



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 VaporWorx or a qualified automotive technician and/or safety official.

Instruction sheet for the KPM1500 Ally speed control system. For use only with the VaporWorx supplied KPM1500 fuel module only (not Streetfighter.)

The purpose of the "Ally" system is to allow the OEM Pulse Width Modulation Fuel System Control Module/Fuel Pump Pressure Module/Fuel Pump Driver Module/etc. to control one pump in the KPM fuel module while the VaporWorx controller powers the other. When used this way the power output of the FSCM typically remains within factory power thresholds, meaning that MIL codes are minimized. FSCM fuel system programming is done as normal since the Ally controller is transparent to the OEM system.

The Ally works by using any FSCM pulsed positive output as a guide for function. Both pumps, powered by separate sources, are under the single control of the FSCM. Hence, the OEM feedback and diagnostics remain in place. In this application, both pumps must together whenever the engine is on. The KPM1500 pumps do not have a built-in check valve, hence the second pump cannot be turned off since it will allow fuel to backfeed and cause a severe leak.

Voltage boosters can also be used subject to the maximum voltage that the OE FSCM can accommodate. Often the maximum voltage before trouble codes are noted is 16.5v. Note that voltage boosters are typically not effective with high-power pumps. Testing has shown that, for example, a JMS FuelMax will add only 1v at full power and is not considered a useful upgrade.

What other parts are needed?

- 1) An inline fuel filter with a 10um (micron) or smaller filtering element. Radium Engineering has excellent inline filters that use the modern microglass 6um filtering element that meets the stringent requirements for Bosch injectors (Injector Dynamics.) **Regular filter servicing is mandatory to prevent clogging which will lead to lean engine running conditions.** It is suggested to purchase a few extra filter elements as maintenance spares.
- 2) If changing to an AN-type line, new fittings to connect to the pump and install the OEM fuel pressure sensor will be needed. OEM 3/8" / 10mm lines have shown to be effective to 800-850fwhp on e85. 1/2" lines have shown to be effective to 1200fwhp.

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 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.

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. It is your responsibility to protect yourself and others while working the car, so take time to prepare and confirm that your work areas in, around, and under the vehicle are safe. An appropriate ABC rated fire extinguisher must be at the ready at all times.

Note that the following instructions only apply to a VaporWorx supplied KMP1500 fuel module. If a KPM1500 fuel module that is not supplied by VaporWorx or not modified using VaporWorx supplied parts is used malfunction will result and possibly cause damage to the OEM and VaporWorx control systems and KPM pumps.

- 1) See the Wiring Diagram on the last page for reference.
- 2) Disconnect the negative cable from the battery.
- 3) Using the OEM shop manual as a guide, remove the fuel pump from the tank. This may require removal of the tank from the vehicle. Alternatively, a hole may be cut into the floorboard to allow top access to the fuel pump. Chassis specific access panels are available from a variety of sources that allow easier access to the fuel pump.

Helpful tip: Wrenches for the large black fuel pump locking ring are available on Amazon for about what a lunch costs. It's well worth it vs. the internet "hack" using a hammer and punch.

