

# INSTALLATION INSTRUCTIONS MULTI-PUMP FUEL SURGE TANK

P/Ns: 20-0437-XX / 20-0438-XX / 20-0443-00

MPFSTs manufactured after April 2019

Document: 19-0202

Support: info@radiumauto.com

## CAUTION

Only a qualified technician following applicable safety procedures should perform the installation of this product. One must have knowledge in repair and modification of fuel systems and general vehicle modifications to install this product.

**Gasoline and other fuels are flammable and can be explosive.**

Only install in a well-ventilated location to minimize buildup of fuel vapors.

No sparks, open flames, smoking or other ignition sources are to be present. Draining and removal of all fuel from the fuel system is recommended. Proper eye and personal protection is required at all times during installation.

## WARNING

The fuel system is under pressure! Do not loosen any connections until relieving the fuel system pressure.

Consult a service manual for instructions on relieving fuel pressure safely. This product is designed for off-highway and racing use only.

Fuel system components may not be legal for sale or use on emissions controlled motor vehicles. Consult local, state, and federal laws.

## READ AND UNDERSTAND THESE INSTRUCTIONS COMPLETELY BEFORE BEGINNING INSTALLATION

The Radium Engineering Multi-Pump Fuel Surge Tank (MPFST) is designed to enhance the fuel system by providing resistance to starvation (from fuel slosh) and by increasing the fueling capability of the system. It is designed for fuel injected engines only and should not be used in carbureted applications.

The primary fuel pump in the vehicle's main gas tank will no longer directly feed the engine. This fuel pump will now be used to fill and maintain the level of fuel in the surge tank. When selecting this fuel pump, keep in mind that it will operate at a very low pressure since it simply cycles fuel right back into the main gas tank. Standard EFI fuel pumps will typically suffice.

The fuel pump(s) inside the MPFST will now be the high-pressure source for the engine's fuel demand. A fuel pressure regulator must be used. Fuel pressure should be checked before and after installation to ensure there is no difference with the MPFST operating. Any change in fuel pressure will affect engine performance.

If purchased with "Pumps Included", everything is internally configured and is ready to be installed. If purchased with "Pumps Not Included", reference the instructions at the end of this manual for proper assembly.

## MOUNTING

The MPFST should be firmly mounted to a stable, structural component of the vehicle away from moving parts, excessive heat, and collision prone areas. The MPFST should not shake or vibrate excessively during operation. This MPFST is designed to be mounted in a standing vertical orientation only. Surge protection effectiveness will suffer if excessively tilted from the vertical position. A threaded plate or M6x1.0mm nuts are required to secure the MPFST using the provided M6 x 1.0mm mounting bolts. If necessary, rubber isolating sandwich mounts (not included) can be used to reduce noise/vibration transmission to the chassis.

## PLUMBING

### Overflow/Supply/Return

The SUPPLY port receives fuel from the lift pump to fill the MPFST. The OVERFLOW port allows excess fuel to drain back to the main gas tank. The RETURN port accepts the low pressure FPR fuel to fill the MPFST. If installing in a vehicle without a return port on the fuel pump module, the OVERFLOW port needs to enter the tank through some other means. This may require installing a fitting and/or modifying the fuel tank.

