

# OWNERS MANUAL

WITH INSTALLATION  
INSTRUCTIONS

# **banks**

## SIDEWINDER

®

## TURBO

FORD 6.9/7.3L DIESEL VANS

THIS MANUAL IS FOR USE WITH SYSTEMS 21011 and 21019

# **banks**

GALE BANKS ENGINEERING

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# BANKS SIDEWINDER® TURBO FORD 6.9/7.3L DIESEL VANS

Dear Customer:

You have just purchased the finest, most technologically advanced turbocharging system available for light truck diesel engines. GALE BANKS ENGINEERING has utilized the knowledge and experience gained through more than fifteen years of turbocharged engine design to combine performance, durability and good looks into a professional quality turbocharger kit. Best performance and installation of your system will be realized by thoroughly reading and following the installation instructions before and throughout the installation.

Your Sidewinder turbocharger system operates by utilizing the engine's exhaust gasses to spin a turbine wheel, which in turn drives a compressor through a common shaft. The compressor draws air through the air cleaner and forces it into the engine at a greater density and pressure than that which the atmosphere would normally provide. This additional air will burn more completely the available fuel, or additional fuel, resulting in greater performance and efficiency. The volume and pressure (boost) that the turbocharger puts out is controlled by the size of the turbocharger in relation to the size of the engine, the position of the accelerator and the load on the vehicle. A small amount of engine oil is fed to the turbocharger shaft assembly to lubricate the shaft bearings, and then returned to the engine. Your GALE BANKS ENGINEERING turbo system is legal in all 50 states when used with the Banks 3" exhaust system — CARB E.O. No. D-161-2.

We at Gale Banks Engineering are confident that you will be pleased with the performance of your turbocharged diesel and hope we may be of service in the future.

Thank You,

## IMPORTANT

To obtain optimum performance from your BANKS turbocharger system, it is necessary to make an adjustment to the fuel injection pump. This adjustment is easily made by following the enclosed instructions. However, it is extremely important that the instructions be followed very carefully. Before starting the injection pump adjustment procedure, please note the following:

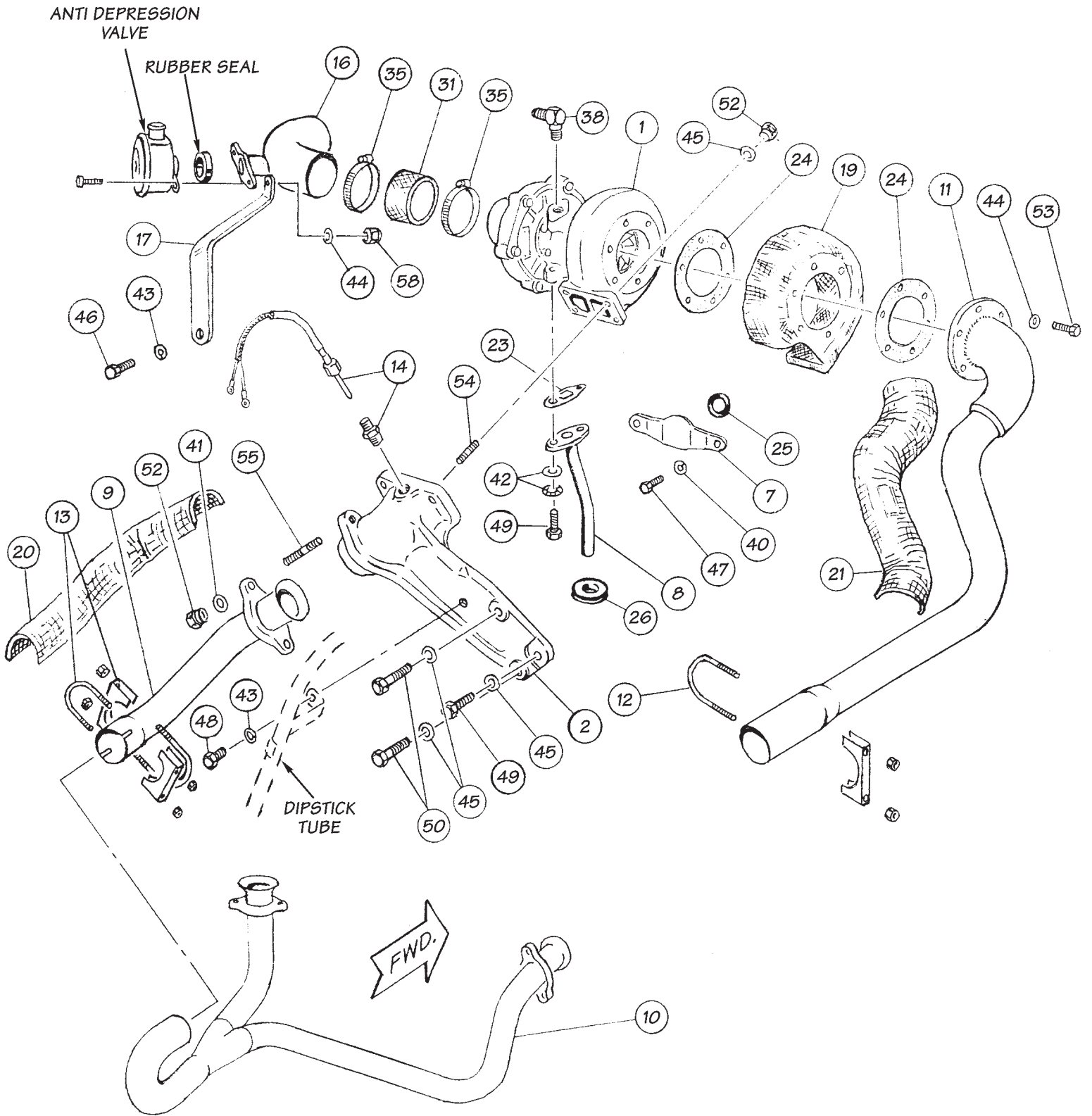
1. The engine must be Cold (preferably overnight) before starting the injection pump adjustment procedure. Do NOT attempt to turn the engine over or adjust the injection pump while the engine is warm.

2. To gain access to the injection pump adjusting screw, it is necessary to rotate the engine crankshaft, so that the screw is properly positioned. As noted in the instructions, the crankshaft is rotated by hand, In The Clockwise Direction Only, by turning the vibration damper mounting bolt using an appropriate socket, extension and breaker bar. (On some late model trucks it may be necessary to remove the front crankshaft pulley to gain access to the vibration damper

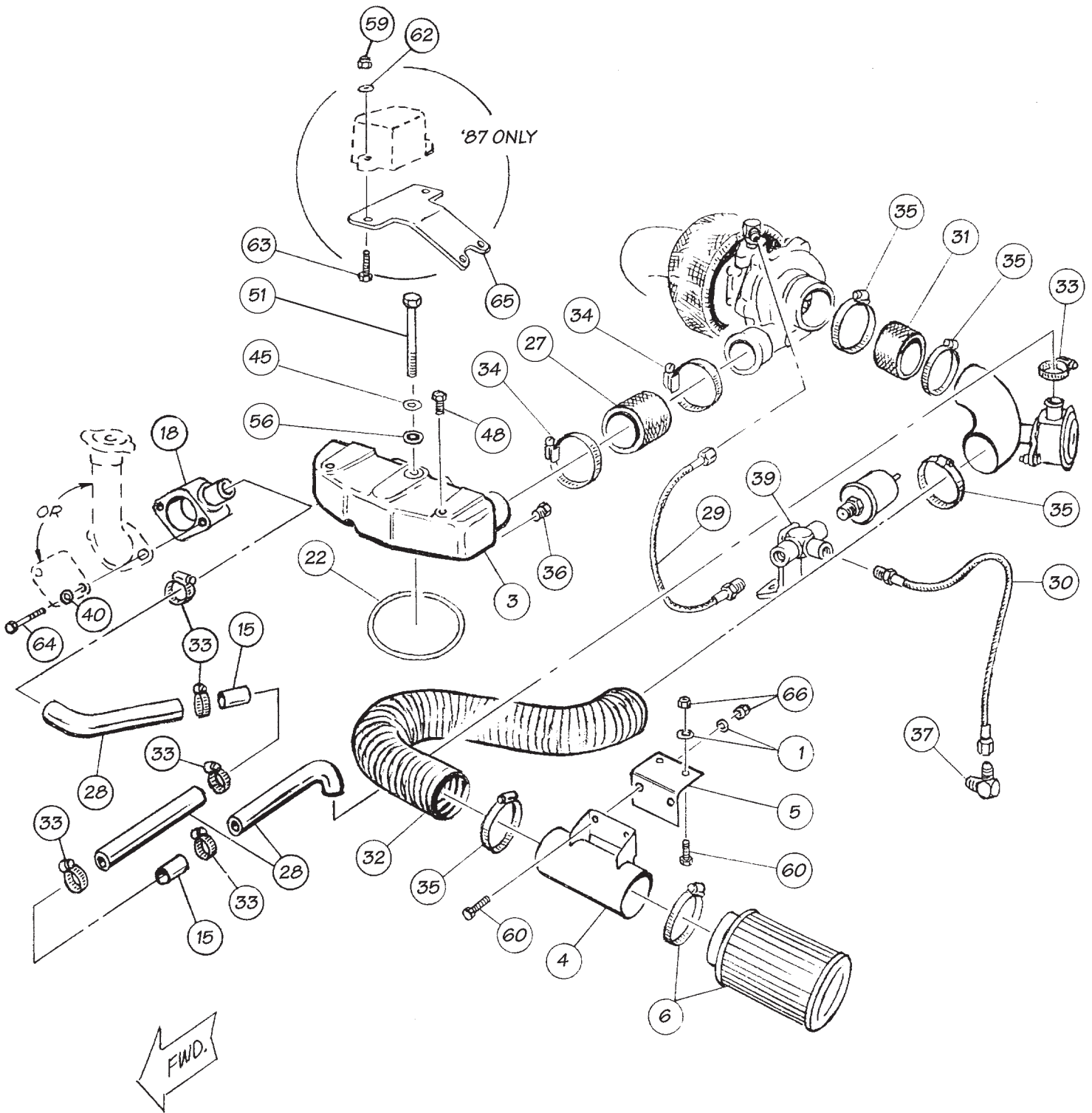
bolt). Do Not Rotate The Crankshaft Using The Starter, for any reason. Even though the fuel solenoid is de-energized, the engine can still start. This is extremely hazardous and can result in both severe personal injury and major mechanical damage. Again when making the injection pump adjustment, Do NOT Rotate The Crankshaft Using The Starter.

3. If you removed the front crankshaft pulley to gain access to the vibration damper bolt, be sure to reinstall the pulley (and belts) before starting the engine.

**FIGURE 1** SEE PAGE 21 FOR PARTS LISTING



**FIGURE 2** SEE PAGE 21 FOR PARTS LISTING



# GENERAL INSTALLATION PRACTICES

**1.** For ease of installation and trouble-free operation of your BANKS turbocharger system, PLEASE READ THIS ENTIRE 24-PAGE INSTRUCTION PACKAGE BEFORE STARTING ANY WORK. If any pages are missing from this package, please call GALE BANKS ENGINEERING immediately for a replacement.)

Become thoroughly familiar with all components and phases of the installation. Determine what additional tools or materials you may need to complete the installation, and at what stages you will require welding, if it is to be done by other than yourself.

**2.** Inspect all components supplied for any foreign material that may have entered during shipping and handling. Wash all fuel and oil hoses with solvent and blow dry with compressed air before assembly. Inspect all castings for damage resulting from shipping. Check all machined surfaces for nicks or other damage. Clean all castings with solvent and blow dry with compressed air prior to assembly.

**3.** Any time the vehicle is raised off its wheels, it should be supported by jack stands or ramps of adequate capacity for the vehicle's weight. NEVER PERFORM ANY WORK UNDER A VEHICLE SUPPORTED ONLY BY ITS BUMPER OR HYDRAULIC JACK.

