

# OWNERS MANUAL

...with installation instructions

## **Banks PowerPack® TLC™ System**

**INCLUDING**

- **STINGER® TLC™**

**1998-2003 24 valve (Except Common Rail)  
Class-A Motorhomes with Cummins ISC  
315, 330 or 350 horsepower engine mod-  
els**

THIS MANUAL IS FOR USE WITH SYSTEMS 49296 & 49297

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

Product Information & Sales: (800) 438-7693

**bankspower.com**

**BANKS**

**Dear Customer,**

**If you have any questions concerning the installation of your Banks Power 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.**

## **Preparation and Precautions**

**1.** For ease of installation of your Banks system, familiarize yourself with the procedure by reading the entire manual before starting work. This instruction manual contains **12** pages of text, illustrations and parts listing.

**2.** Disconnect the ground cable from the battery before beginning work. If there are two batteries, disconnect both.

**3.** Route and tie wires and hoses a minimum of 6 inches away from exhaust heat, moving parts and sharp edges. Clearance of 8 inches or more is recommended where possible.

**4.** During installation, keep your work area and components clean to avoid possible dirt entry into the engine.

- Pocket knife or X-Acto knife
- Metric wrench or socket and ratchet set including 10mm, 13mm and 15mm
- $\frac{5}{16}$ " ,  $\frac{7}{16}$ " deep  $\frac{1}{4}$ " drive sockets
- $\frac{1}{2}$ " standard  $\frac{1}{4}$ " drive socket
- Long  $\frac{1}{4}$ " drive extension
- $\frac{1}{4}$ " ratchet
- (2)  $\frac{1}{2}$ " open end wrenches
- Inch-pound and foot-pound torque wrenches (suggested)
- Standard and Phillips-head screwdrivers
- Dead blow hammer
- Needle-nose pliers
- Standard pliers
- Rust penetrant (optional)
- Test light or multimeter
- Clean rags or shop towels
- Standard set of open-end wrenches
- Pry-bar or large water pump pliers
- $\frac{9}{16}$ " socket and ratchet or wrench
- Wire crimper/ stripper
- Drill motor
- $\frac{3}{16}$ " and  $\frac{7}{16}$ " drill bits
- $\frac{1}{4}$ " NPT tap and tap handle
- Heat gun or cigarette lighter (suggested)

### **TYPICAL TOOLS REQUIRED:**

# Installation Procedure

## TURBOCHARGER REMOVAL

1. Loosen the clamps that attach the air inlet tube to the inlet for the turbocharger, and remove the hose elbow from the inlet to gain access to the turbocharger.
2. Loosen the hose clamps on the turbocharger oil drain-tube hose, located between the two sections of the oil drain tube. Slide hose up drain tube towards turbocharger. Depending on the turbo orientation, the oil drain tube may need to be completely removed prior to removing the turbocharger.
3. Disconnect the oil supply hose at the turbocharger.
4. Remove compressor outlet boost tube hose from compressor outlet elbow. Leave the elbow attached to the compressor housing. Stuff a small shop towel or rag into the end of the boost tube to keep foreign objects from entering.

5. Remove exhaust V-band clamp and loosen any remaining clamps to allow the turbine outlet pipe to be pulled away from the turbocharger.

6. Note the orientation of the compressor housing and stock boost reference nipple in the vehicle. The Banks BigHead actuator must be installed in the same orientation. When the new assembly is installed the orientation of the compressor outlet should remain the same. Remove the turbocharger mounting nuts and the turbocharger from the exhaust manifold.

