INSTALLATION INSTRUCTIONS

FUEL SURGE TANK, FST-R
SINGLE INTERNAL PUMP

DOCUMENT #19-0061
SUPPORT: info@radiumauto.com

READ AND UNDERSTAND THESE INSTRUCTIONS COMPLETELY BEFORE BEGINNING INSTALLATION

WARNING: DO NOT SMOKE WHILE WORKING ON FUEL SYSTEM. KEEP SPARKS AND OPEN FLAMES AWAY FROM FUEL SYSTEM. DISCONNECT BATTERY BEFORE BEGINNING WORK.

The Radium Engineering Fuel Surge Tank, Regulated (FST-R) is designed to enhance the fuel system by providing resistance to starvation (from fuel slosh) and by increasing the fueling capability of the system. The FST-R features an integrated high-flow 1:1 vacuum referenced adjustable fuel pressure regulator, eliminating the need for an external FPR and drastically simplifying hose plumbing.

When using a surge tank, the primary fuel pump in the vehicle's main fuel tank will no longer directly feed the engine. This pump will now be used to fill and maintain the level of fuel in the surge tank. The FST pump will now be the high pressure source for the engine's fuel demand. Fuel pressure should be checked before and after installation to ensure that there is no difference with the FST operating. Any change in fuel pressure can affect engine performance.

If the Radium Engineering FST-R was purchased with a pump, the FST-R comes fully assembled, and ready to install. If purchased without a pump, assembly is required.

ASSEMBLY – Standard Brushed Fuel Pumps (Walbro F9000274, Walbro GSS342, AEM 50-1200, etc)

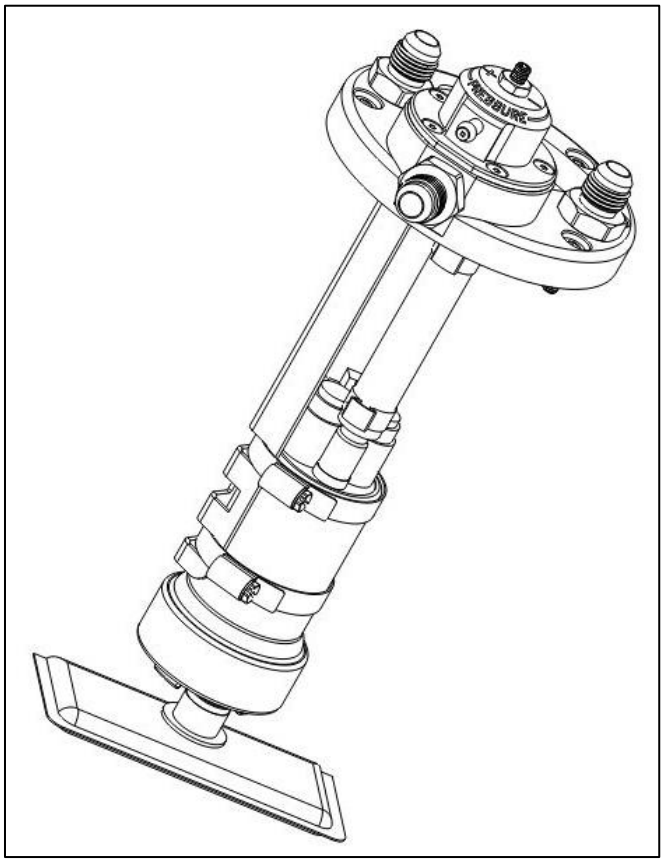
If purchased without a fuel pump pre-installed, unscrew the perimeter bolts and remove the top cap assembly from the canister.

Lubricate the pump barb and both inner ends of the tubing. Note that fuel pump hose barbs can fracture if not treated with extra care. For many 300/320/340LPH pumps, low heat is required to temporarily soften the tubing. If this is the case, be careful not to over-heat and melt the tubing. If the tubing becomes too soft and deformed, replace it with a new piece. Secure using one of the EFI hose clamps and a 9/32" nut driver.