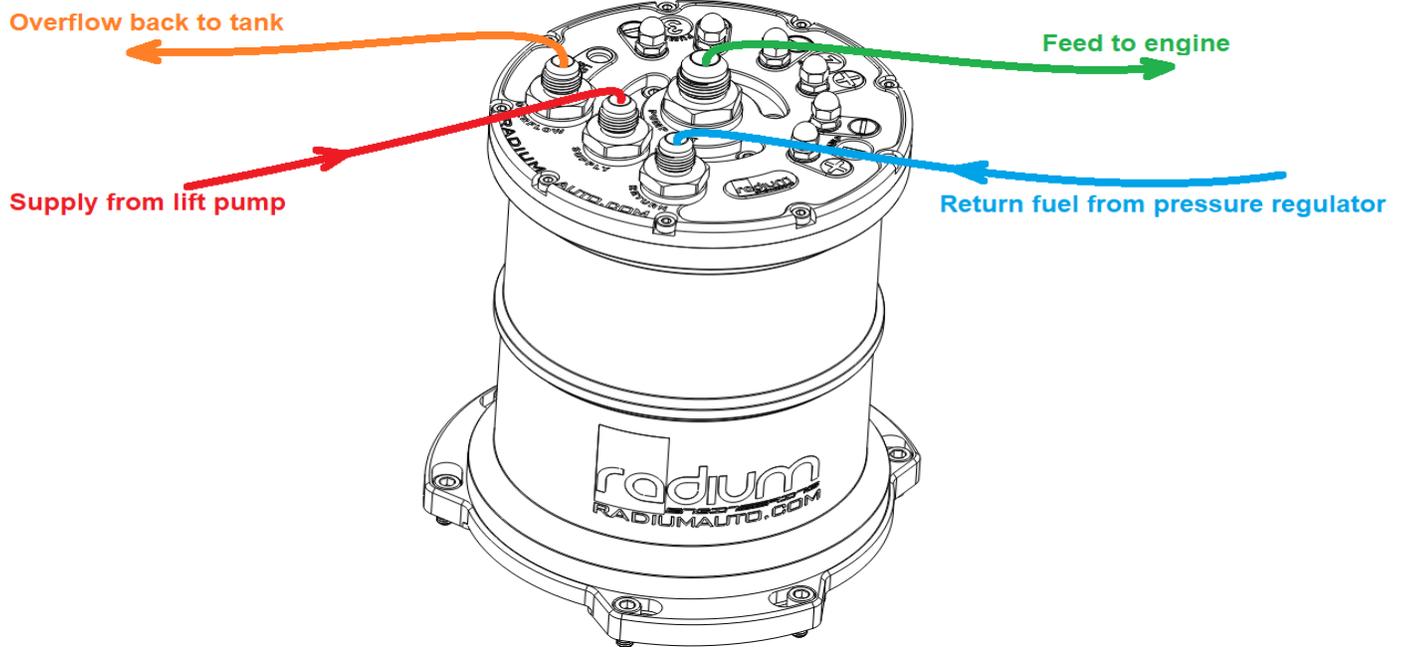
**NOTE: For proper surge tank function, DO NOT swap these ports around.**

All 3 of these ports are female threaded for 8AN ORB (3/4"-16). As shown, 6AN male adapter fittings are included with all MPFST surge tank variations. If different adapter fittings are needed, they must be purchased separately. Visit [radiumauto.com](http://radiumauto.com) and click the product page labeled "8AN ORB Fittings" found in the universal fittings section of the website.



## Pump Out

This port is the single outlet for all internal fuel pumps. This port is female threaded for 10AN ORB. An adapter for 8AN male is included in all MPFST variations. Different adapter fittings can be purchased separately. Visit [radiumauto.com](http://radiumauto.com) and view the product page labeled "10AN ORB Fittings" found in the universal fittings section of the website. Because the MPFST fuel pumps have check valves, it is acceptable to stage the fuel pumps. No fuel will back-feed through a non-running pump.



## WIRING

### Power Leads

Each MPFST fuel pump has dedicated power wiring. The wiring terminals are labeled on the MPFST top plate. Crimp-on ring terminals and heat shrink are supplied. Install the ring terminals on the end of the wires and cover the crimp area with the shrink tubing, as shown. Install the ring terminals on the appropriate MPFST terminals and tighten the included acorn nuts.

Radium Engineering universal wiring kit P/N: 17-0031 is recommended for the fuel pump circuits. Consult the installation instructions for the 17-0031 kit for wiring diagrams. Because some pumps can draw over 20A at high pressure, each pump must have its own dedicated fuse and relay. Fuses and wiring should be sized accordingly. For most setups, 10AWG power wires will suffice. Also, check and understand what kind of signal will be used for triggering the fuel pump relays using a multi-meter or oscilloscope.

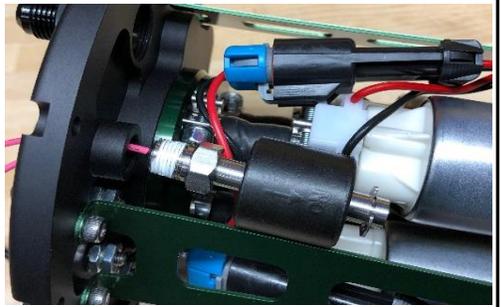


## Fuel Level Switch (20-0461)

To install the optional fuel level switch, the top plate must be removed from the surge tank canister. The float on the switch can be flipped for Normally Open (NO) or Normally Closed (NO) configuration by removing the E-clip. For the switch to be closed during low fuel, the arrow on the float should be pointing downward.