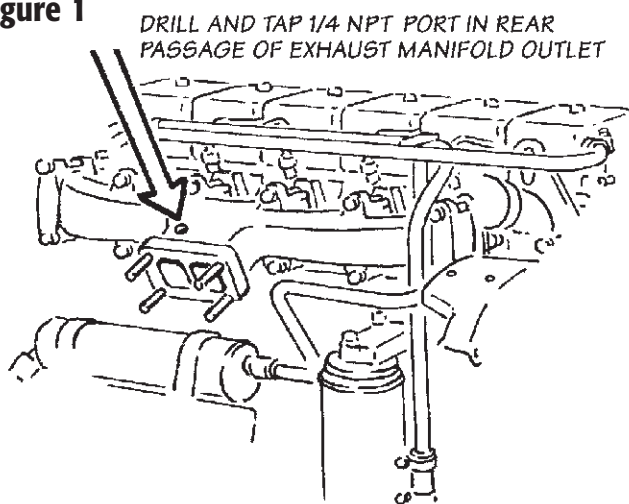
**CAUTION: Anytime the turbocharger is removed from the engine, take care that no foreign objects enter any of the turbocharger connections on the engine or the turbocharger. Foreign objects entering air, exhaust, or oil connections may cause major damage to the engine and/or turbocharger and is not covered under any warranty. Cover the open end of**

**the intercooler pipe with a rag, as this pipe is very susceptible to foreign object entry.**

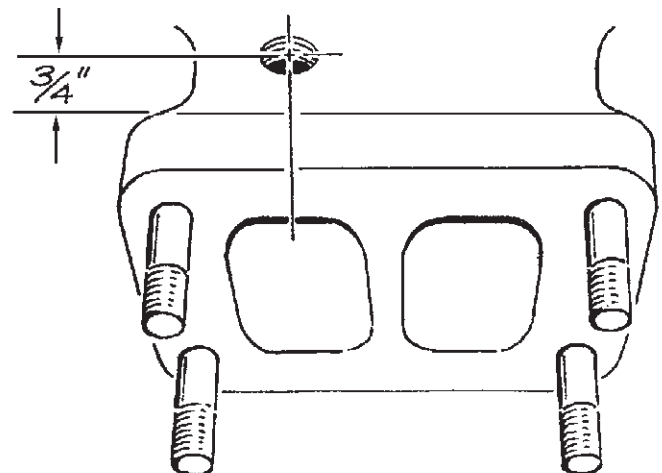
## THERMOCOUPLE INSTALLATION

7. Clean and inspect the exhaust flange mounting surfaces on the exhaust manifold. Make sure the surface is clean and dry.
8. Stuff a small shop towel or rag 4 to 5 inches into the rear exhaust manifold passage through the turbocharger mounting flange. This is to prevent chips from entering the manifold while drilling and tapping. The Cummins ISC engine uses a divided exhaust manifold and turbocharger. The thermocouple must be installed to sample exhaust temperature in the rear exhaust passage (toward the flywheel).
9. Drill through the exhaust manifold into the rear passage at the location shown in **Figure 1**. Use a  $\frac{7}{16}$ " drill, keeping the drill perpendicular to the manifold surface.

**Figure 1**



LOCATE PORT 3/4 INCH BEHIND FLANGE, CENTERED OVER REAR EXHAUST MANIFOLD PASSAGE



**10.** Tap the drilled hole with a ¼" NPT pipe tap. Check the thread depth as you tap by periodically removing the tap and screwing the thermocouple into the tapped hole. The thermocouple should thread in 3 to 3½ turns hand tight. Do not install the probe in place at this time.

**11.** Remove as many loose chips as possible from the exhaust manifold. A shop vacuum, small brush or fingers will help. Now remove the rag using a coat hanger bent into a hook.

**Caution! Make sure rags are removed from exhaust manifold prior to reinstalling turbocharger!**

**12.** Install the thermocouple in the manifold using anti-seize on the threads.

*For PowerPack installation, proceed to Step 17.*

### **BIG-HEAD ACTUATOR INSTALLATION**

**13.** Before removing the stock actuator, note the orientation of the boost reference nipple. The Banks BigHead actuator will need to be installed in the same orientation. Remove the e-clip holding the actuator rod end to the wastegate arm. Unbolt the three actuator bracket bolts from the turbine housing. Note the location of all spacers and retain the spacers and bolts for reinstallation. Remove the two nuts holding the actuator to the bracket and remove the actuator.

