



INSTALLATION INSTRUCTIONS
Diesel Stage 3 Boost Cooler™
WATER-METHANOL INJECTION
SYSTEM



 **CAUTION**

You must completely read through these instructions before installing and operating this product. Failure to do so can result in damage to this product and the vehicle.

Introduction

The Snow Performance Boost Cooler® Diesel Stage 3 water injection system provides more power, cooler EGTs, and excellent fuel economy increases. The Stage 3™ system does not require a sustained high load state in order to provide maximum fuel economy gains. The Stage 3™ system uses a new injection management controller that allows for a small spray of water to be injected across the power curve. This provides an increase in combustion efficiency which provides more power without injecting more diesel fuel. This increase in efficiency translates into an increase in fuel economy. Typical fuel economy increases are 3%-5%.

The Stage 3™ system has a secondary output that is used to activate a Power Mode. This introduces a second phase of injection. A larger nozzle(s) is used to inject more fluid to make more power. The Power Mode activation point is adjustable for best performance.

Because the Stage 3™ system injects more frequently, the fluid consumption rate will be higher than other Boost Cooler systems.

The Stage 3™ system has been coupled with the Snow Performance 7 Gallon Reservoir to provide a large fluid tank that fits well into the bed of a truck. This will provide the longest range possible and includes the necessary installation hardware.

Completely read through this instruction manual before attempting installation. Contact Snow Performance Technical Support for any questions or concerns.

Reservoir Installation

- Install plastic reducer bushing and 90° quick connect fitting or 90° 4AN fitting into reservoir outlet. Use E6000® sealant on threads.



- Test fit reservoir in desired mounting location. Typical placement is tucked up along the side of a pickup bed or in a bed mounted tool box.
 - Check the area under the bed near the desired mounting location. Note the location of fuel tanks, fuel lines, and wiring.
 - Mark the location of the four aluminum mounting strap tab bolt holes.
 - Drill through bed with appropriately sized drill bit. **USE CAUTION WHILE DRILLING.**
 - Mount reservoir with aluminum mounting straps using supplied hardware.
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Pump Installation

Braided Line Kits Only- Install (2) 3/8" NPT to 4AN Straight fittings into the pump inlet and outlet using E6000® sealant on the threads. **Do not overtighten as damage to the pump housing can occur.**

Quick Connect Kits Only- Remove the blue rubber plugs from the quick-connect fittings by first pushing the plug toward the pump, hold the grey collar against the pump, and gently pull the blue plug from the fitting.

Warning: Pulling against the quick connects with excessive force may cause fitting damage.

Step 1: Position the fluid pump so that the inlet is positioned at or below the lowest point of the reservoir, and within two feet of the reservoir. (Pump can be installed in any orientation). This will ensure the pump is primed with fluid for optimal flow and pressure to the nozzles.

****Arrows on the pump inlet and outlet indicate the direction of fluid flow****



Step 2: Install the fluid pump with four (4) #8x1&1/2" screws and four (4) #8 washers (supplied) in desired mounting location. Typical locations are next to the tank in the bed or underneath the bed on frame rail.

Step 3: Fit the high temp nylon tubing or braided line between the tank outlet fitting and the pump inlet, ensuring there are no kinks in the line and there is no stress on the fittings. Sharp kinks/bends can cause a leak in the system.

Quick Connect Kits Only- Once high temp nylon is measured from tank outlet to pump inlet cut tubing using razor blade. Remove any burrs so that the fluid line properly seals against the internal o-rings inside the quick connect fittings. Insert tubing into the quick connects until fully seated, and pull lightly against quick connects to ensure proper installation between tank outlet to pump inlet

Nozzle Installation

Nozzle sizing is a function of horsepower, which approximates the engine airflow, and boost, which approximates intake charge heat.

Recommended starting points:

HP	MPG MAX	POWER MODE
350 > WHP	175 ml/min	375 ml/min
400 - 500 WHP	175 ml/min	625 m/min
500 < WHP	375 ml/min	625 ml/min

Assemble desired nozzle into nozzle holder using E6000® sealant. **The end of the nozzle with the fine mesh screen is to be inserted into the nozzle holder.** Torque 1/2 turn past finger tight. Do not use Teflon sealants on Snow Performance fittings.