Slide a second hose clamp onto the tubing attached to the fuel pump. Use lubrication as previously mentioned and push the tube over the barb underneath the fuel hat. Do NOT apply heat on this side of the tubing connection. It is NOT required.

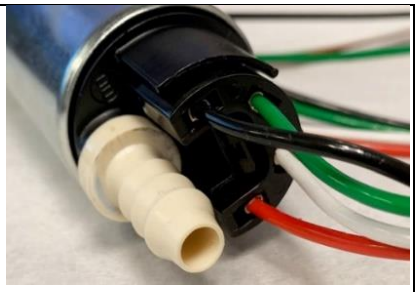
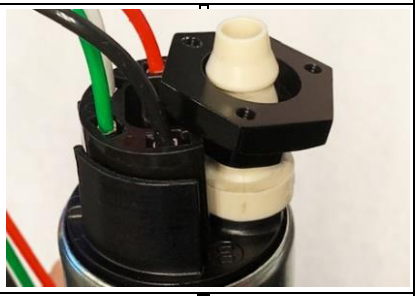
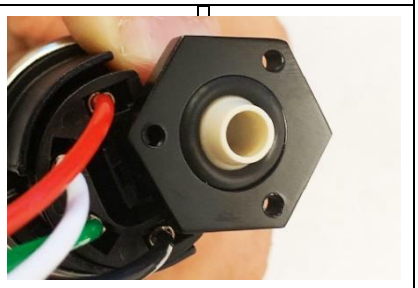
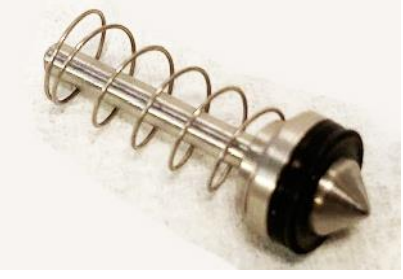
Rotate the pump until it seats against the pump mounting bracket. Tighten the upper hose clamp. Secure the pump to the bracket using the two included large hose clamps as shown in the diagram.
Make sure there is a sock filter installed on the pump inlet. Connect the electrical lead to the fuel pump.

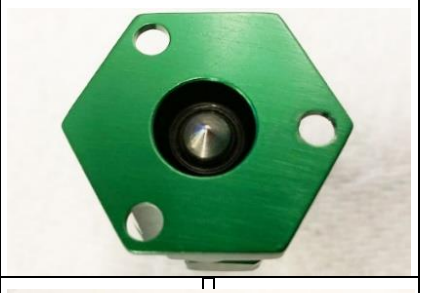
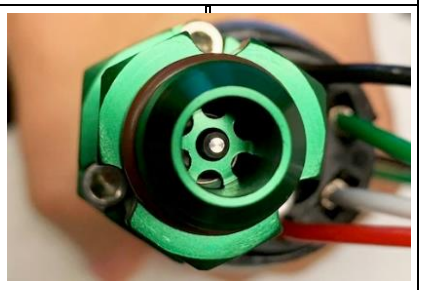
Install the gasket. Next, carefully place the pump assembly onto the canister. Torque the bolts in an alternating cross-pattern **making sure the gasket does not pinch.** The surge tank is now ready to install into the vehicle.



ASSEMBLY – E5LM Brushless Fuel Pump

Follow the instructions below for installing an E5LM brushless pump into the FST-R surge tank 20-0368-00.