**4.** Use the Teflon tape provided on all pipe thread connections. Hold tape back from the first two threads of the fitting so tape will not flake off into the fluid. (This is especially critical on oil lines.)

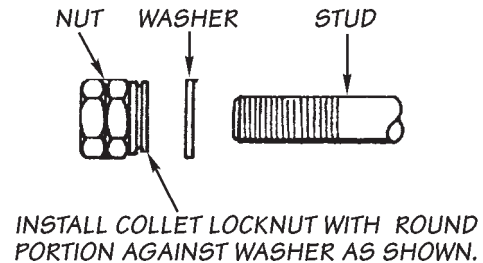
**5.** All threads to be secured with Loctite must be clean, dry and free of any oil or grease. Clean threads with lacquer thinner as required.

**6.** Pay particular attention to the routing of all hoses and wiring. Keep them away from exhaust heat, moving parts and sharp edges that may cause cuts or other damage. Route or tie hoses away from critical areas as required. Keep all hoses a minimum of 1" from hot exhaust parts; 1½" or more is recommended whenever possible.

**7.** Collet stainless steel locknuts are used on the studs in the turbine mounting bracket.

The locknuts should be installed as shown in **Figure 3**. The nuts will spin on freely and lock only when tightened.

**FIGURE 3**



**8.** Muffler and exhaust piping are not included with this kit. An exhaust parts kit containing these components is available separately from GALE BANKS ENGINEERING. The BANKS 3" exhaust system is required for emissions legal installation.

**9.** General assembly diagrams are provided in addition to the specific step or section diagrams in the text. General assembly diagrams show relationships of individual components for reference; however, numbered step-by-step procedures should be followed for proper assembly sequence.

**10.** Right-hand and left-hand designations refer to the driver's right or left, as seated in the vehicle, (i.e.: Right-hand refers to the passenger side of the vehicle, unless noted otherwise. "FWD" in illustrations refers to "FORWARD", or "FRONT OF VEHICLE".

**11.** ALL BANKS components are designed, tested and manufactured to standards far exceeding factory OEM specifications. However, due to normal variations in production vehicles, it may be necessary to slightly modify some exhaust-system components for proper fit.

NOTE: All parts are furnished in kit unless noted otherwise.

## Notification:

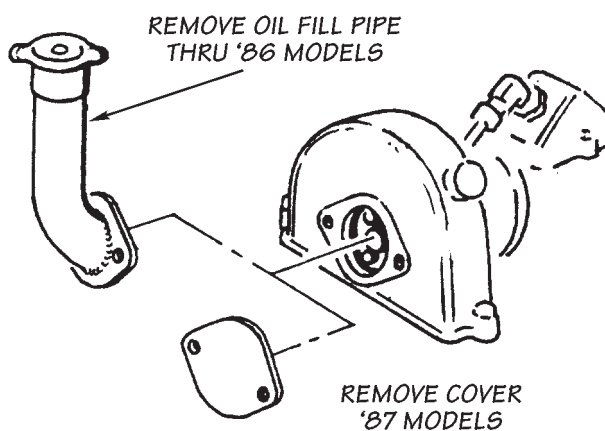
**The Banks Ram-Air Filter comes pre-oiled and no piling is necessary for initial installation. Service the Filter as specified in the Cleaning and Oiling the Banks Ram-Air Filter Section of this manual.**

# GENERAL INSTALLATION

1. Remove engine cover. Disconnect ground cables from both batteries. Disconnect electrical connections from top of injection pump.
2. Disconnect plastic air inlet duct. Remove air cleaner housing and element. Leave plastic air inlet duct in place for engine compartment cooling.
3. Disconnect wire from oil pressure sender unit, located on rear of engine.
4. Remove oil pressure sender unit and fitting from rear of engine. Retain sender for later installation.
5. Install 1/8" NPT brass pipe plug in hole at rear of block where oil pressure sender unit and fitting were removed. Use Teflon tape on threads.
6. **On Automatic Transmission Vehicles Only**, remove steel tube connected to transmission modulator valve.
7. Remove oil fill-pipe from front of engine. (Note: 1987 models use an inspection cover plate, remove cover plate). See [Figure 4](#).

## INJECTION PUMP ADJUSTMENT

FIGURE 4



To obtain the maximum available performance from your Sidewinder turbo system, it is necessary to make an adjustment to the fuel injection pump. The pump adjustment increases the fuel delivery capacity of the pump. This adjustment is made by turning an internal screw, found within the pump. The pump is infinitely adjustable from the standard setting to an approximately 50% increase in power. BANKS recommends one of two settings, as follows:

**LEVEL 1:** Exceeds 30 percent increase in rear wheel horsepower. Suitable for general use, work trucks and towing. Recommended for heavy loads and most applications. (This is the **ONLY** emissions legal setting.)

**LEVEL 2:** Approximately 50 percent increase in rear wheel horsepower. For high performance use. (This setting is **NOT** emissions legal.)

**NOTE:** Exhaust gas temperature (EGT) must not exceed 1150°F, as shown on the EGT gauge (pyrometer) furnished with the kit. If the EGT approaches this temperature under heavy, uphill load, the fuel pump capacity adjustment must be reduced. The level one pump setting will cause no problem, very rarely approaching this temperature.

8. Adjust injector pump delivery for desired application, as follows:

**NOTE:** The engine must be **COLD** before starting this procedure.

**NOTE:** Utmost cleanliness should be exercised. **DO NOT** allow any foreign material, including lint from rags, to enter the injector pump during the adjustment procedure — the lint from a rag can clog an injector. Lay any removed parts on a clean newspaper during the adjustment procedure.

**A.** Place a drip pan under the rear of the engine, under the flywheel inspection cover area, to catch spilled fuel. Clean the area of the pump in the vicinity of the small access cover, located on the left side of the pump, as viewed from the front of the vehicle, with diesel fuel or parts solvent. **DO NOT** clean the pump while it is hot; doing so may damage the pump.

**B.** Remove the cover plate, retained by two small screws. Use care not to damage the rubber gasket; it will be reused during reassembly.

**IMPORTANT:** Utmost care must be used to prevent foreign objects and dirt from falling into the pump to prevent damage.

**C.** Rotate engine by hand, in a clockwise direction, using a breaker bar, short extension and suitable socket on the harmonic balancer retaining bolt. Align the injector drive pin, as viewed through the opening for the oil fill pipe, in a straight up (12 o'clock) position. Using a small mirror, check that the allen head adjustment screw is visible within the inspection hole. It may be necessary to rotate the engine somewhat more to gain access to the adjusting screw. See [Figures 5 and 6](#). **Do Not Attempt To Rotate The Engine With The**

Starter.

D. Using a  $\frac{5}{32}$ " allen wrench (with sharp corners), rotate the screw to obtain the desired performance level:

**LEVEL 1:**  $\frac{1}{4}$  turn, clockwise

**LEVEL 2:**  $\frac{3}{8}$  turn, clockwise

NOTE: The allen screw turns fairly tightly and is self locking. Turning the screw clockwise increases fuel delivery capacity. Keep track of your adjustments.

E. Replace access cover on pump. Again exercise care to prevent foreign material from entering pump.

F. Wipe up any spilled fuel remaining on valley cover. This completes the pump adjustment procedure.

FIGURE 5

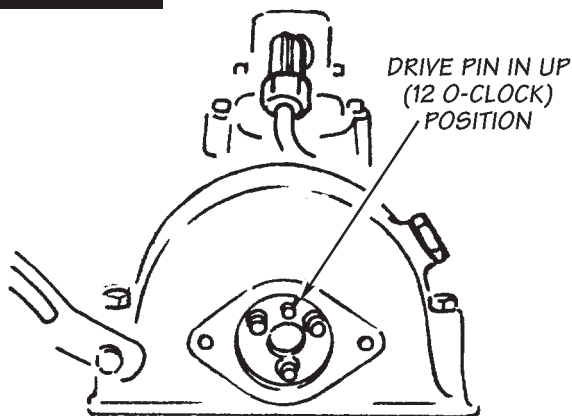
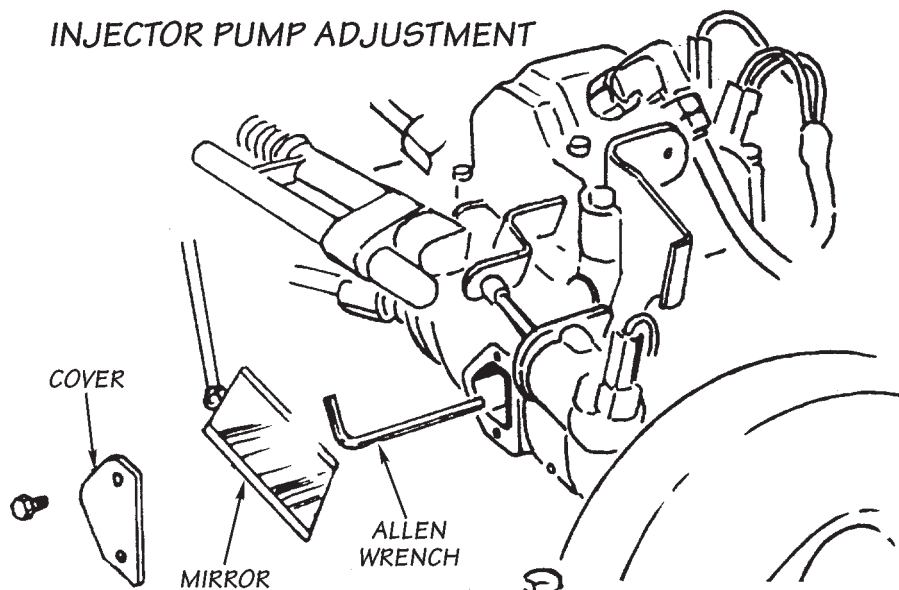


FIGURE 6

### INJECTOR PUMP ADJUSTMENT



9. Reroute the injector return hoses. Refer to **Figure 7**, which shows how the return lines should be routed. Remove and install necessary components as required to complete the system as shown. (Additional hose is provided for the rerouting.) Note that there should be a minimum of four inches clearance between the injector return line and the turbine housing or turbo mounting bracket when turbo is installed.

**On Automatic Transmission Vehicles Only**, also be sure that the new injector return hose does not interfere with the transmission kickdown linkage.

10. Remove the engine lifting lug from left rear of the intake manifold. Replace bolts with new  $\frac{3}{8}$ "-16 x  $2\frac{1}{2}$ " hex head bolts provided, and original washers. (Do not use original bolts or reinstall lifting lug.)

11. Remove the engine lifting lug from left rear of the intake manifold. Retain the bolts for later installation.

12. Remove the crankcase anti-depression valve (the round sheet metal can be attached to the rear of the intake manifold). Remove standpipe and grommet from valley cover. (Standpipe may come out attached to anti-depression valve.) Retain anti-depression valve and mounting bolts for later installation. Note, 1987 models: Remove short length of hose and clamp from anti-depression valve.

13. Carefully clean around the hole where the original grommet was installed at the rear of the valley cover and where the anti-depression valve was mounted on intake manifold. (Use acetone, lacquer thinner or other non-oil based solvent.)

14. Install grommet in valley cover as follows. Fill grommet groove with RTV silicone

sealer provided. Press grommet through opening in valley cover and smooth RTV around grommet. Remove excess RTV. See **Figure 8**.

**15.** Install rubber o-ring in groove in manifold block-off plate. See **Figure 8**.

**16.** Install manifold block-off plate (and o-ring) on intake manifold where anti-depression valve was removed, using two  $\frac{5}{16}$ "-18 x 1" hex head bolts and split lockwashers. See **Figure 8**.