- 4) Using the OEM shop manual as a guide, install the new VaporWorx supplied KPM1500 fuel pump module and new green sealing ring. A KPM-supplied fuel level sensor may also be used but is not needed for controller operation. The KPM sensor, like the OEM, has a 40F-250F ohm range.
- 5) Install an inline fuel filter of your choice. See the first page for suggested filters. The filter can be placed anywhere between the pump and engine. The lines must be cleaned/flushed before final attachment to the engine side.
- 6) 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 controller and any wiring near sources of heat such as exhaust systems, radiators, etc. The cooler the electronics are during operation, the longer their expected life will be. Self-tapping screws are provided for mounting but other fastener mounting methods are acceptable. Heavy duty Velcro or double-sided tape can also be used. Confirm that the mounting screws will not penetrate fuel tanks, lines, electrical, body panels, or any other systems during installation.
- 7) Connect the supplied black 4' long wire from the controller BAT/PUMP- to the battery negative terminal. **Do not chassis ground.** Controller malfunction will result. Excess length should be trimmed to keep wiring lengths minimal. Ring terminals are included in the kit and must be securely installed. Heat shrink tubing is provided to insulate the ring terminal crimp area like that of the one already installed on the wire. Attach, but do not tighten the nut on the VaporWorx controller. The negative wire to the pump will be attached later.
- 8) Perform the same for the BAT+ fused link wire included in the kit. Connect the short end to the 12v+ terminal on the battery, and the long end to the VaporWorx controller. Cut to length and terminate the ends using the provided terminals and heat shrink like that for the negative wire. Confirm that the installed heat shrink does not wedge between the ring terminal and the controller stud. If it does, trim the heat shrink with a razor knife. Tighten the BAT+ nut on the VaporWorx controller to **10in-lbs. DO NOT OVERTIGHTEN THE NUT.**
- 9) Plug the two-cavity GT150 connector with the grey wire into the mating connector on the VaporWorx controller. Install the protective braid and route the wire to the FSCM area or wherever the tie into the pump+ wire will occur. The red wire on the controller side of the plug will not be used. If preferred, this 20ga grey wire can be combined into the same harness as the VaporWorx fuel pump power wiring shown later in this instruction sheet (no small wire braid needed inside of the larger fuel pump wire braid).
- 10) The 20ga VaporWorx grey wire ties into the FSCM fuel pump+ wire. **It may be tied-in anywhere along the length of the FSCM pump+ wire. For this instruction sheet it will be shown with the connection made close to the fuel pump.** For GM chassis this is usually the heavy gauge grey wire that goes to the fuel module #1 plug cavity.

In some applications the FSCM fuel pump+ wire may be a different color or different position. Refer to the Shop Manual for your vehicle to confirm. See Photo 1.

Helpful Tip: The wire braid included in the kit is much easier to work with if cut and the ends are sealed with a soldering iron. Rolling the ends of the cooled wire braid between your fingers to break up the ends will make installing the braid over the ends of the wires easier. It may also be helpful to put a piece of blue painters tape over the end of the wire(s) to help make it easier to slide the braid on.

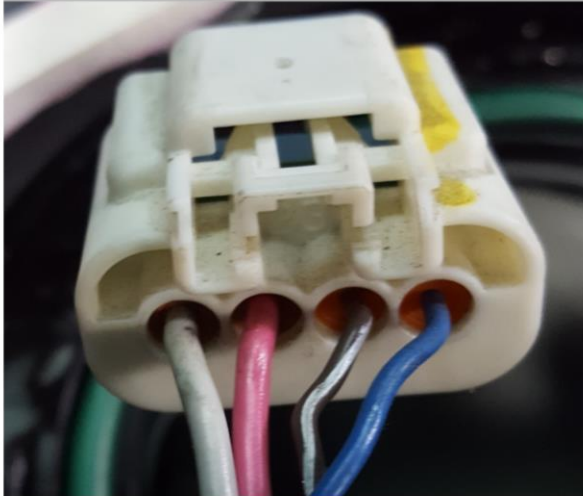


Photo 1. GM ZL1 Fuel Module Plug
Left to right:
Grey = Pump +
Pink = Pump -
Brown = Fuel level sensor low reference
Blue = Fuel level sensor output

Photo 1. FSCM wiring may be different colors. Refer to an OEM shop manual to determine the Pump+ and Pump- wiring colors.

- 11) Using Photo 2 as a guide, remove the Pump+ wire from the from the harness side electrical plug. The light blue end cap must be removed, and the terminal locking tab pried back with a miniature screwdriver. Only the Pump+ wire needs to be removed.

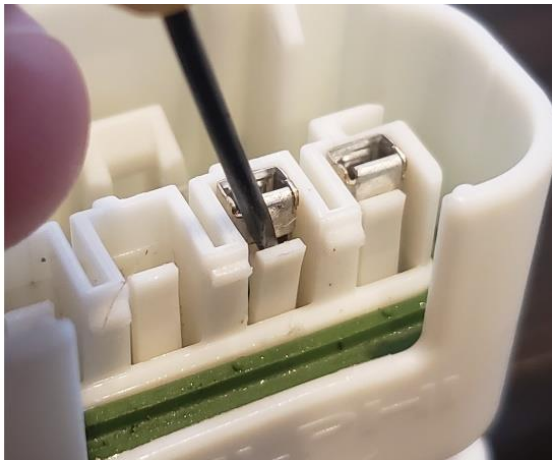


Photo 2. Gently pry the locking tab back to release the Pump+ terminal from the plug body. The wire and terminal will slide out the opposite side of the plug. Pump negative terminal shown for clarity.