Correct

The nozzle is mounted using its external 1/8 NPT threads. Tighten the nozzle and nozzle holder assembly one half turn past finger tight using E6000® sealant to seal the threads. Note that the nozzles can be mounted almost anywhere at or before the inlet to the intake. They must be located after the turbo and intercooler however. Ideal locations are usually immediately before the intake itself on the tube coming from the intercooler outlet. Ensure that the nozzle has a clear spray pattern into the airflow, and that the tip of the nozzle is flush with the inner wall of the pipe or protruding slightly into the airflow.

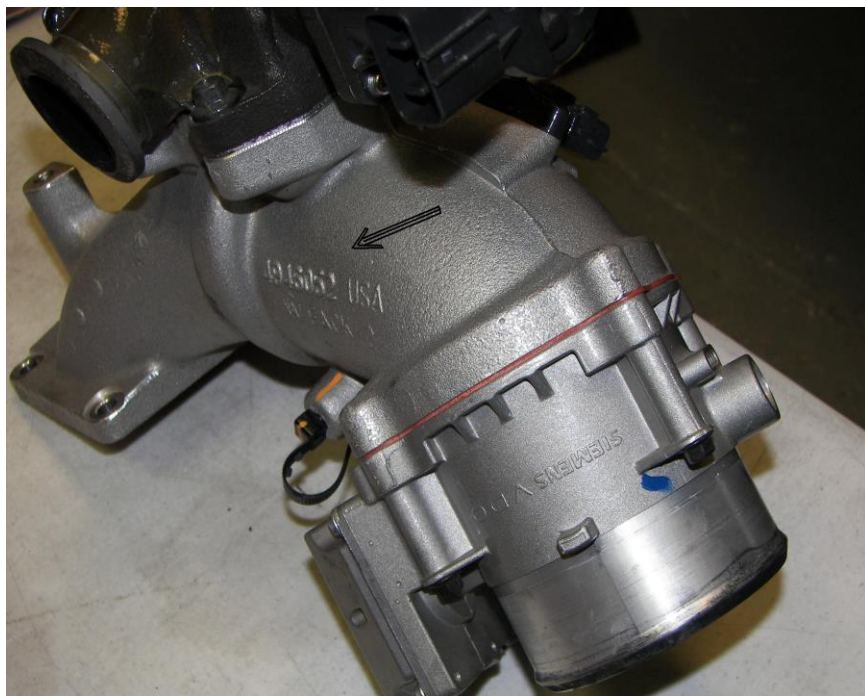


Correct

Dodge Applications:

5.9L Cummins:





6.7L Cummins:

Nozzles are mounted in the cast intake elbow located on the driver's side of the engine. This elbow houses the EGR valve, EGR throttle plate, and the MAP sensor.

Recommended location is after the EGR throttle plate – indicated by arrow in photo.

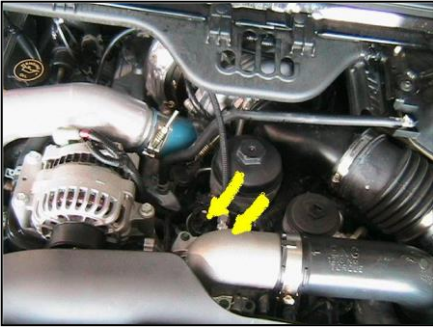
Tip: It is recommended that the cast elbow be removed before drilling and tapping.

Tip: Mount nozzles in the middle of the elbow on the front side approx 3" apart so spray is 90° to airflow.

Tip: To make sure there is no pooling of fluid while injecting, make sure nozzle tip is at least flush with the inside of the elbow when tightened.

