



Clocking a TD-04 Turbo Compressor Housing

Appendix A : AWIC Silicone and Tubing Fitting



Revision A: 7-13-2015

Tools:

- Metric Sockets (10, 12, 14, 17mm)
- 5mm Hex Key
- Large Internal Snap Ring Pliers
- 3/8" Socket Extension
- Wrenches and Adjustable Wrench
- .1015" Drill Bit (#39, or similar)
- Large Phillips Screwdriver
- Electric Drill
- Bench Mounted Vice
- PB Blaster
- File
- Ruler

Optional Tools:

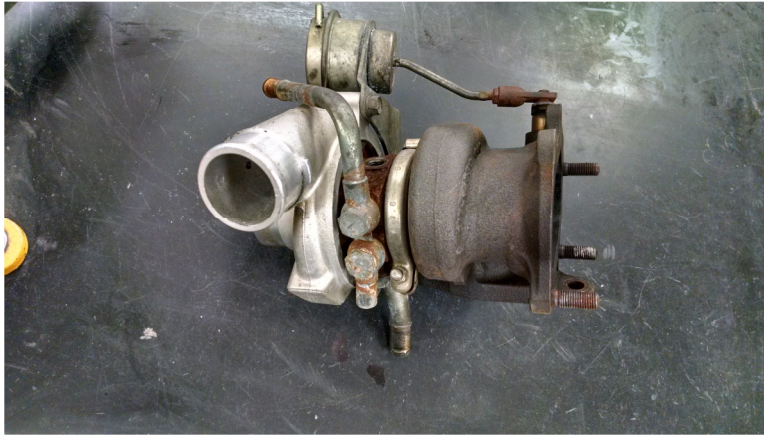
- Aluminum Vice Jaws
- ¼" and 11/32" Drill Bit
- 1/8-27 NPT Tap
- Flapper Wheel
- Die Grinder
- Bench Mounted Belt Sander
- Small Hammer
- Small Punch
- Small Center Drill
- Quick Clamp
- Vernier Calipers

Parts:

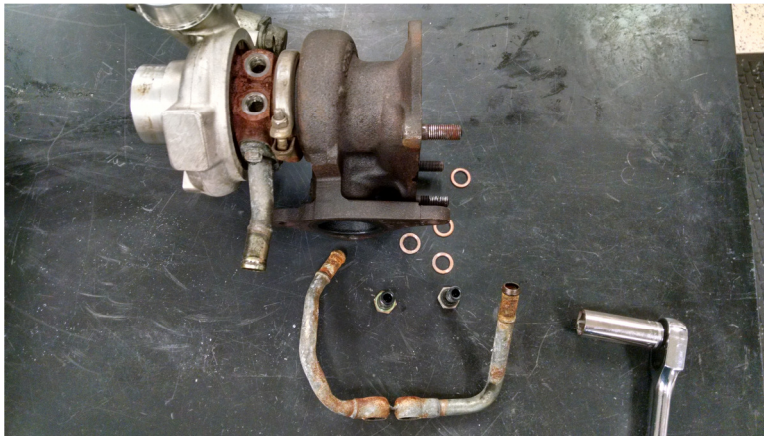
- Zero Decibel Motorsports 70deg Clocking Bracket
- 3X 8mm Button Head Cap Screws
- 1X 8mm Lock Washer
- 1X 8mm Nut with Integrated Star Lock Washer
- High Temp Silicone (or optional oil drain gasket)
- Copper Sealing Washers
- Optional: 1/8" NPT to Barb Fitting
- Optional: Oil Drain Gasket

Preparation:

Clean off the turbo using compressed air to remove all dirt, dust, and rust. Pay special attention to the center housing where the water lines and snap ring are as this area will have the most loose rust. Create a clean work area free of contamination and objects that could fall onto the turbo.

**1: Remove Water Lines**

Use a 17mm socket to remove both banjo bolts that secure water lines. Remove all 4 copper washers (lower washers may stick to housing).



