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INSTALLATION INSTRUCTIONS FOR PART #47005 DIESEL STAGE 3 MPG-MAX™ WATER / METHANOL INJECTION SYSTEM UNIVERSAL TURBO DIESEL

Notes

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The names, addresses and telephone numbers mentioned are current as of November 15, 2008. Note that this information is subject to change. Please refer to www.snowperformance.net for current information.



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 **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.

In the event of failure, Snow will repair or replace the part at Snow's sole discretion. Failures resulting from misapplication or misuse of the Product, failure to adhere to any specifications or instructions, or failure resulting from neglect, abuse, accidents, or act of nature are not covered under this warranty.

Warranty service may be obtained by calling 866-365-2762, getting an RMA (Return Merchandise Authorization), delivering the part to Snow along with proof of purchase. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to Snow, and to use the original shipping container or equivalent. Shipping for Warranty replacement parts shipped outside the continental US will be charged to customer.

LIMITATION OF LIABILITY

REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT IS THE ORIGINAL RETAIL PURCHASER'S EXCLUSIVE REMEDY UNDER THIS WARRANTY.

DAMAGE OR INJURY TO THE ORIGINAL RETAIL PURCHASER, TO HIS OR HER VEHICLE, CARGO, OR PROPERTY, AND/OR TO ANY OTHER PERSON OR PROPERTY IS NOT COVERED BY THIS WARRANTY.

THIS WARRANTY IS EXPRESSLY MADE IN LIEU OF ANY AND ALL OTHER EXPRESS WARRANTIES, WHETHER ORAL OR WRITTEN. SNOW SOLE LIABILITY IS LIMITED TO THE REMEDY SET FORTH ABOVE. IN NO EVENT WILL SNOW BE LIABLE FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, INCIDENTAL, SPECIAL, EXEMPLARY, OR PUNITIVE DAMAGES OR FOR ANY OTHER DAMAGES OF ANY KIND OR NATURE (INCLUDING, BUT NOT LIMITED TO, LOST PROFITS OR LOST SALES).

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

Non-Warranty Repair/Retest

Products returned due to damage or misuse and Products retested with no problem found are subject to repair/retest charges and product will be returned to customer at customer's expense. A purchase order or credit card number must be provided in order to obtain an RMA (Return Merchandise Authorization) number prior to returning Product.

Warranty

Snow Performance's commitment to providing the best water/methanol system is reflected in the components and construction of all Snow Performance Boost Cooler® kits.

A lifetime warranty for injection systems is available with exclusive use of Boost Juice injection fluid. The standard warranty is 90 days from purchase and covers all Snow Performance products and accessories purchased on or after October 30, 2008 manufactured by Snow Performance, Inc. (Snow). This warranty terminates when the original retail purchaser sells or otherwise transfers the product to any other person.

Warranty Policy

Snow Performance, Inc. warrants that the Product shall conform to and perform in accordance with published technical specifications and shall be free of defects in materials and workmanship providing:

1. You are the original purchaser and provide proof of purchase.
2. For lifetime warranty, the Warranty Card that came with system (not applicable to separate parts purchases) is returned to Snow within 90-days of purchase. If valid warranty card not on file with Snow, the standard 90 day warranty applies from date of purchase.
3. An RMA # has been attained and is displayed on package containing returned part.

Subject to Snow's inspection of the product, Snow will remedy defects in materials and/or workmanship by repairing or replacing, at Snow's option, the defective product without charge for parts or labor, subject to the limitations and exclusions described in this warranty.

This warranty does not cover problems caused by normal wear and tear including aesthetic oxidation of surfaces, accidents, unlawful vehicle operation, or modifications or repairs to product not performed or authorized by Snow.

This includes any product that is disassembled or taken apart for any reason. In addition, this warranty does not cover problems resulting from conditions beyond Snow's control including, but not limited to, theft, misuse, overloading, or failure to assemble, mount or use the product in accordance with Snow's written instructions or guidelines included with the product or made available to the original retail purchaser.