Ford Applications:

6.0L Powerstroke:



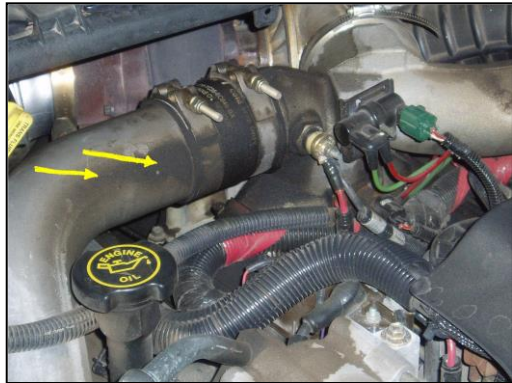
6.4L Powerstroke:



6.7L Powerstroke:

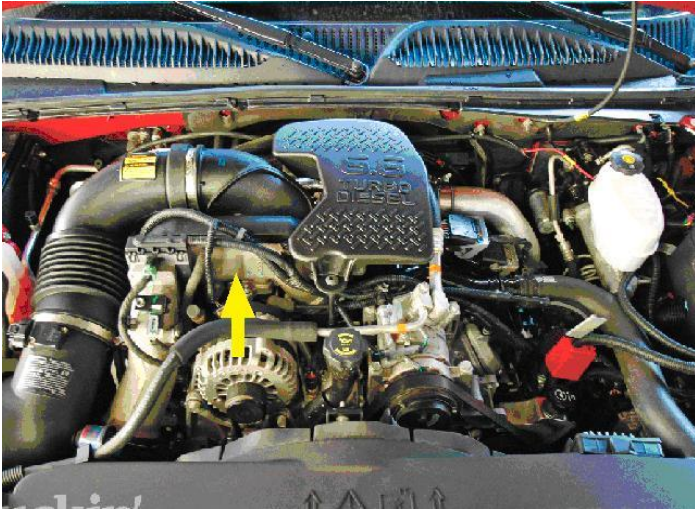


7.3L Powerstroke



GM Applications:

2004-2007 LB7, LLY, LBZ



2007-10 LMM



2011-Up LML



Nozzle/Solenoid/Check Valve (Quick Connect Kits)

Solenoids are flow directional. Be sure to note which port is the INLET/PRESSURE port (2 or IN) and which is the OUTLET port (1 or OUT).

The main outlet line coming from the Reservoir connects to the first solenoids inlet. The outlet of this solenoid connects to the inlet of the pump. The outlet of the pump connects to the Union "T". One outlet of the tee goes to the small nozzle and the other outlet of the tee connects to the second solenoid inlet. The outlet from the second solenoid will connect to the larger nozzle.

Measure the distance from the pump outlet to the injection location. Cut the 1/4" red tubing using utility knife. Make cuts as square as possible.

Ensure there are no kinks in the tubing and insert tubing into quick disconnects until fully seated. Gently pull on tubing to ensure a good connection. Use tie wraps to help route tubing and to ensure it doesn't contact moving or hot parts in the engine compartment.

The check valve assembly will ensure that boost pressure does not back-feed air into the system or siphon due to engine vacuum. Ensure the check valve is installed with the arrow pointing in the direction of flow. The Check valve will be installed between the pump outlet and T fitting. Install check valve as close to T fitting as possible.

Quick Connect Kits Only- Fit the NPT thread to push connect adapters in both sides of the check valve using E-6000 sealant on the threads. Press the high pressure



tubing in each fitting, ensuring the check valve is oriented properly in the direction of flow.

Nozzle and Solenoid Connection (Braided Line Kits)

Solenoids are flow directional. Your solenoids come pre-installed on a distribution block. Before installing on vehicle remove all NPT threaded fittings and install E6000 sealant on threads / re install. Typical install locations are on firewall of vehicle within 2 feet of nozzle locations. Use supplied self-tapping screws/washers to install in desired location.

The pump outlet connects to the 20' section of braided line and then to the check valve inlet. Using the 2' sections of braided line connect both the distribution block outlets to the nozzle holder fittings in intake.

Install EGT Probe

Drill and tap (1/8"-27 NPT Tap, 11/32 pre-drill) exhaust manifold pre-turbo. Remove manifold prior to drilling.

Mount the Temp Probe using the compression fitting (provided).

Dodge Applications:



Ford Applications:

6.0L/6.4L Powerstroke:

The EGT probe can be mounted in the bend on the driver's side exhaust manifold.