**14.** Install the Banks BigHead actuator in place of the factory actuator using the two ⅞" long hexagonal spacers provided. The spacers are provided to clear the turbocharger compressor housing on some installations.

**15.** Turn the rod end link on the threads of the actuator rod until the hole lines up with the pin on the wastegate arm. Turn the rod end clockwise an additional six full turns such that it will preload the wastegate.

**16.** Apply a regulated supply of air pressure to the nipple of the actuator until the rod extends enough to slip over the wastegate arm. Reinstall the e-clip on the wastegate arm. An extra e-clip is supplied in the kit. Tighten all bolts and nuts that remain loose.

### **TURBOCHARGER DISASSEMBLY and RE-ASSEMBLY**

**17.** Clamp the turbine inlet flange of the turbocharger in a bench vise. Loosen the six bolts attaching the turbine housing to the center bearing section of the turbocharger. See **Figure 2**.

**18.** Remove the bolts, lock plates, and/or clamp plates. Carefully remove the center bearing and compressor assembly from the cast iron turbine housing. If the turbocharger has been in service for some time, rust and carbon may prevent the center bearing and compressor assembly from easily separating from the turbine housing. If light hammer blows, penetrating oil

or heat will not free the compressor assembly from the turbine housing, the clamp bolt adjacent to the turbo oil inlet connection may be backed out so as to push against the bearing casting and separate the two components. Remove any loose rust or carbon from the bearing housing that might prevent proper engagement into the new turbine housing.

**19.** Install the center bearing and compressor assembly into the new Banks Quick-Turbo turbine housing. Apply a dab of anti-seize compound to the bolts, and then install bolts, clamp plates, and lock plates finger-tight to allow for final positioning. If the Banks BigHead actuator is installed on the bracket in the wrong orientation, remove the actuator and rotate it 180 degrees. Do not change the length of the actuator rod. Re-install by applying regulated shop air to the boost reference nipple until the rod end drops over the wastegate arm. Re-install e-clip.

### **TURBOCHARGER INSTALLATION**

**20.** Install the new turbine inlet gasket provided and apply a dab of anti-seize compound to the four turbo mounting studs. Install the turbocharger on the exhaust manifold. Tighten the turbocharger mounting nuts to 24 ft-lbs.

**21.** Align the compressor outlet elbow with the boost tube and tighten the clamp. Tighten the turbine housing clamp plate bolts to 11.3N-m (100 in.-lb.) torque.

Spin the turbocharger shaft to make sure it turns freely. If not, loosen the turbine clamp plate bolts and check for misalignment between the turbine housing and turbocharger center section. Retighten bolts and check again.

*NOTE: If alignment cannot be achieved by loosening and retightening the bolts, it may be necessary to clean rust or deposits from the engaging portion of the center bearing housing. Refer back to Step 18.*

Reconnect and tighten the turbo oil supply hose.

**22.** Slide oil drain hose into position and tighten clamps. Replace gasket with new one provided, if drain line was removed.