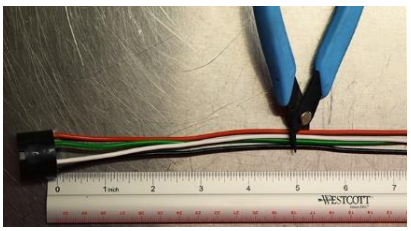
1		Inspect the pump outlet hose barb. If deformed or damaged, the Radium check valve pump adapter will NOT attach properly. The Ti Automotive E5LM 4-pin wiring connector MUST first be installed on the pump before proceeding.	
2		To install the check valve, first slide the black collar over the pump outlet with the flat surface upward, as shown.	
3		Next, slip the stainless steel retainers under the hose barb ridge closest to the end of the pump outlet opening. Be patient as this will take a little bit of work. Pull the collar up to confirm the retainers lock into place as depicted.	
4	Oil	Place the included O-ring on the pump outlet. Apply a petroleum-based lubricant to the O-ring. Slide the black collar upward and tuck the O-ring into the groove, as shown.	
5		Place the O-ring onto the check valve plunger groove, as shown.	
6		Place the provided spring around the plunger rod, as shown.	

7		Insert the plunger rod through the internal center hole of the green adapter fitting, as shown.	
8	2.5mm Allen Wrench Thread Locker	Apply a high strength thread locking compound to the threads on the 3 included bolts. Line up the green fitting holes to the black fitting threads. Make sure the brown o-ring is present on the 6AN male fitting as shown in the picture.	
9	Oil 1" Wrench	After tightening all bolts evenly, inspect the internal side of the green fitting. When installed properly, the plunger should be slightly sticking out of the center hole at rest, as shown.	
10	Oil 15mm Wrench	Apply a light amount of oil to the brown o-ring on the 6AN male fitting. Tighten the fuel pump check valve into the 6AN ORB port on the underside of the FST-R top plate.	

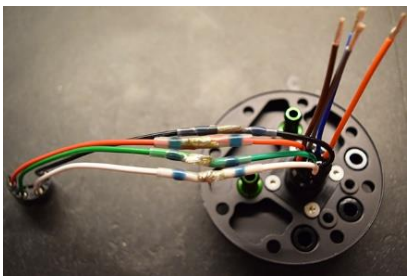
With the check valve installation complete and the pump in place, the next step is to complete the wiring.

1. Using diagonal cutters, cut all wires found on the TI Automotive E5LM pumps' flying lead wiring connector(s) to 5 inches, as shown.

Next, strip the insulation back on all wires ~3/16" (5mm) from the Ti Automotive connector and Radium Engineering internal connector.



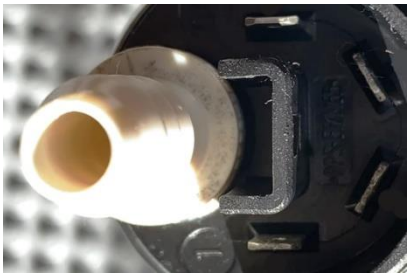
2. For each connection, insert a wire through one side of a crimpless butt connector (included). Using the "Wire Color Cross Reference" chart below, find the opposing wire and twist the 2 together. Next, center the butt connector on the bare wires. Using a heat gun, circle around the connector to melt the solder and heat shrink consistently, as shown. Be careful with the surrounding area as the internal solder can take a while to melt. Finally, verify the connection is solid by gently tugging the wires.
Picture shows a different dual pump fuel surge tank variation.



3. As shown, the Ti Automotive E5LM has 4 electrical terminals.

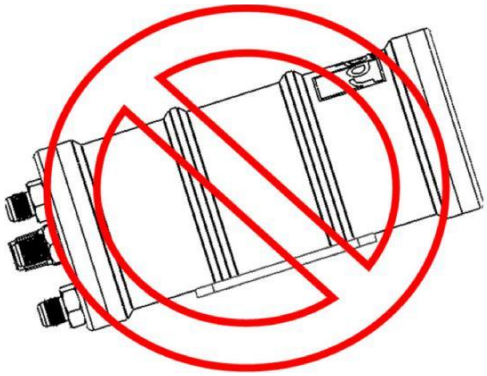
When connecting the pump wires, first plug in the bulkhead connector. During the wire assembly, mark the wire color/location on both the internal and external harness wires.