Remove the small 2AN ORB plug from the top plate using a 1/8" Allen wrench. Apply a small amount of PTFE paste or tape to the level switch threads, as shown. Route switch wires through the top plate's threaded hole and thread the switch into the underside of the top plate. Hand tighten the switch, then add another 1.5 to 3 turns with a wrench until tight and sealed.

The MPFST top can now be installed back on the canister. The 2 switch wires can be routed for the installer's specific purposes. The switch will activate when fuel level drops by 20% or more.



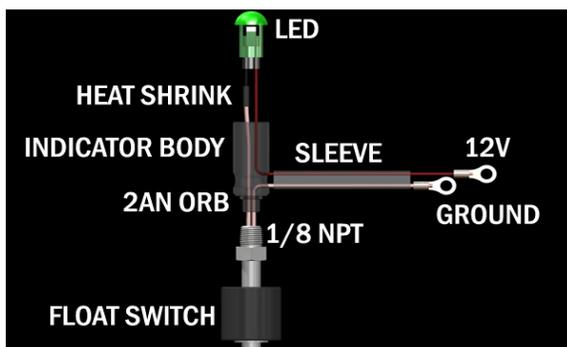
## Diagnostic Indicator Kit (20-0508)

Route the 2 pink wires (from the 20-0461 fuel level switch) through the included black aluminum tube. Next, thread the tube into the MPFST top plate and tighten. Route one of the switch wires back down into the tube and out one of the side holes of the aluminum tube. Pull slack out. Cut the other switch wire short and solder it to the red LED wire, which should also be cut short. Make sure to cover this connection with the included shrink tube. Route the LED black wire down into the tube and out the same hole as the other level switch wire.

Push the LED down into the tube until it is fully seated. Cover both loose wires with the protective sleeving and route to the power source. For simplicity, this can be the pump #1 power terminals.

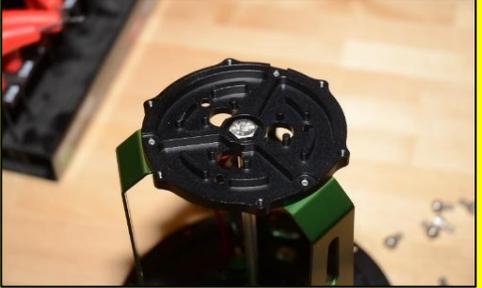
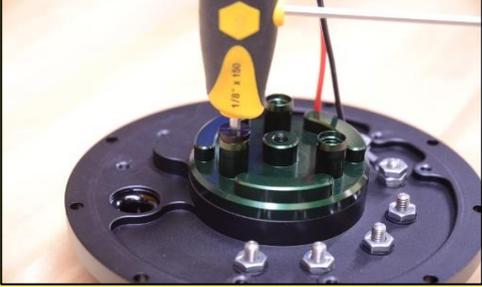
Crimp the ring terminals to the power and ground wires. Connect the red to the positive terminal and black to the negative terminal. Use heat shrink on the ring terminal crimps.

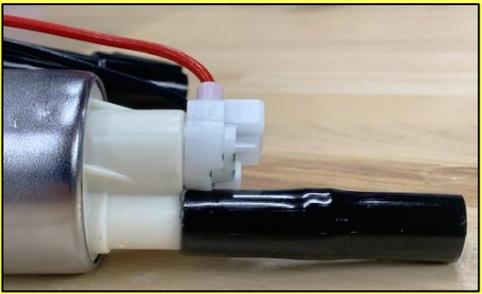
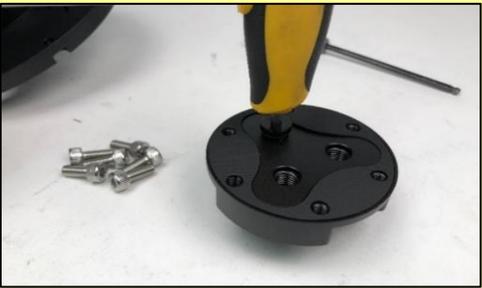
NOTE: The wiring described above puts the switch on the positive side of the LED. The switch can also be put on the negative side of the LED, as shown below:

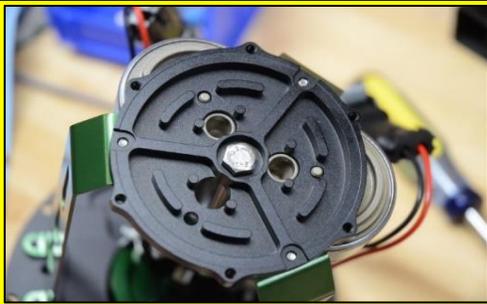
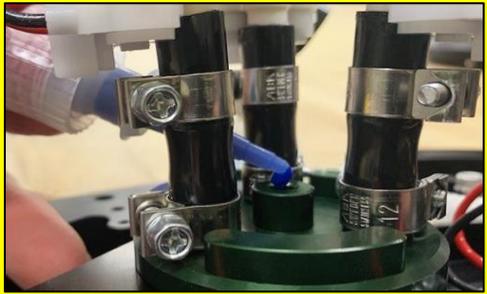
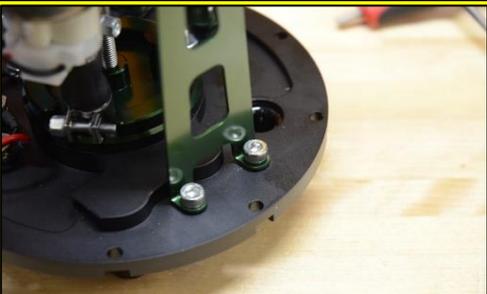


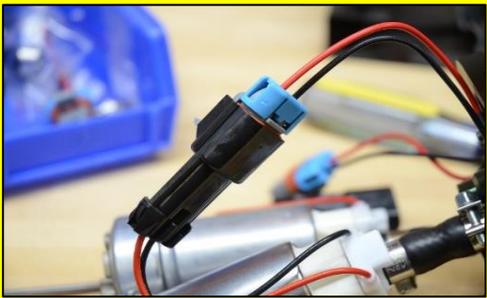
## Start Up

The MPFST must be primed with fuel before the engine can start. Remove the MPFST pump fuses and cycle the vehicle's ignition power several times. This will activate the lift pump for a few seconds each time. After 3-4 cycles the engine should be ready. Reinstall the fuel pump fuses and start the engine. Fix any potential leaks and adjust fuel pressure.

STEP	TOOLS NEEDED	INSTRUCTIONS	PHOTO
1	3mm Allen Wrench	<p><b>20-0437-XX / 20-0438-XX ASSEMBLY</b></p> <p>If delivered without pumps installed, follow the assembly section below. For brushless 20-0443-00 MPFST, see next section.</p> <p>Remove the 9 perimeter bolts holding the top plate on the surge tank.</p>	
2		Lift off the top cap and set the assembly on the work bench.	
3	Allen Hex Wrench	Remove the 6 screws holding the bracket to the underside of the MPFST pump cap.	
4	10mm Socket	<p><b>THIS STEP IS NOT PERMITTED IF MANUFACTURED AFTER DEC 2021</b></p> <p>Remove the center bolt shown in the picture. Lift the pump cradle assembly off and set aside.</p>	
5		<p>Submersible fuel tubing will need to be installed between the pump outlet and the barbed fitting under the fuel hat. As shown, extra tubing is provided in case of damage during assembly. The fuel tubing is pre-cut to an exact length to match the specific pump noted in the kit.</p> <p>NOTE: Care must be taken not to kink the tubing. If too much force is applied, replace the tube.</p> <p>If installing Walbro F90000267/274/285 pumps, skip steps 9-13. If installing Walbro GSS342 or AEM 50-1200 pumps, skip steps 6-8.</p>	
6	1/8" Hex Wrench	<p><b>Walbro F90000267/274/285 pumps ONLY</b></p> <p>For 1 or 2 pump configurations, install the 2AN ORB plugs into collector block port(s) that will not be used. It does not matter which ports. For 3 pump configurations, do not install any port plugs.</p>	

