

Owner's Manual

with Installation Instructions

Banks Twin Turbo for Small Block Chevrolet

THIS MANUAL IS FOR USE WITH KITS 21101, 21102, 21103, 21104, 21107, 21108, 21109, 21110 21112, 24008, 24085, 24090, 24092, 24714, 24715, 24717, 42442, 51103, 51104

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General Installation Practices

Dear Customer,

If you have any questions concerning the installation of your Banks Twin Turbo System, please call our Technical Service Hotline at (888) 839-2700 between 7:00 am and 5:00 pm (PT). If you have any questions relating to shipping or billing, please contact our Customer Service Department at (888) 839-5600.

Thank you.

1. Before starting work, familiarize yourself with the installation procedure by reading all of the instructions.
2. Throughout this manual, the left side of the vehicle refers to the driver's side, and the right side to the passenger's side.
3. Before installing any components, inspect them for any foreign material that may have entered during shipping and handling, machining or assembly. Remove any burrs, machining chips and polishing compound from castings. Rinse all hoses and tube assemblies with solvent and blow dry, especially braided hoses after assembly of hose-end fittings.
4. Teflon paste has been provided with this kit for pipe thread assemblies. We recommend it over Teflon tape to eliminate the possibility of tape fragments getting into the lubrication and fuel systems. Flared fittings, hose and tube assemblies require no sealant.
5. Plastic or fiberglass parts, rubber hoses, brake lines, wiring, etc. in close proximity to hot exhaust components will need to be shielded from heat. We **do not** recommend that the exhaust system be covered with any kind of heat wrap or blanket, as this may overheat it causing warpage, cracks, or burnout. We recommend placing heat shielding on or between adjacent components. This may be in the form of reflective blanket material, or sheet metal forming air gaps, such as on our turbo exhaust manifold. On vehicles with low hood lines, it is advisable to mount heat shielding on the underside of the hood over the turbos and exhaust piping.
6. Check valves may need to be installed in-line with any accessories normally operated by manifold vacuum. (e.g. power brake booster, automatic transmission modulator, heater or A/C dampers)
7. When connecting MAP sensor, reference line should be connected to manifold vacuum/pressure below the throttle blades. No check valve should be used.
8. During installation, keep the work area clean. Do not allow anything to be dropped into intake, exhaust, or lubrication system components while performing the installation, as foreign objects will cause immediate engine damage upon start-up.
9. These instructions describe the final assembly of the turbo system on a finished engine. We suggest you make a dry-run assembly of all components finger-tight to verify any issues of fit and to familiarize yourself with the procedure.

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Section 1

ENGINE SUPPORT SYSTEMS

Your Banks Sidewinder Twin-Turbo system has the potential to make considerable power, but only if the vehicle's support systems are upgraded to match. We recommend you consider making the following modifications if you have not already done so.

FUEL SYSTEM

A quality high-performance EFI fuel pump capable of producing the recommended injector pressure and fuel flow volume for the anticipated power level will be required. Check with your EFI manufacturer for their nozzle flow rates and pressures. As a general rule, an engine at WOT under load will use 1/2 pound of gasoline per horsepower per hour.

Thus, an 800-horsepower engine will require a fuel-flow capacity of 400 pounds per hour total flow from the eight injectors. This is a minimum requirement, as the pump should have some additional flow and pressure reserve to allow for pressure regulation and high demand conditions. Install a fuel pressure gauge to monitor pressure while tuning. Pressure is ΔP injector. If your injector needs a ΔP of 45 psi and you will be running 10 psi of boost pressure, the pump will need to make 55 psi of pressure at the necessary fuel flow rate, plus 5 psi for regulation.

The fuel tank pick-up line or outlet fitting should be at least as large as the fuel pump inlet, typically a -10 or -12 line size. If at all possible, mount the pump in the rear of the vehicle, close to the fuel tank. A high-flow fine mesh fuel filter should be installed at the fuel pump inlet. Check with the pump manufacturer for filter micron size.

High-volume/high-pressure electric pumps must be supported by an

electrical system capable of providing the rated pump amperage and supply voltage. Check that the wire gauge and fuse amperage is appropriate for the pump selected. Most ECUs switch the pump on and off through a relay tied to the ECU's ignition circuit.

EXHAUST SYSTEM

Turbochargers respond quicker and will produce more boost with minimum backpressure. If possible, use a 3-inch-diameter outlet pipe from each turbocharger. In a minimum space situation, you may reduce to 2 1/2-inch-diameter off of each turbo, increasing to 3 inches as soon as possible, but power will be reduced. In a racing application, keep the pipe size 3 inches or larger, and as short as practical. On a street vehicle, mufflers should be a low restriction chambered design (no glass packs) with inlet and outlet sizes at least 3 inches. Keep the number of bends to a minimum, and as free flowing as practical. Stainless steel tubing is not necessary, but will last a lot longer.

The wastegates are provided with V-band outlet connections for welding to 1 3/4" tubing. On a street driven car, the wastegates' outlet tubes can be merged into the turbocharger outlet tubes 12"-24" downstream of the turbos. When doing this we recommend some kind of slip joint or bellows be placed in the wastegate outlet tubes to minimize tube distortion or cracking from different thermal expansion rates.

Our turbo system is designed with the wastegate outlets pointing out toward each side. If necessary for the vehicle application, the wastegates may be rotated to another position, but new actuation hard-line tubes will have to be made.

The turbochargers are supplied with heat shields, outlet gaskets, 3" tube outlet flanges, and eight 3/8-16 x 1" 12 pt. bolts. One outlet gasket is used on each side of the heat shield. When building the exhaust system, have the heat shields and all gaskets in place so your final stack-up of parts will be correct.

IGNITION

A high-energy multiple spark or CD ignition system is required to provide adequate spark energy during high boost operation. Check with your ECU manufacturer to determine what type of ignition triggering is compatible with the ECU circuitry. Distributor cap, rotor, and plug wires must be in top condition to prevent miss firing under boost. Spiral-core, low-resistance plug wire is recommended for use with most electronic ignition systems.

Sparkplug selection will vary somewhat with the system application and cylinder heads used. In general, plugs will need to be several heat ranges colder than stock to prevent the plug from becoming a source of pre-ignition. Do not use projected tip plugs that extend the center insulator into the combustion chamber.

LUBRICATION

Any oil suitable for lubricating the engine will lubricate the turbos. Oil contaminated by dirt or debris, or a lack of oil, will cause rapid turbo bearing failure. Anytime new turbos are installed, or a new engine is started for the first time, the turbos should be oil-primed prior to engine start-up. Disconnect the turbo oil drain lines at the oil-pan fittings and crank the engine with the ignition off until oil

is observed flowing from the drain lines, then reconnect lines and start the engine. An alternative method is to pump several shots of clean engine oil into each turbo oil inlet fitting, then crank the engine with the turbo feed lines disconnected and ignition off until oil flows from the feed lines. Reconnect the lines and start the engine. Oil priming ensures that the turbos will not be spinning before engine oil reaches them, as in an unprimed engine with empty oil passages.

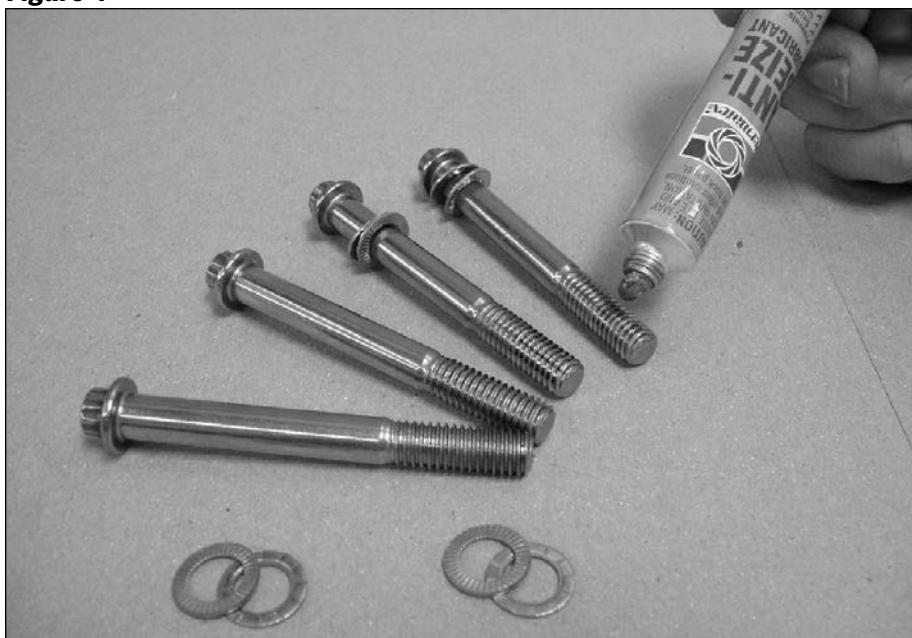
When a turbocharged engine is shut off after a period of operation, especially when it has been run under moderate or high boost, it is recommended that it be allowed to idle for 30-60 seconds before shut down. This allows engine oil to cool the turbo bearings and to prevent the hot turbo from baking the engine oil into sludge on the turbo bearings. Do not shut a turbocharged engine off immediately following high RPM/boost operation, as the turbos will spin for a number of seconds with no oil pressure, causing bearing damage. Never place a restrictor in the inlet or outlet turbocharger oil line. The turbocharger bearing clearances provide the necessary restriction to oil flow. A restricted or blocked turbo oil drain line will cause oil to back up into the turbo, pushing past the seals and entering the intake or exhaust system resulting in oil burning. Restricted oil inlet flow may result in damaged turbo bearings. If the engine will not produce normal oil pressure, steps must be taken to upgrade the engine's oil system, or reduce oil temperature/increase viscosity.

-END, SECTION 1-

Section 2

EXHAUST MANIFOLD INSTALLATION

Figure 1



1. Apply a small amount of anti-seize onto the threads of the twelve $\frac{3}{8}$ -16 x 3" bolts. See **Figure 1**. Install two lock washers on each bolt.

Note: Lock washers may be supplied already cemented together. If not, install two washers per bolt with the course serrations facing each other.

2. Install each manifold with the heat shield between the manifold and the

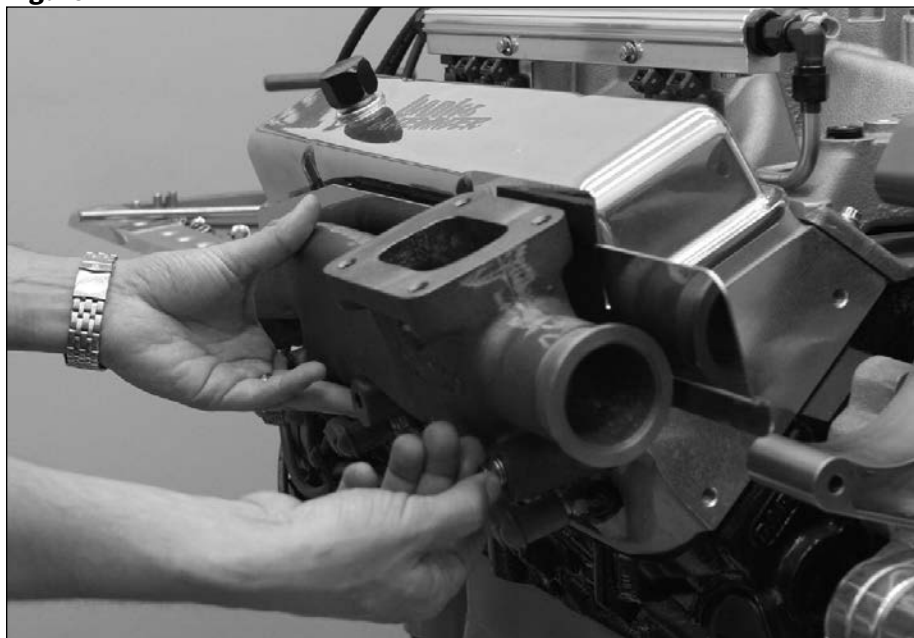
cylinder head using the two outside bolts. Peel the protective covering off of the heat shield before installation. See **Figure 2**.

