



Warning! This product can expose you to chemicals such as styrene which is known to the State of California to cause cancer. For more information, visit www.P65Warnings.ca.gov

California Proposition 65 Warning Label

VaporWorx

We Give You Gas

WARNING

Working with fuel is dangerous. If fuel is handled improperly it can lead to fires and death. It is imperative above anything else that all appropriate safety measures be used to control the fuel and any ignition sources, including static electricity, heat, sparks, and any other sources. Proper high-pressure fuel lines and connections must be used in accordance to the manufacturer's specifications and routed away from any potential sources of heat, ignition, and protected from mechanical damage. If you are unsure about your work or safety, stop work immediately and consult with a qualified automotive technician and/or safety official.

Thank you for your purchase of the VaporWorx fuel module speed control system for the KPM Streetfighter 1500HP fuel module. These are stand-alone systems that require minimal ECM commands: Only a 12+ turn on signal is needed for basic operation. Hence, it will work with any EFI control system. NOTE: FAST XFI uses a negative trigger for fuel pump turn-on. Please contact VaporWorx in this case as we have a solution for this application.

The purpose of the VaporWorx fuel module control system is to allow the fuel module pump(s) to adjust their speed based on the fuel demand. As fuel demand increases, the VaporWorx pulse width modulation control will also increase the fuel pump speed. As fuel demand decreases, so will the pump speed. This allows a large pumping system to run reliably with significantly reduced power and heat generation. It effectively makes a very large pump seem much smaller during cruise/low fuel demand conditions where minimal fuel volume is needed.

The PressureWorx system can provide either a constant or a 1:1 rate of fuel pressure change with manifold pressure. For these systems initial fuel pressure can be as low as 36psi. Wiring connections to the engine MAP sensor are required for manifold referenced fuel pressure, and the VaporWorx kits are specific to each MAP sensor, so ordering must be done accordingly (1bar, 2bar, or 3bar.) To use a PressureWorx system in constant fuel pressure mode, do not connect the MAP wiring to the VaporWorx controller and adjust the fuel pressure accordingly.

Unless otherwise specified the PressureWorx kits are tuned for GM 3-bar MAP sensors. Typical 3-bar sensors such as GM P/N 12592525 used on the LSA and ZR1 crate engines are a good choice. For any other sensors, please contact VaporWorx.

The choice between constant or manifold referenced fuel pressure should be decided between you and your engine tuner. The tuner is key to getting the engine running correctly, and his/her input in this matter is critical to making both of your jobs easier. However, for the KPM Streetfighter 1500HP manifold referenced fuel pressure is recommended. **Final fuel pressure must be checked with a fuel pressure gauge.**

VaporWorx was founded on Customer Satisfaction and Service. We strive to treat people and our products the way we would want others to treat us and the products we purchase. That is why our electronics products are tested thoroughly before they are packaged and shipped. VaporWorx stands behind our products for one full year after purchase with a well-stocked repair facility and quick turnaround times. VaporWorx does not want to be the reason you cannot enjoy your car. The Terms of Warranty and Service are as follows:

Limited Warranty

VaporWorx warrants its products to be free from defects in material and workmanship under normal use and if properly installed for a period of one year from date of purchase. If found to be defective as mentioned above, it will be replaced or repaired if returned along with proof of date of purchase. This shall constitute the sole remedy of the purchaser and the sole liability of VaporWorx to the extent permitted by law, the foregoing is exclusive and in lieu of all other warranties or representations whether expressed or implied, including any implied warranty of merchantability or fitness. In no event shall VaporWorx be liable for special or consequential damages. This warranty is only valid on products purchased from VaporWorx or their Authorized Dealers.

Service

In case of malfunction, your VaporWorx component will be repaired free of charges according to the terms of the warranty. When returning VaporWorx components for warranty service, Proof of Purchase must be supplied for warranty verification. After the warranty period has expired, repair service is charged based on a minimum and maximum charge rate. (Contact VaporWorx for current rates).

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The following steps will help to ensure good fuel module operation and long life. Careful attention to wire routing, protection, strain relief, connectors, crimps, etc. will lead to a longer lasting and more reliable installation. Appropriate safety equipment, lifting procedures, jacking, vehicle support/jackstands, PPE, and all other proper and safe work methods must be utilized at all times. An appropriate ABC rated fire extinguisher must be at the ready at all times.