- 12) Exercising caution, strip approximately 1/2" from the heavy gauge FSCM Pump + wire. Do not cut the FSCM wire.
- 13) Slide two 1/2" long pieces of small heat shrink on to the VaporWorx 20ga grey wire. Cut and strip the VaporWorx 20ga grey wire to the appropriate lengths, then secure the wire to the FSCM grey wire by soldering. Seal the connection with the supplied adhesive lined heat shrink. See Photos 3A and 3B.



Photos 3A and 3B. The VaporWorx 20ga grey wire is tied into the FSCM fuel pump+ wire. Use a small amount of solder to make the connection and seal with heat shrink or rubber self-sealing tape.

- 14) Re-install the Pump+ wire and light blue cap into the white fuel pump plug.
- 15) Slide the ½" pieces of heat shrink to the ends of the wire braid and heat to seal both ends.
- 16) Plug the white fuel pump power plug into the KMP1500 fuel pump hat plug.
- 17) There are two power studs on the top of the KMP1500 fuel pump hat. The stud with the red label is for VaporWorx Pump+, the stud with the black label is for VaporWorx Pump-. Using the hardware provided, attach the long 10ga VaporWorx wiring harness to the corresponding studs using the installed ¼" ring terminals.
- 18) Using a backup wrench to keep the studs from spinning, tighten each nut to 5 ft-lbs/60in-lbs. **Do not allow the studs to rotate.** Route the wires as needed to make a smooth and tidy installation toward the VaporWorx controller. The basic attachments should look like those in Photo 4, but your application may require a different routing path.

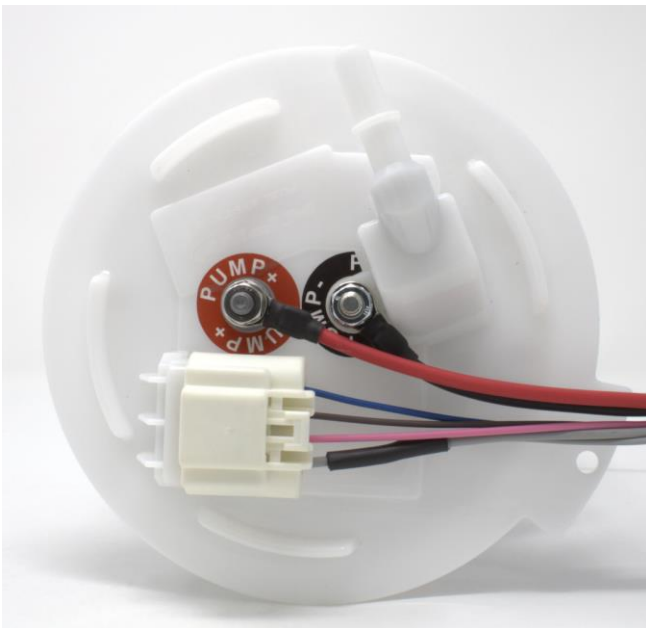


Photo 4. Note the VaporWorx controller 10ga black routes to the stud with the black PUMP- label, and the red wire to the red PUMP+ label. Use a backup wrench on the stud when tightening the top nut so that the stud does not spin. Route the wiring as needed to make a good routing path back to the VaporWorx controller.

- 19) Route the black and red VaporWorx 10ga wires from the KPM1500 fuel module to the VaporWorx controller. Use rubber grommets, clamps, zip ties, etc. to protect and support the wiring where needed. Do not route near sources of heat, rotating components, or other objects that may cause wire damage.

- 20) Cut the 10ga wires to the appropriate lengths allowing for movement and strain relief. Install the provided wire braid and cut to length. Slip two ½" long pieces of heat shrink on to the braid. If desired, the grey 20ga wire may also be included in this wire braid. Taping the ends the wires with painters tape may make braid installation easier.
- 21) Strip the black 10ga wire insulation ¼" and crimp the supplied 10ga x #6 ring terminal. Install heat shrink over the crimped section of the terminal. Install the ring terminal on to the VaporWorx controller BAT / PUMP– terminal stud and tighten the nut to 10in-lbs. **DO NOT OVERTIGHTEN THE NUT.**
- 22) Strip the red 10ga wire insulation ¼" and crimp the supplied 10ga x #6 ring terminal. Install heat shrink over the crimped section of the terminal. Install the ring terminal on to the VaporWorx controller PUMP+ terminal stud and tighten the nut to 10in-lbs. **DO NOT OVERTIGHTEN THE NUT.**
- 23) Confirm that the installed heat shrink does not wedge between the ring terminal and the controller stud. If it does, trim the heat shrink with a razor knife.
- 24) Slide the heat shrink to the ends of the wire braid and heat to shrink.
- 25) Secure all wiring using zip ties, clamps, etc.