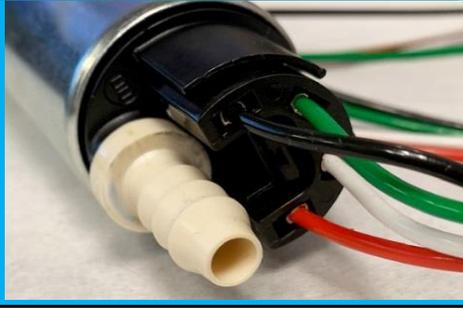
7	Oil Lubrication	<b>Walbro F90000267/274/285 pumps ONLY</b>	
		First, apply oil lubrication to all associated barbs and to both inner ends of the tubing. Gently apply force to push it onto the fuel pump outlet barb.	
		For proper fitment, the tube(s) must be pushed ALL THE WAY down the fuel pump outlet, as shown.	
8	9/32" Nut Driver	<b>Walbro F90000267/274/285 pumps ONLY</b>	
		As shown, secure using one of the EFI hose clamps.	
		If applicable, repeat this process for the second pump.	
		<b>Skip to Step 14</b>	
9	4mm Hex Wrench	<b>Walbro GSS342 or AEM 50-1200 pumps ONLY</b>	
		If installing 3 pumps, skip this step.	
		For 1 or 2 pump configurations, remove the 6 screws around the outlet port, as shown. This will release the pump collector from the bottom of the plate.	
10	1/8" Hex Wrench	<b>Walbro GSS342 or AEM 50-1200 pumps ONLY</b>	
	4mm Hex Wrench	If installing 3 pumps, skip this step.	
	in-lb Torque Wrench	As shown, install plugs into any ports that will not be used. It does not matter which ports are plugged. Next, mate the collector back to the bottom side of the top plate. Align the gasket with the features of the underside of the plate.	
		Torque the 6 screws removed in the previous step to 32 in-lbs.	
11		<b>Walbro GSS342 or AEM 50-1200 pumps ONLY</b>	
		-For Walbro GSS342 255LPH pumps use the longer tubing (right).	
		-For AEM 50-1200 pumps use the shorter tubing (left).	
12		<b>Walbro GSS342 or AEM 50-1200 pumps ONLY</b>	
		For many 300/320/340LPH pumps (such as AEM 50-1200), low heat is required to temporarily soften the tubing. This can be achieved using boiling water or a heat gun.	
		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.	

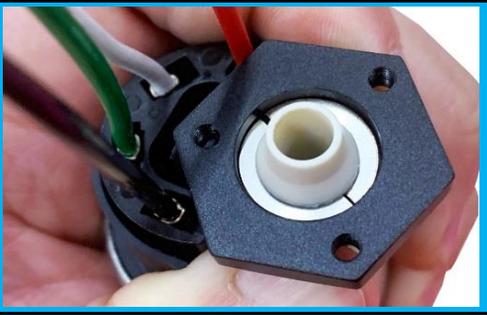
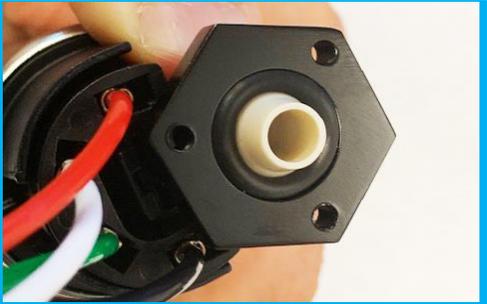
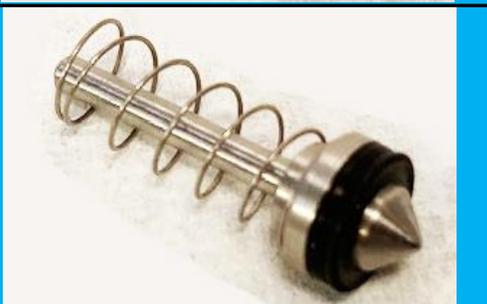
13	Oil Lubrication	<p><b>Walbro GSS342 or AEM 50-1200 pumps ONLY</b></p> <p>Lubricate all associated barbs and both inner ends of the tubing. Gently apply force to push it onto the fuel pump outlet barb. NOTE: Fuel pump hose barbs can fracture if not treated with extra care.</p> <p>As shown, secure using one of the EFI hose clamps. If applicable, repeat this process for the second pump.</p>	
	9/32" Nut Driver		
14	Oil Lubrication	<p>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 until it is fully seated. NOTE: Do NOT apply heat on this side of the tubing connection. It is NOT required. Rotate each fuel pump so the electrical connectors are facing outward. Secure the EFI clamps.</p> <p>Check the orientation of the pumps by installing the pump retaining plate. Rotate the pumps until the inlets and pegs align with the holes in the plate.</p>	
	9/32" Nut Driver		
15		<p><b>THIS STEP IS NOT PERMITTED IF MANUFACTURED AFTER DEC 2021</b></p> <p>To remove the green lower filter screen, unscrew the 6 Allen head screws.</p>	
16	10mm Socket	<p><b>THIS STEP IS NOT PERMITTED IF MANUFACTURED AFTER DEC 2021</b></p> <p>Apply a drop of medium-strength threadlocker to the center area shown. Install the bolt through the pump retaining plate and thread it into the pump collector block. Loosely install this screw.</p>	
	Threadlocker		
17	Allen Hex Wrench	<p>Reinstall the 6 screws removed from the earlier step.</p>	
18	10mm Socket	<p><b>THIS STEP IS NOT PERMITTED IF MANUFACTURED AFTER DEC 2021</b></p> <p>After all 6 screws are installed and tight, snug down the long bolt using a 10mm socket. Do not overtighten as it could over-compress the short hoses and damage the pump(s).</p>	