See Diagram 1 for basic wiring layout

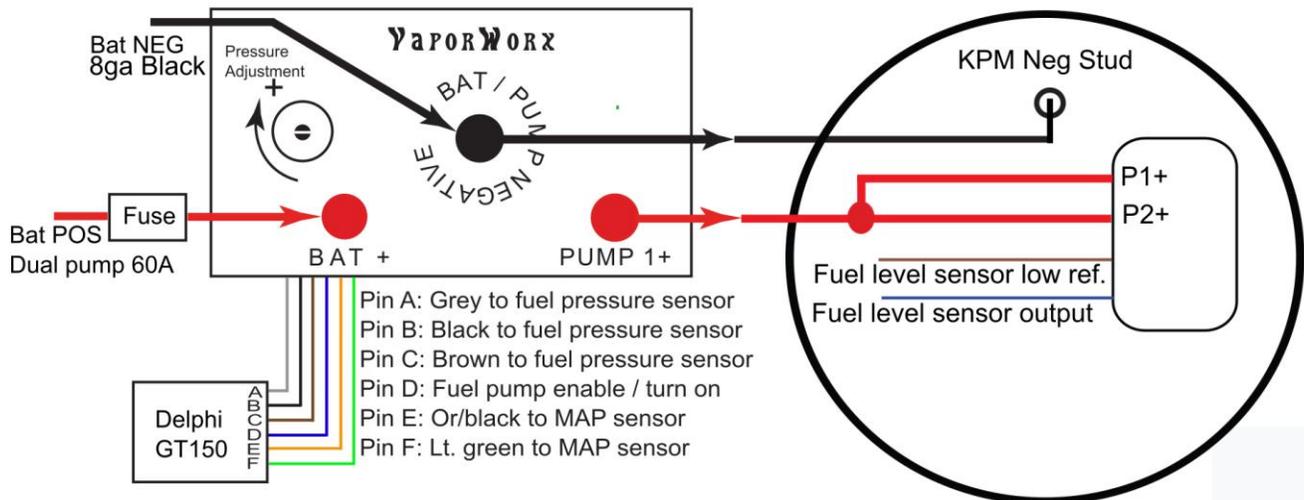


Diagram 1. Basic wiring layout for the PWKPM1500 VaporWorx controller. The wiring may enter/exit the controller area as needed provided that there is no chance of shorting between connections. The default MAP sensor that the VaporWorx controller is tuned for is the GM LSA 3bar 12592525/Bosch 0261230262 (others available.)

- 1) Find a suitable flat surface to mount the VaporWorx pulse width modulation controller (black box) near the vehicle battery. It is imperative that the box be mounted as close and **directly to the battery** as practical. If not connected directly to the battery controller malfunction will result. Do not mount the controllers near sources of heat such as exhaust systems, radiators, etc. The cooler the electronics are during operation, the longer their expected life will be. #8 x 3/4" screws are provided for mounting. If possible, mount the controller such that heat from the controller can be absorbed by the chassis/sheetmetal.
- 2) Install the fuel pressure sensor into a 1/8"-NPT female fitting that is tapped into the fuel line near the fuel module outlet like that in Photo 4. The sensor must be mounted near the fuel module outlet so that pressure fluctuations due to fuel injector or mechanical pump operation are minimized. If the sensor is mounted in the engine fuel rail rapid pressure fluctuations may occur. Use a small amount of Teflon paste to seal **just the threads** of the sensor. If needed, VaporWorx carries a variety of AN fittings for this purpose.
- 3) If desired the supplied braided loom can be installed over the fuel pressure sensor wiring. If so, slip a 1" piece of heat shrink tubing on the wiring first, then install the loom. The heat shrink will secure the ends of the loom to the wiring near the plugs. The ECM fuel-enable wiring may also be integrated into this harness if desired. A short piece of blue wire is provided if needed. Sealing the ends of the braided loom with a soldering iron will help keep them from fraying. This wiring may be included in the same wiring harness as the main pump wiring coming from the VaporWorx controller.
- 4) Plug the three-cavity fuel pressure sensor plug into the fuel pressure sensor.
- 5) Route and secure the fuel pressure sensor wiring harness to the area where VaporWorx controller is mounted. Be sure to leave sufficient wire length so that there is no strain on the wiring near the connectors. Secure the harness to the vehicle away from where it may become damaged from heat, road hazards, rotating parts, exhaust, etc. and verify that the cable will not be chafed or cut on sharp edges. Use rubber grommets to protect the wiring where needed.
- 6) Connect the MAP sensor wiring to the engine MAP sensor and route to the VaporWorx controller using similar techniques as the fuel pressure sensor wiring. This option will provide a 1:1 manifold referenced fuel pressure. This will allow for an approximate 43psi fuel pressure at idle/cruise, but will ramp up fuel pressure as engine power increases. It significantly reduces power to the pump(s) during idle/cruise vs. a 60psi setting. For servicing, it is helpful to add a pigtail and two-pin plug near the engine wiring harness for attaching the VaporWorx MAP wiring.