**17.** Remove exhaust head pipes and exhaust system, including mufflers and tailpipe.

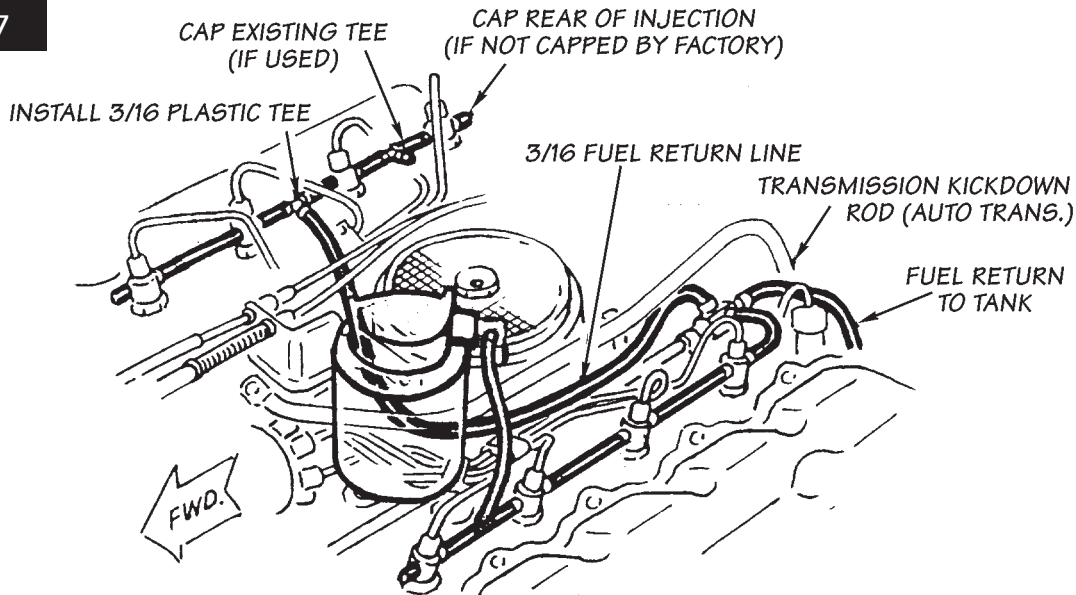
**18. On Automatic Transmission Vehicles Only**, remove the transmission dipstick from

the dipstick tube. Then unbolt the transmission dipstick tube at the bellhousing and remove the dipstick tube from the transmission. Retain all these components for later installation. Cover the dipstick tube opening with a clean rag, paper towel or tape to prevent contamination from entering the transmission. Reinstall bellhousing bolt.

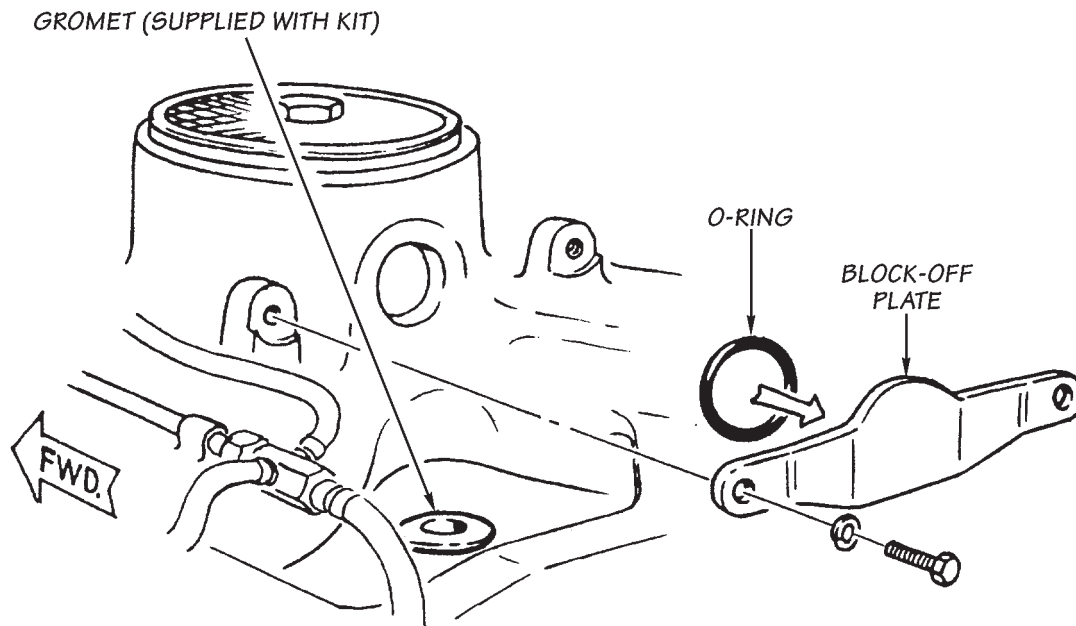
**19. 1987 models, glow plug relay relocation:**

**A.** On 1987 models, unbolt the glow plug relay from the rear of the intake manifold (leave wire loom attached to relay. Remove cable clamps holding wire loom to rear of engine. Disconnect relay ground wire from engine.

**FIGURE 7**



**FIGURE 8**



**B.** Remove the two intake manifold bolts located between the third and fourth fuel injector (counting from the front to the rear) on the right (passenger) side of the engine. See **Figure 9**.

**C.** Mount the glow plug relay to the glow plug relay bracket (provided) using two 1/4"-20 x 1" hex bolts, two 1/2" O.D. x 1/4" I.D. washers, and two 1/4"-20 nylock nuts. Clamp the relay ground wire under one of the nuts. See **Figure 9**.

**D.** Install the bracket and relay on the intake manifold using the intake bolts and washers removed in section B. Route the wiring as shown in **Figure 10**. Plastic clips may be removed from wire loom jacket as required for rerouting wiring.

**20.** Remove pipe plug for oil feed connection, located on lower left side at rear of block, above and to the rear of the oil filter. See **Figure 11**.

**21.** Install 1/8" NPT x -4AN turbo oil feed elbow in block. Aim elbow at approximately one o'clock position. See **Figure 11**.

**22.** Install oil feed hoses onto oil feed line tee. Use Teflon tape on threads. See **Figure 12**.

**23.** Install oil pressure sender onto oil feed line tee. Use Teflon tape on threads. See **Figure 12**.

**24.** Install oil feedline tee on intake manifold, using rear-most intake manifold mounting bolt hole, on the left side. Use original bolt and washer. Replace the other left rear manifold bolt with one new 3/8"-16 x 2 1/2" hex head bolt and original washer.

NOTE: Oil feed line to block must go under injector tubing loop at rear-most injector.

**25.** Connect oil feed hose to elbow installed in step 21.

**26.** Lengthen the oil pressure gauge sender wire as follows:

Cut the plug from the wire loom leaving 2-3 inches of wire attached to the plug. Lengthen the wire from the loom as required using wire and connector provided in the kit. Route the wire in front of the intake manifold air inlet opening to the gauge sender. Keep wire clear of any moving parts. Note: Connectors squeeze together onto the wire with pliers. Re-install plug on sender.

**27.** Tie wrap glow plug wiring and throttle cable at rear of intake manifold (snugly but not tight enough to cause binding or kinking). See **Figure 13**.

**28.** Cut one 6 x 14" heat blanket into one piece 6 x 6" and one piece 8 x 6". Wrap one 8 x 6" piece around the glow plug wiring and throttle cable near turbine housing. Secure using wire ties provided (See **Figure 14**). Save the other pieces for later installation (to be used around hoses for rear heater and/or air conditioning where close to exhaust).

**29.** Cut ear off of right side of transmission bell housing, using a hacksaw. See **Figure 15**.

**FIGURE 9**

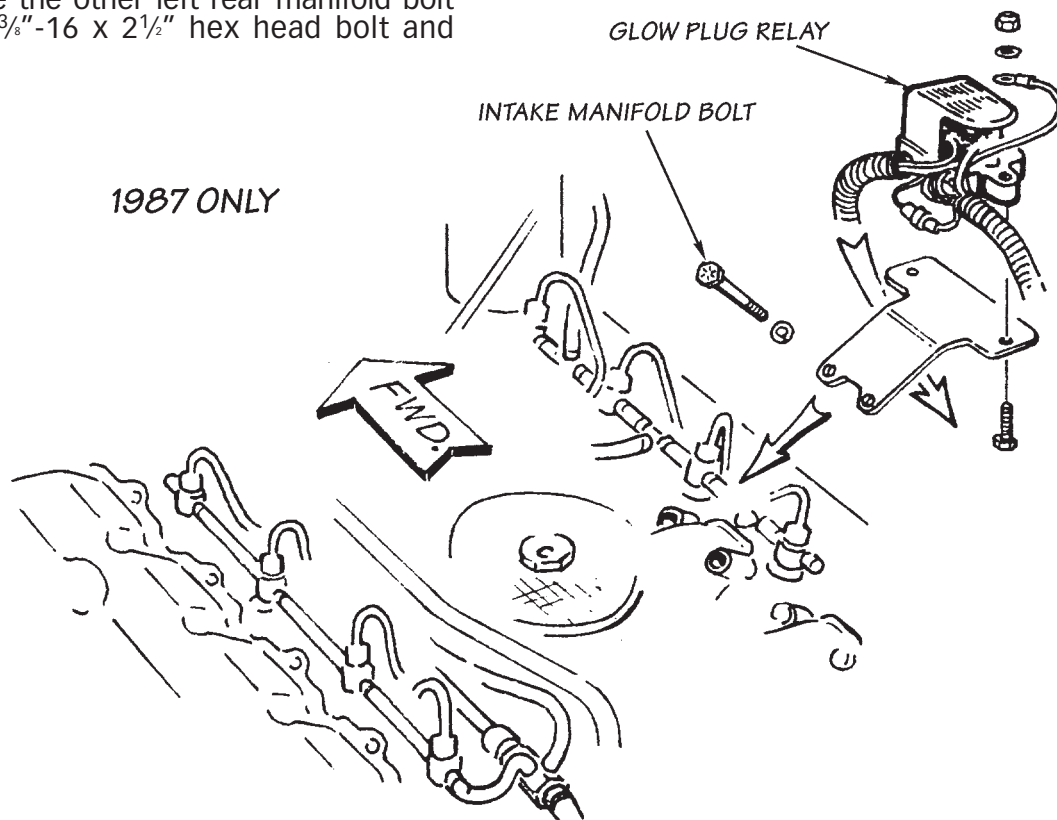
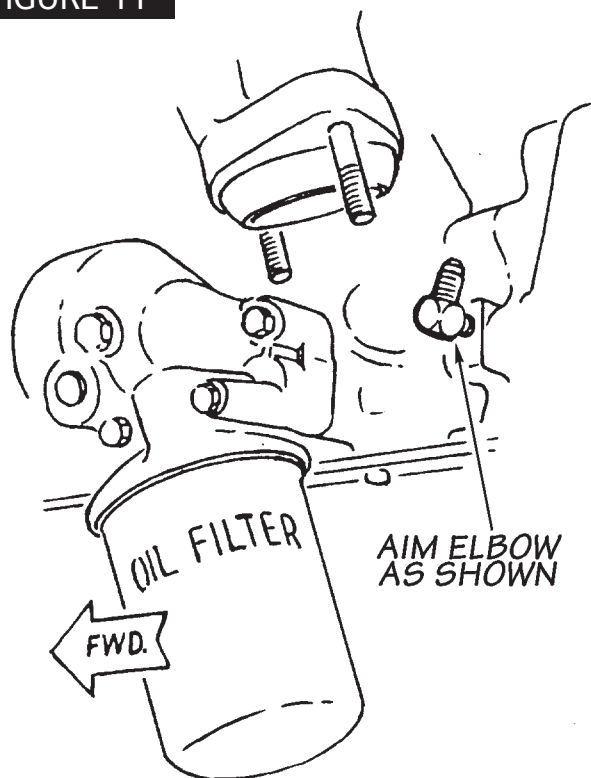


FIGURE 10

1987 ONLY



FIGURE 11



30. Install the pyrometer adapter fitting (from the pyrometer kit) into the  $\frac{1}{4}$ " NPT threaded hole in the turbo mounting bracket.

31. Install four  $\frac{3}{8}$  x  $1\frac{1}{2}$ " studs in the rectangular pad on the turbo mounting bracket. Note that the coarse threads on the studs fit into the turbo mounting bracket.

32. Install two  $\frac{3}{8}$  x 2" studs in the circular pad on the turbo mounting bracket. Again note that the coarse threads on the studs fit into the turbo mounting bracket.