3. Install the remaining 10 bolts, finger tight.

4. Make an initial pass torqueing each bolt to 15 ft-lbs. Then make a final pass torqueing each bolt to 35 ft-lbs.

-END, SECTION 2-

Figure 2



Section 3

TURBOCHARGER ASSEMBLY INSTALLATION

1. Apply a small amount of anti-seize onto the coarse threads of the eight $\frac{3}{8}$ " studs. *Note: Two of the studs are shorter.*

2. Install four studs into the turbine inlet flange on each exhaust manifold. The short studs are used in the right front corner of each manifold. See **Figure 3**.

3. Thread two $\frac{3}{8}$ " fine thread hex nuts onto one of the studs.

4. Lock the nuts together by turning them in opposite directions toward each other. See **Figure 4**.

5. Once the nuts are locked together use a wrench to snug the stud into the exhaust manifold flange by turning the upper nut. (Approx 5-8 ft-lbs).

6. Loosen the nuts by turning them in the opposite direction and remove them from the stud.

7. Repeat Steps 3 – 6 for the remaining seven studs.

8. Each exhaust manifold is provided with a $\frac{1}{4}$ " NPT pipe port for an exhaust gas temperature gauge probe (pyrometer). These ports are on the side of the manifold below the turbo flange. If a pyrometer probe is not installed, make sure a provided $\frac{1}{4}$ " pipe plug is installed in this port on each manifold. Use Anti-seize on the pipe threads. See **Figure 5**.

9. Remove the turbochargers from their packaging. Carefully check the turbochargers for any packing debris. Remove any debris found in the assembly.

Note: Debris in the turbocharger can damage it and the engine if not removed.

10. Install the two turbochargers onto the two exhaust manifolds. The turbine outlet should face the rear of

Figure 3

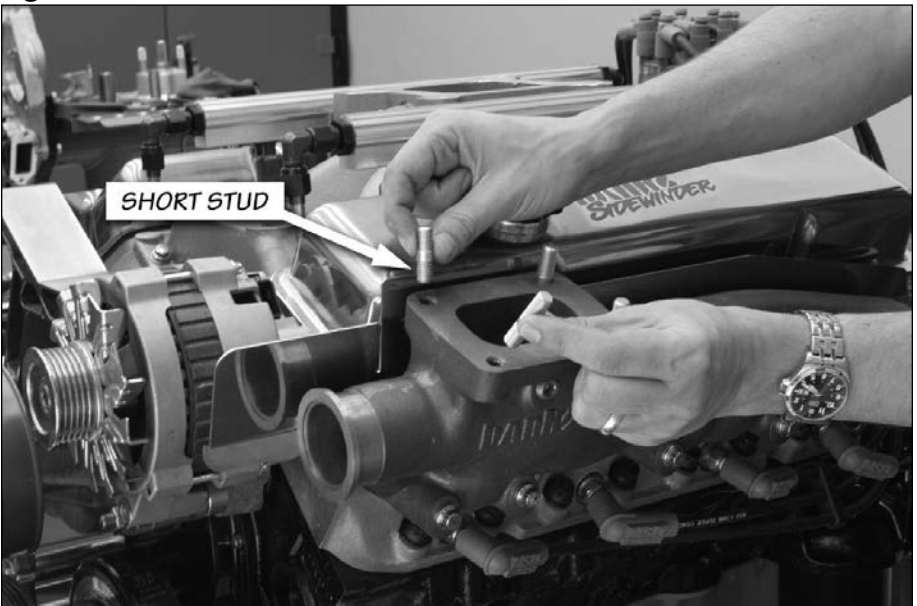


Figure 4



Figure 5



the engine. See **Figure 6**. *Note: No gasket is used between the turbocharger and manifold.*

11. Install a $\frac{3}{8}$ " AN washer over the six longer studs. *Note: Due to casting clearance, washers cannot be used on the two shorter studs.*

12. Apply a small amount of anti-seize onto the threads.

13. Install a $\frac{3}{8}$ " collet-lock nut onto each of the 8 studs with the round collet side of the nut against the AN washer and tighten to approximately 15 - 20 ft-lbs. Start the first nut on the short stud of each turbo flange. *Note: This torque value is just for reference. A torque wrench cannot be used to tighten these studs due to the limited clearance. The nuts must be tightened with an end wrench. See **Figure 7**.*

14. Loosen the six compressor and six turbine housing bolts on each

turbocharger so the housing may be rotated. Rotate the turbo center sections so that each oil inlet flange faces up. *Note: The oil inlet port is round and the oil drain port is square.*

15. Lay a straightedge on top of the oil inlet flanges of the center sections.

16. Rotate the center sections until the top surface of each oil inlet flange is flush with the straightedge. See **Figure 8**.

17. Tighten all six bolts that hold the center section to the exhaust turbine housing on each turbocharger to 12-15 ft-lbs. (For reference only, use an end wrench)

18. Bend over the lock tabs for each of the bolts tightened. *Note: Leave the bolts that hold the compressor housing to the center section loose until later.*

-END, SECTION 3-

Figure 6

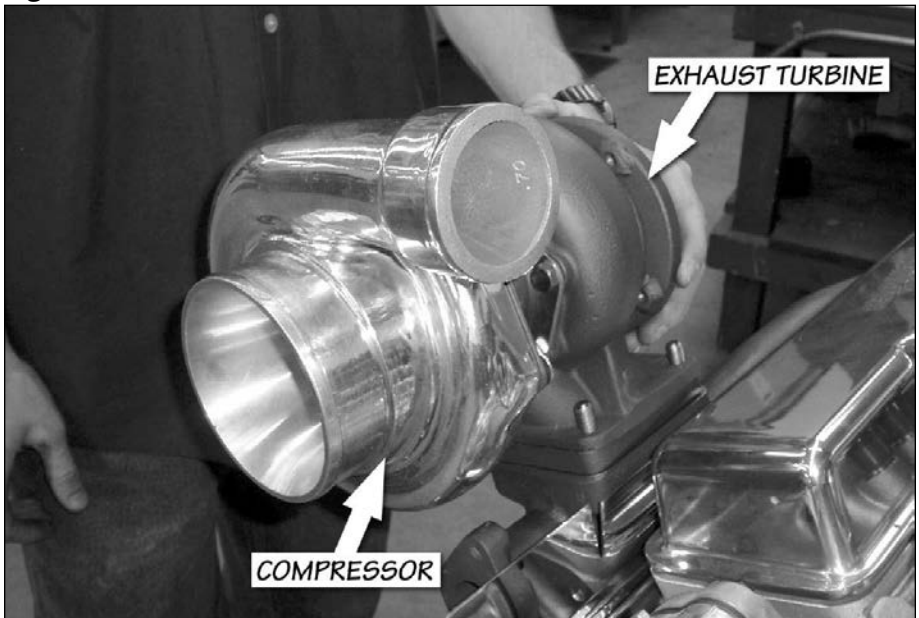
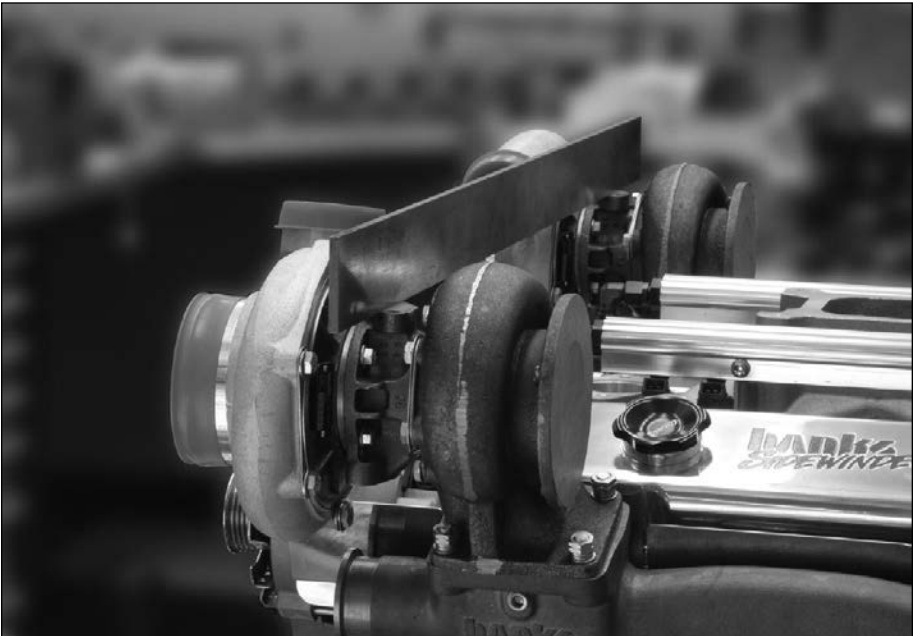


Figure 7



Figure 8



Section 4

TURBOCHARGER OIL FEED LINE INSTALLATION

1. Install an aluminum turbo oil inlet flange adapter and o-ring onto the center section of each turbocharger using a pair of M8x1.25 12-point bolts. Torque bolts to 15-18 ft. lbs. See **Figure 9**.

2. Apply liquid Teflon to the 1/4" NPT thread of the two 1/4" NPT -4 AN 90° elbow fittings.

3. Install one of these fittings into the top of each aluminum adapter on the center section. Using a 9/16" wrench, rotate both fittings until they are tight and the -4 AN male ends point directly at each other See **Figure 10**.

4. Apply liquid Teflon to the 1/4" NPT thread of the 1/4" x -6 AN male fitting and install it into the 1/4" NPT female thread of the 1/4" x -4 male T-fitting. See **Figure 11**.

If installing on an aftermarket block follow Steps 5 and 6. If installing on a stock block skip to Step 7.

5. If installing on an aftermarket block, apply liquid Teflon to the 1/2" NPT thread of the 1/2" x -6 AN male fitting and install it into the 1/2" NPT port on the back of the block. See **Figure 12**

6. Install the 3/8" tube onto the -6 AN fitting on the back of the block and route forward to the front of the intake manifold. (See **Figure 13**). Install T-fitting assembly on the end of the tube. Only tighten finger tight. Skip to Step 9.