- 7) Route the ECM fuel pump enable wire to the VaporWorx controller. From a diagnostics standpoint it may be preferable to run the same colored wire all the way to Pin D on the VaporWorx controller connector. The VaporWorx controller requires a 12v positive signal to operate. If a negative signal is used the system will not function properly. For GM engine harnesses and power centers a 14ga gray power wire controlled by the ECM for the fuel pump is often used. This wire can also be used to tie into the blue 20ga wire on the VaporWorx controller. This is a low-power circuit, hence a 20 gauge wire may be used for the full run to the controller. **DO NOT USE THIS WIRE TO PROVIDE BAT + POWER TO THE VAPORWORX CONTROLLER. BAT + MUST BE CONNECTED DIRECTLY TO THE BATTERY. DO NOT USE THE PWM OUTPUT FROM THE OEM FUEL SYSTEM CONTROL MODULE AS A FUEL PUMP ENABLE SIGNAL.**
- 8) The VaporWorx GT150 six-pin connector provides fuel pressure sensor, MAP sensor, and fuel pump enable signal connections. Using the terminals and seals provided as seen in Photo 1, crimp the terminals to the wires like that shown in Photo 2. Solder the terminals to the wires if needed. Slide heat shrink tubing over the harness braid(s) before installing terminals, but wait to heat shrink until all wires are installed into the plug.
- A: Grey 20ga from the fuel pressure sensor
 - B: Black 20ga from the fuel pressure sensor
 - C: Brown 20ga from the fuel pressure sensor
 - D: Blue 20ga from the ECM fuel pump enable circuit (BAT+ signal)
 - E: Orange/Black 20ga from the engine MAP (-) sensor*
 - F: Light Green 20ga from the engine MAP (output) sensor* *Manifold referenced fuel pressure only.

Alternate → Yellow for BAT- trigger signal for ECM fuel pump enable signal.

For constant (non-manifold referenced) fuel pressure, leave the Orange/Black and Lt. Green wires disconnected.

Using the ECM fuel pump enable circuit will allow the safety features of the ECM to remain functional. If an IGN + signal is used the fuel system may continue running after an accident. If the fuel lines, tank, fuel module, or other components are damaged, fuel may be pumped in an uncontrolled manner. Modern ECM's will shut down the fuel pump enable circuit if engine rotation is not sensed, hence making for a safer condition. It is the imperative that these features remain functional for your safety.

Pin A: Grey Pin B: Black Pin C: Brown Pin D: Blue Pin E: Orange/Black* Pin F: Lt. Green*