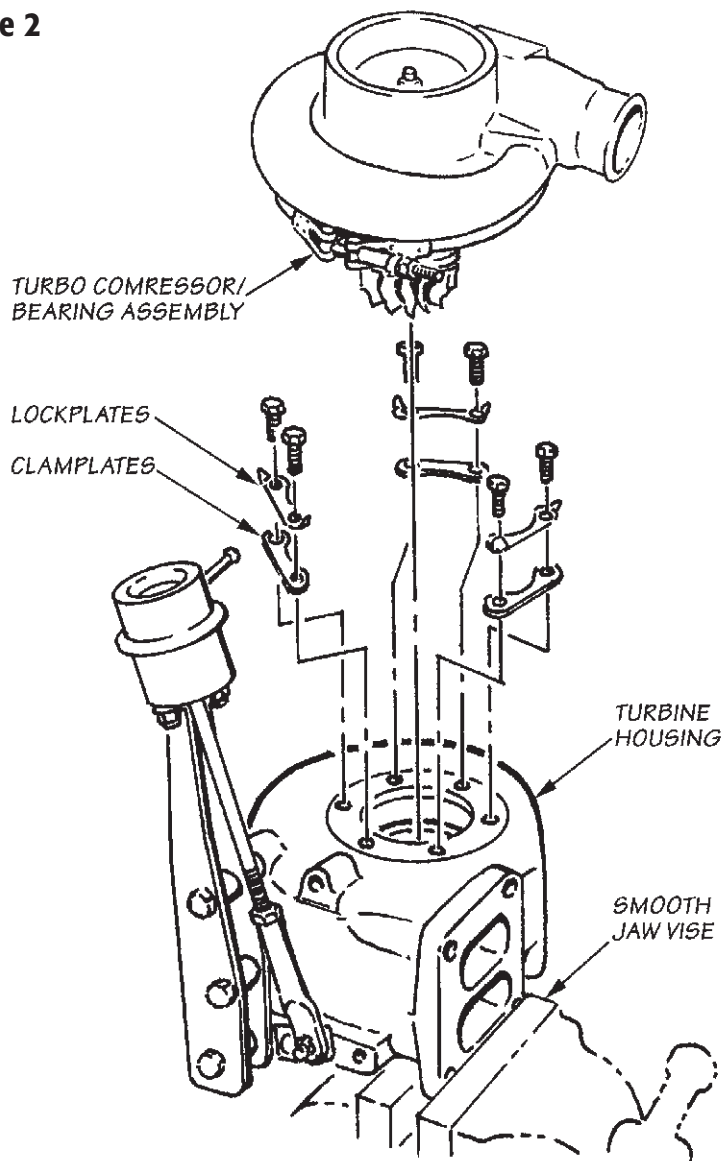
**23.** Install the air inlet tube (from the air cleaner housing) and the turbo exhaust pipe onto the turbocharger. Reattach the wastegate actuator boost line using a crimp lock clamp provided. A length of blue silicone hose is provided for boost line if needed.

### OTTOMIND INSTALLATION

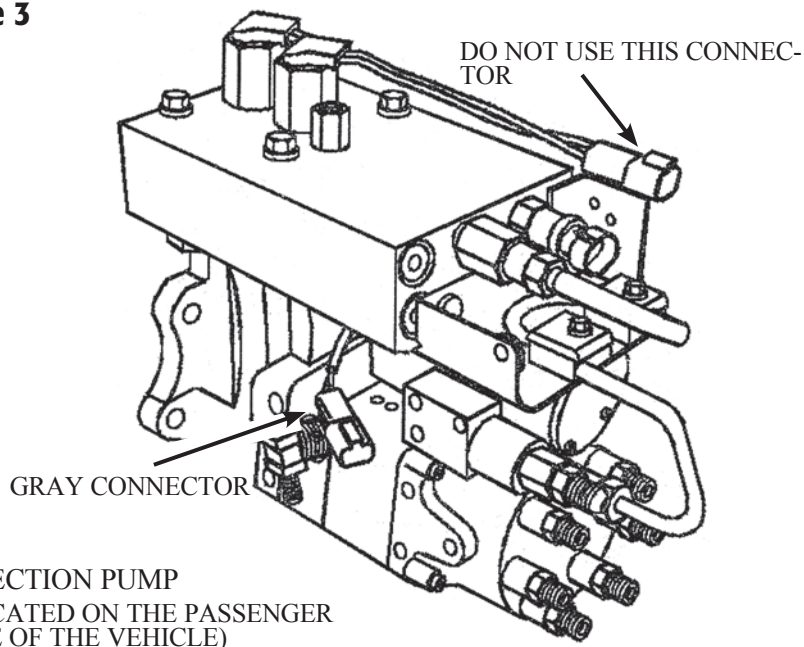
**24.** Locate a gray, rectangular, 4-wire connector on the fuel injection pump. See **Figure 3**.