33. Mount turbo on turbo mounting bracket, using four  $\frac{3}{8}$ "-24 stainless steel collet nuts and four  $\frac{5}{8}$ " OD x  $\frac{3}{8}$ " ID flat washers. No gasket is required (See general notes on collet lock nut installation, Figure 3).

34. **IMPORTANT: Remove the plastic caps from the turbocharger oil inlet and outlet connections.**

35. Use gasket adhesive ("Gasgacinch" or similar) to attach the oil drain tube gasket to the oil drain tube. Place a small bead of RTV silicone sealer around the oil drain tube about  $\frac{3}{8}$ " up from the bottom, then insert the oil drain tube into the grommet in the valley cover.

36. Position the turbo mounting bracket and turbocharger in place at the rear of the right hand cylinder head. Start one  $\frac{3}{8}$ "-16 x  $1\frac{1}{4}$ " hex head bolt, two or three turns, through the top mounting hole in the turbo mounting bracket, into the head.

37. Mount the oil drain tube in position on the turbo, using two  $\frac{3}{8}$ "-16 x 1" hex head bolts and four  $\frac{3}{8}$ " I.D. circle lock washers. (Circle lock washers must be used in pairs as shown in Figure

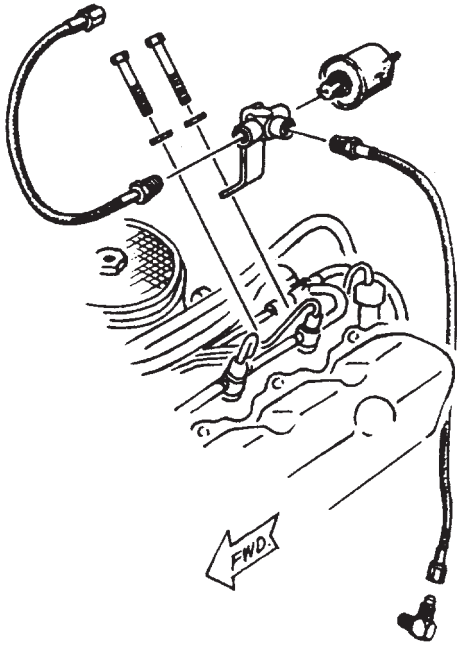
16).

38. Install the other two bolts in the bolts in the turbo mounting bracket (one  $\frac{3}{8}$ "-16 x  $1\frac{1}{4}$ " hex head and one  $\frac{3}{8}$ "-16 x 1" hex head; short bolt goes through thin corner of bracket). Leave bolts loose enough to adjust turbo mounting bracket position to suit.

39. Install  $\frac{1}{4}$ " NPT x -4AN elbow in the oil inlet connection on the turbocharger. (The oil inlet connection in the only  $\frac{1}{4}$ " NPT port on the turbocharger). Aim the fitting as shown in Figure

P.N. 96308 V.2.0

**FIGURE 12**



17. Use Teflon tape on the pipe threads

**40.** Place air inlet gasket and pressure chamber in position on the intake manifold. Make sure the pressure chamber touches and sits squarely on the gasket.

**41.** Line up turbo compressor discharge with pressure chamber hose joint, lifting the turbo slightly for proper alignment. Tighten the top bolt in the turbo mounting bracket, then the other two. Scribe the pressure chamber and front of the intake manifold air inlet opening, across the gasket joint, for future reference. See [Figure 18](#).

NOTE: If the turbocharger needs to be rotated to correct misalignment, it can be easily aligned by loosening, but not removing, the six turbine

housing bolts and the six compressor housing bolts and rotating these parts slightly into the proper position. Be sure to bend the locking tabs over against the heads of the bolts after re-tightening.

**42.** Remove pressure chamber from intake manifold.

**43.** Line up the turbine heat shield and gasket on the turbocharger. You may use  $\frac{5}{16}$ " studs, pins or bolts with heads removed to ease the installation.

**44.** Install turbo down tube on the turbocharger, using six  $\frac{5}{16}$ "-18 x  $\frac{7}{8}$ " stainless steel hex head bolts and  $\frac{9}{16}$ " OD x  $\frac{5}{16}$ " ID flat washers. Make sure gaskets and heat shield are properly in place.

**45.** Install Y-pipe extension on turbo mounting bracket, using two  $\frac{3}{8}$ "-24 stainless collet lock nuts and two  $\frac{13}{16}$ " O.D. x  $\frac{3}{8}$ " I.D. flat washers. Leave nuts loose enough to move extension tube as required for alignment.

**46.** Install Y-pipe assembly onto engine exhaust manifolds and Y-pipe extension. Do not install U-clamps.

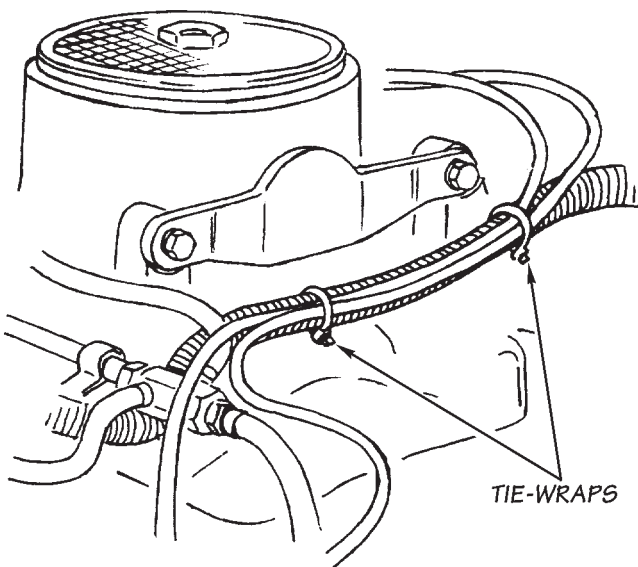
**47.** Tighten Y-pipe extension collet lock nuts.

**48.** Install two  $2\frac{1}{2}$ " exhaust U-clamps on slip connection joining Y-pipe and Y-pipe extension, 180° apart. See [Figure 1](#).

**49.** Drill holes and mount air cleaner assembly on bracket on rear lip of hood opening with four  $\frac{1}{4}$ "-20 nylock nuts. See [Figures 2](#) and [19](#).

**50.** Trim insulation material from underside of hood, as shown in [Figure 20](#).

**FIGURE 13**



**FIGURE 14**

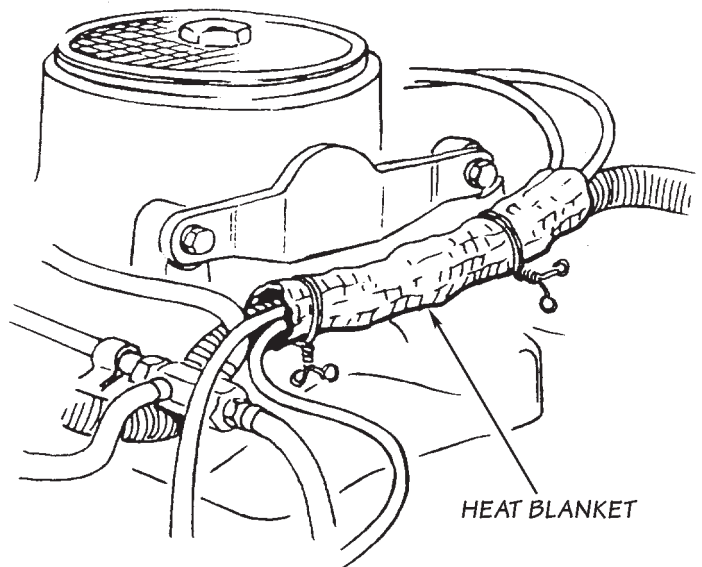


FIGURE 15

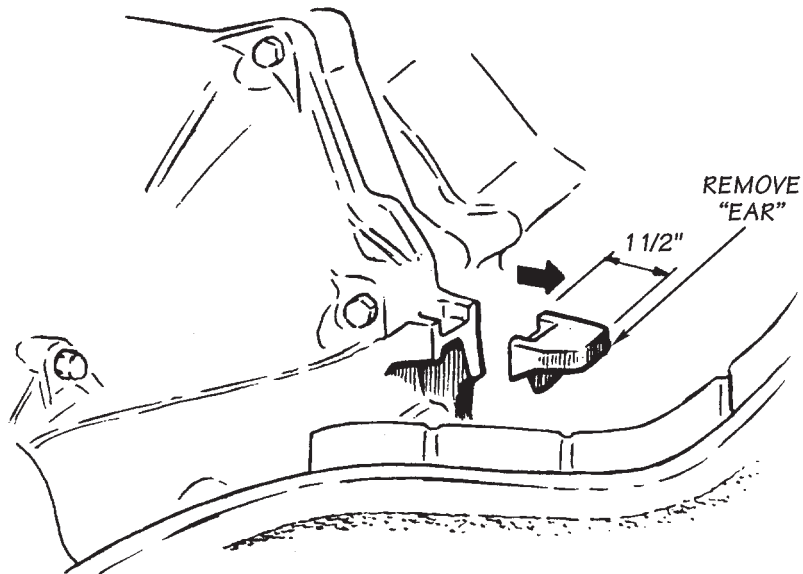


FIGURE 16

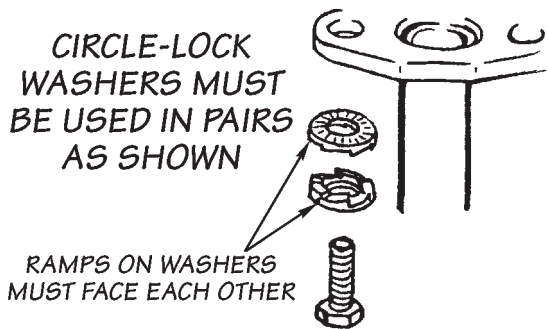


FIGURE 17

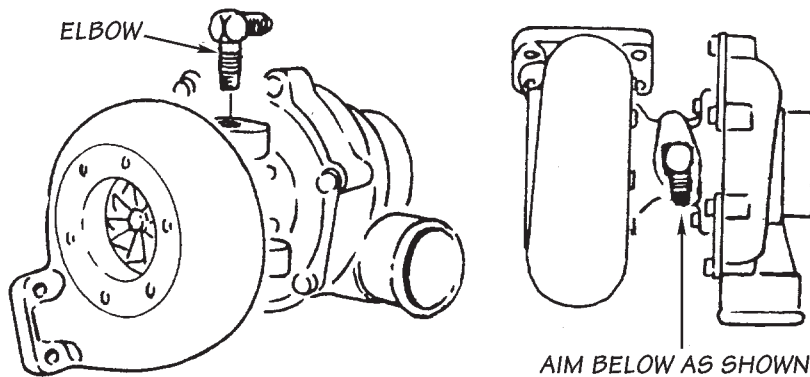
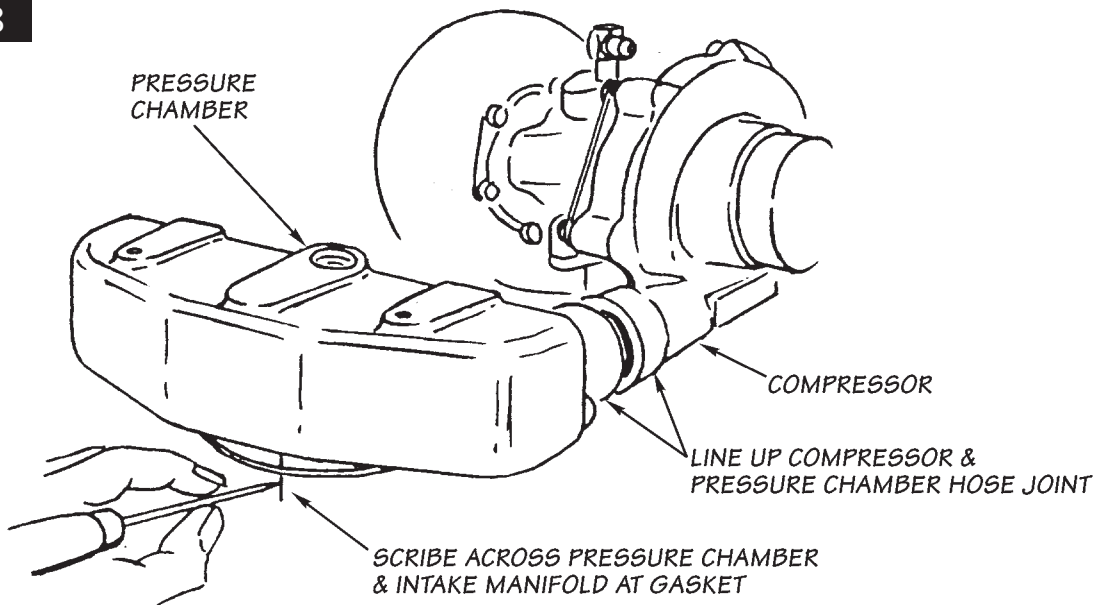


FIGURE 18



**51.** Install two  $\frac{3}{8}$ "-16 x  $\frac{1}{2}$ " bolts in the top of the pressure chamber. Use Loctite on threads. See **Figure 21**.