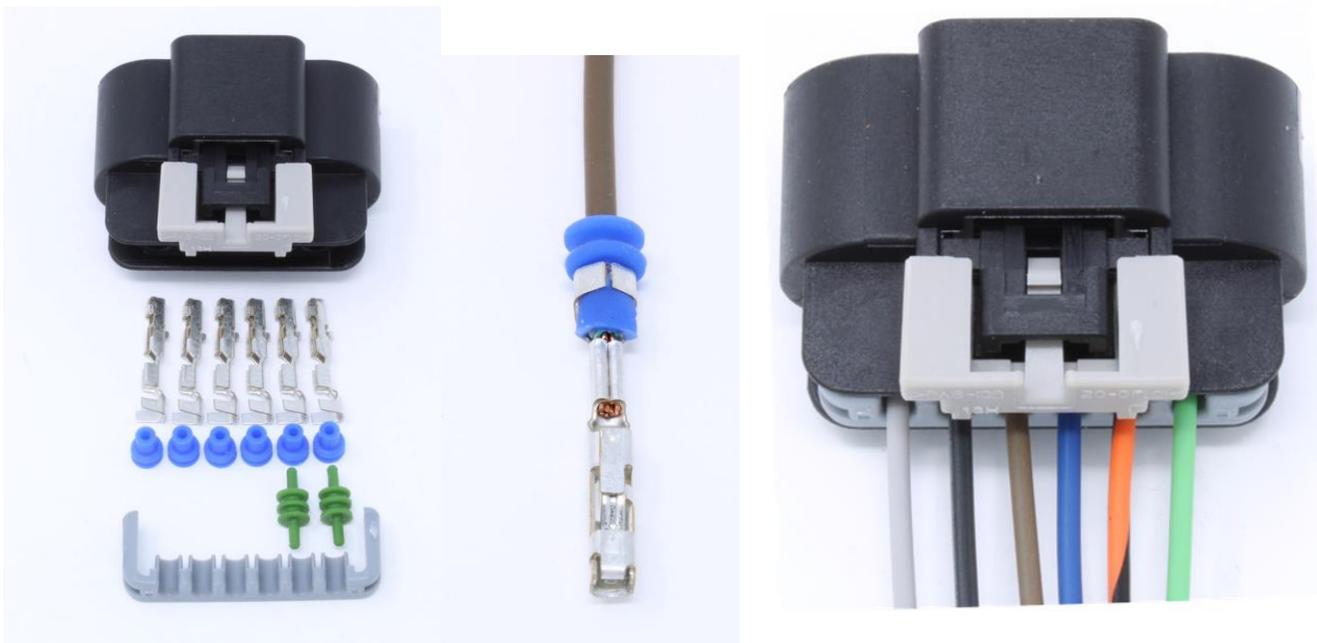


Photo 1: The GT150 connector body, terminals, seals, and terminal positional assurance clip. Photo 2: The terminal is crimped to the wire and seal. The part number for the Delphi terminal is 12191818. The seal is 15366060. Spare parts are available from Vaporworx. Photo 3: Delphi GT150 female connector assembly. Note that the colors must align to the

controller plug. Delphi designates the gender of the connector assembly by the terminal used, not the gender of the plug body. Hence the plug that appears male uses a female terminal and is designated female by Delphi.