**IMPORTANT: Do not confuse this connector with an identical one located slightly above the injection pump near the valve cover of the engine. The connector may be painted to match engine color.**

**Figure 2**



**Figure 3**



Unplug the connector and plug the corresponding connectors on the OttoMind wire loom into the factory connectors.

**25.** Plug the Manifold Absolute Pressure (MAP) sensor into the OttoMind main wiring loom. Locate the MAP sensor on the intake manifold. It will be located toward the back of the engine (toward the flywheel). Unplug the factory connector and plug the corresponding connectors on the OttoMind wiring loom into the sensor and the factory wire loom.

**26.** Locate the 2-pin power source connector in the main loom of the engine. This will be a 2-pin black connector with a cap located near the engine identification tag. It will most likely be fastened to the loom with nylon ties. Cut the nylon ties and remove the cap, exposing the connector. Plug the corresponding connector on the OttoMind wire loom into the power source connector. This connector may not be available on some installations. If not, use extension harness provided to tap into a key-on 12v power source within the engine compartment. Install 5 amp fuse in fuse holder.

**27.** Locate the bulkhead connector for the transmission wiring. This will be on the driver's side of the coach near the output end of the transmission (away from the engine). See **Figure 4**. Expose the wires on the bulkhead side of the connector and locate wire number "107-T3." This wire is normally green (but may

be another color) and should have its name printed on it. This wire goes to cavity "E" in the bulkhead connector. Install a T-Tap on this wire.

**28.** Connect the blue wire with the male spade connector to the T-Tap.

**29.** Determine a good mounting location for the OttoMind. Make sure that it is in a location that is clear of water or debris from the road. Using the two holes in the mounting bracket, and the sheet metal screws provided, mount the OttoMind to a suitable location such as underneath the bed over the engine compartment.

**30.** Plug the main connector from the wire loom into the OttoMind connector.

**31.** Connect the corresponding leads of the thermocouple leadwire to the thermocouple. Route the leadwire across the engine bay toward the OttoMind. Plug the remaining end of the leadwire into the proper port on the OttoMind. Secure the leadwire with the provided cable ties away from heat and moving components.

#### **GAUGE INSTALLATION**

**32.** Choose a suitable location under the lower edge of the dash panel for mounting the instrument panel provided where it can be conveniently viewed by the driver. *Note: Molded instrument consoles for top-of-dash mounting and additional gauges are available through Gale Banks Engineering.*

**33.** Using the panel as a template, drill two  $\frac{3}{16}$ " diameter holes in the dash and mount the panel with two no. 10 x  $\frac{1}{2}$ " machine screws, nuts and star washers provided.

**34.** Locate the gauge wire loom with the 4-pin connector in the Banks system. Plug the connector into the corresponding location on the OttoMind box. Route the wire loom from the OttoMind box toward the gauge location.

**35.** Install the DynaFact boost and pyrometer gauges in the mounting panel using the clamps and thumbnuts provided. Plug the BLACK wire lead to the male spade terminal on the BLACK wire of each gauge wire harness. Plug the YELLOW wire into the Yellow wire of the boost gauge wire harness and the RED wire into the RED wire of the pyrometer gauge wire harness. The GREEN wire remains unused.