2: Separate Water Lines

After the water lines have been removed, flex the two pipes to break apart the tab connecting them in the middle. Remove the remainder of the tab using a belt sander or file. This is done to allow the water lines to be adjusted independently for improved clearance as necessary.



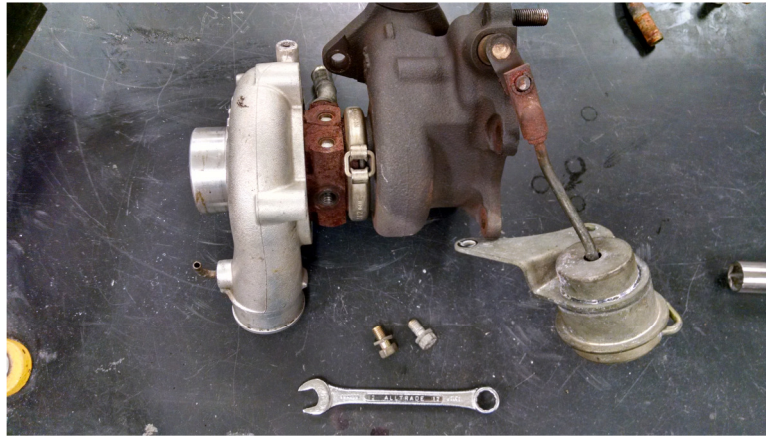
3: Remove Oil Drain

Use a 10mm socket with an extension to remove the two bolts. Tube may stick to the gasket. If you plan to use a new gasket, scrap the old gasket off. If you plan to reuse the gasket along with a thin layer of silicone be careful not to tear the gasket beyond what the silicone can repair.



4: Remove Wastegate

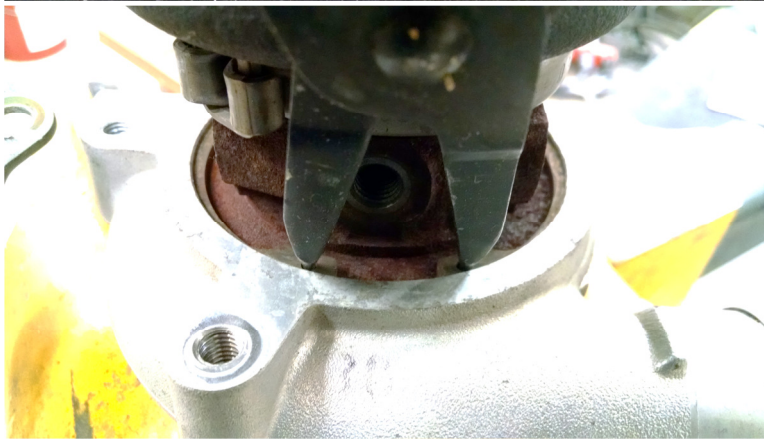
Remove the two bolts with lock washers holding the wastegate bracket to the turbo. You may choose to remove the e-clip on the flapper arm or leave it in place and let the wastegate dangle.



5: Remove Snap Ring

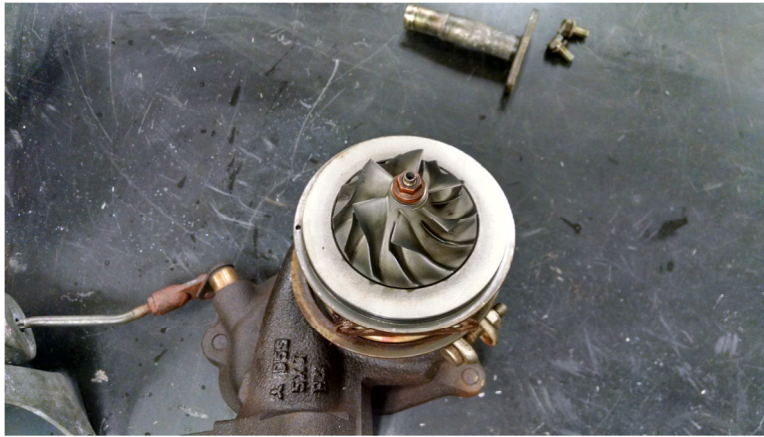
Place the turbo into the vice with the exhaust housing facing upwards. Clamp on the neck of the compressor inlet. Ensure all loose rust is removed from the snap ring area and spray some PB Blaster onto the ring and allow a few minutes for it to penetrate. Using the snap ring pliers attempt to loosen the snap ring. If it is stuck, using a small hammer and punch can help to free it. Do not use excessive force. The snap ring has a tapered outside that pulls the compressor housing onto the center housing and puts a lot of pressure onto the ring and housing. Using a pair of quick clamps to pull the compressor housing closer to the exhaust housing can relieve some pressure on snap ring. Snap ring pliers with a lock on them are useful to give you time to work and rest without needing to maintain a constant grip on the pliers.