Kit Contents

Parts

- 1 7 Gallon Reservoir
- 1 150+ psig Pump
- 18 ft Red High Pressure Tubing
- 4 ft Black Wire Loom
- Installation Instructions

Electrical Packet

- 2 Blue Butt Connectors
- 3 Small Eyehooks
- 1 Male Connector
- 1 Female Connector
- 10 Tie Wraps
- 1 Armed Switch
- 3 in Double Sided Tape
- 1 Yellow Temp Probe Connector
- Diesel Stage 3 MPG Max Controller
- Temperature Probe

Mechanical Packets

- 1 Nozzle Holder
- 2 3/8" NPT – 1/8" NPT Reducer Bushings
- 2 1/8" NPT – 1/4" Tube Elbow Fittings
- 7 #8x1&1/2" Screws
- 7 #8 Washers
- 1 #6x1/2" Screw
- 2 Dual Nozzle Upgrades
- 2 Flow Control Solenoid Upgrades
- 1 1/8" NPT to 1/8" Hose Barb
- 1 Temp Probe Compression Fitting – 3/16"
- 3 ft 1/8" Tygon Tubing
- 1 E-6000 (GOOP)
- 1 Sticker
- 1 175ml/min Nozzle
- 1 375ml/min Nozzle
- 1 625ml/min Nozzle

Introduction

The Snow Performance Boost Cooler® Diesel Stage 3 MPG-MAX™ water/methanol injection system provides more power, cooler EGTs, and excellent fuel economy increases. The MPG-MAX™ system does not require a sustained high load state in order to provide maximum fuel economy gains. The MPG-MAX™ system uses a new injection management controller that allows for a small spray of water/methanol to be injected across the power band. 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 10%-15% or 1-3 MPG.

The MPG-MAX™ system has a secondary output that is used to activate a Power Mode. This introduces a second phase of injection. Larger nozzles are used to inject more fluid to make more power. The Power Mode activation point is adjustable for best performance.

Because the MPG-MAX™ system injects more frequently, the fluid consumption rate will be higher than other Boost Cooler systems. The MPG-MAX™ 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.

Refer to the follow installation diagram. Note that not all vehicles will need to use three nozzles. Completely read through this instruction manual before attempting installation. Contact Snow Performance for any questions or concerns.

Nozzle Identification Chart:

Nozzle Color	Nozzle Size	Nozzle Color	Nozzle Size
Yellow	60 ml/min	Purple	225 ml/min
Black	100 ml/min	Red	375 ml/min
Green	175 ml/min	Blue	625 ml/min