**52.** If installing optional boost gauge, install boost gauge fitting (supplied in boost gauge kit) in pressure chamber.

NOTE: Nut on fitting must be removed to allow installation. Fitting should be aimed toward left side of vehicle. Refer to **Figure 21**.

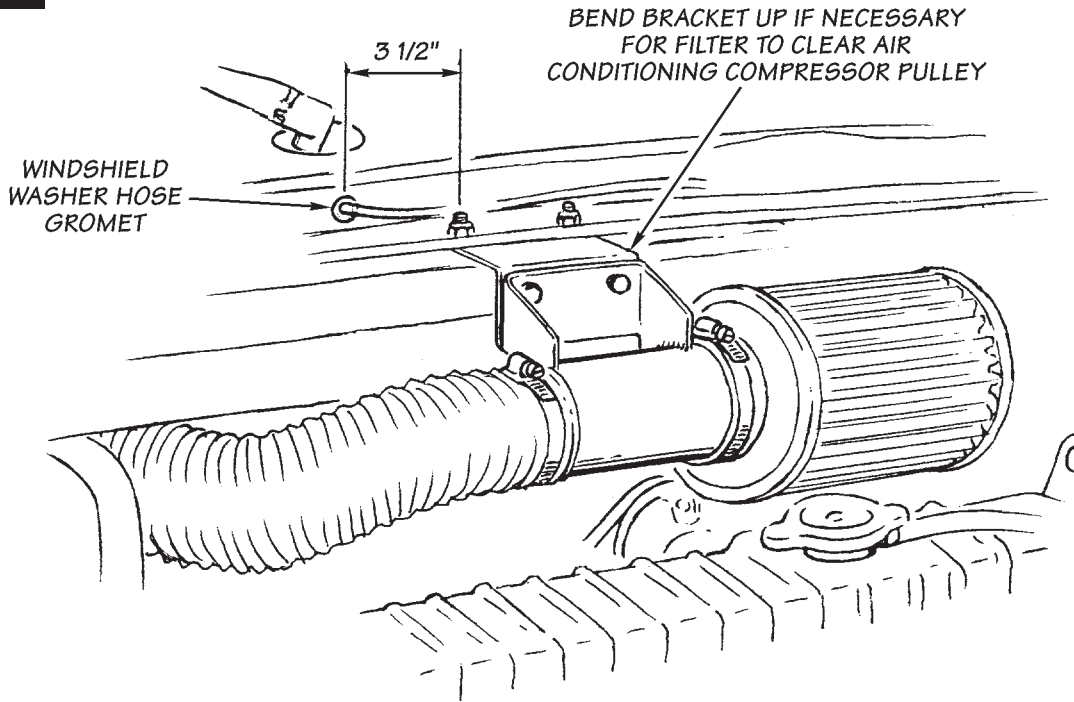
If boost gauge will not be installed, substitute  $\frac{1}{8}$ " NPT pipe plug, from kit. Use Teflon tape on

threads.

**53.** Install 2" diameter x 2" long silicone hose and two #36 hose clamps on turbocharger compressor discharge connection. Leave clamps loose temporarily.

**54.** Install pressure chamber (and gasket) on intake manifold, using one  $\frac{3}{8}$ "-16 x 4" hex head bolt,  $\frac{5}{8}$ " OD x  $\frac{3}{8}$ " ID flat washer and  $\frac{3}{8}$ " ID sealing washer. Be sure pressure chamber aligns properly with scribe marks previously made.

**FIGURE 19**



**FIGURE 20**

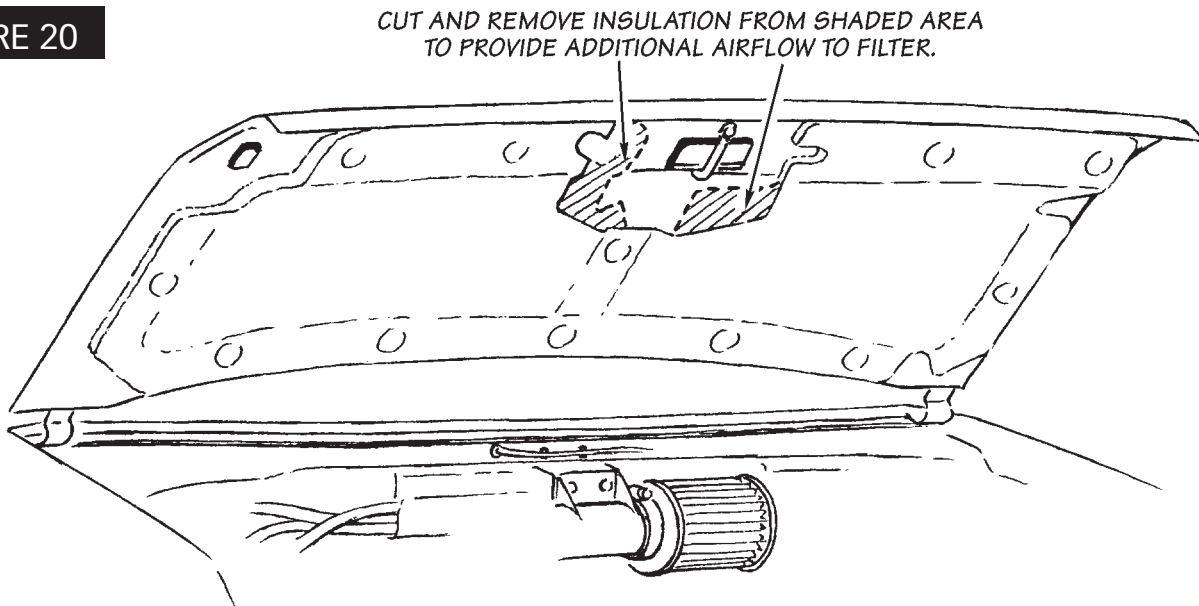


FIGURE 21

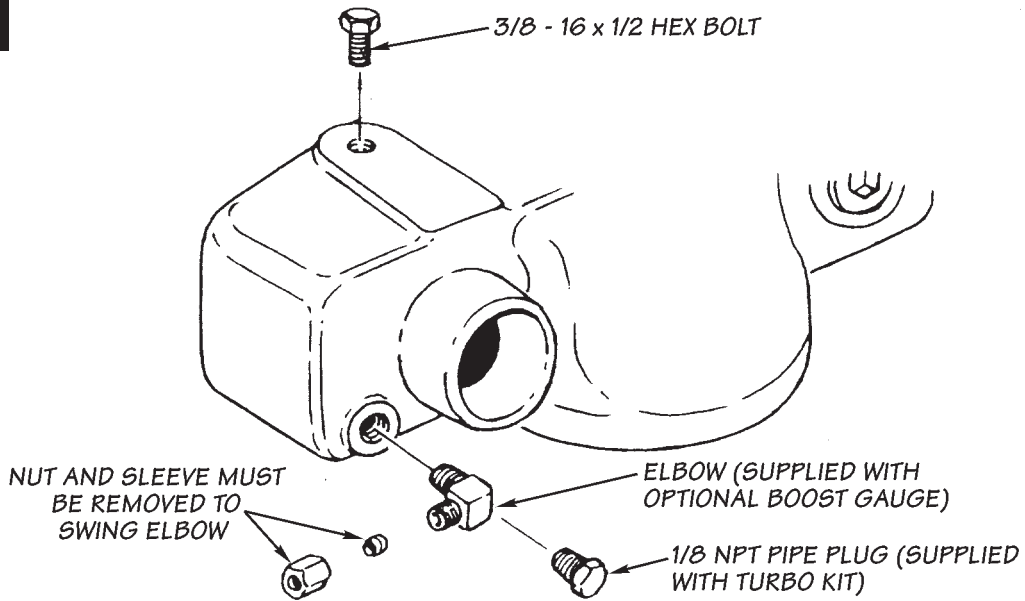
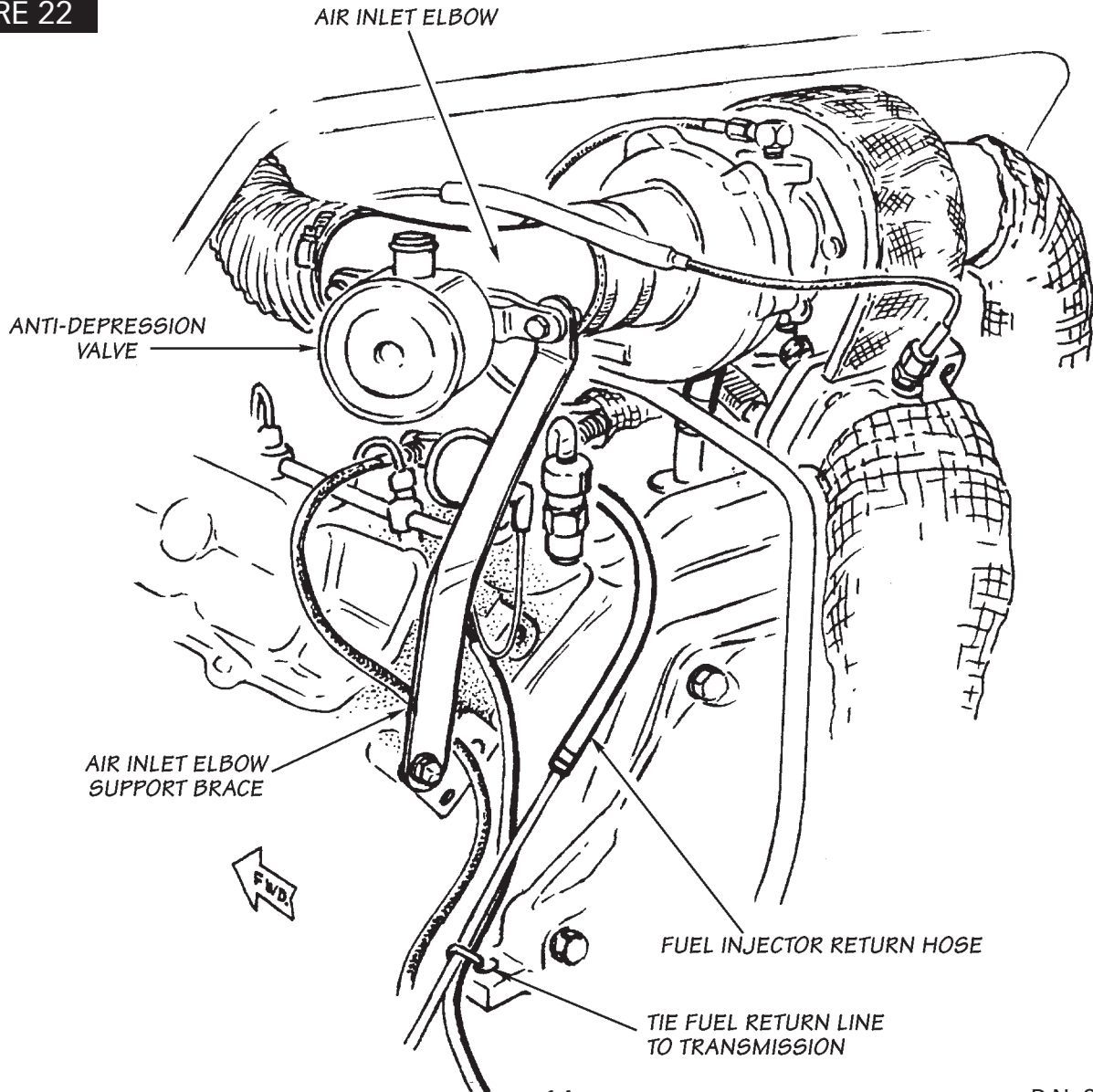


FIGURE 22



**55.** Tighten compressor discharge hose clamps.

**56.** Install turbo compressor air inlet elbow and 3 x 1<sup>3</sup>/<sub>4</sub>" long silicone hose on compressor. See [Figure 1](#). Do not tighten clamps at this time.