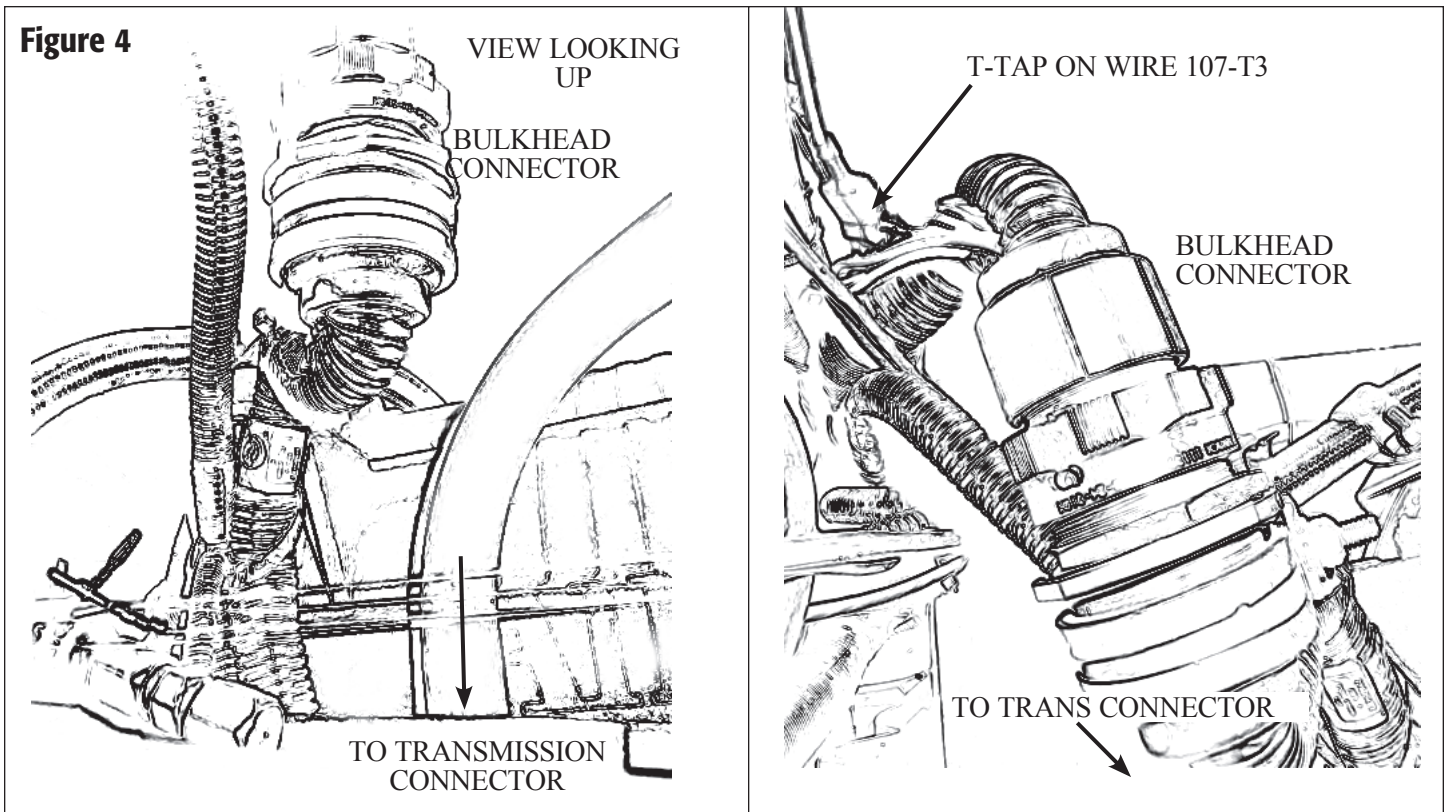
**36.** Connect the 4-pin connector of each gauge into the back of its corresponding gauge.

**a.** Crimp the remaining Black and RED wires from each 4-pin connector gauge harness to the butt connectors as shown in Figure 5.