Preparation Required Prior to Engine Startup

- 1) The VaporWorx controller is calibrated to work with the OEM FSCM. No further adjustment is needed.
- 2) Insert the 40A fuse into the fuse link. A small spark during insertion is normal if the battery is connected. The pump should not be running.
- 3) Confirm that all wiring is connected per the diagram on the last page and that the fuel lines have been properly filtered, cleaned, attached, and sealed.
- 4) Put fuel into the tank.
- 5) Re-attach the battery negative cable.
- 6) Connect a pressure gauge to the engine fuel rail or monitor via the vehicle OBDII port.
- 7) Turn on the ignition switch. The fuel system should turn on for 1-2 seconds during the prime cycle. Turn off the ignition and check for leaks. Repair as needed.
- 8) If the fuel level in the tank is above the white bucket reservoir (usually 3+ gallons for modern OEM tanks), you may immediately cycle the ignition on again to continue to prime the fuel system. Continue cycling until pressure is obtained.
- 9) If the fuel level in the tank is below the top of the white bucket/reservoir, after the first prime cycle wait 30 seconds before cycling again. Repeat the 30 second cycle until pressure is obtained.
- 10) Check for leaks and repair as required.
- 11) If no leaks are found, start the engine and confirm the requested fuel pressure is obtained.
- 12) If a very large injector is used (100#/hr+) it is possible that the OEM FSCM may react to the pulses generated by injectors as they open and close. Often the FSCM smooths out the pulses from a functional standpoint. However, visually using a gauge or via HPTuners/OBDII datalogging, large pressure spikes may be seen. These spikes make it difficult to determine actual fuel pressure. A fuel pulse damper offered by Radium Engineering has shown to reduce the pulses.



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

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Instruction sheet for the KPM1500 high-pressure regulator and secondary pump electrical wiring changes

This instruction sheet is for use only with the KMP1500 fuel pump module. It does not apply to any other KPM pump versions.

For use above 50psi the pressure regulator in the KPM1500 must be changed. The provided regulator will allow for OEM Fuel System Control Modules and for VaporWorx stand alone controller systems to operate properly. For more information visit the KPM fuel pump section on the VaporWorx website for your application.

For applications that will be using an OEM FSCM and VaporWorx controllers, modifications are needed to add a secondary pump positive post to the top hat. The OEM FSCM cannot share a ground that is connected to either the chassis or the battery, like the VaporWorx Ally controller is. The FSCM wiring must only go to one pump while the VaporWorx Ally goes to the other. No sharing of grounds or else the FSCM will throw MIL codes.

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Note that the following instructions only apply to the KPM1500 fuel module.

Fuel Pressure Regulator Change

Note: VaporWorx supplied KPM1500 fuel pump modules, unless otherwise specified, will have the high pressure regulator already installed.

The pressure regulator change is needed whenever a fuel pressure higher than 50psi is required and/or a returnless PWM control system is used. This means that just about every application outside of Australia will need to have the regulator changed.

- 1) Set the fuel pump on a thick padded surface, like a large folded towel, to provide a soft working surface.
- 2) Note along the top edge of the white surge tank the four retaining tabs. Using care to not over-bend the tabs, release all four so that the pumping section can be separated from the surge tank. It may be helpful to place strips of thin metal, long screwdrivers, etc. to keep the pumping section separated from the surge tank by about 1". See Photo 1.



Photo 1. Release the four retaining tabs to separate the surge tank from the pumping section.

- 3) Using needle nose pliers, pull the regulator retaining wire out and remove the ground strap. Note that the retaining wire is held down by the wire. See Photo 2.