Install Notes

Pump Setting _____

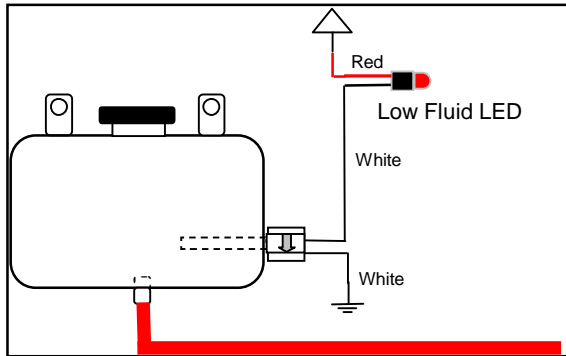
Nozzle Size _____

Controller Setting _____

Disclaimer

Do not use this product until you have carefully read the following agreement. This sets forth the terms and conditions for the use of this product. The installation of this product indicates that the BUYER has read and understands this agreement and accepts its terms and conditions. Performance products by their nature are designed to increase horsepower and performance not engineered in the original vehicle and the increased stress could result in damage to related systems. This is a high performance product – use at your own risk. Snow Performance Inc., Its agents, employees or owners shall not be under any liability whether in contract or otherwise whether or not resulting from our negligence or contents of information supplied for any damage or loss resulting from such information. The **BUYER** is responsible to fully understand the capability and limitations of his/her vehicle according to manufacturer specifications and agrees to hold the **SELLER** harmless from any damage resulting from failure to adhere to such specifications. The **SELLER** disclaims any warranty and expressly disclaims any liability for personal injury or damages. The **BUYER** acknowledges and agrees that the disclaimer of any liability for personal injury is a material term for this agreement and the **BUYER** agrees to indemnify the **SELLER** and to hold the **SELLER** harmless from any claim related to the item of the equipment purchased. Under no circumstances will the **SELLER** be liable for any damages or expenses by reason of use or sale of any such equipment. The **BUYER** is responsible to obey all applicable federal, state, and local laws, statutes, and ordinances when operating his/her vehicle, and the **BUYER** agrees to hold **SELLER** harmless from any violation thereof. The **SELLER** assumes no liability regarding the improper installation or misapplication of its products. It is the installer's responsibility to check for proper installation and if in doubt, contact the manufacturer.

Fluid Level Switch (optional)