7. If installing on a stock block, apply liquid Teflon to the 1/4" NPT thread of the 90° 1/4" NPT x -6 AN male fitting and install it into the 1/4" NPT port on the oil filter flange of the block. Aim fitting so it points up. See **Figure 14**

Figure 9



Figure 10

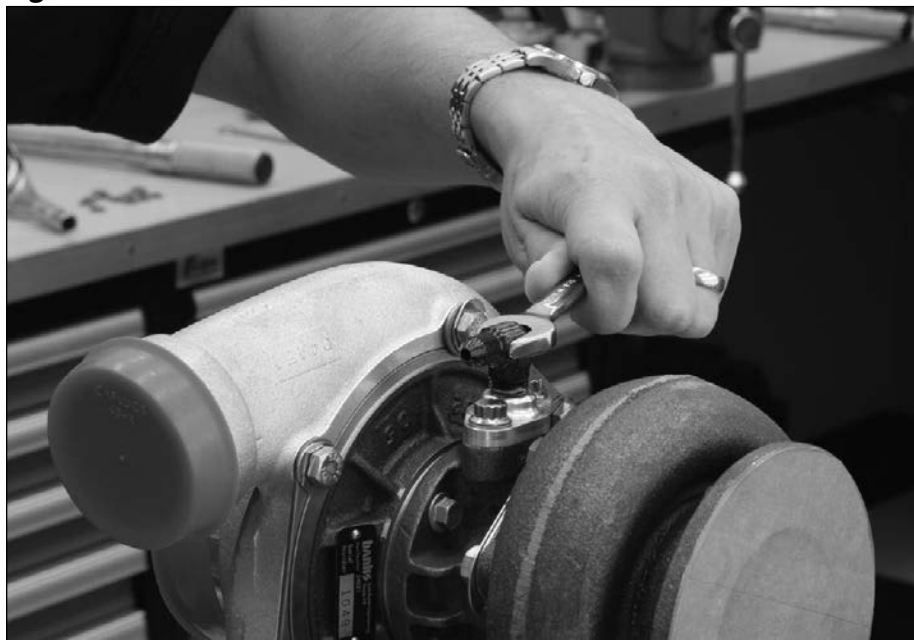


Figure 11

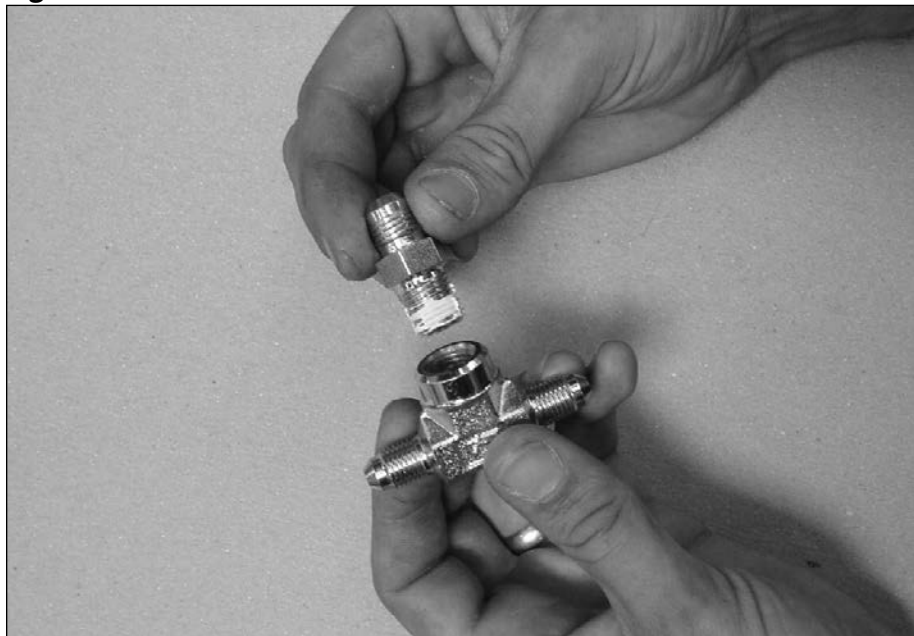
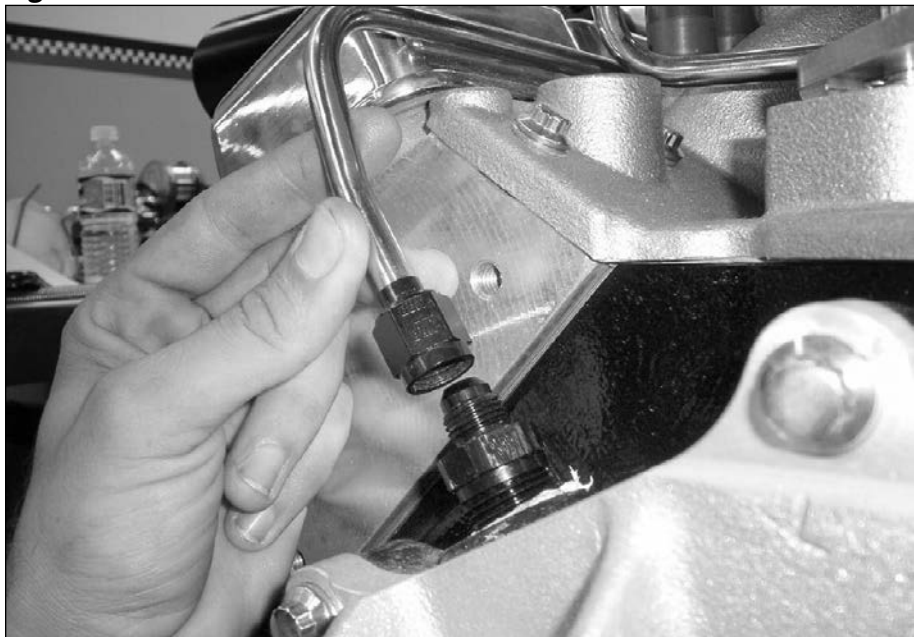


Figure 12



Figure 13



8. Install the $\frac{3}{8}$ " tube onto the elbow fitting in the block and route forward to the front of the intake manifold. Install the T-fitting assembly on the end of the tube. Only tighten finger tight.

9. Install the long tube onto the -4 male fitting on the right side turbocharger and route to the T-fitting.

10. Install the short tube onto the -4

male fitting on the left side turbocharger and route to the T-fitting.

*Note: Lines may be sprung apart or bent slightly with light thumb pressure to install the T-fitting. All hardline assembly tube nuts should be left finger tight until all tubes are in place and final adjustments for best tube fit is complete. See **Figure 15**.*

-END, SECTION 4-

Figure 14

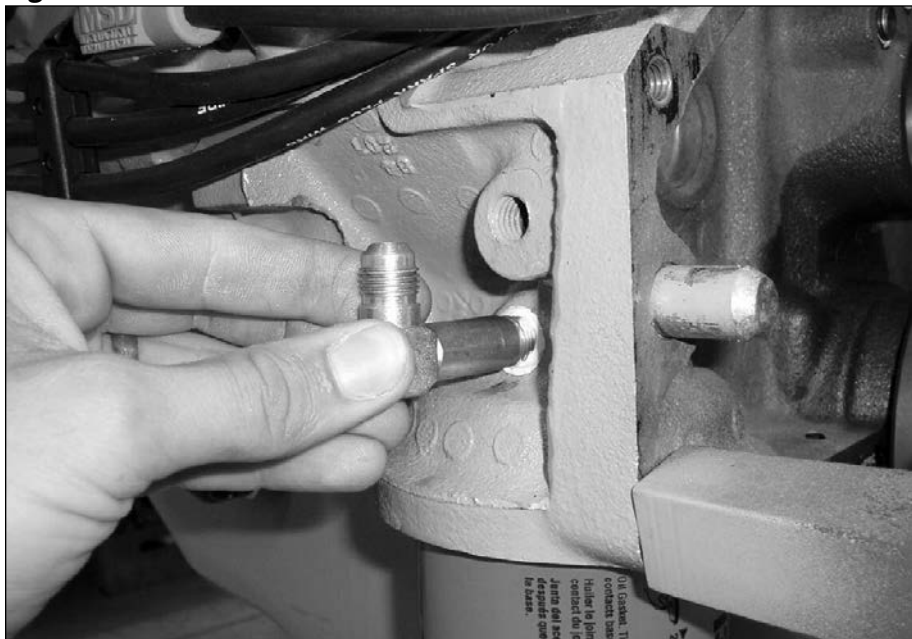
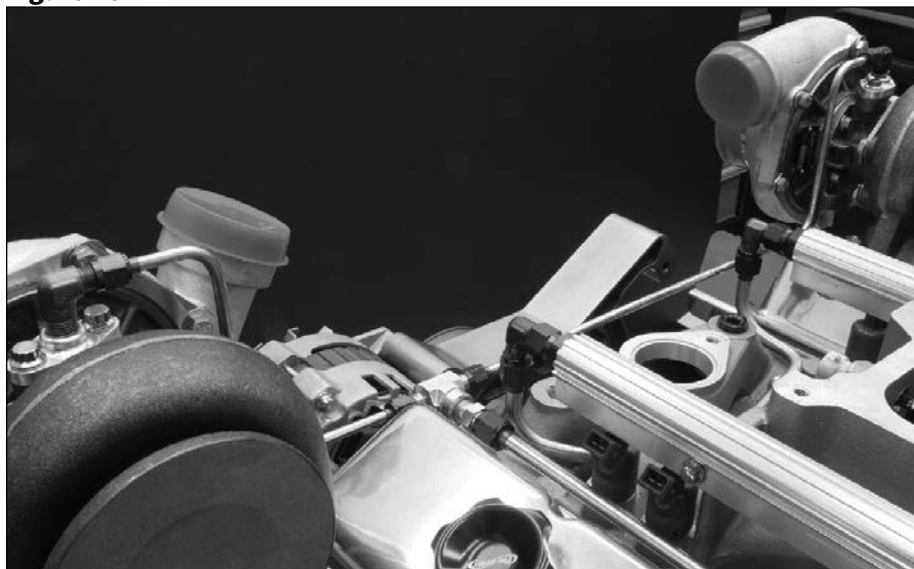


Figure 15



Section 5

TURBOCHARGER OIL DRAIN LINE INSTALLATION

1. Oil drain threaded bungs must be welded to the oil pan prior to installing fittings. Two 1/2" NPT bungs are provided for welding to a steel oil pan (for an aluminum pan, installer must provide aluminum weld bungs). Locate the center of each bung 1 1/2 inches below the pan rail flange adjacent to the center main cap, check for pan bolt clearance. This location prevents return oil from being slung by the counterweights or rod caps, and is required for proper alignment with the oil drain tubes. With the pan off the engine, punch or drill a 5/8 -inch-diameter hole through the pan wall at each center mark. Center each bung over the hole, check that the chamfered thread side of the bung faces out, then weld or braze the bungs to the pan. See **Figure 16**

2. Install 1/2" NPT x 5/8 hose 45° elbow fitting into the oil pan with the end

pointing straight up. See **Figure 17**

3. Apply anti-seize to the four 8mm x 1.25 x 20mm hex bolts.

4. Install a pair of circle lock washers over each 8mm bolt and insert the bolts from below the oil drain tube flanges. Place the gaskets over the bolts and install onto the underside of the turbocharger center sections. Only tighten finger tight at this time. See **Figure 18**

Note: Lock washers may be supplied already cemented together. If not, install two washers per bolt with the course serrations facing each other.

