Banks Big Hoss® Intake Manifold System

2001-2007 Chevy/GMC Duramax Turbo-Diesel Engines

THIS MANUAL IS FOR USE WITH KITS 42733

Gale Banks Engineering
546 Duggan Avenue • Azusa, ca 91702
(626) 969-9600 • Fax (626) 334-1743

Product Information & Sales: (888) 635-4565
Customer Support: (888) 839-5600
Installation Support: (888) 839-2700

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General Assembly

Figure 1
# Bill of Materials

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Section 1
SYSTEM DESCRIPTION

The Banks manifolding will increase airflow by streamlining the air entry into the cylinder head ports and providing a plenum and runner system. This allows increased performance with a given boost or even greater performance at elevated boost levels.

The Banks Big Hoss manifold is ideal for competition installations where extensive cylinder head and injection modifications are planned.

The Banks Big Hoss Intake Manifold is intended for use with custom-built twin turbo systems in which the factory turbo has been removed from the rear valley area of the engine. Because this Big Hoss Manifold System is not intended to fit a particular vehicle or chassis, design and fabrication of all turbo and accessory mount components, as well as turbo selection, is up to the installer.

-END, SECTION 1-
Installing the Banks Big Hoss Intake Manifolding requires relocating the turbochargers and all intake, exhaust and cooling system components from the top of the engine. The coolant outlet tube, oil fill tube, crankcase breathers, fuel lines, belt driven engine accessories, wires looms and other components will have to be modified and/or relocated to accommodate the Banks Big Hoss manifold. A shop manual should be consulted as necessary for information regarding the disassembly, assembly and safety of fuel injection and other engine components.

-END, SECTION 2-
This manifold installation procedure assumes that the cylinder heads are assembled with all port and valve work completed, and are installed and torqued, ready for manifold installation. Because of the custom nature of this application, the installer should test fit all components and related systems prior to performing a final assembly of the intake manifolding. If the original coolant outlet/thermostat housing “Y” casting is to be retained, modifications to this casting and the thermostat cover will need to be considered to clear the manifold castings.

Once the manifold castings are bolted in place, it becomes somewhat difficult to access and make system connections under the plenums in the valley area. Preplan your work and make as many of your required system connections in the valley before installing the manifold halves. Pre-assemble and install any fuel and oil hoses that tie outside components to the valley area.

The fuel injection pump should be installed along with inlet and return adapter fittings in the pump ports. Injectors should be installed in the cylinder heads.

Install a turbocharger oil supply adapter fitting (not supplied) in the boss in the engine valley along with any related plumbing (hose with divider “T” and branch lines to provide oil to the turbochargers) as this area becomes inaccessible once the manifolds are installed. Fitting or hose end used for oil supply should be a 90° elbow style to point forward to clear fuel return cluster panel.

- END, SECTION 3-
1. Install oil return block-off plate and gasket over original oil return port at rear of valley area if the port is not used. Secure with original M8 studs and nuts. See Figure 2.

2. Identify factory fuel return line tube cluster with fuel temperature sensor. Using a tubing cutter, cut and discard the fuel pump return line with the “T” as shown. See Figure 3. With
the sensor removed, Debur cut end of tube on the cluster, rinse assembly with solvent and blow dry. Reinstall sensor

3. Using a 45° double flaring tool, perform the first operation of a \( \frac{5}{16} \) " tube dia. double flare on the cut end of the pump return tube. Compress the tube with the flaring tool just enough to create a "bulge" to act as a hose barb so a \( \frac{5}{16} \) dia. hose may be installed and clamped.

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**Figure 3**
4. Mount fuel return line tube cluster to support panel using three 10-32 x \( \frac{5}{8} \) pan head screws, 10-32 Nylock nuts, and \( \frac{3}{8} \) I.D. cushion loop clamps. See Figure 4.

5. Install assembled support panel in rear of engine valley on existing turbo mounting bosses using three M12 x 1.75 x 16 mm button head socket screws.

6. Cut and install a \( \frac{5}{16} \)" dia. by 18-inch long fuel hose between the return fitting on top of the fuel pump and the return cluster tube that was cut. Re-use two spring-band clamps from the original fuel return hose assembly and slide over fuel hose. Clamp into place. See Figure 5 and 6.

7. Install one end of the remaining \( \frac{5}{16} \)" dia. fuel hose on the short nipple fitting on the fuel return cluster using another original fuel return spring band clamp. See Figure 5.

8. Cut a 3" long piece of \( \frac{1}{8} \)" dia. fuel hose and install it on the \( \frac{3}{8} \)" dia. hose nipple on the fuel return tube cluster. See Figure 5.

9. Install the side nipple of a \( \frac{1}{8} \)" plastic barb tee in the 3" piece of hose installed in the previous step. See Figure 5 and 6.

-END, SECTION 4-
HIGH PRESSURE FUEL OUT FROM PUMP TO LEFT FUEL RAIL

LEFT BANK INJECTORS

OEM PLASTIC "TEE" BETWEEN INJECTORS

PUMP RETURN FITTING

FUEL PUMP

FUEL RETURN CLUSTER ASSY.

RETURN LINE TO FUEL TANK

1/8" PLASTIC BARB "TEE"

PRESSURE RELIEF RETURN NIPPLE AT REAR OF LEFT FUEL RAIL

RIGHT BANK INJECTORS
Section 5
MANIFOLD SUB ASSEMBLY

1. Inspect manifolds for any chips or debris that may have been left from machining or handling. Spray inside of manifolds with parts cleaners or solvent if required.