- 9) Insert the wires into the Delphi GT150 female connector body as shown in Photo 3. The pinout schedule is listed below for the connector body. Capital letters can be found on the connector body on one side only near the wire insertion holes. Just align the colors to the mating VaporWorx connector.
- 10) Re-verify that the wires have been properly placed in the connector and that the colors align. This is the most common assembly error, so please verify your work. If the wiring is incorrect, or the crimp not satisfactory, then the terminals will need to be removed and placed in the proper cavity. This can be done by removing the purple cap on the inside of the connector body face using a small screwdriver to pry up on the sides. The terminal can then be released by gently prying back on the locking tab that secures the terminal to the body. Once corrected re-install the purple connector body cap. NOTE: The purple cap acts as a terminal locking device. Once the cap is fully seated removal and installation of the terminals is very difficult. The cap has a pre-terminal installation position where it is located in the body but not fully seated. Fully seat the cap once terminal installation is completed.
- 11) Once the correct wiring has been confirmed, install the terminal position assurance clip as shown in Photo 3.
- 12) The labels on the top of the VaporWorx controller lid shows the input and output of the positive side of the controller. Using the supplied fused link, connect the short end directly to the battery positive and the other to the controller BAT+ input terminal using the provided ring terminals. Use the provided heat shrink to seal the ring terminal crimps. Tighten the nut on the VaporWorx controller to 10inlbs maximum. *Do not over-tighten the brass terminal nuts on the controller / 10 in-lbs maximum torque.*
- 13) An 8ga x 4' black wire is provided to route from the BAT/PUMP- terminal on the controller to the battery. Like the positive side, crimp and heat shrink the connections. Do not tighten the nut on the negative terminal on the controller since the fuel pump negative will also be attached.
- 14) Install the ring terminal on the long 8ga black wire to the VaporWorx controller BAT/PUMP- terminal that is shared with the BAT- wire. Tighten the nut on the VaporWorx controller to 10inlbs maximum. *Do not over-tighten the brass terminal nuts on the controller / 10 in-lbs maximum torque.*
- 15) Route the long 8ga black wire to the fuel pump area. Do not terminate the wire.
- 16) Install the white fuel pump plug with two red wires into the fuel module plug. This plug has two red wires with a butt connector. Slide a 1-1/4" long piece of 3/8" diameter heat shrink tubing on to the red wires.
- 17) Like the long black pump wire, perform the same operation for the long 8ga red wire. Attach it to the PUMP + terminal on the VaporWorx controller. Tighten the nut on the VaporWorx controller to 10inlbs maximum. *Do not over-tighten the brass terminal nuts on the controller / 10 in-lbs maximum torque.*
- 18) Loosely install the provided 8ga x 1/4" dia ring terminal on to the ground post on top of the KPM fuel module. Route the long 8ga black wire to the ring terminal and cut the wire to the appropriate length. Be sure to leave sufficient length for insulation stripping/crimping and relieve the wire of excessive strain. Do not install the ring terminal.
- 19) Perform the same operation with the long 8ga red wire. Route it to the butt connector on the fuel module plug wiring and cut the wire to the appropriate length. Do not crimp to the butt connector.
- 20) Using the supplied wire braid, slide the braid over the long 8ga wires until it reaches the VaporWorx controller area. The fuel pressure, MAP sensor, and ECM fuel pump enable wiring may be included in the same harness if desired. Cut the braid using a soldering iron to reduce fraying. Slide two pieces 3/4" long heat shrink tubing on to the braid. Do not heat shrink the braid.
- 21) Slide a 3/4"L x 3/8" dia piece of heat shrink tubing on to the long 8ga black wire. Remove the 8ga x 1/4" dia ring terminal from the ground post. Strip the insulation and securely crimp the 8ga x 1/4" dia ring terminal. Heat the shrink tubing over the crimp area. Install the ring terminal back on to the negative post and tighten the nut securely.
- 22) Remove the white fuel pump plug from the fuel module. Strip the insulation from the long 8ga red wire and securely crimp it to the butt connector. Slide the heat shrink tubing over the butt connector and heat into place.

- 23) Secure the heat shrink installed in Step 20 over both ends of the wire braid, near the VaporWorx controller and the KPM fuel pump. This keeps the wire braid from moving and fraying.
- 24) Secure all wiring away from sources of heat, sharp edges, and any other potential damage points.