6: Separate Turbo

Gently rock the exhaust housing while pulling up. There is a dowel pin in the compressor housing that will prevent you from rotating the two parts relative to each other. There is a large o-ring mounted on the center housing that adds drag as the compressor housing is coming apart. If necessary, use a small hammer to gently tap upwards on opposing sides of the exhaust housing. Do not use excessive force or tap only on a single location. Once the two parts are separated remove the compressor housing from the vice place the exhaust housing in the vice clamping on two of the studs.



7: Drill New Dowel Pin Locating Hole

There is a dowel pin pressed into the compressor housing that keys with a hole in the center housing to ensure proper alignment of the compressor outlet. This dowel pin can either be pulled out or ground down or, the preferred method, is to drill a new hole. With the existing hole positioned on the left, make a mark on the flange of the center housing that is 1.894" from the center of the existing hole. This does not need to be perfect.

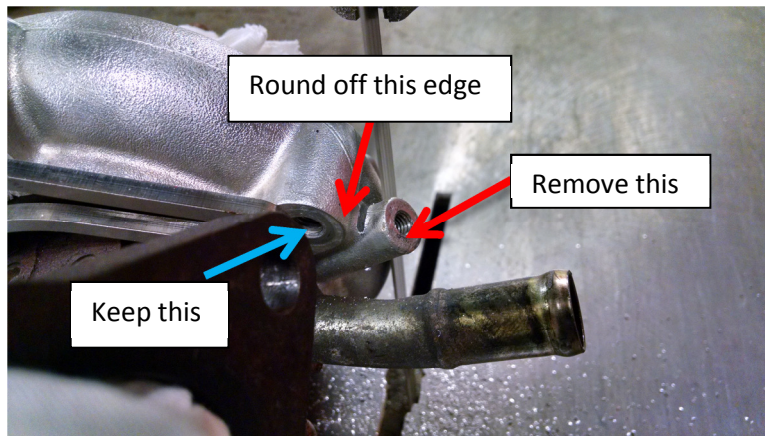
It is recommended to use a center drill to start the hole as they are not prone to wandering like a drill bit. Start the hole on the previously created mark centering it on the flange. A perfectly located hole can be as small as .078 (2mm). It is easier to use a larger drill bit and allow for some misalignment. Drill slowly using light using light pressure stopping often to clear off chips and check progress. If the drill bit snaps or breaks through the flange unexpectedly the drill can damage the fins on the compressor wheel if you are pushing too hard. This is why it is important to use light pressure and proceed slowly. Place the compressor housing onto the center housing and check that the dowel pin is able to fit in the hole. If it is not, then use the next larger drill until the dowel pin and hole are able to mesh together. Repeat as necessary. After this is completed, set the exhaust housing aside.





8: Remove Oil Feed Line Mounting Boss

With the housing clocked, the boss is no longer in the correct position and not needed. It interferes with the lower water line and must be removed. Simply cut it off with a saw or file it down. Do not remove the boss with the larger 8mm threaded hole completely, but round off the square edge.