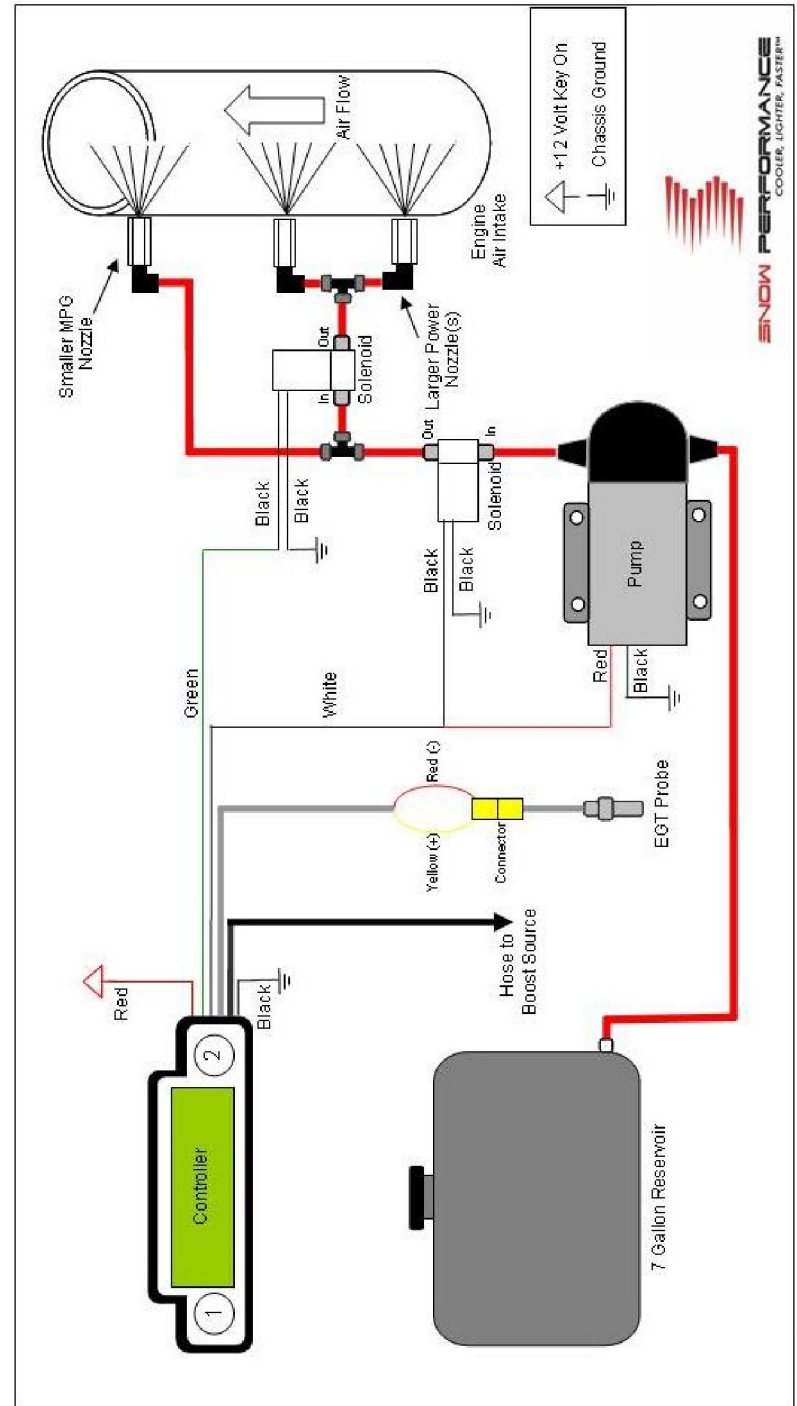


Instructions

- After mounting reservoir, mount red LED in dash.
- Wire LED per diagram with RED wire to a 12v key on source, and the WHITE wire to one of the WHITE wires of the level switch.
- Connect other WHITE wire of the level switch to vehicle ground.
- With key-on source enabled, the red LED should be ON with no fluid in the reservoir. Upon filling the reservoir, the red LED should turn OFF.



TECH TIP The level switch is designed to indicate when there is less than 1" of fluid in the reservoir.



Installation - Mechanical

Step 1 Reservoir Install

- Install reducer bushing with filter screen and 90° quick connect fitting into reservoir outlet. Use a methanol resistant 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 appropriate hardware.

Maintenance – Remove nozzle(s) and clean screen filters at least once per year using carb cleaner.

The Boost Cooler® has been designed to operate with high concentrations of methanol. Oil or other additives are not required for system lubrication.

For best performance, cooling and system life it is recommend that Snow Performance Boost Juice™ (#40008) be the exclusive fluid used in the system.

Tuning Quick Reference

If combustion quench occurs as evidenced by engine “bucking”, reduce the injection quantity. This can be done by:

1. Lowering the pump pressure by turning the pump regulator adjusting screw counterclockwise.
2. Using a smaller nozzle(s).
3. Using Screen 9 and Screen 10 to adjust the gain.

Also, fresh methanol – less than 1 month old when exposed to atmosphere – and using a greater methanol concentration – up to 50% - will reduce combustion quench.

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

75/25 water/methanol will reduce EGTs and power will increase approximately 40 HP.

50/50 water/methanol will reduce EGTs and increase power approximately 70+ HP.

Caution: To avoid “pooling” in the intake and possible engine damage upon start-up, it is recommended that:

1. The engine be run without water/methanol for at least 5 minutes after injection before turning the engine off.
2. The “armed switch” is turned to the off position when the engine is off.

Caution: Do not attempt to inject water/methanol until the engine has reach operating temperature. A cold engine is more susceptible to quench and poor performance.

Step 2 Pump Install

- Install 3/8” NPT to 1/8” NPT plastic reducer bushing using GOOP sealant on threads. Tighten 2-3 turns past finger tight. Install 1/8” elbow fitting into bushing using a small amount of GOOP sealant on threads. Tighten 2-3 turns past finger tight. Mount pump below and close to the reservoir.



Pump Mounted Under Truck Bed
Avoid mounting the pump where it will encounter road spray or debris directly.

- Mount pump in desired location. Typical pump placement is under the bed, on the bed floor, or on a frame rail. The pump is a pusher type and must be mounted at the same level as the reservoir outlet or lower. DO NOT mount pumps above reservoir or in engine bay. Pump can be mounted horizontally or vertically using (4) supplied #8x1½” screws and washers.
- Measure and cut tubing from reservoir to pump and pump to injection point.
- Install included Solenoid Upgrade between pump and injection point. DO NOT install the solenoid between the reservoir and pump. Typical solenoid placement is closer towards the injection point (in the engine bay on the fire wall for instance).

Step 3 Nozzle Selection

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
300 or less WHP	175 ml/min	375 ml/min
300 - 400 WHP	175 ml/min	625 m/min
450 or more WHP	175 ml/min	375 ml/min + 625 ml/min

TECH TIP Seal the nozzle into the nozzle holder using **GOOP** sealant. Using a sealant that is not permanent will allow for nozzle changes during tuning. Simply remove the nozzle, clean the threads, and reinstall using sealant.