**57.** Mount compressor air inlet elbow brace on rear of left cylinder head, using one 3/8"-16 x 3/4" hex head bolt and one 3/8" split lock washer. Install anti-depression valve, with hose connection facing upward, on the air inlet elbow, using original bolts and two 9/16" OD x 5/16" ID flat washers and 5/16"-18 nylock nuts. Be sure original seal is in place on anti-depression valve mounting surface. Remove existing o-ring and nylon sleeve from the anti-depression valve hose connection (through 1986 models). See [Figures 1](#) and [22](#).

**58.** Tighten air inlet elbow hose clamps, at turbocharger and elbow.

**59.** Connect oil feed hose to turbocharger oil inlet elbow.

**60.** Install 3" diameter flexible fresh air inlet hose between air cleaner assembly and air inlet elbow, using two #52 hose clamps.

**61.** Remove and discard the hose clamp from the heater hose connection on the water pump. Hose clamp may be cut with snips to avoid disconnecting hose.

**62.** Thoroughly degrease the oil fill-pipe flange face (injector pump drive cover flange face on 1987 models) using acetone lacquer thinner or other non-oil based solvent. Install the crankcase vent hose adapter and oil fill-pipe (inspection cover on 1987 models) using two 5/16"-18 x 2" hex bolts and two 5/16" split lock washers. Use silicone sealer on both flange surfaces. See [Figure 23](#).

**63.** Replace the hose clamp previously removed from the heater hose with a No. 10 hose clamp, provided in the kit. Keep the tail of the hose clamp clear of the alternator drive belt. See [Figure 23](#).

**64.** Install crankcase vent hose, from crankcase vent adapter nipple to anti-depression valve, using two #16 hose clamps, as shown in [Figure 23](#). Be sure that hose is installed with no low areas that could cause oil puddling in the hose.

**65.** Install pyrometer and gauge panel. Refer to manufacturer's instructions included with pyrometer.

**66.** Install accessory instruments, if used. Refer to manufacturer's instructions included with instruments.

**67.** Install muffler and exhaust system (not included with the turbo system) as shown

in [Figure 27](#). Because of various vehicle/chassis combinations, the illustration provided is general, but typical of the exhaust system routing.

NOTE: The factory muffler and exhaust system are NOT suitable for turbocharged engines. The entire exhaust system, from the turbo down-pipe through to the tail pipe, should be three inch diameter, including the muffler. Use of a smaller muffler or exhaust piping will result in significantly inferior performance. A separate 3" high-flow exhaust system includes a special low restriction 3" core muffler, pre-formed tubing sections and all components necessary to install the complete exhaust system. The BANKS 3" exhaust system is Required for emissions legal applications. Use of any other exhaust with the turbo system is not emissions legal.

For those wishing to do their own exhaust system fabrication, the following recommendations should be followed (see [Figure 28](#)):

**A.** Be sure to use a high quality, low restriction 3" core muffler, designed for turbocharged diesel applications. (Most 3" mufflers available from muffler shops are low quality, high restriction "economy" replacement mufflers, usually based on a 2<sup>1</sup>/<sub>2</sub>" or smaller core.)

**B.** Make all bends as gradual as possible. Align all weld joints as carefully as possible so the exhaust flow will not experience "steps" in the tubing.

**C.** Do not "cheat" bends or make miter-weld joints. These types of bends are too abrupt for proper exhaust flow.

**D.** Maintain adequate clearance to chassis, floorboards, driveline, moving suspension parts, etc. Suspend exhaust tubing in rubber hangers to allow for engine movement. The original hangers may be reused if in good condition.

**68.** Install a 9 x 24" heat blanket on turbo down-pipe. Make sure top of pipe is covered by the heat blanket. Secure using wire ties provided. See [Figure 24](#).

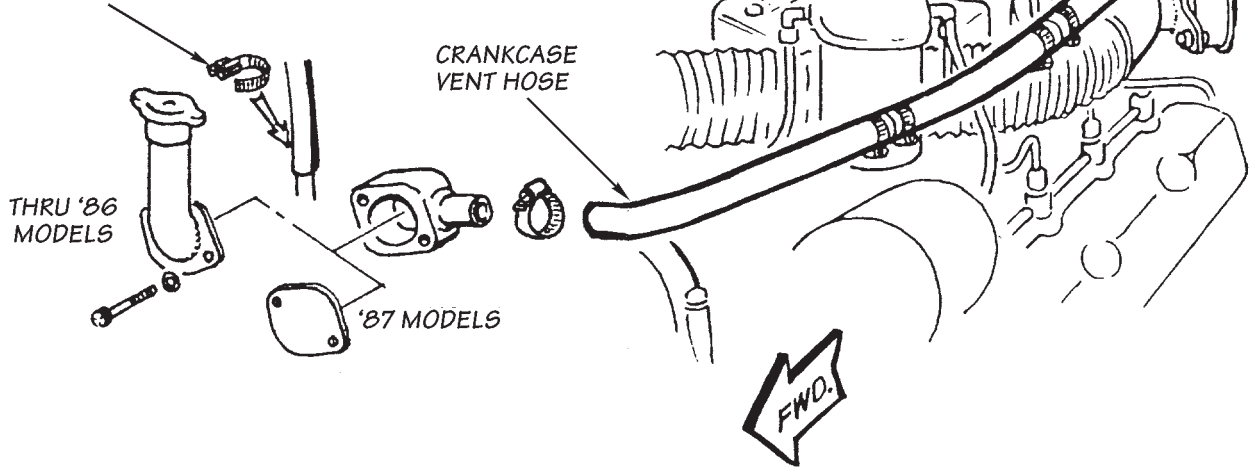
**69.** Install a 7 x 24" heat blanket on Y-pipe extension, sliding it up from the bottom, all the way up to the pyrometer fitting on the turbo mounting bracket. Secure, again using wire ties. See [Figure 24](#).

**70.** Install remaining 6 x 8" piece of heat blanket on hoses for rear heater and/or air conditioning if these hoses are routed near exhaust.

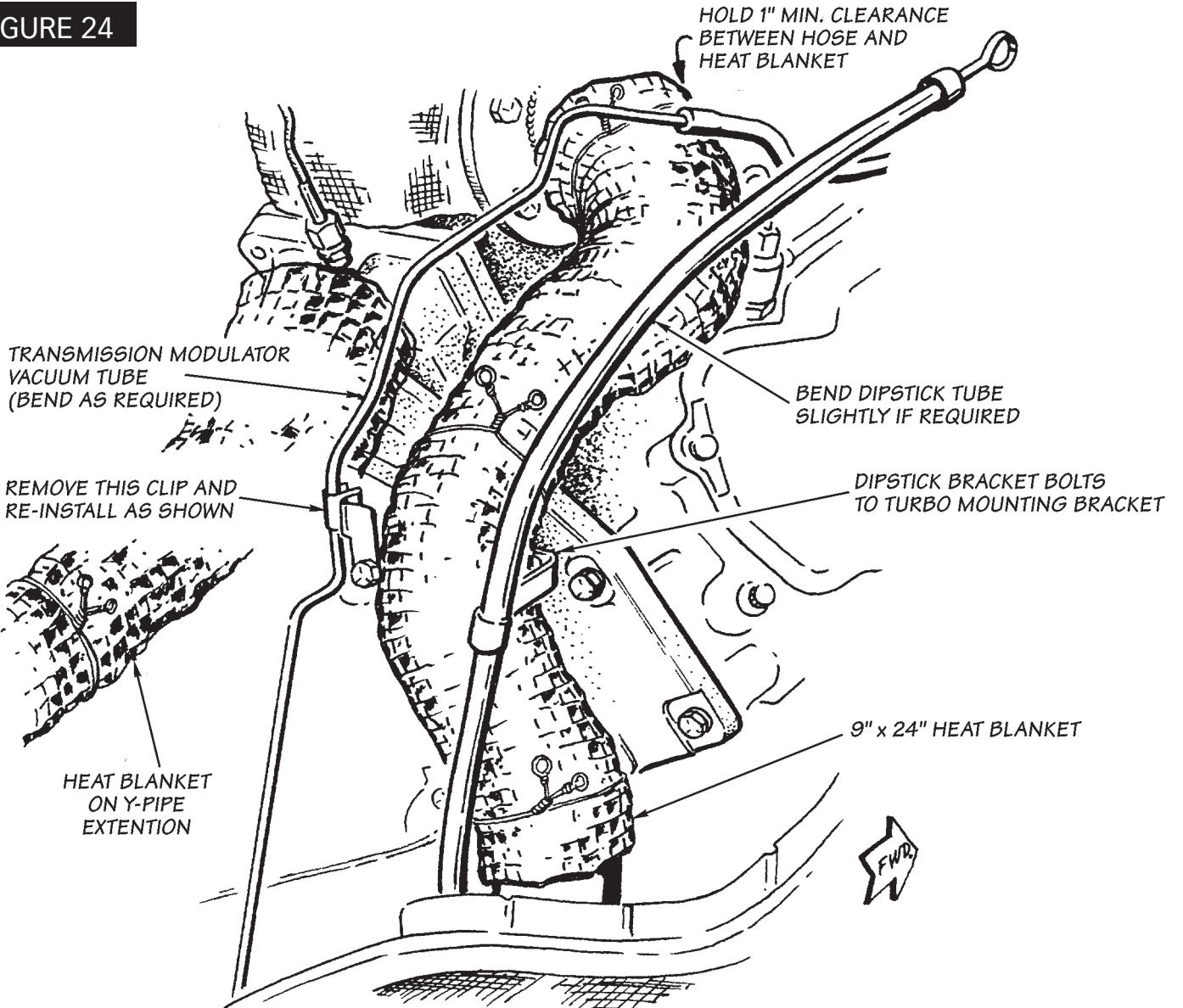
**71.** Reroute the fuel injector return hose to the left side of the transmission bellhousing. See [Figure 22](#). Check to be sure the injector return hose does not rub on any sharp edges.

**FIGURE 23**

NO. 10 HOSE CLAMP  
OPEN CLAMP AND INSTALL  
ON HEATER HOSE.



**FIGURE 24**



**72. On Automatic Transmission Vehicles Only:** Bend transmission modulator vacuum tube as shown in Figure 24, and then reinstall. Make sure vacuum hose has at least one inch of clearance to down-pipe heat shield.

**73. On Automatic Transmission Vehicles Only:** Modify and reinstall transmission dipstick and tube. Attach tube to turbo mounting bracket with one  $\frac{3}{8}$ "-16 x  $\frac{1}{2}$ " hex bolt and  $\frac{3}{8}$ " split lock washer. See Figures 24 and 26.

**74. On Automatic Transmission Vehicles Only:** Reroute the transmission neutral safety switch wire to the left side of the transmission bellhousing. Install the 6 x 14" heat blanket on Y-pipe near the neutral safety switch/back-up light switch and wiring, located on left side of transmission. See Figure 25.

