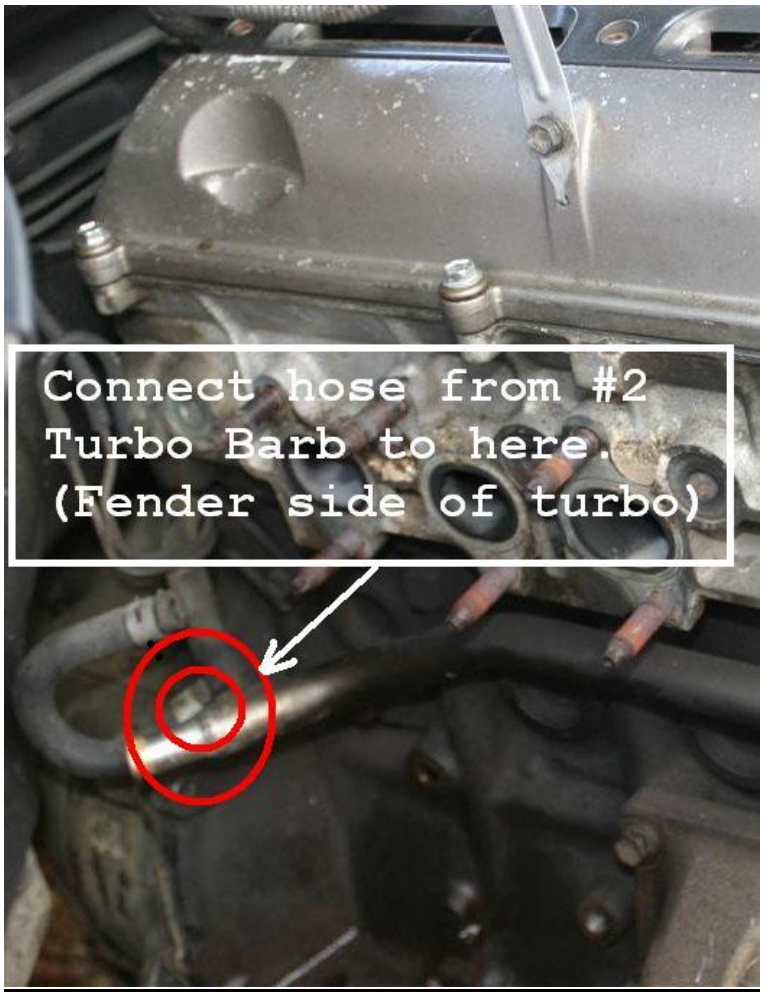
The picture on the Left is the #1 turbo oil drain. This hose is a 45 degree on each end. As mentioned previously, finger tighten all the -10 Fittings so you can move the assembly around so it lines up to the 2 block bolts for the return flange->block adapter


IACV Hose needs to be cut to 3-3/4" Long


Miss-aligned
by 1". Need
shorter hoses


Need to cut new hoses shorter
Off by 3/4"


Connect Hose here for #2 Turbo Inlet
remove
Connect Hose here for #1 Turbo Inlet
Connect hose to Turbo "outlet" barb to metal tube.
These are the 3/8" hose to barb connections for the Turbo water Inlets. Inlets are on "manifold" side of Turbo.

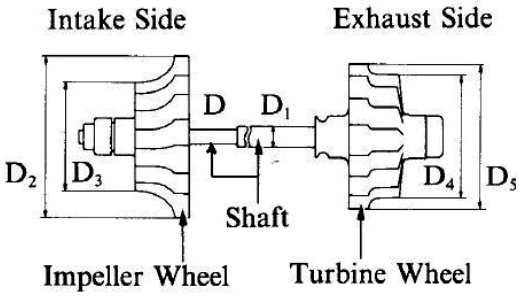

Connect hose from #2
Turbo Barb to here.
(Fender side of turbo)

TORQUE SPECIFICATION

Part tightened		Ft-Lbs
Front lower arm bracket stay x Front suspension	Bolt	33
	Nut	43
Upper front crossmember extension x Front suspension	Bolt	22
	Nut	25
Front exhaust pipe x No.2 front exhaust pipe		43
Pipe support bracket x Transmission		32
No.2 front exhaust pipe x Exhaust gas control valve		46
No.1 air tube x No.1 turbocharger		15
No.4 air tube x No.1 turbocharger		15
Intake air control valve x No.2 turbocharger		15
Exhaust bypass pipe x Exhaust gas control valve		18
Exhaust bypass pipe x Turbine outlet elbow		18
Exhaust gas control valve stay x Cylinder block		32
Exhaust gas control valve stay x Exhaust gas control valve		32
Main heated oxygen sensor x Exhaust gas control valve		14
Exhaust gas control valve x Turbine outlet elbow		51
Turbocharger stay x Cylinder block		32
Turbocharger stay x Turbocharger		32
Turbo oil pipe x Cylinder block		29
Turbo oil pipe x Turbocharger		15
Turbocharger x Exhaust manifold		40
No.2 air tube x No.2 turbocharger		15
Side bearing housing plate x Turbocharger		78 in-lbf
Turbo water pipe x Turbocharger		78 in-lbf
Turbocharger x Turbine outlet elbow		18
CAC duct x CAC		43 in-lbf
CAC x Body		10

Section 5: Turbo sizing comparison

Some basic comparisons between a stock CT12B and these new GT28R Garrett Cartridges:



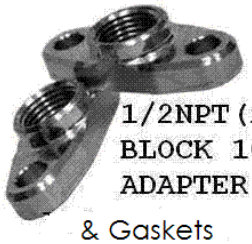
Specifications◀ mm (in.)