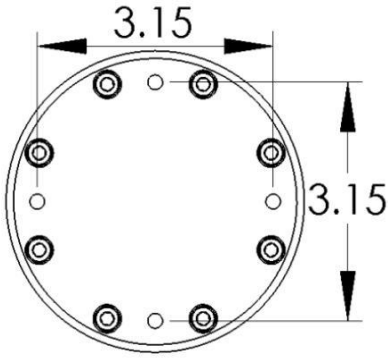
Re-assemble the surge tank while paying close attention to the gasket and making sure it does not get pinched.

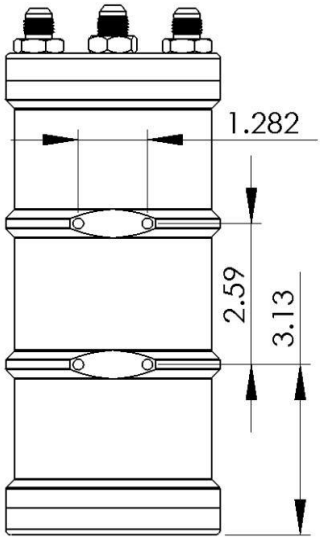


MOUNTING

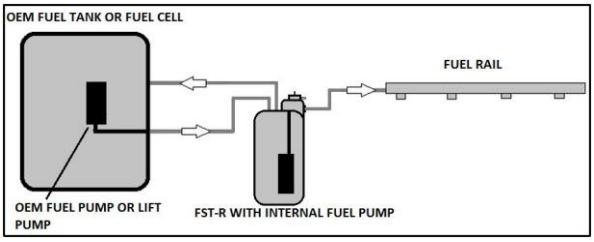
The FST should be firmly mounted to a stable, structural component of the vehicle away from moving parts and excessive heat. Universal mounting brackets are available from www.radiumauto.com. The FST should not shake or vibrate excessively during operation. It is possible to mount the FST-R anywhere between a vertical and horizontal position, however, vertical is preferred for optimal protection. DO NOT ORIENT FST WITH FITTING-END DOWNWARD. This will trap air and lead to premature fuel starvation.





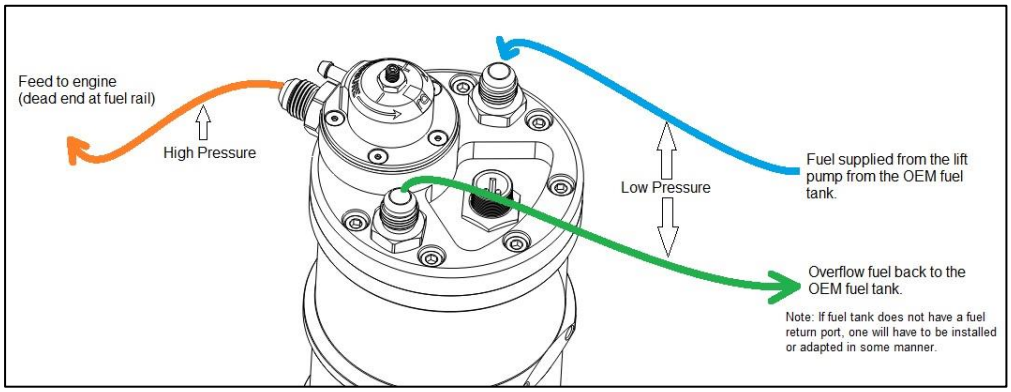


PLUMBING



The FST-R is designed to be plumbed in a “dead end” configuration. This modern method of fuel plumbing is preferred by most OEM manufacturers over traditional fuel return systems. The fuel traveling to the engine fuel rail(s) does not return back to the surge tank. Instead all returning fuel is kept away from the engine bay and is cycled internally in the FST-R. This aids in keeping fuel temperatures low and avoids cavitation and vapor lock by preventing warm cycling fuel from returning to the fuel tank

NO OTHER REGULATOR SHOULD BE USED IN THE FUEL SYSTEM. The only regulator in use should be the one integrated in the FST-R.