6.7L Powerstroke:



6.7L EGR tube mount.



Temp probe must protrude into exhaust. Do not kink probe or use pliers to bend. Mount the Temp Probe using the 3/16" compression fitting (provided).

7.3L Powerstroke:

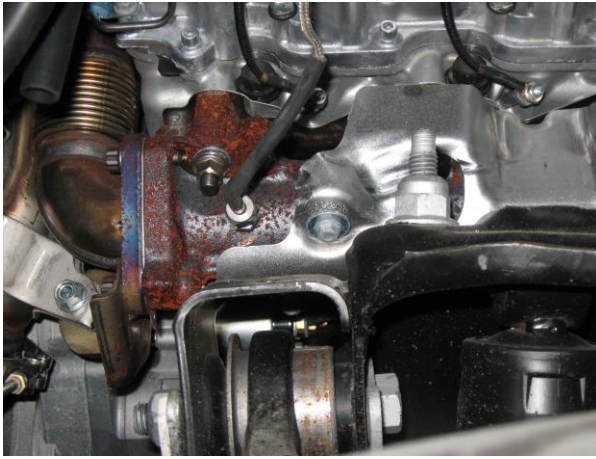
The EGT probe can be mounted in the drivers side exhaust manifold pre-turbo. Mount the Temp Probe using the 3/16" compression fitting (provided).



GM Applications:

Drill and tap exhaust manifold pre-turbo. If this is performed with the exhaust manifold still on the engine, start the engine and let it idle while drilling and tapping. This will prevent shaving from entering the exhaust and turbo. During tapping, coat tap with heavy grease so it will collect any metal shavings.





The passenger side exhaust manifold can be reached by removing the inner fender skirt, and accessing through the fender well.

Stage 3 Controller Installation



Attach controller to secure location with easy access in driver's compartment using supplied tape. Install brass hose barb into intake tubing 3" prior to nozzles. Connect black silicone tubing from brass hose barb to clear tubing coming from the controller and secure with a tie wrap.



CAUTION: Disconnect the negative battery terminal while connecting wires to prevent electrical fire or damage to controller.

- Connect BLACK to a good ground location.
- Connect WHITE wire to Pump RED power wire.
- Connect GREEN wire to one BLACK wire from solenoid. Connect other BLACK wire to ground.
- Connect RED wire to inline switch and then connect to +12V key on source.
- Connect GREY wire to second ground location.
- Wire the Yellow "K" type temp probe connector to temp probe installed in Step 6 above. The YELLOW wire connects to the POSITIVE terminal, the RED wire connects to the NEGATIVE terminal of the connector. Connect to the lead from control module.



TECH TIP

Always have a good electrical ground connection. Poor ground will result in erratic operation.

Controller Operation

The controller has an LCD display screen that has three display modes, and seven control/setup screen.

To control the screen selection, the unit has two operator buttons; one to the left of the screen (button 1) and one to the right of the screen (button 2). Pressing and releasing button 1 will cause the display to change to the next screen. Button 2 is only active in the control/setup screens, and is used to change the current control setting of the setup screen displayed.

The system memory will remember the current display setting even if the unit is turned off. The controller will turn on at the last used display setting.

READ ONLY MODE – The controller has a read only mode and is only indicated on a screen that displays percent of injection. When in Read Only Mode, boost pressure and EGT's will be displayed but the controller will not display or command any percent of injection. Read Only Mode is when you want to use the controller as a gauge only, or to get baseline readings for controller setup.

Pressing and holding button 2, then pressing button 1, then releasing both buttons will change the system to read only without changing the display screen. The pump will not activate in read only. All screen display functions will remain active even when the injection is turned off. To get the controller out of read only mode simply repeat the procedure.

Display Screens



This mode displays Boost Pressure (P), EGT Temperature (T) and the Percentage of Injection (Inj) as three independent bar graphs.



This mode displays the Boost Pressure and EGT temperature in PSI and degrees F.