**b.** Strip one end of the RED wire and crimp it to the butt connector containing the RED wires from step 'a'.

**c.** Strip one end of the BLACK wire and crimp it to the butt connector containing the BLACK wires from step 'a'.

**Figure 4**

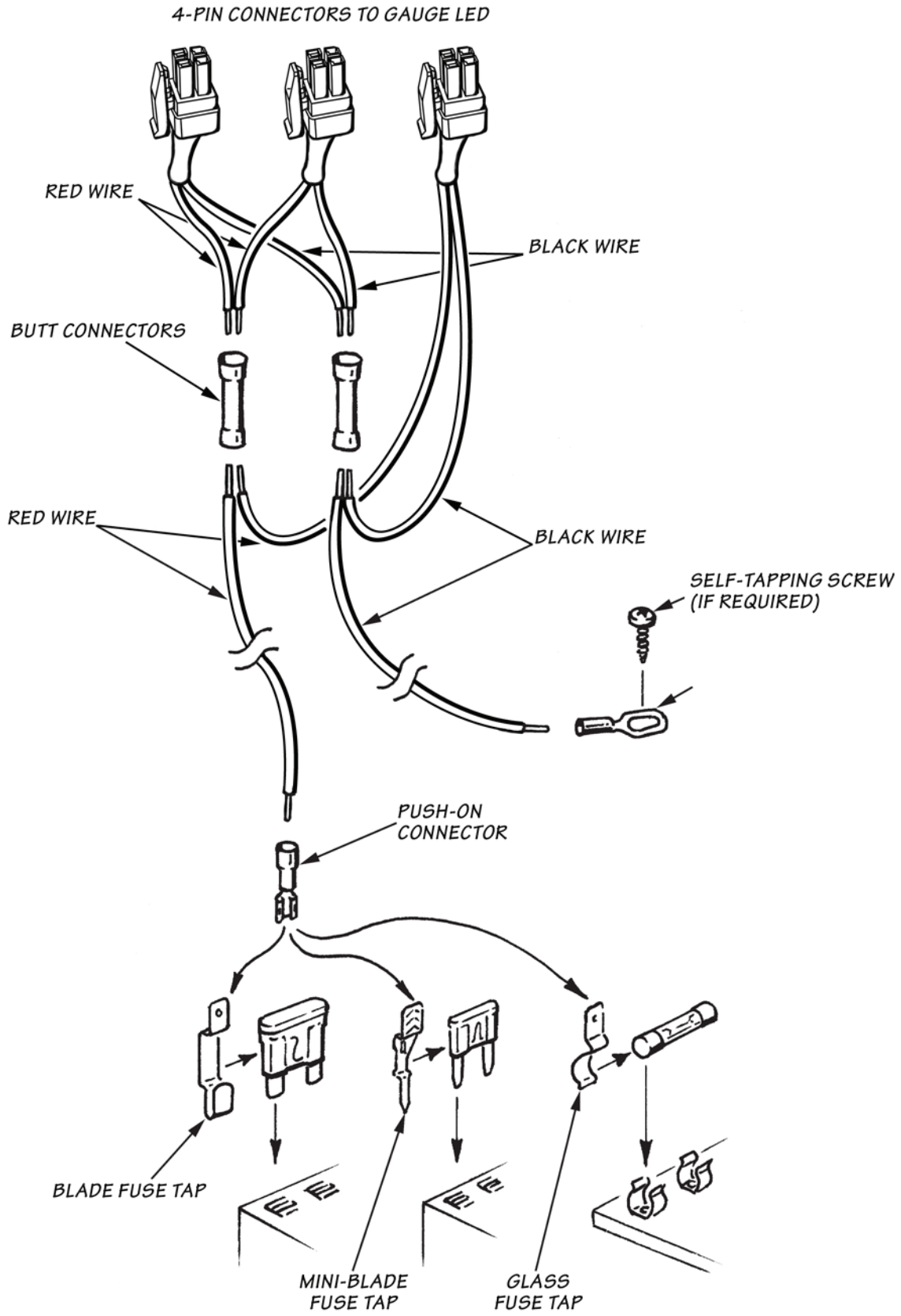


**d.** Route the RED wire to the fuse box. Locate the appropriate fuse for instrument lighting in the owner's manual. Cut the RED wire as required and strip the end. Crimp the push on connector to the RED wire and connect to the fuse as shown in Figure 5. Alternatively, locate power wire to dimmer switch and install T-tap. Cut the RED wire as required and strip the end. Crimp the push on T-tap connector to the RED wire and connect to T-tap on dimmer power wire.