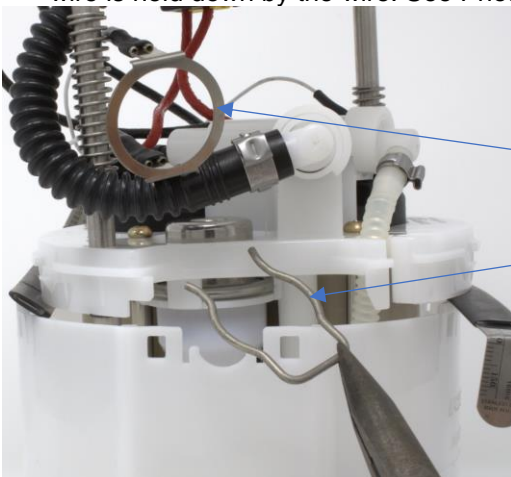


Photo 2. Remove the wire retainer and ground strap.

Ground strap
Wire retainer

- Using a small flat screwdriver, insert the blade between the regulator base and the white plastic. Gently work the regulator loose and remove from the pump assembly. See Photo 3.

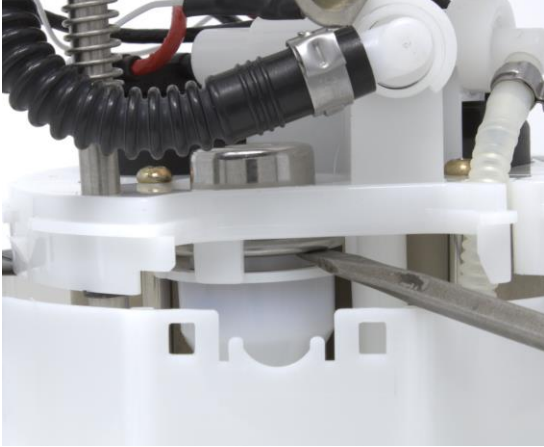


Photo 3. Work the regulator loose and remove from the pump assembly.

- Apply oil to both o-rings on the VaporWorx supplied high-pressure regulator. Insert it into the pump and press it down until it fully seats like the removed regulator is shown in Photo 2.
- Slide the ground strap over the regulator body and re-install the wire retaining clip.
- Set the pumping section back into the surge tank and verify that the four retaining tabs are fully seated.

Wiring changes for OEM Fuel System Control Modules and VaporWorx Ally PWM Control systems. Not required for stand-alone PWM control systems.

VaporWorx supplied KPM1500 fuel pump modules, unless otherwise specified, will have the secondary wiring already installed.

- Set the fuel pump on a thick padded surface, like a large folded towel, to provide a soft working surface.
- Using Photo 1 as a guide, note the black dot. This is where the hole for the VaporWorx supplied Pump 2+ positive bulkhead connection will be made. Using the VaporWorx supplied drill bit, carefully drill the hole in the "dot" location. The drill bit will try to grab once it breaks the plastic surface, so be careful to not allow the bit to deeply go below the hat.

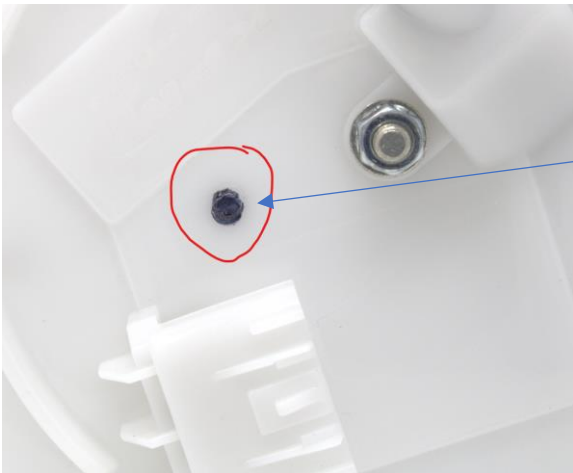


Photo 1. Drill hole for the power bulkhead at the location shown by the black dot. Confirm that the location will allow for the bulkhead stud and seal to seat on flat surfaces.

- If needed, remove any burrs from both sides of the hole. Insert the bulkhead power feed stud into the hat like that shown in Photos 2 and 2A.



Photo 2 and 2A. The bulkhead stud must have the rubber embossed sealing washer under the head. The wire colors will be red, not black, as shown.



- 4) Install the large flat washer on to the bulkhead stud on the underside of the KPM1500 hat. Apply threadlocker to just a few threads near the washer. The intent is to cover only the threads that will come into contact with the flanged nut. See Photo 3.