5. Measure and cut a piece of the 5/8" rubber hose long enough to engage 1" of the right drain tube when installed on the hose fitting on the oil pan. The elbow fitting in the pan may be rotated slightly for best alignment.

Figure 16

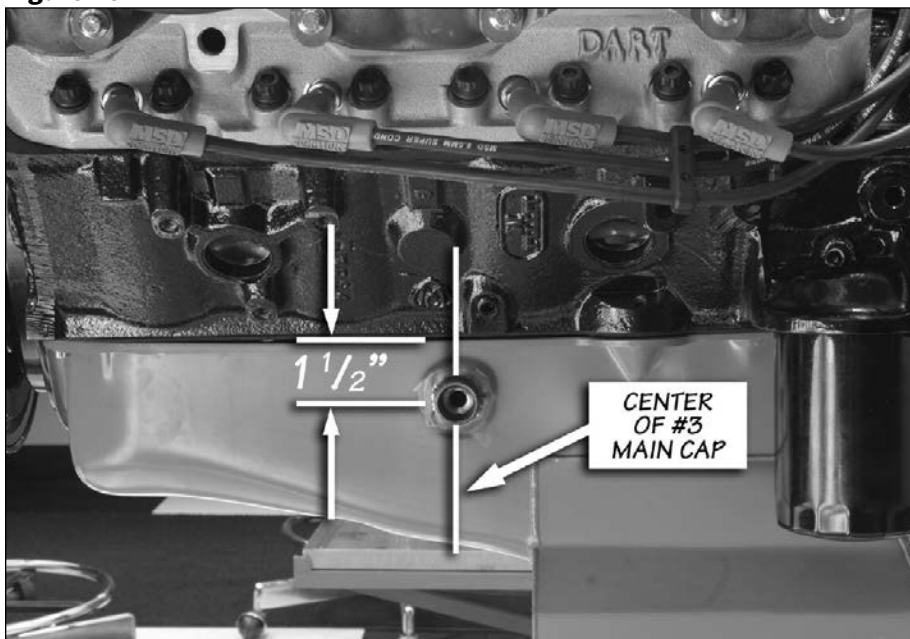


Figure 17



Figure 18



6. Unbolt the drain tube from the turbocharger. Slide two spring band clamps onto the hose. Install the hose on the pan fitting and then push the drain tube into the hoses.

7. Reinstall drain tubes. After bolts are installed, torque each bolt to 15-18 ft-lbs.

8. Use pliers to expand the spring band clamps and locate each clamp $\frac{1}{4}$ " in from each end of the hose. When completed, repeat step 6 and 7 and install hose and clamps on left side drain tube. See **Figure 19**

-END, SECTION 5-

Figure 19



Section 6

TURBOCHARGER WASTEGATE INSTALLATION

1. Remove the wastegate assemblies from their cartons. There is a right and left wastegate, identified by orientation of the logo and the outlet flange. The outlet flanges should face to the outside of the engine with the logos right-side-up when viewed from the front of the engine.

2. Install the right wastegate onto the front of the right exhaust manifold with the V-band clamp, bolt, and lock nut provided. Use a small dab of Anti-seize on the bolt threads. Make sure the wastegate valve seat ring is between the wastegate and the manifold with the tapered side against the wastegate valve. Tighten the bolt to the point that the wastegate is secure but can still be rotated to position by hand. Repeat this procedure for the left wastegate. See **Figure 20** and **Figure 21**

Note: When installing wastegates with

high boost springs, it may be easier for two people to perform the clamping / bolting procedure.

3. Adjust the two wastegates so the front logo lettering is level on each one; this will make the side ports level. See **Figure 22** . Torque each wastegate clamp bolt/nut to 5-7 ft. lbs. Install a 10 mm banjo bolt, - 4AN fitting body, and two crush washers (found in the wastegates parts package) in the 10mm side port of each wastegate with the -4 thread pointing straight up, and tighten. *Note: washers go on either side of the fitting body.* See **Figure 23**.

4. Install the remaining 10 mm banjo bolts, barbed hose fitting bodies and crush washers in the front of each wastegates with the fitting pointed down. These are the cover vents. See **Figure 24**.

-END, SECTION 6-

Figure 20

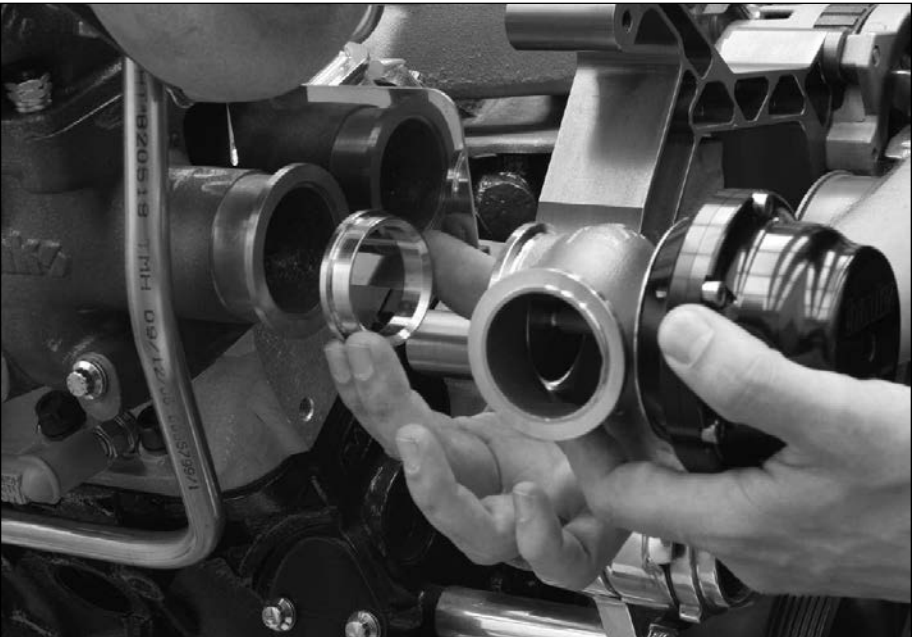


Figure 21



Figure 22

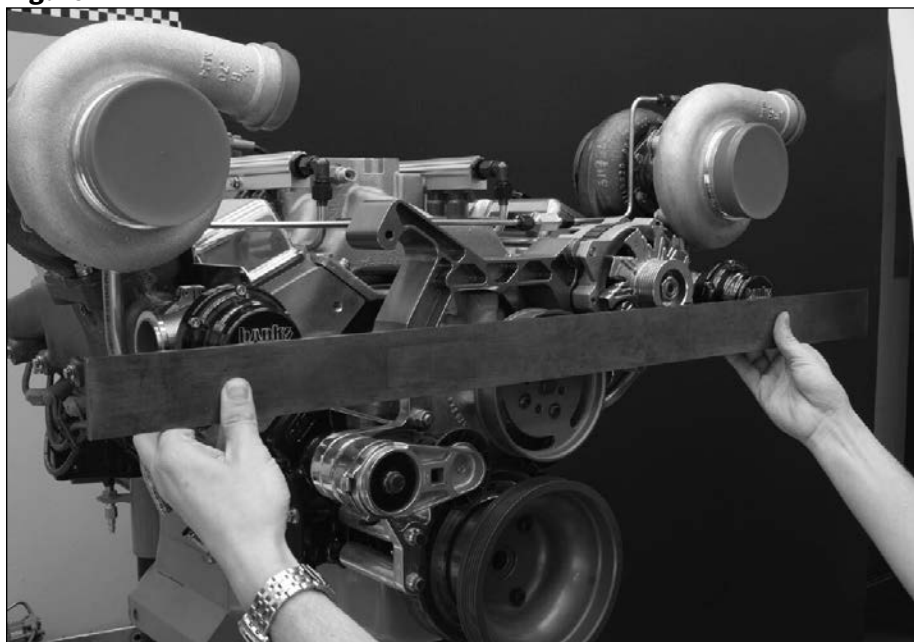


Figure 23

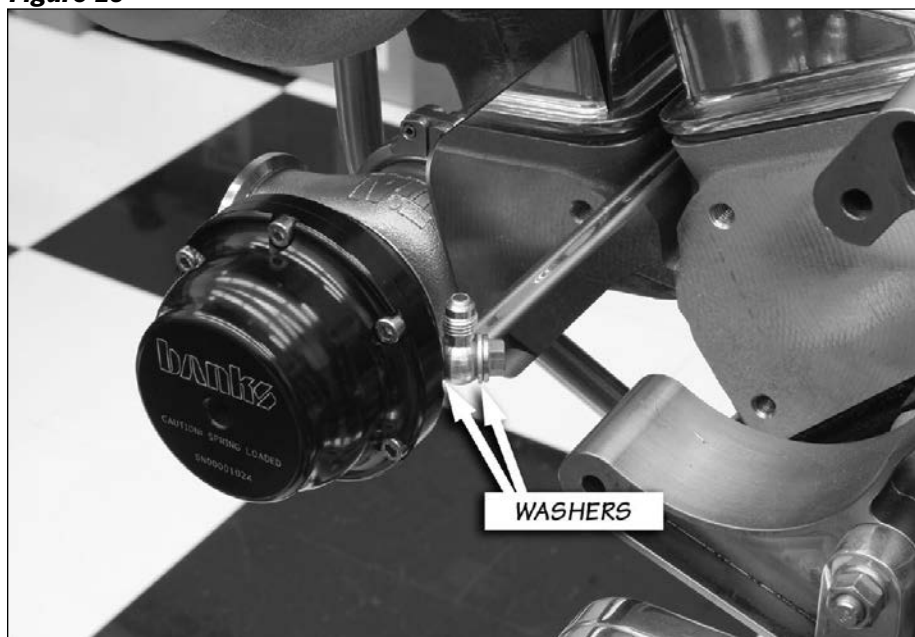
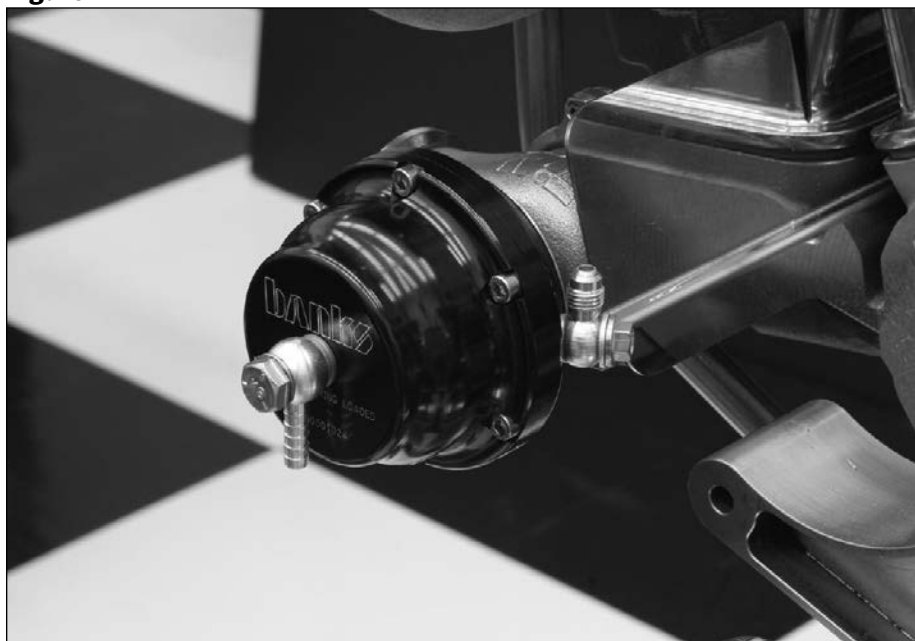


Figure 24



Section 7

PRESSURE CHAMBER INSTALLATION

1. A 1/2-inch NPT female pipe thread port must be provided at the rear of the intake manifold plenum area for the shuttle valve vacuum line. Drill and tap into the manifold at the approximate location of the elbow fitting shown in **Figure 25**. Check that your proposed location will allow the 45° 1/2" NPT x -10AN elbow to be rotated 360° when tightened. If any additional vacuum/boost components are to be connected to the rear of the manifold plenum (MAP sensor, boost gauge, fuel pressure regulator ref., etc.), drill and tap the necessary pipe thread ports as shown in **Figure 25** above the elbow fitting. Many EFI throttle bodies provide alternative ports to connect these components. Install pipe plugs (not supplied) in any ports not used.