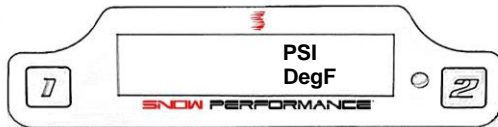
This mode displays the Boost Pressure and EGT temperature in BAR and degrees C.



This mode displays the Boost Pressure, EGT Temperature and injection in Standard units.



This mode displays the Boost, EGT and Injection in Metric units

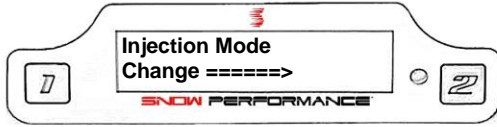


This display shows both digital and bar graph readings for Boost Pressure and EGT Temperature in Standard units.



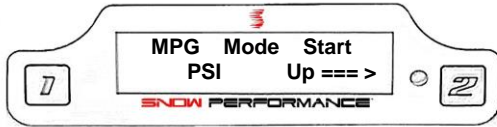
This display shows both digital and bar graph readings for boost and EGT in Metric units.

Control/Setting Screens



This is the setup screen for the control mode. Pressing the right button (# 2) will toggle the setting between MPG and Tow. If Tow is selected, the 2-D matrix value for the injection is used. If MPG is selected, boost alone will determine injection. Tow mode is used in loaded or towing situations. MPG injection is used in day to day driving and high-performance situations.

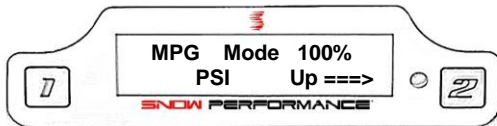
MPG Mode Settings



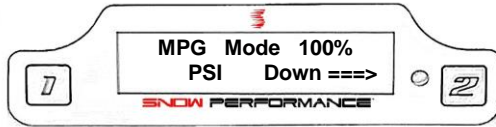
MPG MODE START - UP. Pressing and releasing button 2 will increase the injection activation point. **This should be set 2psi above your vehicle's unloaded flat land cruising boost.**



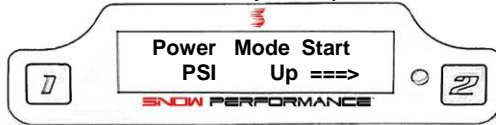
MPG MODE START - DOWN. Pressing and releasing button 2 will decrease the injection activation point.



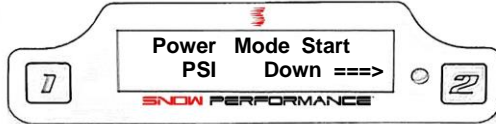
MPG MODE 100% - UP. Pressing and releasing button 2 will increase the maximum injection point. **This should be set at your vehicles ½ throttle boost PSI**



MPG MODE 100% - DOWN. Pressing and releasing button 2 will decrease the maximum injection point.



POWER MODE START - UP. Pressing and releasing button 2 will increase the Power Mode injection activation point. **This should be set to 75% of your vehicles max boost pressure.**

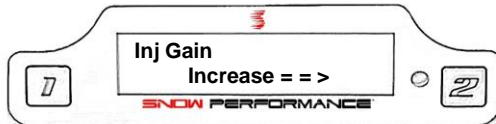


POWER MODE START - DOWN. Pressing and releasing button 2 will decrease the Power Mode injection activation point.

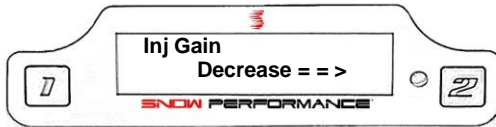
Tow Mode Settings



This screen is used to select between LOW, MED, and HI boost mode. **For vehicles making 8-18 psig of boost, use LOW mode. For vehicles making 18-25 psig of boost, use MED mode. For vehicles making 25+ psig of boost, use HI mode.**



This screen is used to increase the injection gain setting. Pressing and releasing button 2 will increase the gain setting. **Changes in gain affect injection in Tow Mode only. 5%-10% changes make a big impact.**



This screen is used to decrease the injection gain setting. Pressing and releasing button 2 will decrease the gain setting.