The FST-R has three -6AN ORB ports, these ports come by default with 6AN male adapters installed. Other adapters can be used as well but must be purchased separately. To complete the installation, -6AN (3/8”) hoses will need to be constructed. The two -6AN ports on top of the fuel surge tank (shown in blue and green) are interchangeable. One port receives fuel from the main tank’s “lift” pump and the other port is for fuel returning back to the main fuel tank. The side port on the FST-R

(shown in orange) is the fuel pump output port and is routed to the engine/fuel rail. A low-micron fuel filter should be used on the feed line.

To achieve a 1:1 vacuum reference, a vacuum hose needs to be routed from the intake manifold to the vacuum nipple on the FST-R top cap. The nipple is sized for 5mm or 3/16" ID hose. Because the vacuum reference uses a 1:1 ratio, every 1lb of boost pressure on a turbocharged or supercharged application, will yield a 1lb rise in fuel pressure. The range of adjustability is from 20psi to the maximum the fuel pump can deliver.

INTERCHANGEABLE ORIFICE

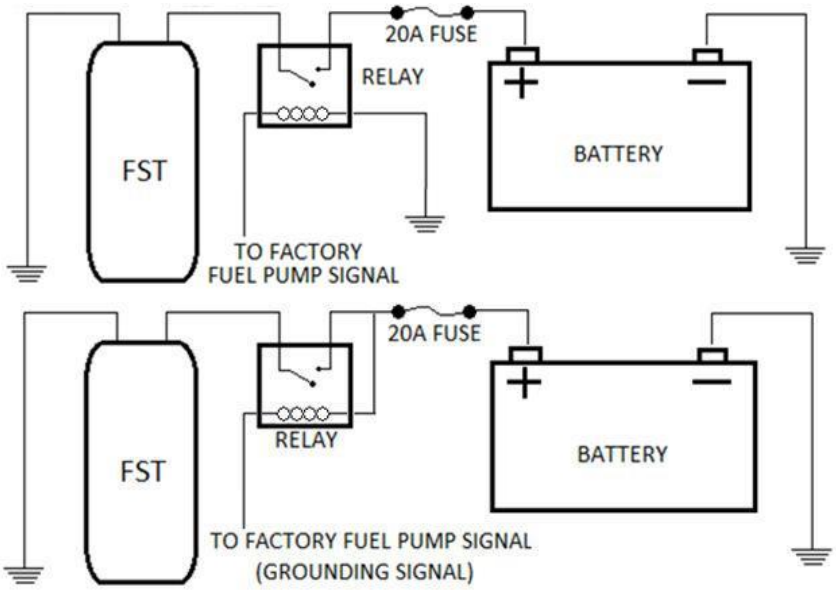
The FST-R is supplied with an extra regulator orifice (small round gold-colored fitting). This is not needed for most applications using standard brushed fuel pumps (Walbro F90000…., AEM, etc). However, for applications using the E5LM brushless pump, the gold colored orifice can be tried if base fuel pressure is not low enough (i.e. too much pump flow for the regulator to handle). This can be installed by removing the top cap of the regulator and swapping with the pre-installed silver orifice. Reference the SERVICE section below.

WIRING INTO THE VEHICLE

If the 17-0031 DIY wiring kit was purchased, reference the instructions for that product.

The surge tank pump must be wired to a 12V source capable of providing 20A. The 24" flying lead wiring harness is color coded for easy identification (red is power, black is ground). A 20A fuse should be used along with at least 12 AWG wire for both contacts (10 AWG for long runs). It is highly recommended to activate the FST pump with a relay that is triggered by the same signal as the primary fuel pump.