Note: This operation is best performed with the manifold removed. Always properly clean before installation.

2. Apply liquid Teflon to the pipe threads of the 1/2" x -10 AN 45° fitting and install into the back of the intake manifold. Aim the fitting approximately as shown in **Figure 25**.

3. Install the four 5/16" x 6.5" studs into the manifold until bottomed.

4. Thread two 5/16" fine thread hex nuts onto one of the studs.

5. Lock the nuts together by turning them in opposite directions toward each other. See **Figure 26**

6. Once the nuts are locked together use a wrench to snug the stud into the intake manifold by turning the upper nut. (Approx 5-8 ft-lbs).

7. Loosen the nuts by turning them in the opposite direction and remove them from the stud.

8. Repeat Steps 4 – 7 for the remaining three studs.

Figure 25

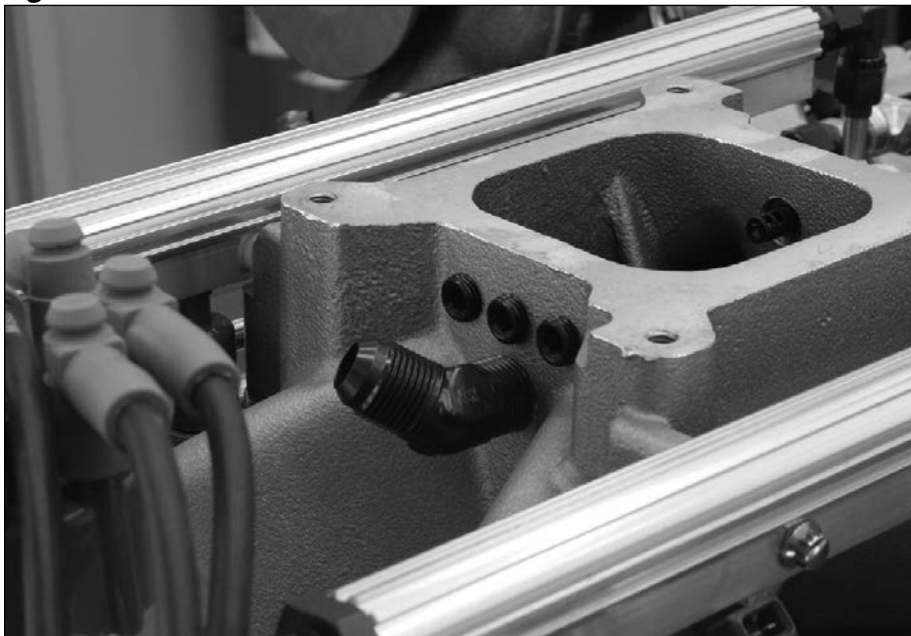
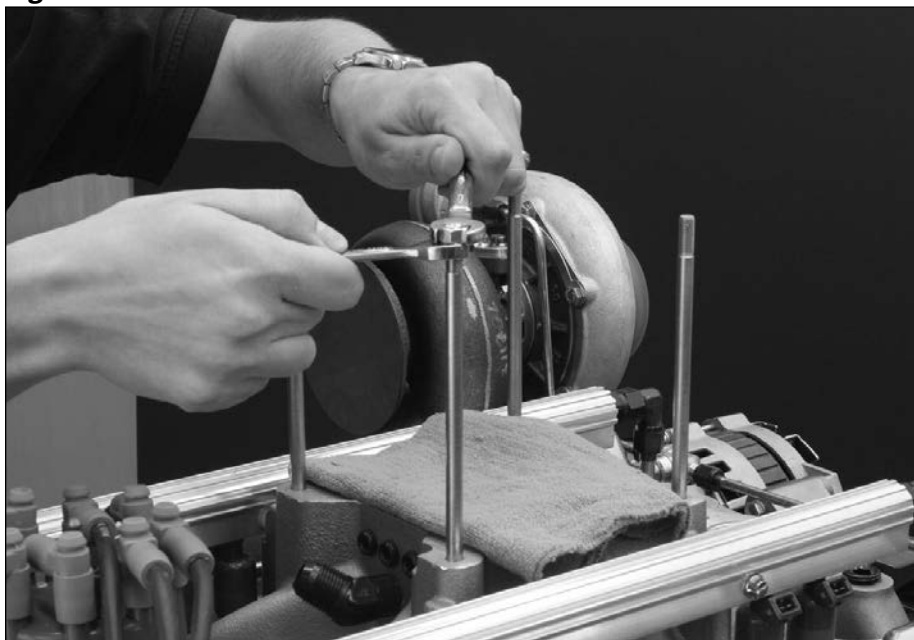


Figure 26



9. Install the throttle body gasket and then the throttle body.

Note: The stud length, spacer tube length, and spacer ring height have been established to work with an Accel DFI intake manifold and 1-5/8" tall throttle body. This combination of parts will place the pressure chamber at the correct elevation to line up the turbo boost tubes and provide a proper seal of the o-rings. If you are using a different combination of intake manifold and/or throttle body, you will need to alter the spacer heights as necessary to seal the o-rings and make boost tubes line up. If shortening the spacer tubes is required, make sure you remove material from the non-chamfered end of the tubes.

10. Slide a pressure chamber spacer tube over each of the four previously installed studs so it rests on the throttle body mounting ear. The

chamfered end of each tube must be up. Slide a 5/16" x 1/16" o-ring over each stud so it rests in the chamfer on each tube. See **Figure 27**

11. Set a 5" x 1/16" o-ring onto the inlet flange surface of the throttle body. See **Figure 28**. Install the pressure chamber spacer ring onto the throttle body inlet flange and o-ring. *Note: The spacer ring has a step cut into one end and a groove in the other. The end with the step faces down. The ring may be a tight fit on some throttle bodies. Set a 5 1/4" x 1/16" o-ring in the groove on the top edge of the spacer ring. See **Figure 29**.*

12. Apply liquid Teflon to the pipe threads of a 1/4" x - 4 AN 90° fitting from the wastegate actuation parts kit. Install this fitting in the 1/4" pipe port on the bottom of the pressure chamber body near the right front stud hole. Tighten the fitting so it will point

Figure 27



Figure 28

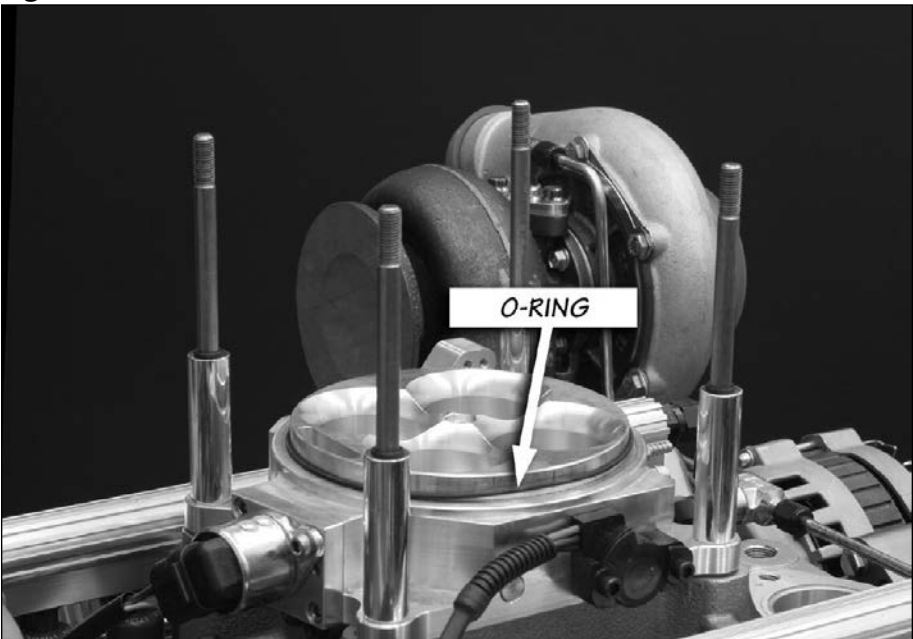


Figure 29



forward in the vehicle. Apply liquid Teflon to a $\frac{1}{8}$ " pipe plug and install it in the $\frac{1}{8}$ " port near the other front stud hole. See **Figure 30**.

13. Install the pressure chamber over the four studs and seat it against the o-ring. Install the pressure chamber cover over the four studs. No sealant or gasket is used between the pressure chamber and cover. Install eleven, $\frac{5}{16}$ -18 x $\frac{3}{4}$ " button head bolts and lightly snug the bolts. See **Figure 31**.

14. Install four $\frac{5}{16}$ " thread seal washers over the studs and push them down until they contact the cover. Install four $\frac{5}{16}$ " AN washers and $\frac{5}{16}$ "-24 Nylock nuts on the studs and torque evenly to 5-7 ft-lb. Now torque the eleven cover bolts to 8-10 ft. lbs.

15. Place one $2\frac{1}{2}$ " x $\frac{1}{16}$ " o-ring into the groove of each of the two $2\frac{1}{2}$ " hose nipples. Install the hose nipples onto the front of the pressure chamber using eight $\frac{1}{4}$ -20 x $\frac{1}{2}$ " socket head cap screws. Torque to 5-7 ft-lbs. See **Figure 32**.

16. Check the operation of the throttle lever on the throttle body to ensure that the lever or installed throttle cable or linkage cannot hit the pressure chamber or other components causing a stuck throttle or run-away open throttle condition. Take whatever actions are required to provide necessary clearance. This may require a modified lever or lever extension.