Variable Controller Tuning

MPG MODE

In MPG mode, injection is commanded by boost pressure only. The MPG mode is meant to inject a small amount of fluid just above your vehicles cruising load state.

If combustion quench occurs as evidenced by engine bucking, bogging, or white smoke from the exhaust then too much fluid is being injected too soon. To prevent quench in MPG Mode try the following:

- Adjust the MPG MODE START point to come on at a higher boost level. Adjusting the 100% point higher will also help reduce quench.
- Change out MPG MAX nozzle to the next size smaller.

If quench occurs when the POWER MODE (Red LED on Controller is ON) activates try each of the following:

- Toggle to the POWER MODE START point to come on at a higher boost level.
- Change out POWER MODE nozzle(s) to the next size smaller.

An example of a vehicle with a max boost of 30psi and a flat land cruising boost of 8psi should be set up with the following settings:

MPG Start 10psi
MPG 100% 18psi
Power Mode Start 23psi





The Stage 3® system is not designed to inject at normal cruising conditions. Injecting constantly will damage the controller and/or pump. For best gains the controller should inject just above cruising boost



CAUTION: Prolonged quench may cause lower engine damage over a period of time.

TOW MODE

In Tow mode, the controller will measure EGTs and boost pressure to calculate the injection rate. Based on these two inputs, the controller uses pre-mapped 2-D matrix to determine how much fluid to inject. Because the controller is pre-programmed, there are no start and full points to adjust.

If combustion quench occurs as evidenced by engine bucking, bogging, or white smoke from the exhaust then too much fluid is being injected too soon. To prevent quench in TOW Mode try the following:

- Make sure the boost range is set to your vehicles towing boost range.

Low 8-18psi
Med 18-25psi
Hi 25+ psi

- Adjust the gain down in 5-10% increments until quench no longer occurs.

An example of a vehicle with a max boost of 25psi while towing should be set up with the following settings:

Boost Range Med
Gain 100%



Testing the Injection System

Disconnect pump command wire from controller.

Using a 12 volt source, apply power to red wire of pump. Pump should activate and fluid level in tank should go down. It is recommended to also check the nozzle spray pattern while following this procedure. Also check for leaks.



If pump goes on and fluid level doesn't go down, check hose routing, fluid level.

Activation of pump for short periods (2 - 5 sec.) will purge air bubbles after installation. This can be accomplished during initial use.

Testing the Controller

- With tube removed form the nozzle, place the controller in “boost only” mode by selecting MPG mode. Set start at 5psig and full at 6psig.
 - Disconnect the silicone boost line from the ‘T’ fitting on the intake boost line.
 - Turn key on and ensure arming switch on.
 - Using a hand pump, apply 10-20 psig of pressure to the boost line going to the controller.
 - Pump should activate, fluid should flow, and tank level should go down.
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Frequently Asked Questions

Quench

If combustion quench occurs as evidenced by engine “bucking” or white exhaust smoke, reduce amount of fluid that is being injected. This can be done by:

Check your settings.

Using a smaller nozzle(s).

If quench is in Tow Mode use Screen 9 and Screen 10 to adjust the gain.



Injection before the motor is at operating temperature or when the ambient temperature is below 40°F could result in quench and reduced overall performance.

What Fluid to Use

100% Water - Will cool combustion and EGTs and will increase power approx 20-30 HP.

How Much Fluid Will I Use?

Every application is different but typical fluid usage is:

1 Gallon of fluid per 150 miles with no load

1 Gallon of fluid per 75 miles towing 15,000 lbs

My System Injects All the Time

Check your settings, if you have the start point set to low, the system will inject more than it is designed. Check your ground(-) connection. Make sure that the 12v positive(+) to the controller is on a switched power source.

What Maintenance Do I Need To Do?

The only recommended maintenance is to remove nozzle(s) and clean screen filters at least once per year using carb cleaner.

Install Notes

For future reference it is a good idea to record install notes. This is great if you need technical support, or need to order replacement parts in the future.

Nozzle Sizes _____

Controller Settings

MPG Start _____ PSI

MPG 100% _____ PSI

Power Mode Start _____ PSI

Boost Range _____

Injection Gain _____ %