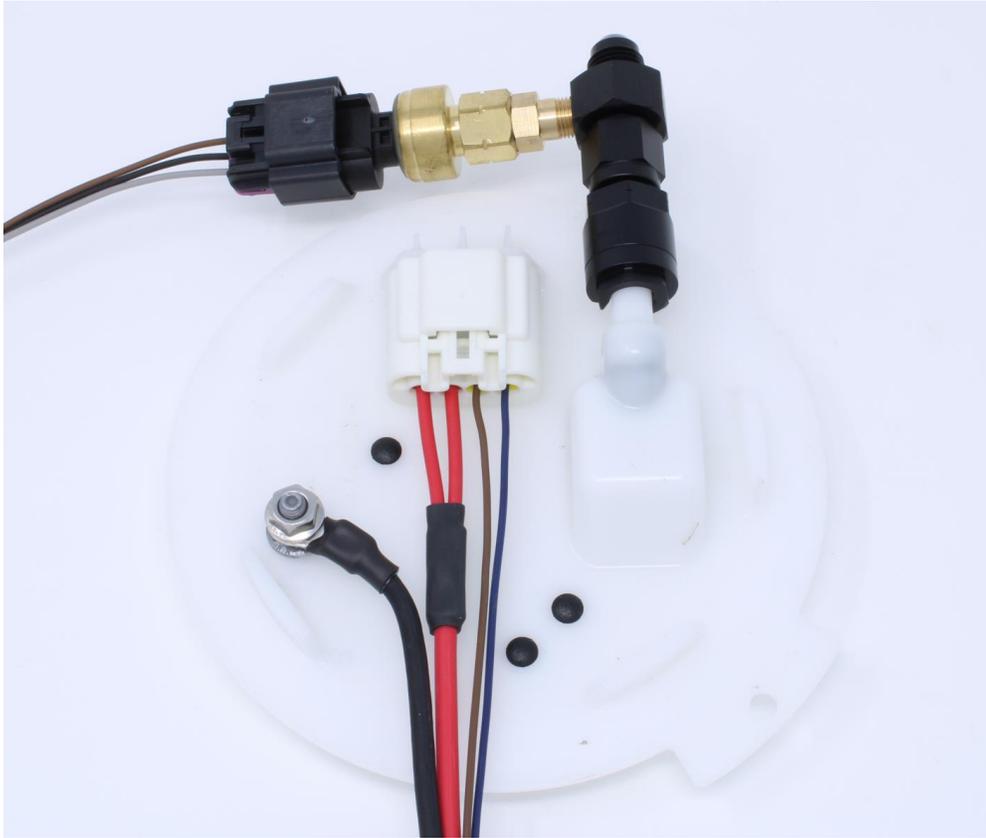


Photo 4. KPM Streetfighter 1500HP fuel module hat with power, fuel level, and fuel pressure sensor wiring attached. The fuel pressure placement shown as an example only, but should be mounted as close to the fuel outlet.

- 25) Fuel level sensor wiring is included in the white fuel module plug. Brown is low reference (ground), blue is output. Attach these wires to the corresponding wiring in the chassis harness. Fuel level sensor wiring connections are not needed for VaporWorx controller operation. The OEM fuel level sensor range is 40F – 250E ohm range.
- 26) Confirm that the VaporWorx controller connections are complete and the power wiring nuts are tight.

Preparation Required Prior to Engine Startup

- 1) The VaporWorx controller will be tuned to run using MAP sensor input, hence approximately 43psi at idle. This requires MAP sensor attachment. For constant pressure applications/no MAP sensor connection, turn the pressure adjustment screw on the controller two turns clockwise. **Final pressure must be verified with a mechanical gauge.**
- 2) Fill the fuel tank to 3/4-full minimum. Check for any leaks.
- 3) Disconnect the fuel line from the engine fuel rail. Route or extend this line to a fuel-rated and approved container. Secure the line to the container so that it will remain in place when fuel is pumped through the line. High-pressure fuel flow will cause a flexible line to whip if not secured.
- 4) Insert the supplied fuse into the WeatherPack fuse link.
- 5) Turn on the ignition switch. Fuel should begin to flow in several seconds. If the ECM controls the fuel turn-on circuit (blue wire) then it may take several cycles to flush the system. Most ECM's have a safety feature that turns off the fuel pump after 2-3 seconds if it does not sense that the engine is running. Do not run the pump for more than five seconds with the fuel line removed from the rail. After five seconds, allow at least one minute before repeating the turn-on cycle so that the fuel module reservoir can refill. NOTE: The fuel module venturi pumps do not work unless there is high fuel pressure. With the fuel line disconnected, no fuel pressure is available to power the venturi pumps. The pause between flushing cycles is to allow the module reservoir to refill with fuel.

In some cases, after several cycles the ECM may not turn the fuel circuit on until it senses engine rotation. In this case, if needed, 12v+ can be applied to the VaporWorx controller blue wire for a few seconds. The pump should begin to run. The fuel pressure sensor wiring must remain in place and not be disconnected.

- 6) Reconnect the fuel line to the engine fuel rail and attach a fuel pressure gauge to the engine fuel rail.
- 7) Turn on the ignition switch but do not start the engine. The fuel pressure gauge should rise and settle near its pre-set value. Turn off the ignition key and inspect the fuel system for leaks. It is normal that the fuel pressure will spike after fuel system shutdown. Fuel pressure should return to normal after engine start-up. Like before, it may take several cycles to fill the fuel rails and create pressure.
- 8) If no leaks are found, start the engine. Fuel pressure may increase 2-3psi higher than what was observed during engine-off. Again, check for leaks and repair as needed.
- 9) On the top of the controller there is a small hole where the fuel pressure adjustment screw is located. Note the arrow on the lid of the controller. Inside the hole is a brass potentiometer screw that is used to adjust the fuel pressure. Using the smaller exposed blade on the supplied blue trimmer tool, adjust the fuel pressure for constant pressure systems to 58psi/4bar, and approximately 43psi for manifold referenced. Pressure change, ½-turn = approximately 5psi pressure change.

Fuel pressure must be verified by either a mechanical or electric gauge.