-END, SECTION 7-

Figure 30

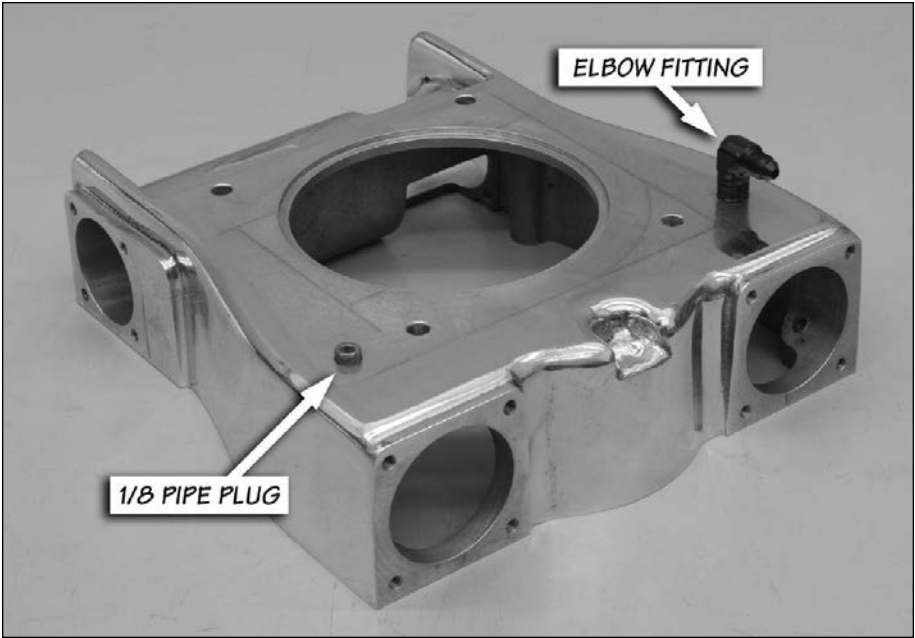


Figure 31

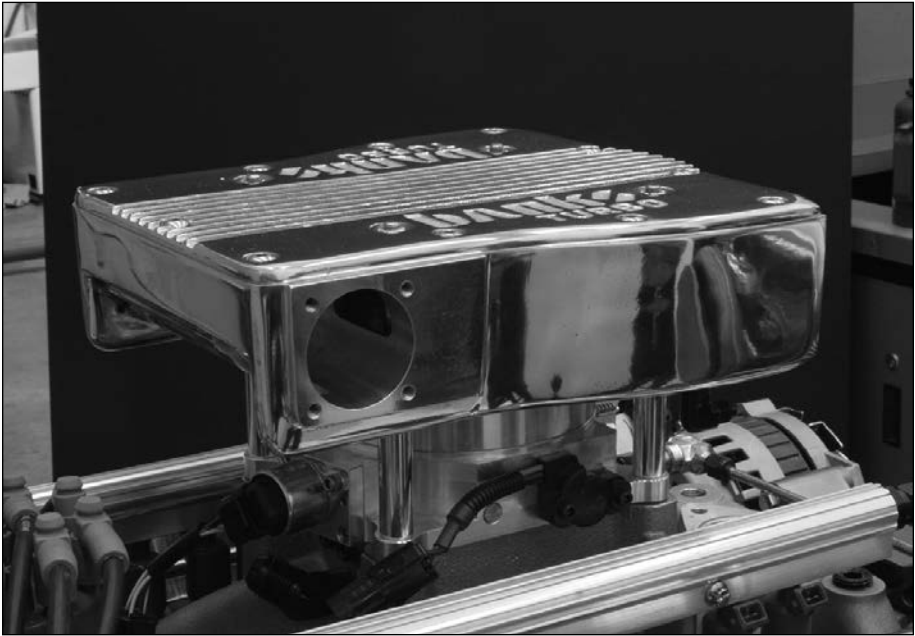


Figure 32



Section 8

SHUTTLE VALVE INSTALLATION

Note: This installation may require assistance from a second person. Ensure shuttle valve bore is clean and free of debris. Temporarily install the valve piston to ensure that it moves freely through the bore.

1. Install the shuttle valve cap and gasket onto the right side of the pressure chamber using four 1/4-20 x 1/2" socket bolts. Torque the 1/4" bolts to 30-36 in-lbs (2.5-3 ft-lbs). See **Figure 33**.

2. Place the shuttle valve piston into the bore with the tapered end first. See **Figure 34**.

3. Obtain four 1/4-20 x 1/2" socket head bolts and have the necessary tools handy for their installation.

4. Slide the spring into the valve inside the bore. Insert the spring guide into the spring. See **Figure 35**.

5. Push on the spring guide to compress the spring until the spring guide flange is seated against the pressure chamber. See **Figure 36**. Install the four 1/4-20 x 1/2" bolts to hold the spring guide. Make sure to have at least two bolts (opposite corners) installed before releasing the spring guide to avoid damage to the components or personal injury. Torque the 1/4" bolts to 5-7 ft-lbs. *Note: This step is much easier with two people.*

6. Apply liquid Teflon to the 1/2" NPT threads of the 1/2" NPT x -10 AN 90° fitting.

7. Install the 1/2" NPT x -10 AN 90° fitting into the spring guide. Tighten the fitting leaving the -10 end facing straight back. See **Figure 37**

8. Assemble the -10 hose with the straight hose end on one end and the 90° hose end on the other to route

Figure 33

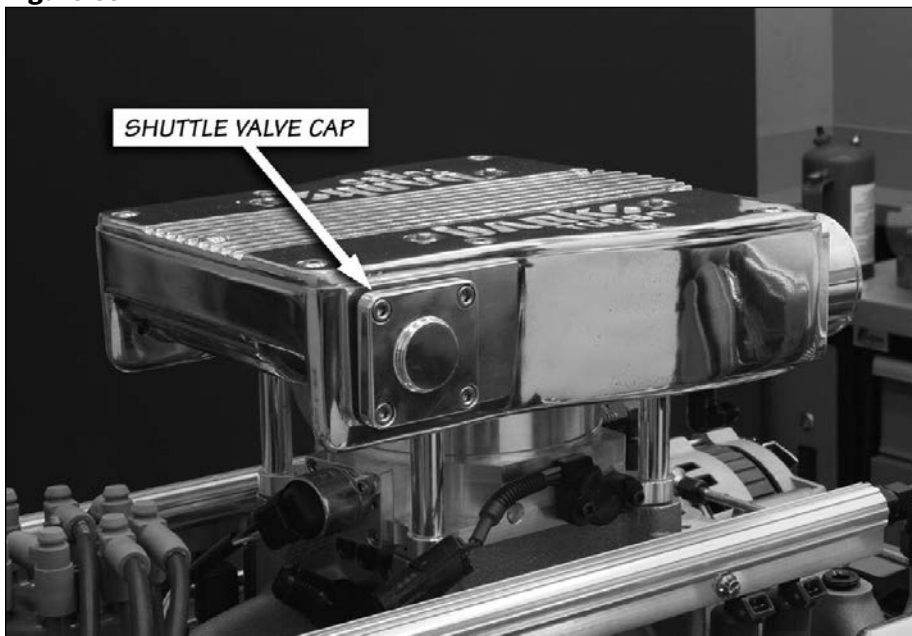


Figure 34

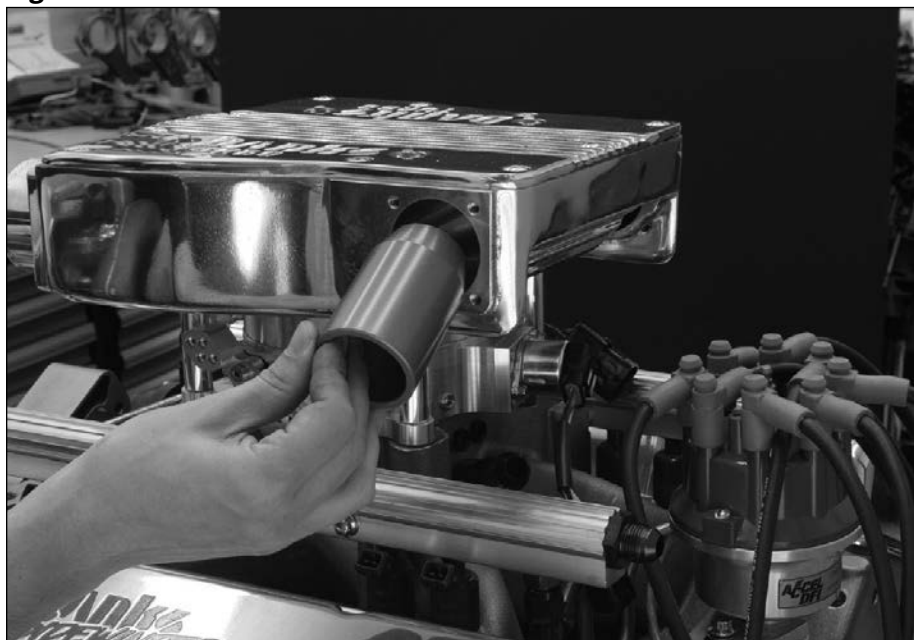


Figure 35

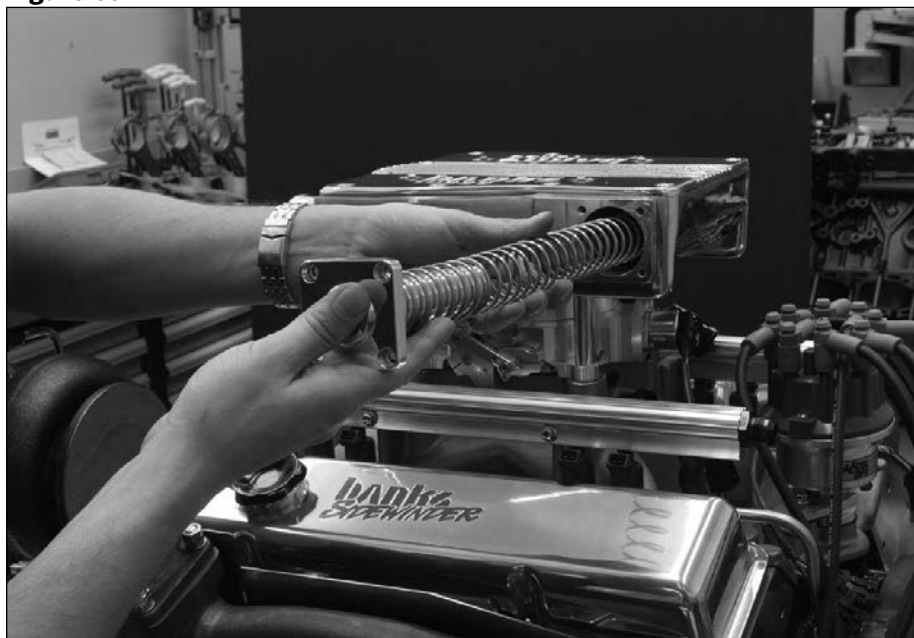


Figure 36

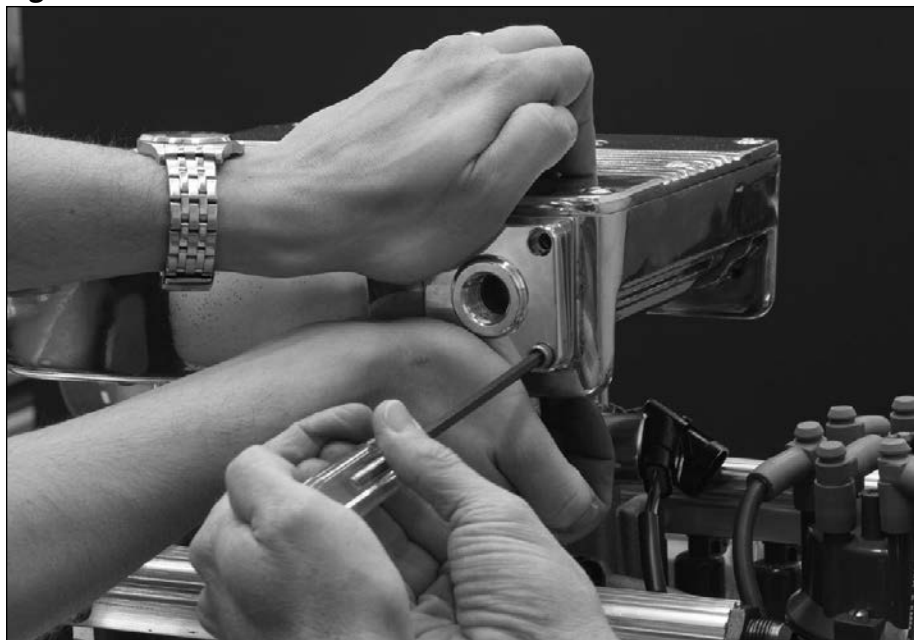


Figure 37



from the intake manifold to the pressure chamber. The straight hose end connects to the intake manifold and the 90° hose end connects to the pressure chamber. See **Figure 38**. Carefully measure the necessary length of hose and cut to size. See

"Hose and End Fitting Assembly" on page 39 for instructions on how to assemble the hose.