**75.** Reconnect battery cables.

**76.** Loosen oil feed line connection at the turbocharger. Crank engine until oil flows from connection. Retighten connection and crank until engine oil pressure gauge reading is in normal range. Cranking time should be limited to 20 to 30 seconds, followed by one minute of cooling. This cycle should be repeated as required.

**77.** Reconnect wires to injection pump.

**78.** Visually check the installation for any improperly installed components, improperly routed wires and hoses, intake air leaks and any wires or hoses too close to hot exhaust, turbo components, or sharp edges.

**79.** Start engine. It may not start immediately, due to fuel lost when adjusting the injector pump. Observe the cranking recommendations noted above. It also may be necessary to depress the accelerator pedal somewhat.

**80.** Run engine at idle for a few minutes, to allow it to warm. Check oil feed lines for leaks. Engine may idle erratically or surge until air is fully purged from fuel system.

**81.** Reinstall engine cover.

**82.** Drive vehicle. Several short bursts of acceleration are required to completely purge the fuel system of air. The engine may run slightly rough until the purge is complete, but will not in any way cause damage to the engine.

**83.** Check injector pump adjustment. See "CHECKING ENGINE PERFORMANCE".

FIGURE 25

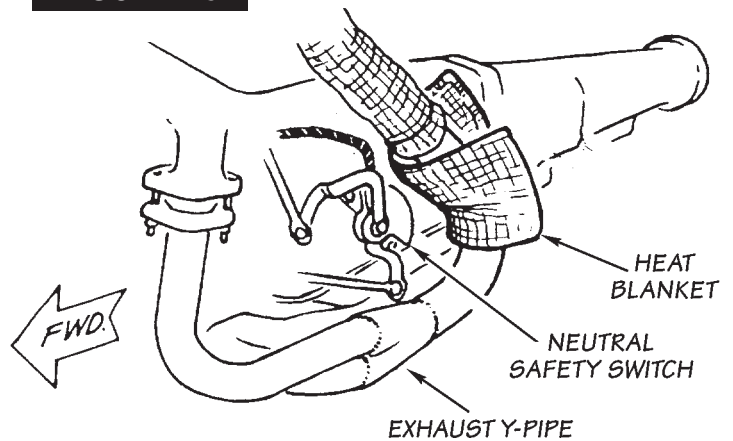


FIGURE 26

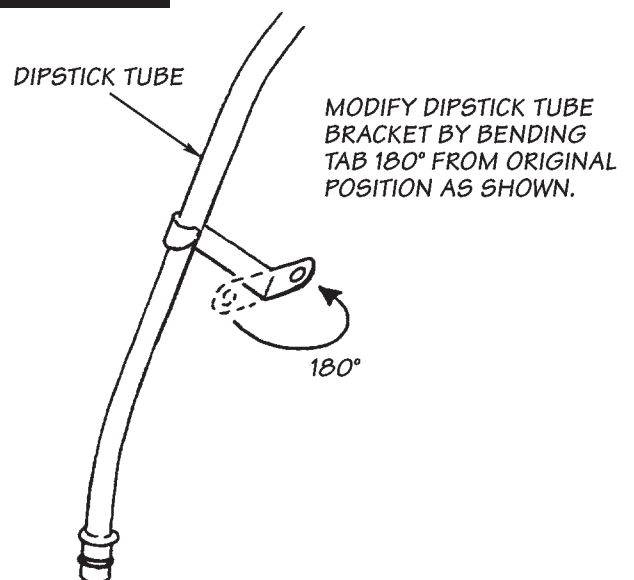
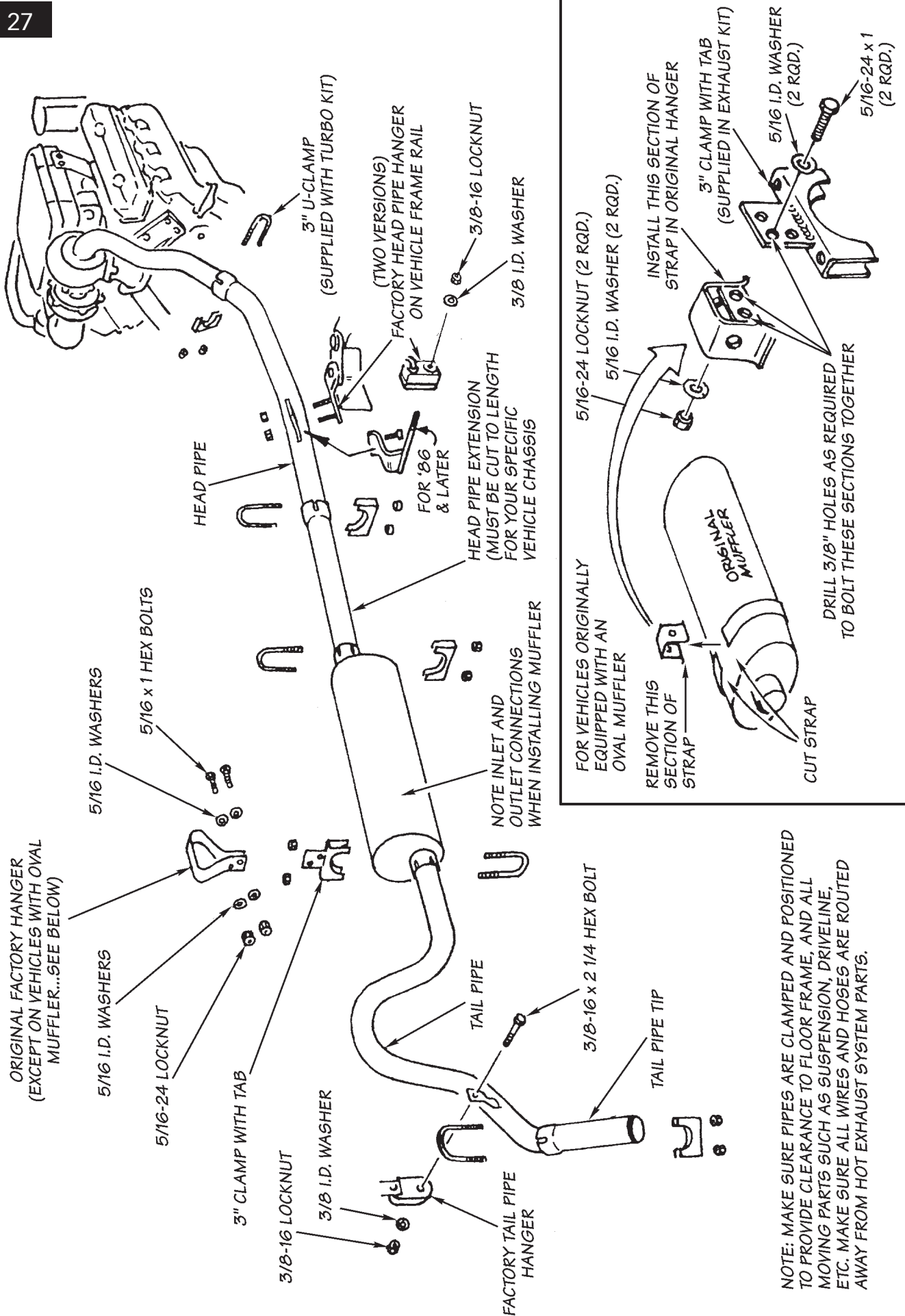


FIGURE 27

6.9/7.3L FORD DIESEL TURBO  
BANKS TURBO EXHAUST  
SYSTEM INSTALLATION



NOTE: MAKE SURE PIPES ARE CLAMPED AND POSITIONED TO PROVIDE CLEARANCE TO FLOOR FRAME, AND ALL MOVING PARTS SUCH AS SUSPENSION, DRIVELINE, ETC. MAKE SURE ALL WIRES AND HOSES ARE ROUTED AWAY FROM HOT EXHAUST SYSTEM PARTS.

# CHECKING ENGINE PERFORMANCE

Use your pyrometer (exhaust temperature gauge) to monitor your engine's operation. At idle exhaust gas temperature (EGT) will be very low, perhaps only 150°F. As the throttle is opened for higher speeds and greater loads, the EGT will rise. The highest EGT will be seen under maximum load at full throttle, such as climbing a steep grade with a heavily laden vehicle. Use caution if your EGT approaches 1100°F, with 1150°F being the ABSOLUTE MAXIMUM!

If the vehicle approaches those EGT levels under these conditions, downshift the vehicle to reduce the load, or back off the throttle. If frequent high EGT levels are encountered, the fuel delivery of the injection pump will have to be reduced by backing out the Allen head screw in the injection pump as indicated in the Pump Adjustment section. A high EGT can also be caused by a restrictive exhaust system.

We recommend engine oil temperature be below 240°F, as measured in the oil pan, (An optional oil temperature gauge is available from GALE BANKS ENGINEERING). Optimum oil temperature is 220°F. Continuously high oil temperature is indicative of the need for an additional oil cooler. If you do not have an oil temperature gauge, watch your oil pressure. Falling oil pressure under a heavy load is caused by rising oil temperature. Use caution.

We recommend that coolant temperature, also, should not exceed 220°F.

NOTE: Because the oil pressure gauge sender is now tapped into a different location on the engine, your oil pressure gauge readings will be slightly lower, although your engine oil pump is still putting out the same pressure. Once the engine has warmed up, take note of the oil pressure at various engine speeds and use these readings as your new standard for normal oil pressure.

# OPERATING CHARACTERISTICS

Your BANKS turbocharged diesel engine should exhibit the following operating characteristics:

**Cruise Conditions (Constant 60 mph on Level Road):** EGT should be approximately 400°F; boost gauge, if so equipped, should read 1 to 2 pounds.

**High Load Conditions (Uphill with Heavy Load):** EGT should typically be 900 to 1000°F, with 1100 as a maximum; boost levels may approach 9 pounds.

It is important to realize that diesels, unlike gasoline engines, run cooler with additional air. It is impossible to run a diesel too "lean". Exhaust gas temperature rises as more fuel is added. Turbocharging a diesel typically lowers the EGT. Normal cruise condition EGT for a normally aspirated (non-turbocharged) diesel engine is typically 600 to 650°F. As noted above, cruise condition EGT for a turbocharged diesel is typically

400°F. This lower EGT translates directly to lower piston and valve temperatures, and significantly increased engine life.

It is also important to understand that turbocharged boost pressures are load related, that is the turbocharger makes boost only when called upon to do so (by load requirements). The turbo will not "make boost" with the transmission in neutral, but makes boost proportional to the load. Long uphill grades, with a heavy load, will result in maximum boost. In other words, the turbo makes boost only when it is needed. This characteristic makes turbochargers so attractive that the vast majority of long haul trucks and off-road earth moving equipment are equipped with turbochargers. Turbocharging typically results in more power and torque, better fuel economy and increased engine life.

# CLEANING AND OILING THE BANKS RAM-AIR FILTER

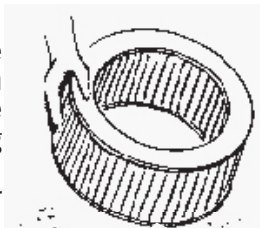
## Notification:

The Banks Ram-Air Filter comes pre-oiled and no oiling is necessary for initial installation.

Use Banks Ram-Air Filter cleaning system (part #90094), available from Gale Banks Engineering to service the Air Filter. Follow the instructions included with the cleaning system to clean and re-oil your Banks Ram-Air Filter.

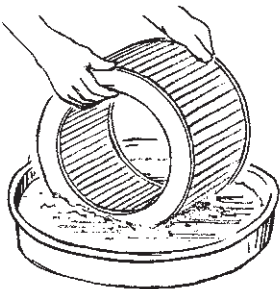
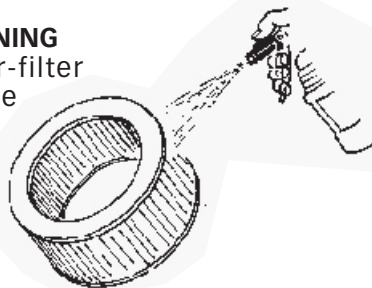
### 1. PRE-CLEANING

Tap the element to dislodge any large embedded dirt, then gently brush with a soft bristle brush. NOTE: If complete cleaning is not practical at this time, reoil the element and reinstall in your vehicle.