- 10) Shut down the engine as soon as practical and check the fuel system for leaks. Repair any leaks.
- 11) Restart the engine. Quickly depress and release the throttle pedal. For constant pressure systems the fuel pressure should remain constant, with perhaps a small pressure drop-off. For manifold referenced, the fuel pressure should rise and fall with manifold pressure.

Troubleshooting

- 1) Fuel pump runs at full speed when the engine is on:
 - a. Adjust the fuel pressure via the small screw on the side of the box.

- b. Check fuel pressure sensor wiring connections. On the fuel pressure sensor plug Pin 1 = Brown, Pin 2 = Black, Pin 3 = Grey. Confirm that these wires align with the same wires on the controller GT150 plug. It is possible to crimp across the insulation of the wire and not obtain a good circuit pathway, hence, causing a controller malfunction.
- c. Confirm that the input and output main power wires from the battery and to the fuel module are correct/not reversed.
- d. Confirm the controller is connected directly to battery power. No chassis grounds.

2) Fuel pump does not run:

- a. Check the input fuse (60A)
- b. Check fuel pressure sensor wiring connections. On the fuel pressure sensor plug Pin 1 = Brown, Pin 2 = Black, Pin 3 = Grey. Confirm that these wires align with the same wires on the controller GT150 plug. It is possible to crimp across the insulation of the wire and not obtain a good circuit pathway, hence causing a controller malfunction.
- c. Confirm that a minimum of 10v is available to the VaporWorx blue wire Pin D. 12v + can be applied directly to the GT150 Pin D blue wire for testing only.
- d. Check that the brass nuts for the battery and fuel module power wiring terminals are properly tightened and free of contamination and corrosion.
- e. Check the bottom brass nuts that are under the battery and fuel module ring terminals. The shoulder washers that act as an insulator may relax over time. Retighten to 10 in-lbs maximum and test.
- f. Excessive fuel pressure due to engine shutoff. After ignition shutoff the injectors shut but the pump still spins, causing a pressure spike. This is normal, but until the pressure drops below the set pressure, the controller will not send power to the fuel module.
- g. Check the temperature of the VaporWorx controller black aluminum lid. If the lid is over 225°F the controller will shut down.
- h. Confirm that the battery and butt-joint connections are good. Use a volt-ohm meter to check connections.
 - i. Confirm that the input and output main power wires from the battery and to the fuel module are correct/not reversed.
 - j. Confirm the controller is connected directly to battery power. No chassis grounds.

3) The fuel pressure rapidly fluctuates, especially at idle:

- a. The fuel pressure sensor is too close to the fuel rail. The VaporWorx system can react fast enough to chase individual injector pulses at idle, hence causing rapid fuel pressure gauge readings. Once engine speeds increase this tendency reduces. Move the fuel pressure to as close to the fuel module as practical. In some case where a very short primary fuel line is used, a longer line from a "T" may be needed to install the fuel pressure sensor into. This extra head length acts a damping system for the injector pulses. A Radium pressure damper has also shown to be very effective.

4) Fuel pump does not have adequate pressure:

- a. Turn the fuel pressure adjustment screw inside the hole on the side of the controller. A small eyeglass screwdriver can be used, as well as the tool supplied in the kit.
- b. Remove the power wiring from the brass terminals on the top of the controller. Confirm that the lower brass nuts are tight.
- c. Check that the connections from the VaporWorx controller to the fuel module are good.
- d. Using a heavy gauge jumper wire, connect the BAT+ to the PUMP+ on the VaporWorx controller. If the fuse is good the pump should run. If the pump is running but little or no fuel pressure exists, then either the fuel module is internally damage (broken plastics), the fuel pump(s) have been damaged, or there is a massive leak. The most common cause of fuel pump damage is running the pumps dry. Fuel is the life blood for pumps. If the pump does not run then there is a problem with the electrical wiring at the module connection.

Fuel Module Output Testing

One question that often arises is how to monitor pump output. This is good to know in order to determine if the pump is adequate for the power produced. To test this, connect a digital voltmeter to the BAT (+) and Pump (+) terminals. These connections must be made on the controller terminals. In a safe and legal way, have an assistant watch the meter as the car is driven at wide open throttle/maximum fuel demand. Once the voltage is less than 0.2volts, the controller is effectively sending maximum power to the pump(s). After this point is reached fuel pressure will begin to fall due to a pump over-capacity condition.