9. Install the hose and tighten the fittings.

-END, SECTION 8-

Figure 38



Section 9

WASTEGATE ACTUATION KIT INSTALLATION

1. Install the boost reference tube (shortest hard-line tube) onto the fitting under the right front corner of the pressure chamber. Leave tube nut finger tight. Install the -4 AN T-fitting on the end of the boost reference tube. Leave tube nut finger tight. See **Figure 39**.

2. Install the left and right wastegate feed tubes between the -4 AN T-fitting and the -4 AN banjo 90° fittings on the wastegates. See **Figure 40**. Leave tube nuts finger tight. *Note: Tube from pressure chamber to T-fitting is made to fit Accel/DFI pressure chamber height.*

3. Tighten all of the tube nuts on the wastegate and oil hardline tube assemblies while adjusting the tubes for best fit. To avoid twisting the

tubing, use two wrenches while tightening the tubing on the T-fitting. See **Figure 41**. Hardline tube assemblies may be bent slightly using moderate thumb pressure and adapter fittings rotated slightly as required for alignment. Wastegate tubes should run above oil tubes across the front of the engine.

4. Once tubes are adjusted, install three tube spacer clamps on the tube assemblies as shown in **Figure 42**. Readjust the tubes if necessary to allow the tubes to run one above another through the clamps. When tube adjustment is final, tighten the bolts in the tube clamps. See **Figure 43** for the look of the finished installation.

-END, SECTION 9-

Figure 39

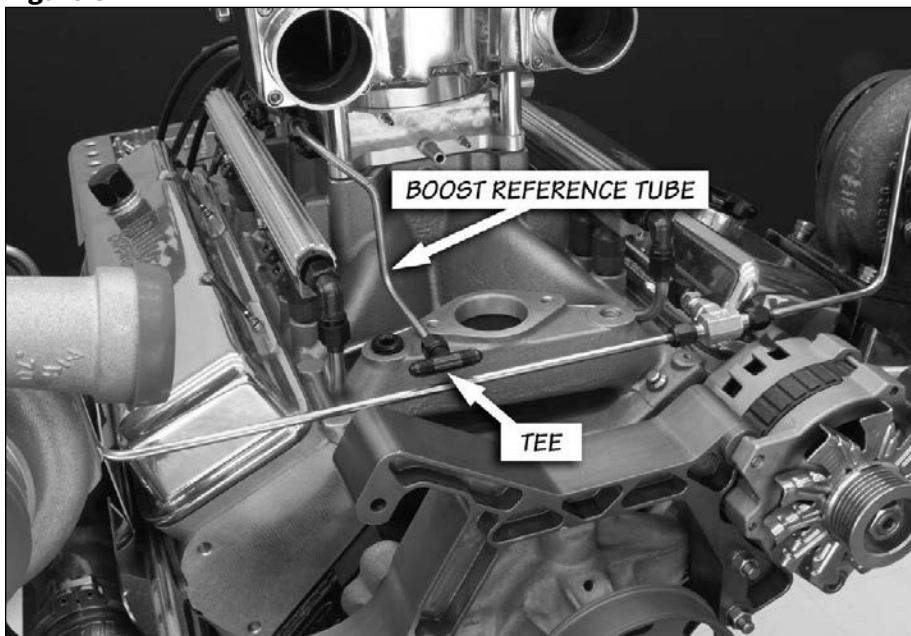


Figure 40

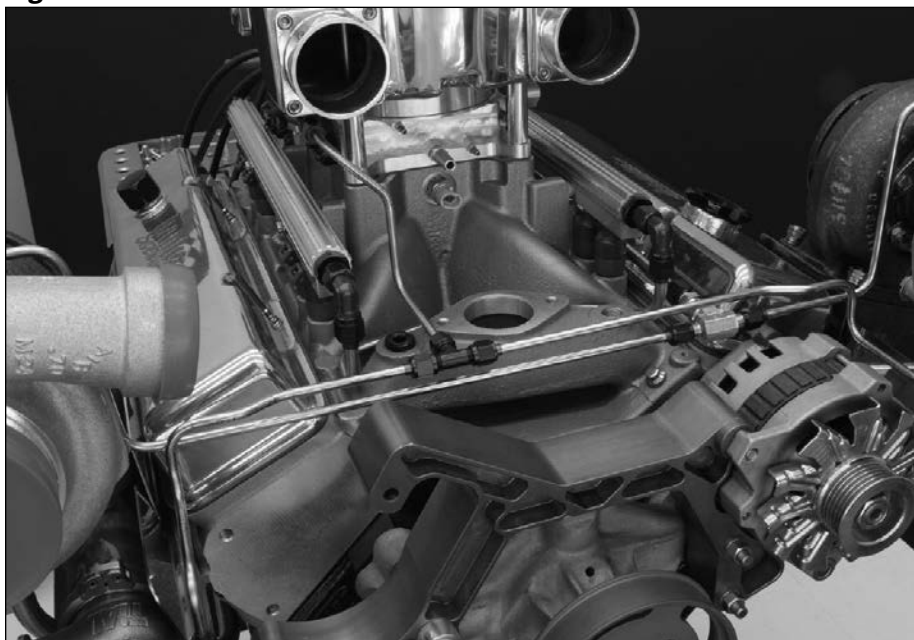


Figure 41



Figure 42

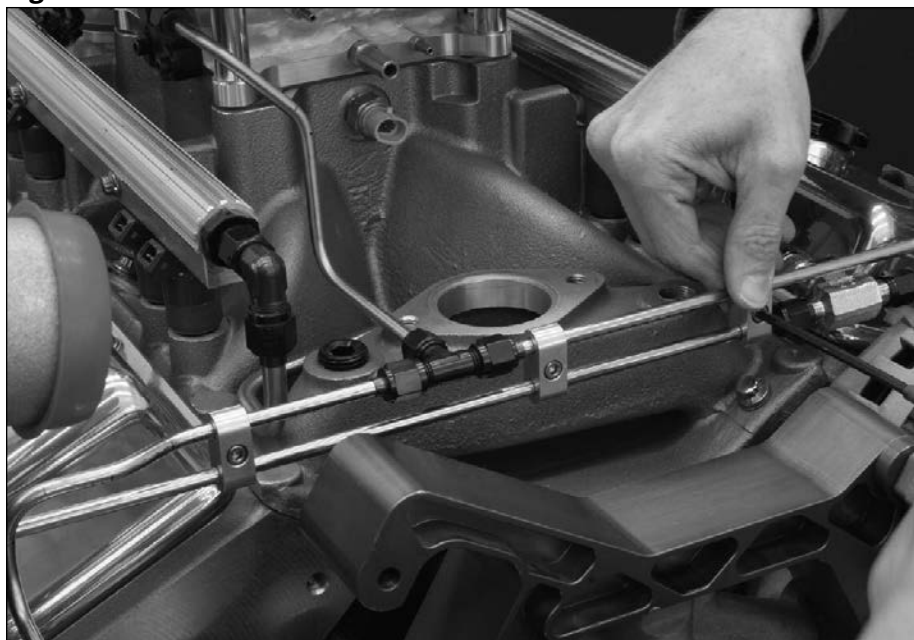
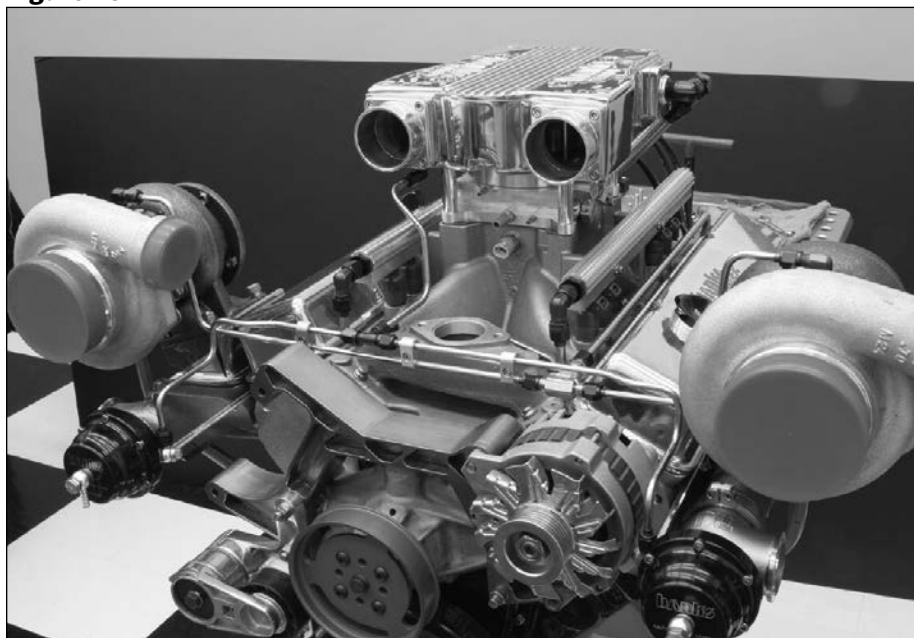


Figure 43



Section 10

BOOST TUBE INSTALLATION

1. Test fit boost tubes between turbo compressor covers and hose nipples on pressure chamber. Rotate the compressors to align with the boost tubes and pressure chamber hose nipples. There should be approximately $\frac{1}{8}$ " of an air gap between the boost tube and the turbo or nose nipple. See **Figure 44**. *Note: There is a right-hand and left-hand boost tube. Try different orientations to find the best fit.*

2. Install the boost tubes using four pieces of $2\frac{1}{2}$ " x $2\frac{1}{2}$ " silicone hose and eight T-bolt hose clamps. See **Figure 45** and **46**.