Assemble desired nozzle into nozzle holder using methanol resistant 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.



Correct



Incorrect

Testing the System

Step 1 Test Pump and Mechanical System

Disconnect pump 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, there is an obstruction in the tube or nozzle.

Activation of pump for short periods (2 - 5 sec.) will not cause engine damage.

Step 2 Test Controller

- With the nozzles removed from the intake, place the controller in "boost only" mode by disabling the EGT Control mode. Set gain to 100.
- Disconnect the Tygon boost line from the hose barb at the intake.
- Using an air compressor, apply 10-20 psig of pressure to the boost line.
- Pump should activate, fluid should flow, and tank level should go down.

Tow MODE

When Tow Mode is enabled, 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.

- Toggle to Screen 8. Select Tow Mode.
- Toggle to Screen 9. Select boost level. See “Controller Operation: Screen 9”.
- Toggle to Screen 12/13. Adjust the POWER MODE activation point up or down. Initially set the POWER MODE start point to activate 6-10 psig of your maximum boost pressure. If the max boost pressure is 30 set the POWER MODE start point to 20-24 psig. If the max boost pressure is 45 set the POWER MODE start point to 35-39 psig.

ADJUSTING THE CONTROLLER

The MPG MAX phase of injection is meant to inject a small amount of fluid under moderate load. If combustion quench occurs as evidenced by engine bucking or bogging, too much fluid is being injected too soon. To prevent quench try each of the following:

- Toggle to Screen 8A. Adjust the MPG MODE START point to come on at a higher boost level.
- Toggle to Screen 11. Adjust the GAIN down to reduce overall injection amount if in Tow Mode
- Change out MPG MAX nozzle to the next size smaller.

If quench occurs when the POWER MODE activates try each of the following:

- Toggle to Screen 12. Adjust the POWER MODE START point to come on at a higher boost level.
- Toggle to Screen 11. Adjust the GAIN down to reduce overall injection amount.
- Change out POWER MODE nozzle(s) to the next size smaller.

Step 4 Nozzle Mounting

The nozzle assembly should be installed 90° to the direction of airflow. On round intake tubes, this is 360° around the tube meaning the nozzle can be mounted in any direction. This will ensure maximum cooling as the nozzle sprays in a cone pattern. Choose and mark mounting location on air intake for nozzle placement.

Remove the inlet piece just before the intake and drill and tap (11/32" pre-drill, 1/8"-27 NPT tap) for two or three nozzles. While the inlet piece is removed, drill and tap an additional hole for the 1/8" NPT to 1/8" hose barb fitting. This will be the dedicated boost source for the controller.



The nozzle is mounted into the intake using its external 1/8 NPT threads. Tighten the nozzle and nozzle holder assembly one half turn past hand tight using methanol resistant sealant to seal the threads.

Step 5 Nozzle and Solenoid Connection

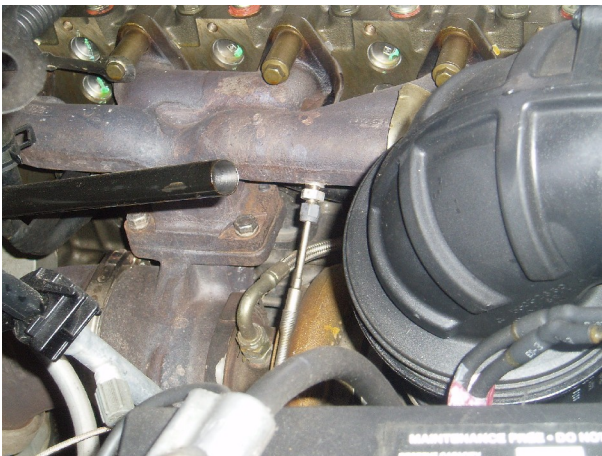
Refer to the installation diagram.