Photo 3. The large flat washer goes on first, then apply thread locking compound to the threads where the nut will be final set. The thread locking compound is for the serrated nut only. Do not apply excessive thread locking compound.

- 5) Using a backup wrench on the top hex of the stud, tighten the flanged nut to 60in-lbs. Do not allow the stud to rotate, hence the use of the backup wrench. This minimizes the chances of damaging the rubber sealing washer. See Photo 4.



Photo 4. Using a backup wrench to prevent the stud from spinning, tighten the underhat hex flanged nut to 60in-lbs.

- 6) Remove the black power plug from under the KPM1500 hat. Remove the yellow Terminal Position Assurance clip. Using a very small screwdriver in the location shown in Photo 5, remove both red wires from the black plug.



Photo 5. Remove both terminals from the black underhat plug. There is a small retaining tab inside the plug that need to be pried away from the terminal. Be cautious here, over-bending the tab may cause it to break.

- 7) In Photo 6 note that the pump on the left will be referred to as Pump 1, the right Pump 2. Cut the black negative wire from Pump 1 on the left close to the underhat stud like that shown in Photo 6.



Photo 6. Pump 1 is on the left, Pump 2 on the right. Cut the black wire coming from the left side Pump 1- near where it crimps to the KPM bulkhead stud. The cut wire does not need to be insulated.

- 8) Take the negative and positive wires from Pump 1 and lightly pull them toward the area where the underhat plug receptacle is located. Cut the black wire so that it is about 1/2" shorter than the red. Strip the end of the black wire and crimp the VaporWorx provided MetriPack 280 terminal to the black wire. See Photo 7

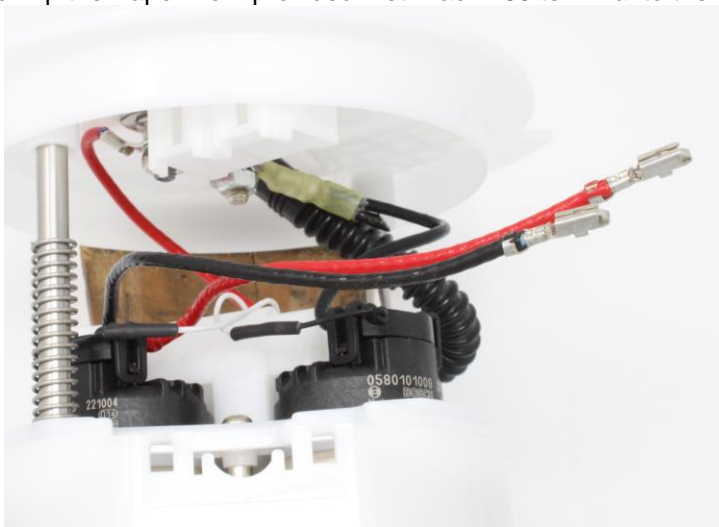


Photo 7. Pump 1 black negative wire is about 1/2" shorter than the red positive wire when extended as shown. These two wires will go into the removed black plug.

- 9) Insert the Pump 1+ red wire into the A cavity on the black plug that was removed earlier. Insert the Pump 1- black wire into the B cavity. Re-install the yellow Terminal Position Assurance clip, and insert the plug back into the underhat receptacle. The final assembly must look like Photo 8.



Photo 8. Note that the Pump 1+ red wire goes to the outside cavity, the Pump 1- next to it. The idea here is that both wires from the pump go to the black plug. The bulkhead studs will provide power for Pump 2.

- 10) Take the red wire from Pump 2 and cut the terminal off leaving as much wire length as possible. Strip $\frac{1}{4}$ " of insulation and crimp the $\frac{1}{4}$ " ring terminal to the wire. See Photo 9.



Photo 9. The Pump 2+ wire has the $\frac{1}{4}$ " ring terminal installed.

- 11) Route the Pump 2+ wire toward the bulkhead power stud installed earlier. Using the provided hardware, install the ring terminal, star washer, and nut. Tighten the nut to 60in-lbs using a backup wrench like earlier to keep the stud from spinning. See Photo 10.



Photo 10. The Pump 2+ red wire is attached to the earlier installed bulkhead stud.

12) Apply the supplied Pump + and Pump – labels as shown in Photo 11.



Photo 11.