3. Make sure hose clamps are properly positioned behind hose beads, then tighten clamps. Tighten the six bolts securing each turbo compressor cover to 10-12 ft-lbs, then bend lock tabs against bolt heads. (This is a reference torque figure).

4. Installation of the turbo components is now complete. Refer to the notes at the beginning of this manual for engine support system recommendations and operation. See **Figure 47** for a view of the completed engine assembly.

-END, SECTION 10-

Figure 44

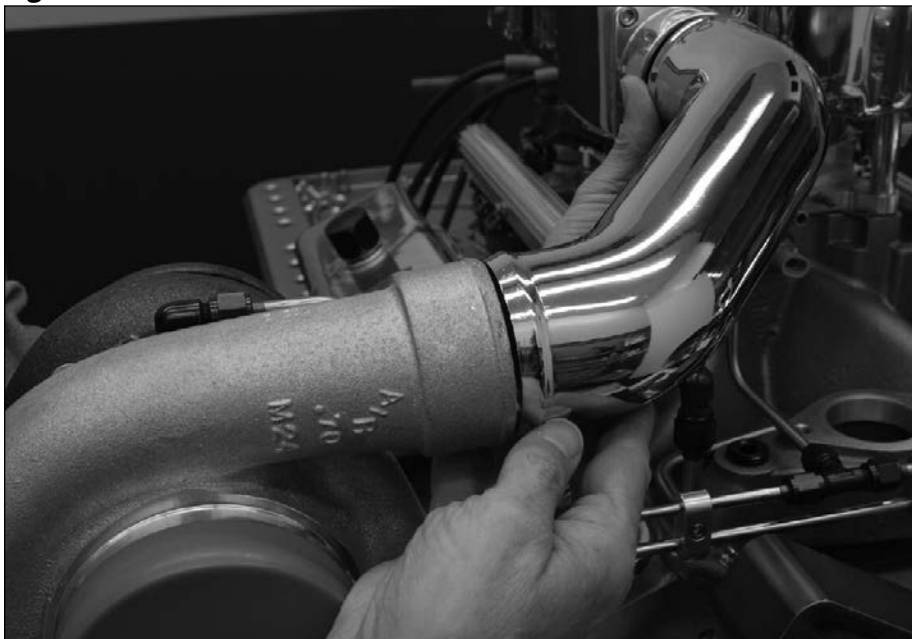


Figure 45

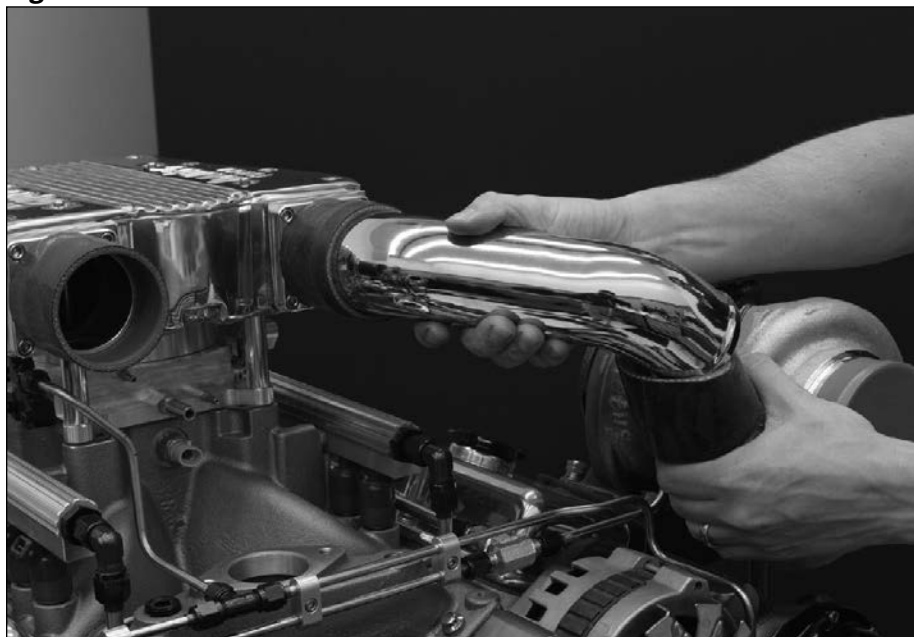


Figure 46

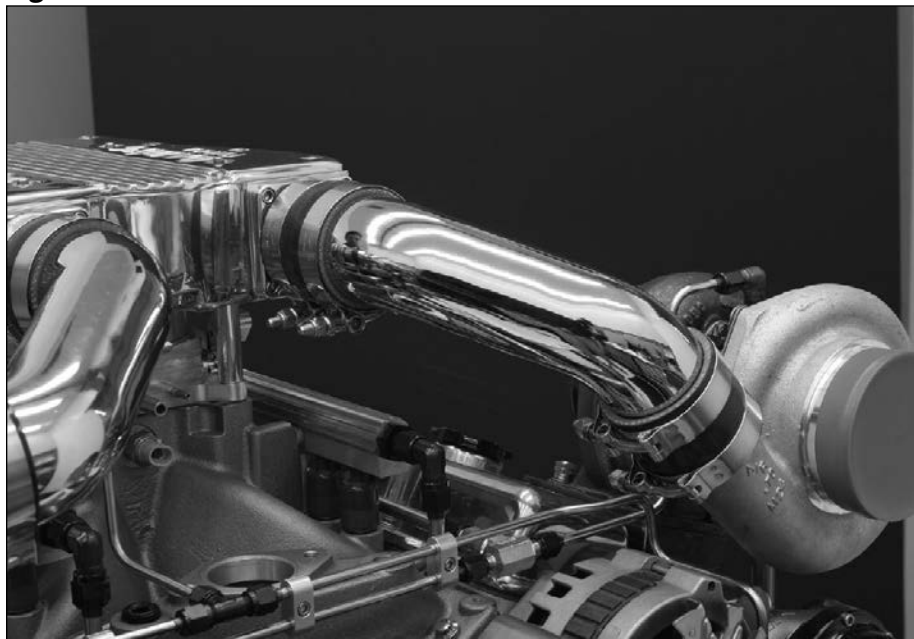
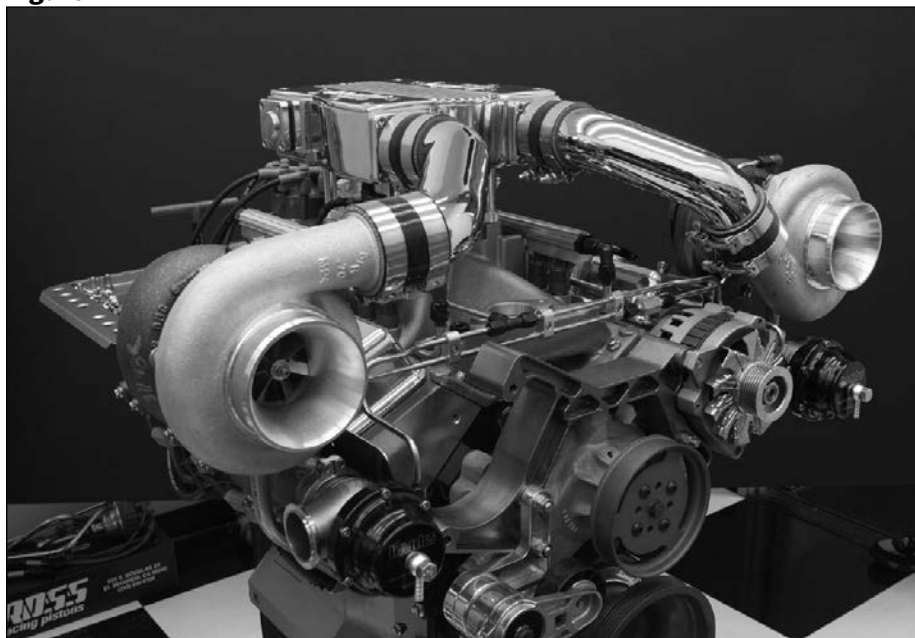


Figure 47



Section 11

BRAIDED HOSE AND END FITTING ASSEMBLY

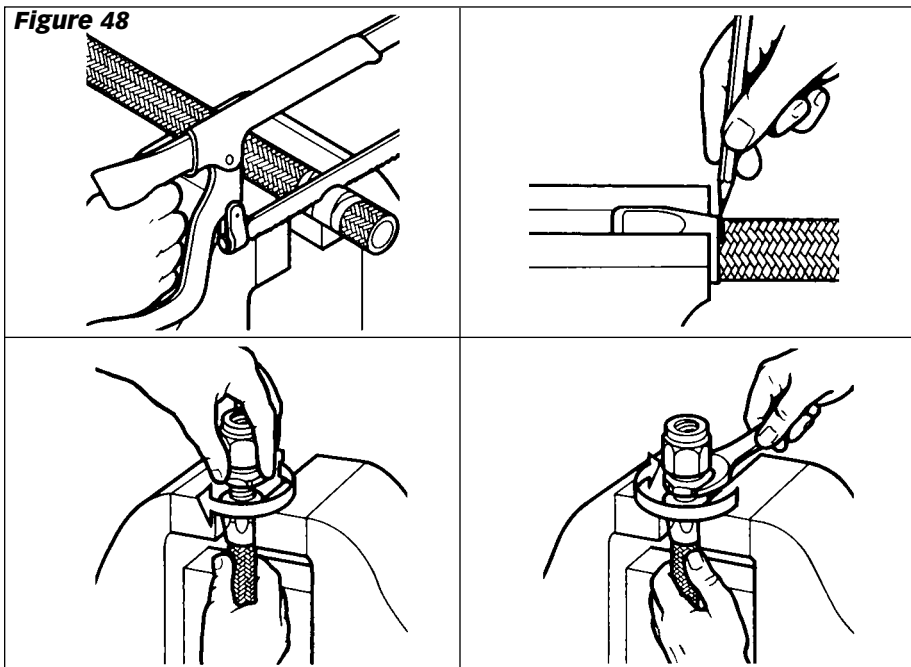
1. Wrap hose tightly with tape at cutting point. Using a fine tooth hacksaw, cable cutters or radiac wheel, cut the hose in the middle of the tape. Remove tape after cutting, being careful not to fray the braid.
2. Twist hose into socket to the depth indicated by the hose insertion mark on the outside of the socket. This should be just short of the back of the threads.
3. **VERY IMPORTANT**— Mark hose with tape or suitable marking device at rear of socket. This mark will later indicate to you if the hose has pushed out of the socket during assembly.
4. Using motor oil or assembly lube, liberally lubricate inside of hose in socket and threads on nipple end of hose fitting.
5. Clamp socket and hose in a smooth jaw vise as shown in the illustration in

Figure 48. Do not over tighten, as this can easily deform the socket. A layer of masking tape can be wrapped around the socket to protect the finish.

6. Push the nipple portion of the fitting into the socket and hose while turning to engage the threads. Continue tightening by hand as far as possible to make sure that the threads are properly mated with no cross threading.
7. Using a wrench, complete tightening until a $\frac{1}{16}$ " gap or less exists between the hex portions of the socket and nipple.
8. Check mark made on hose in step 3 for any evidence of hose push-out. Rinse the completed hose assembly with solvent and blow dry.

-END, SECTION 11-

Figure 48



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