2. Lightly oil the o-rings on two-20 SAE socket head hydraulic plugs and install a plug in the back end of each of the manifold castings. Tighten the plugs using a ¾ inch Allen wrench. See Figure 7.

3. Install an M6 x 1.0 x 24mm stud in the front plenum boss on the left hand manifold. Apply Loctite to the short thread end of the stud and tighten into the manifold. See Figure 7.

4. Install left and right inlet nipple flanges and \( \frac{1}{16} \) x 2.989 I.D. o-rings to the front of each manifold using four \( \frac{1}{4} \)-20-x \( \frac{3}{4} \) socket head cap screws per flange. A small dab of gasket sealant or RTV may be used to hold o-ring in place during assembly.

NOTE: Suggest using Dow-Corning No. III valve lubricant with silicone.

-END, SECTION 5-
Section 6
INSTALL MANIFOLDS ON CYLINDER HEADS

NOTE: Normally manifolds install with their inlet flanges facing forward, however they may be reversed for special applications.

1. Two balance tube spools with o-ring seals interconnect the manifold plenums. These spools are supplied blank (no drilled thru-hole) and may be drilled out as desired. Different turbocharger performance characteristics may require different balance hole sizes to dampen intake pulsation and maintain the same boost levels in both banks of the engine. We suggest you start by drilling a \( \frac{1}{2} \) diameter hole through each spool and enlarge the hole if testing dictates.

2. Install two \( \frac{3}{32} \)” x 1.612” diameter and three \( \frac{3}{32} \)” x 2.487” diameter o-rings in the grooves on each manifold mounting flange. The small o-rings go in the grooves around the end runners of each manifold. 

NOTE: Dow-Corning III, or a small dab of gasket sealant or RTV may be used to hold the o-rings in place in the manifold flange grooves. See Figure 7.

3. Install two \( \frac{1}{8} \)” x 1.109” diameter o-rings in the grooves on each balance tube spool. Apply a light oil on all four o-rings and insert both balance tubes into the machined bosses on one of the two manifold plenums. See Figure 7.

4. Engage the free ends of the balance tube spools into the bosses on the opposite side manifold and push the manifolds together until the spools seat in the manifolds. Carefully set the paired manifolds on the cylinder head faces while guiding loose fuel and oil lines through the openings between the manifold runners. This works best with an assistant helping. See Figure 7. Check that the o-rings stayed in place.

5. Install eleven M8 x 1.25 x 30mm socket head bolts through each manifold base flange into heads. Leave bolts finger tight. Balance tube spools will be free to slide within their bores, but not to the extent that their o-rings will not seal.

6. Tighten the bolts on the right hand manifold first. A ball-drive hex wrench and L-hex wrench work best in tight places. An 8mm box wrench around the shaft of a long 8mm ball handle can be used to feed through the runners on the manifolds for more torque. Once the right manifold bolts are tight, tighten the left side.

7. Install the right and left fuel rails on the intake manifold base flanges using the original M8 bolts. Fuel rails mount on the rear set of the double bolt pattern. The right hand rail has the fuel pressure sensor.

8. Install the new high-pressure fuel crossover line by feeding it through the opening just behind the front-runners on each manifold. Thread the tube nuts onto each fuel rail, and leave the nuts finger tight. The tube may be bent slightly if necessary to line up the end connections. See Figure 1.

9. Install the original high-pressure fuel line between the outlet connections on top of the fuel pump and front of the left hand fuel rail. The line feeds through the opening behind the front-runner on the left hand manifold and under the crossover fuel line. The line must be reversed end-for-end to clear the manifold runners. Tighten the tube nuts on both fuel lines. It may be easiest to loosen the nuts and disengage the ends of the long fuel line before first tightening the short line, then the long line.
10. Reinstall the high-pressure fuel lines from the fuel rails to the injectors.

11. Install the free end of the 5/16" dia. fuel return hose onto the relief valve outlet nipple at the rear of the left hand fuel rail. Pass the hose through the opening between the runners at the rear of the manifold and secure the hose with an original fuel return spring band clamp. See Figure 7.

12. Install the fuel return line assemblies and clips on the tops of the injectors. Reverse the line assembly on the right bank injectors and reinstall it so the common outlet line is at the rear of the engine. Use the remaining 1/8" dia. hose to join the common outlets of all the injectors to each side of the 1/8" plastic barb "T" at the rear of the fuel line return cluster. See Figure 6.

13. Apply a small drop of light oil to the o-ring on the MAP sensor (not provided) and push sensor into the bore at the front boss pad on the left manifold plenum. Secure the sensor by installing an M6 Nylock nut on the stud. See Figure 7.

NOTE: Some sensors may require bending the sensor mount tab to allow installation of the nut.

14. 1/8" and 1/4" NPT pipe threads are provided at the front and rear boss pads on each manifold plenum. These may be used for wastegate actuation lines or other boost referenced components such as a boost gauge. Install 1/8" or 1/4" NPT socket head pipe plugs in any unused boost reference ports.

15. Connect sensor leads to fuel return temp sensor in engine valley and MAP sensor. Reroute wire loom leads as required to fit your installation.

This concludes the intake manifold installation on the engine.

- END, SECTION 6 -