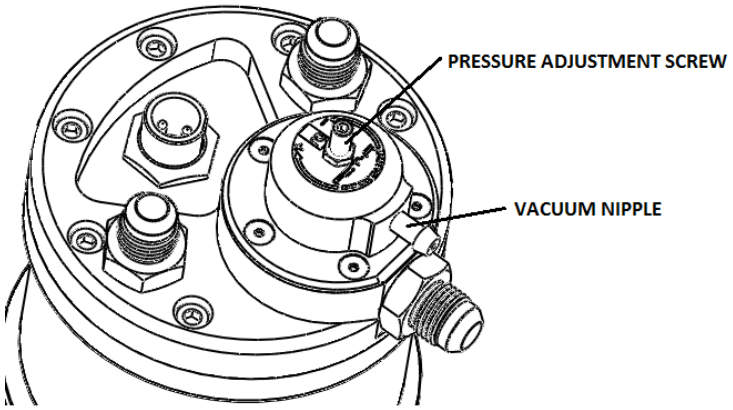
The top right diagram assumes that the primary fuel pump signal is positive 12V. This should be verified with a multi-meter. If the signal is a ground, the relay should be wired as shown in the diagram bottom right.



FUEL PRESSURE ADJUSTMENT

WARNING: THE FST-R FUEL PRESSURE IS NOT PRE-SET. ADJUSTMENT IS REQUIRED BEFORE STARTING ENGINE.

A fuel pressure gauge or sensor is needed in order to monitor pressure. Install the gauge/sensor anywhere along the high pressure line starting from the side port of the FST-R. Closest to the fuel rail will give the most accurate results.
The surge tank must be fully primed with fuel before output pressure can be adjusted. To do this, remove the FST pump fuse and cycle the vehicle's ignition power several times. This will activate the primary fuel pump for a few seconds each time. Check for leaks. After 3-4 cycles, the surge tank should be full of fuel.

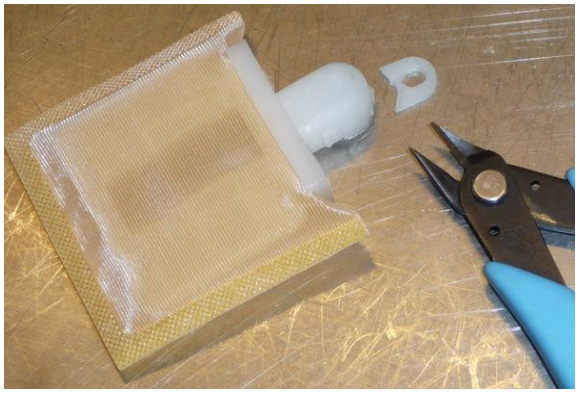


Re-install the FST pump fuse. Turn the ignition key ON. The lift pump and FST pump should prime at the same time. Check for leaks. Watch the pressure gauge during this time. Make adjustments to the pressure adjustment screw using a 3/32" Allen wrench, until proper fuel pressure is obtained. Several priming cycles may be necessary to allow an adjustment and reach the desired pressure.

The engine may now be started. Disconnect the vacuum line from the FST-R and plug the vacuum hose. The engine may hesitate to start the first time while any remaining air is pushed out of the system. With the engine idling, check the static fuel pressure. Make any final adjustments if needed. Use a 3/8" wrench and tighten the jam nut on the adjustment screw. Install the vacuum line back onto the FST-R barbed nipple.

SERVICING

The Radium Engineering FST-R is fully serviceable and all wear parts are available for replacement. All servicing should be done with the FST-R removed from the vehicle.



NOTE: If the FST-R was purchased without a fuel pump included, a filter sock needs to be installed on the pump inlet. Radium Engineering recommends P/N: 14-0143. Depending on the filter sock, it may need to be clocked differently than normal to fit within the FST-R. In this case, the star washer that secures the sock to the pump will not be used. The tab should be cut off, as shown. Instead, the sock will be secured by press-fitting it to the pump inlet.

Pressure Regulator:

1. Remove the 5 small screws. Caution: constant spring pressure will be present. Loosen each screw 1/2 of a turn at a time.
2. Remove the spring and spring cup and set aside.
3. Remove diaphragm and check for rips and general wear.
4. Use a 7/16" socket to remove the orifice.
5. Clean diaphragm seating surface and reassemble in reverse order.