- e.** Locate a metal surface that will serve as an acceptable chassis ground. Cut the BLACK wire to a sufficient length that will allow it to reach the chassis ground and strip the end. Crimp the ring terminal to the BLACK wire as shown in Figure 5.
- f.** Drill a 1/8" hole, if required, to attach the ring terminal to the chassis ground. Caution: If drilling, check the backside to make sure there are no components that may be damaged by drilling.

**g.** Use the supplied self-tapping screw to secure the ring terminal to the chassis ground.

**Figure 5**



# Checking Engine Performance

Go over the entire installation as a precautionary check to ensure that all clamps are tight, wiring and hoses are properly routed, and connections are tight. Start the engine and allow it to warm up. Drive the vehicle under light load (normal around-town driving) for 20 to 30 minutes, and listen for any exhaust leaks or rattles, or intake boost leaks. Shut off the engine and re-tighten all intercooler and turbocharger boost clamps. These connections may have loosened with time, and if leaking, will cause a drop in boost pressure with a loss in performance. Check that clamps are properly positioned on hoses, and periodically check tightness of hose clamps at regular maintenance intervals, such as when the oil is changed.

Observe the operation of the boost and pyrometer gauges while driving under varying conditions. Turbocharger boost pressure will increase as a function of load and engine RPM, thus the engine will produce little boost while cruising at light throttle, with maximum boost while climbing hills heavily loaded and during acceleration. Note the boost level seen during hard acceleration with a given load. If performance seems to have deteriorated sometime in the future, the maximum boost figures may be compared to see if boost has dropped off. Lower boost may be

caused by turbo ducting leaks, a malfunctioning wastegate or fuel injection pump, or dirty air filter. Typical maximum boost pressure settings may vary considerably with model year of vehicle, engine CPL and altitude.

Use your pyrometer gauge to monitor exhaust gas temperature (EGT) in the engine. At idle, exhaust gas temperature will be very low, perhaps only 300° F. As the engine is accelerated for higher speeds with 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.

A bypass plug is included in the kit. If the OttoMind module must be removed for any reason, install bypass connector on end of main wire harness.

Your OttoMind is calibrated to maintain a maximum EGT of 1300°F. The EGT may exceed 1300° for short periods of time during high-load conditions. This is normal and EGT should return to at or below 1300° within a few seconds. If you find that EGT remains high for any length of time, check for boost leaks of a dirty air filter. If the condition persists, contact our technical service department at (888) 839-2700.

## Parts List:

**1998-2003 24 valve (Except Common Rail) Class-A Motorhomes with Cummins ISC 315, 330 or 350 horsepower engine models**

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ASSEMBLY, Quick-Turbo w/ Big Head Actuator (PowerPack only)

ACTUATOR, Big Head (Stinger only)

OTTOMIND TLC

HARNESS, Main Wiring

THERMOCOUPLE

GAUGE, Pyrometer

GAUGE, Boost

LEADWIRE, Pyrometer

HARNESS, Gauge Wiring

PANEL, Two-Gauge Mounting Kit

(2) CLAMP, Spring Band

KIT, Light Wiring

CONNECTOR, T-Tap

(2) SCREW, Sheet Metal

ANTI-SEIZE

GASKET, Turbine Inlet

FUSE, 5A

HARNESS, Power Extension

E-Clip

GASKET, Oil Drain

SILICONE HOSE

BYPASS PLUG

(6) CABLE TIE, 8"

(3) UROCAL

OWNERS MANUAL

CARD, Product Registration

WARRANTY STATEMENT, 2 year

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