The main outlet line coming from the pump connects to the first solenoid. The outlet of this solenoid connects to a tee. One outlet of the tee goes to the small MPG-MAX™ nozzle and the other outlet of the tee goes to the second solenoid. The outlet from the second solenoid will either connect to a tee to feed two nozzles or directly to a single nozzle for the POWER MODE phase of injection.

Measure the distance from the pump outlet to the injection location. Cut the ¼" 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

Step 6 Install EGT Probe

Drill and tap (1/8" NPT 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.



Mount the Temp Probe using the 3/16" compression fitting (provided).

Variable Controller Tuning

MPG MODE

When MPG Mode is selected, injection is a function of boost pressure only which is desirable when a more immediate injection is desired. With the MPG Mode function activated, an injection start and full point must be selected.

- Toggle to Screen 8. Select MPG Mode.
- Toggle to Screen 8A/B. Adjust the start point up or down. Typical start points are 6-8 psig.
- Toggle to Screen 8C/D. Adjust the full 100% point up or down. Adjust the full point to about 16 psig in most applications.
- Toggle to Screen 9. Select boost level. See "Controller Operation: Screen 9".
- Toggle to Screen 12/13. Adjust the POWER MODE activation point up or down. Initially set the POWER MODE start point to activate 6-10 psig before your maximum boost pressure. If the max boost pressure is 30 set the POWER MODE start point to 20-24 psig. If the max boost pressure is 45 set the POWER MODE start point to 35-39 psig.

Screen 9

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.

Screen 10

This screen is used to increase the injection gain setting. Pressing and releasing button 2 will increase the gain setting. This setting affects the injection in Tow Mode only. Differences of 5%-10% change injection significantly.

Screen 11

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

Screen 12

POWER MODE START - UP. Pressing and releasing button 2 will increase the Power Mode injection activation point. This should be set approximately 6 psig below maximum boost.

Screen 13

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

Installation - Electrical

Variable Controller Installation



Attach controller to secure location with easy access in driver's compartment using supplied tape. Connect black Tygon tubing from intake plenum to clear tubing coming from the controller and secure with a tie wrap. Your controller has an internal self resetting fuse such that an external automotive type fuse is not required. In the case of a fault, the internal fuse will attempt to reset after one minute of power off.

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

- Connect WHITE wire to Pump RED power wire. The primary solenoid will also connect to this circuit.
- Connect GREEN wire to one BLACK wire from secondary solenoid. Connect other BLACK wire to ground.
- Connect RED wire to +12V key on source with inline switch. (Bronze prong on switch is ground.) When selecting a 12V key on source, try to find a dedicated circuit with at least a 10 AMP fuse.
- Connect BLACK wire to a good 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 of controller.

Controller Operation

The controller has an LCD display screen. The display software allows for seven different display modes and three control/setup screens.

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 sequence 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.

Additionally, button 2 is used for the "Injection ON/OFF" function.

Pressing and holding button 2, then pressing button 1, then releasing both buttons simultaneously 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.

Screen 1

This mode displays pressure (P), temperature (T) and injection percentage (Inj) as three independent bar graphs.

Screen 2

This mode displays the boost pressure and EGT temperature in PSI and degrees F.

Screen 3

This mode displays the boost pressure and EGT temperature in BAR and degrees C.

Screen 4

This mode displays the boost, EGT and injection in Standard units.

Screen 5

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

Screen 6

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

Screen 7

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

Screen 8

This is the setup screen for the injection mode. Pressing the right button (# 2) will toggle the setting between MPG and Tow modes. If Tow Mode is selected, the 2-D matrix value for the injection is used. If the MPG Mode is selected, then boost alone will be used to control injection.

In MPG Mode, the following screens will be presented:

Screen 8A

MPG MODE START - UP. Pressing and releasing button 2 will increase the injection activation point. This should be set at a boost point just above normal cruising conditions, often about 7 psig

Screen 8B

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

Screen 8C

MPG MODE 100% - UP. Pressing and releasing button 2 will increase the maximum injection point. This should be set at the boost achieved under moderate acceleration up an on-ramp or away from a stop light, often about 16 psig

Screen 8D

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