Engine			CT-12B	GT28
Shaft Diameter		D	5.0 (0.197)	6.0 (0.236)
Shaft Diameter Journal		D_1	7.5 (0.295)	8.3 (0.328)
Impeller Wheel	Outlet Diameter	D_2	58.0 (2.283)	60.0 (2.364)
	Inlet Diameter	D_3	39.0 (1.535)	47.25 (1.862)
Turbine Wheel	Outlet Diameter	D_4	44.0 (1.732)	47.00 (1.852)
	Inlet Diameter	D_5	52.0 (2.047)	53.00 (2.088)
Overall Shaft Length			146.0 (5.75)	127.0 (5.00)

Section 6: Pictorial parts list

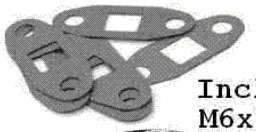
COMPLETE LIST OF PARTS IN THE KIT

Oil Drain parts

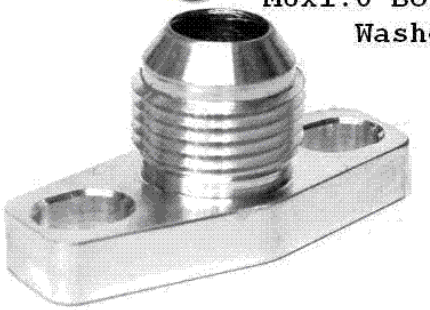


1/2NPT (re-use oem BLOCK 10mm nuts) ADAPTER
& Gaskets

FOR OIL BLOCK

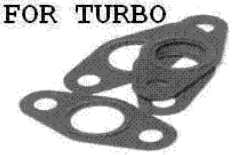


Includes (4) M6x1.0 Bolts Washers



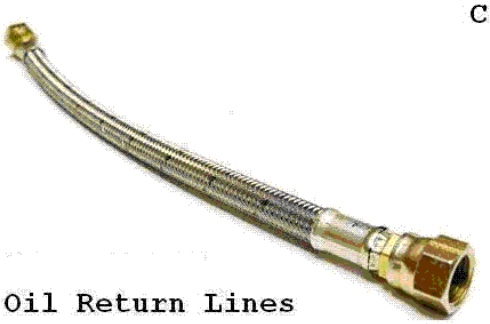
-10AN
Turbo Oil Return
& Gaskets

FOR TURBO



-10AN 1/2"NPT

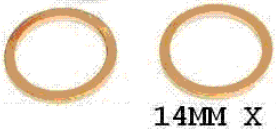
-10AN "Y"
Block
for oil drains



Oil Return Lines
10" -10AN (F)45°-45°
18" -10AN (R)St-90°

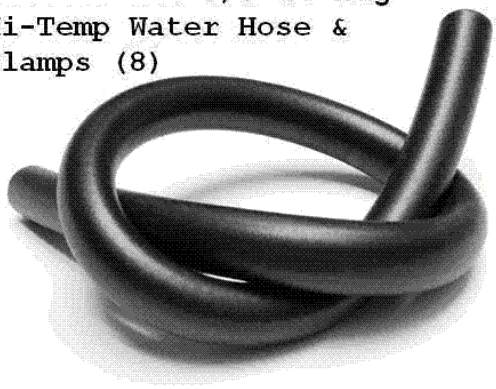
Water supply (4) Each

3/8" BARB



14MM X 1.5MM
WATER INLET/OUTLET (4)

3/8" 84" long
Hi-Temp Water Hose & Clamps (8)

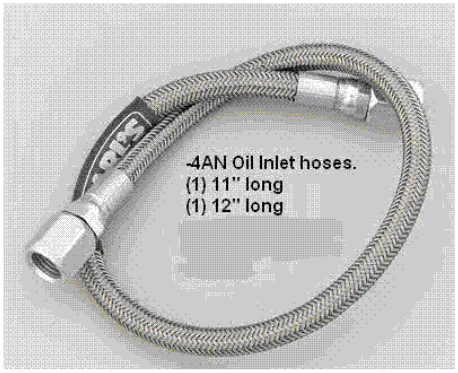


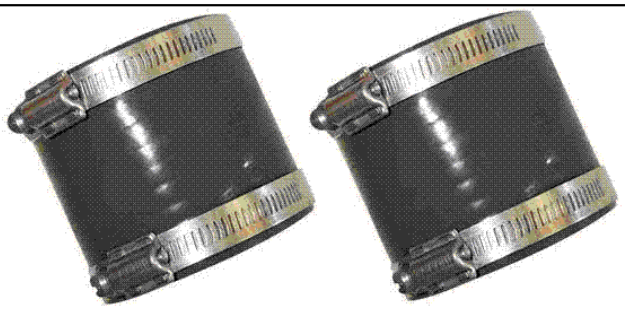
OIL INLET SUPPLIES

12mm Block Banjo
+(4) Washers

(Re-use OEM Bolt)

Not shown:
(2) ½" x 1-1/4" Metal loom extensions (2) M6x1.0 bolts/washers/nuts





(2) 2.25"x 3" Hi-Temp couplers with clamps