### 2. SPRAY-ON CLEANING

Spray Banks air-filter cleaner liberally onto the entire element and let soak for 10 minutes.



### PAN CLEANING

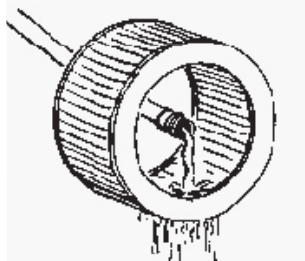
Large air-filter elements can be rolled or soaked in a shallow pan of Banks air-filter cleaner. Remove immediately and let soak for approximately 10 minutes.

### 3. CLEANING HINTS

Use only Banks air-filter cleaner. NO gasoline cleaning, NO steam cleaning, NO caustic cleaning solutions, NO strong detergents, NO high-pressure car wash, NO parts cleaning solvents. Any of these NOs can cause harm to the cotton filter media plus SHRINK and HARDEN the rubber end caps.

### 4. RINSE OFF

Rinse off the element with low-pressure water. Tap water is okay. Always flush from the clean side to dirty side. This removes the dirt and does not drive it into the filter.

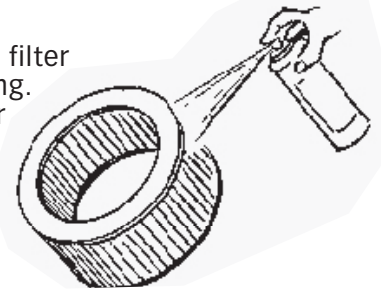


### 5. DRYING HINTS

Always dry naturally. After rinsing, shake off all excess water and let the element dry naturally. DO NOT USE COMPRESSED AIR – DO NOT USE OPEN FLAME – DO NOT USE HEAT DRYERS! EXCESS HEAT WILL SHRINK THE COTTON FILTER MEDIA. COMPRESSED AIR WILL BLOW HOLES IN THE ELEMENT.

### 6. AEROSOL OILING

After cleaning air filter always reoil before using. Spray Banks Ram-Air filter oil down into each pleat with one pass per pleat. Wait 10 minutes and re-oil any white spots still showing.



### 7. OILING HINTS

Never use a Banks Ram-Air filter without oil (the filter will not stop the dirt without the oil). Use only Banks Ram-Air filter oil. Banks air-filter oil is a compound of mineral and animal oil blended with special polymers to form a very efficient tack barrier. Red dye is added to show just where you have applied the oil. Eventually the red color will fade but the oil will remain and filter the air. NEVER USE Automatic Transmission Fluid. NEVER USE Motor Oil. NEVER USE Diesel Fuel. NEVER USE WD40, LPS, or other light-weight oils.

### 8. REINSTALL

Reinstall your Banks Ram-Air filter element with proper care. Make sure the element seats properly in the filter case. Install the cover making sure it's in the right position. Tighten all the nuts, bolts, screws or clips to factory specifications.

### 9. DO NOT DISCARD

Affix the "Do Not Discard" sticker to the filter case (included with every Banks replacement element). Make sure you put the sticker in a highly visible place to alert your mechanic not to discard.

### 10. PERFORMANCE HINTS

Service every 50-100,000 miles on street-driven applications. Service more often in offroad or heavy-dust conditions. If an air-filter restriction gauge is installed, then change the element when the air-filter restriction reaches 18"/H<sub>2</sub>O.

**CAUTION!** Extremely fine dust from agriculture or offroad use will pull the oil from the element. Frequent reoiling of the element's clean side might be required. Completely service when practicable. For extra protection use an air-filter sealing grease on rubber ends of the element. Service only with Banks air-filter cleaner and Banks air-filter oil.

# PARTS LIST – 21011/21019

## Sidewinder Turbo System, Ford 6.9/7.3 Diesel Van

QTY	DESCRIPTION	ITEM #	PART #	QTY	DESCRIPTION	ITEM #	PART #
1	BRACKET, Turbo Mounting	2	52155	2	STUD, 3/8" x 2"	55	91505
1	CHAMBER, Pressure	3	42070	5	WASHER, 1/4" SAE	61	91102
4	CLAMP, Hose, #16		92816	2	WASHER, 1/4" Stainless AN	62	91101
1	DECAL, Carb. E.O. -D-161-36		96029	2	WASHER, 3/8" SAE	41	91402
1	DECAL, Fed. Emis. Comp. Turbo		96020	8	WASHER, 3/8" Stainless AN	45	91401
1	FILTER ELEMENT, Air	6	41503	4	WASHER, 3/8" Circle Lock	42	91407
2	HEATSHIELD, Blanket, 6 x 14"		26001	1	WASHER, 3/8" Split Lock	43	91404
1	HEATSHIELD, Blanket, 7 x 24"	20	26002	1	WASHER, 3/8" Stat-O-Seal	56	91413
1	HEATSHIELD, Blanket, 9 x 24"	21	26003	4	WASHER, 5/16" Split Lock	40	91204
1	HOSE, Air Duct, 3" x 3'	32	94086	8	WASHER, 5/16" Stainless AN	44	91201
1	HOSE, Crankcase Vent.	28	94043	1	KIT, Fitting		92798
1	HOSE, Heater, 1" x .58'		94464	1	FITTING, 1/4" NPT x -4 AN Elbow	38	92110
2	HOSE, Splice, 1 x 1 3/4"	15	94050	1	FITTING, 1/8" NPT x -4 AN Elbow	37	92105
1	KIT, Small Parts		21031	1	FITTING, 3/16" Tee, Plastic		92009
1	ADAPTER, Crankcase Vent Hose	18	94042	1	FITTING, Oil Feed Tee	39	92006
1	ASSEMBLY, Air Inlet Elbow	16	42250	2	PLUG, 1/8" NPT, Hex Head	36	92250
1	BRACE, Air Inlet Elbow Assembly	17	42260	1	KIT, Hose		94356
1	BRACKET, Air Filter Mount.	5	42230	1	CAP, Rubber, Fuel Ret, 1/4"		92027
1	BRACKET, Dip Stick Tube		35299	1	HOSE, Turbo Oil Feed, 13 1/2"	29	94070
1	BRACKET, Glow Plug Relay	65	60081	1	HOSE, Turbo Oil Feed, 21 1/4"	30	94075
2	CLAMP, Exhaust, 2 1/2"	13	52461	1	HOSE, Fuel, 1/4" x 2 1/2'		94134
1	CLAMP, Exhaust, 3"	12	52465	1	HOSE, Fuel, 3/16" x 2 1/2'		94095
1	DRAIN, Turbo Oil.	8	24073	1	KIT, Pyrometer	14	64001
1	HEATSHIELD, Turbine	19	26021	1	MOUNT, Air Filter	4	42220
1	HOSE, Silicone, 2 x 2"	27	94251	1	MOUNTING PANEL, One-Gauge		63001-01
1	HOSE, Silicone, 3 x 1 3/4"	31	94281	2	NUT, Machine Screw,		91833
1	KIT, Clamp		92899	1	PLATE, Block Off, Intake Manifold	7	42130
1	CLAMP, Hose, #10		92810	2	SCREW, Machine		91834
2	CLAMP, Hose, #16	33	92816	1	SET, Gasket		93315
2	CLAMP, Hose, #36 w/Liner	34	92837	1	GASKET, Oil Drain	23	93040
4	CLAMP, Hose, #52 w/Liner	35	92853	1	GASKET, Pressure Chamber	22	93061
8	CLAMP, Spring Band		92875	2	GASKET, Turbine Outlet	24	93001
2	CLAMP, Spring Band		92877	1	GROMMET, Oil Drain	26	93043
1	KIT, Electrical		62100	1	O-RING, Manifold Block-off Plate	25	93150
1	KIT, Fastener		91011	1	SILICONE, Blue Gasket		90023
5	BOLT, 1/4" 20 x 3/4" Hex	60	91117	1	TAPE, Teflon, 1/2 x 100"		91099
2	BOLT, 1/4" 28 x 1" Hex	63	91140	1	THREADLOCKER, Blue, 6 mil		90001
2	BOLT, 3/8" 16 x 1/2" Hex	48	91425	1	TIE, Cable, 11" Black		62002
1	BOLT, 3/8" 16 x 3/4" Hex	46	91426	12	TIE, Wire, Heatshield Blanket, 16"		26013
3	BOLT, 3/8" 16 x 1" Hex	49	91427	1	WASHER,		91832
2	BOLT, 3/8" 16 x 1 1/4" Hex	50	91428	1	MANUAL, Owners, Ford 6.9/7.3 Diesel Van		96308
3	BOLT, 3/8" 16 x 2 1/2" Hex		91432	2	PLAQUE, Banks Sidewinder		96003
1	BOLT, 3/8" 16 x 4"	51	91437	1	PLUG, 1" NPT		92267
2	BOLT, 5/16" 18 x 1" Hex	47	91229	1	PIPE, Turbine Outlet	11	52165
6	BOLT, 5/16" 18 x 1" Stainless Hex	53	91228	1	PIPE, "Y" Assembly (for C-6 Trans. only)	10	52170
2	BOLT, 5/16" 18 x 2" Hex	64	91239	1	PIPE, "Y" Assembly (for E4OD Trans. only)	10	52171
5	NUT, 1/4" 20 Nylock	66	91110	1	PIPE, Extension, Y-Pipe (for C-6 Trans. only)	9	52175
2	NUT, 1/4" 28 Nylock	59	91111	1	PIPE, Extension, Y-Pipe (for E4OD Trans. only)	9	52176
6	NUT, 3/8" 24 Collet Lock, Stainless	52	91418	1	SERVICE KIT, Air Filter		90094
2	NUT, 5/16" 18 Nylock	58	91210	1	TURBOCHARGER, Banks Sidewinder	1	24004
4	STUD, 3/8" x 1 1/2"	54	91503	1	WARRANTY STATEMENT		96362

# TURBO DIESEL TROUBLE SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
High EGT	Excessive Fuel Delivery	Change injector pump setting
	Faulty injector(s)	Repair injectors
	Restricted exhaust system	Modify pipe layout for better flow, check for restrictive mufflers
Excessive fuel smoke (black), poor performance	Faulty injector(s)	Repair injector
	Dirty air cleaner	Clean or replace
	Restricted air intake	Check for collapsed or blocked air intake hoses
	Poor quality or dirty diesel fuel	Replace filters, clean lines, injectors and tanks as required
Excessive oil smoke (blue)	Blocked or restricted turbo oil drain	Eliminate restriction or low spots in drain line
	Leaking turbo oil seal	Replace turbo, replace seal; (Seal leakage may be caused by blocked turbo oil drain)
	Excessive engine blowby being vented into the air intake	Replace worn piston rings or valve guides. Check engine oil level.
Lack of boost, excessive oil smoke, and poor performance	Damaged turbo bearings and seal caused by dirty oil or lack of lubrication	Rebuild turbo, check oil level; Change oil and filter at regular service intervals
	Worn or damaged engine components	Check compression, Replace rings or valves

# TURBO DIESEL TROUBLE SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
Low boost, poor performance, sometimes with high EGT	Restricted exhaust system	Eliminate restrictions, modify pipe layout for better flow
	Muffler too small	Install recommended muffler
Lack of boost or low boost, poor performance	Intake system leaks	Locate and seal leaks; (Check seal between pressure chamber and intake manifold)
	Exhaust system leaks ahead of turbocharger exhaust inlet	Listen for leaks, repair as necessary
	Broken turbocharger blades caused by foreign objects entering intake or exhaust system	Rebuild turbocharger, eliminate means of foreign objects entry
Pyrometer not working	Check that wires are not reversed	Revise Wires
	Poor connections	Clean and secure connections
	Wiring connections shorted together	Insulate connections
Gradual loss of performance, and possibly boost ("Flatten out" at higher RPM)	Clogged (or partially clogged) fuel filter	Replace fuel filter(s)

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