9: Optional: NPT Compressor Fitting and PnP Outlet

These steps are not required but can only be performed with the turbo separated. Instead of using the OEM steel nipple that is pressed into the housing you may wish to replace it with a threaded brass fitting (either straight or angled). Simply bend the fitting to snap it off and file or belt sand any remainder flush with the aluminum housing. Use a $\frac{1}{4}$ " drill bit to remove the embedded portion of the nipple. Follow up with an $\frac{11}{32}$ " drill ($\frac{1}{8}$ " NPT pilot drill size). Tap the hole with an NPT tap stopping often to check the fitment of the NPT fitting. NPT threads are tapered and tapping too deep will make the top of the hole too large and the fitting won't be able to seat properly.

In addition to the fitting, you may port and polish the outlet of the compressor housing. Use various flapper wheels to smooth out the semi-rough casting and taper the outlet. After completing this step blow the housing out with compressed air and run water through it for several minutes ensuring all traces of metal have been removed.



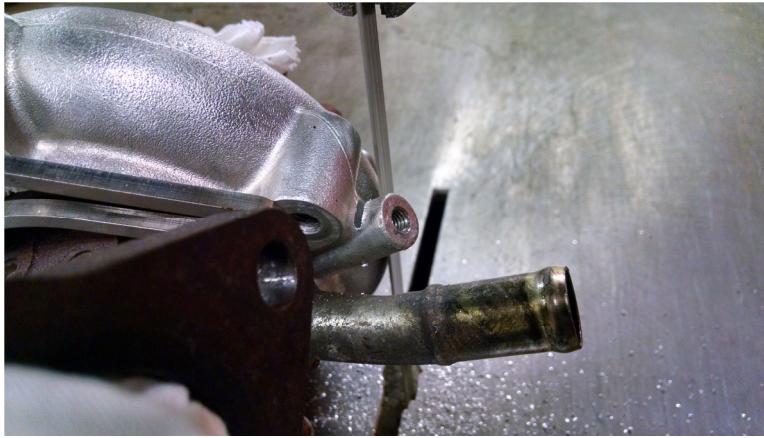
10: Reassemble Compressor and Center Housing/Exhaust Housing

Place the compressor housing into the vice in the same manner as when the turbo was separated. Carefully place the center housing onto the compressor housing being mindful of the fins on the wheel. Make sure the dowel pin and the hole line up. At this point the quick clamp can be used again to pull the two parts of the turbo together in the same manner as it was used to help separate the turbo previously. Squeeze the snap ring together and insert it into the groove in the compressor housing starting the end opposite the open end of the ring. Rotate the compressor wheel by hand to ensure it rotates freely and does not scrape anything.



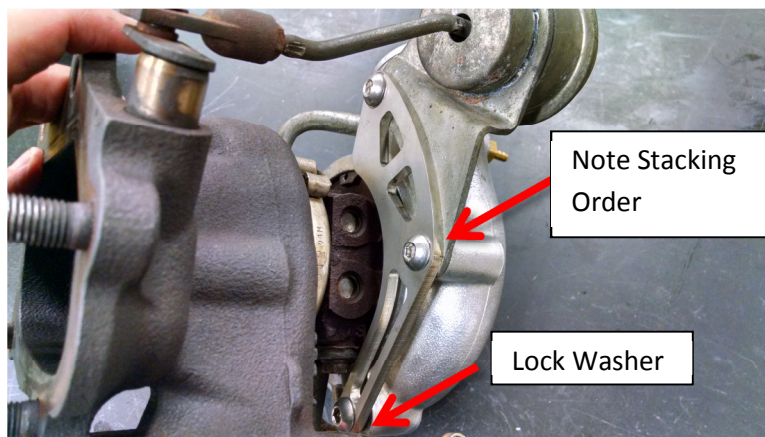
11: Reattach Oil Drain

Reattach the drain using a new gasket or high temp silicone on the old gasket. This is a low pressure return line. Pay attention to the orientation of the line as it is not symmetrical. It should bend away from the compressor housing.



12: Attach Clacking Bracket

Place the bracket in between the exhaust housing and the integrated wastegate bracket. Place an 8mm bolt through the clacking bracket and the nut with the integrated washer on the backside of the integrated wastegate bracket on the hole at the fat end of the bracket. Put a second bolt through the middle hole of the clacking bracket and the integrated bracket and thread it into the hole on the compressor housing. The integrated bracket will sit against the compressor housing. The last hole requires the split lock washer in between the housing and the clacking bracket. Tighten all of the bolts fully.



13: Check Waste Gate Arm

Depending on the tolerances of the parts used the wastegate arm can come very close to the opening in the wastegate housing. If it rubs use a small file to provide the necessary clearance. After ensuring it doesn't rub, check the wastegate flapper. It should be pulled tight against the exhaust housing. If it is not tight, remove the e-clip (if it wasn't previously), loosen the locking nut, and adjust the bracket on the end of the arm in ½ turn increments. After each ½ turn, fit the arm back over the flapper and check to see if it is pulled tight against the housing. Once it is tight, retighten the locking nut.



14: Water Lines

The water lines will need to be tweaked for better clearance with the rotated housing. This is best done by placing the water lines in a vice, placing a 3/8" extension through the banjo bolt hole and bending it. It does not need to bend very far! Bend in small increments and test the fitment. The upper water line gets rotated slightly with the lower line gets bent outwards to clear the boss next to where the oil line boss used to be. Make sure when checking fitment that you put the copper washers in place as this will change the clearance.



15: Test Fit and Oil Line

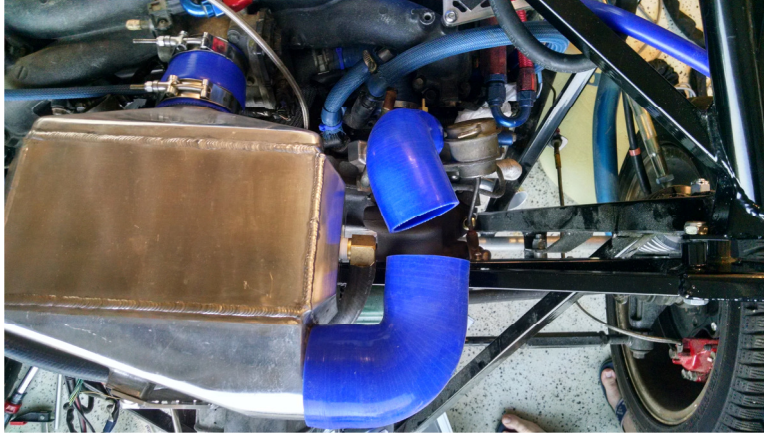
Place the turbo onto the uppipe. The lower water line may need to be bent towards the front of the car to clear the bracket holding the uppipe to the engine. The turbo line may also need to be bent for additional clearance. To bend water lines after they are installed, insert a large Phillips screwdriver into the open end of the tube for extra leverage.

Appendix A: AWIC Silicone and Aluminum Piping Fitment

The following section details the setup when using a clocked turbo for an AWIC on a FFR 818. This specific setup will also work if installing a clocked turbo and type 14 AWIC core onto a Subaru.

1: Silicone Placement

Place a 1.75" to 2.5" x 90deg coupler onto the outlet of the turbo and a 3.0" to 2.5" x 90deg coupler onto the inlet of the AWIC core as shown in the photo below.



2: Mark and Cut Aluminum

Place a 2.5" x 1' x 45deg aluminum pipe on top of the silicone couplers. Change the alignment of the couplers until it lines up well with the pipe. Make a mark on the pipe at the point where the coupler is still straight. Cut the aluminum pipe and deburr both the inside and outside.



3: Test Fit

Remove the silicone coupler from the AWIC core and insert the aluminum into the smaller end. Place the free end of the aluminum into the coupler on the turbo. Replace the larger coupler onto the inlet of the AWIC. Adjust the couplers and aluminum until there is little stress on the couplers.