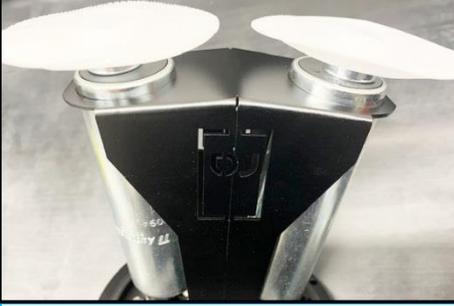
19		<p>Plug in the wiring connectors to the pumps. This may look different depending on the fuel pump model.</p>	
20		<p>Place the inlet screen onto the pump retaining plate as shown. Line up the small tabs in screen holder to the recesses in the plate.</p>	
21	Allen Wrench	<p>Install the 6 small screws to hold the inlet screen in place. Tighten the screws.</p> <p>Allen Wrench Size: Older MPFST: 5/64" Newer MPFST: 3/32"</p>	
22		<p>The assembly of the pump module is now complete. Tuck any wires in close to the pumps.</p>	
23		<p>Make sure the o-ring is properly seated in the MPFST canister groove, as shown.</p>	
24	3mm Hex Wrench	<p>Install the pump module into the surge tank. The orientation should be considered for optimal hose plumbing and electrical routing.</p> <p>Install the 9 perimeter bolts and tighten in an alternating cross pattern to 30 in-lb.</p> <p><b>Assembly Complete</b></p>	
	in-lb Torque Wrench		

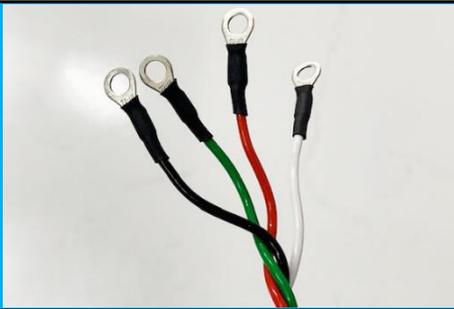
## 20-0443-00 BRUSHLESS E5LM ASSEMBLY

Follow the section below for assembling the brushless E5LM. For 20-0437-XX and 20-0438-XX MPFST, see section above.

STEP	TOOLS NEEDED	INSTRUCTIONS	PHOTO
1	3mm Allen Wrench	Remove the 9 perimeter bolts holding the top plate on the surge tank.	
2		Lift off the top cap and set the assembly on the work bench.	
3	4mm Allen Hex Wrench	Remove the 4 screws holding the bracket to the underside of the MPFST top cap.	
4	1/4" Allen Wrench	If installing 2 fuel surge tank pumps, remove the 6AN ORB plug, as shown.  If installing 1 fuel surge tank pump, make sure there is a 6AN ORB plug in either one of the ports.  Perform the following procedure for both pumps.	
5		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 to the electrical terminals, as shown.	

6		<p>To install the check valve, first slide the black collar over the pump outlet with the flat surface upward, as shown.</p>	
7		<p>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.</p> <p>Pull the collar up to confirm the retainers lock into place as depicted.</p>	
8	Oil	<p>Place the included O-ring on the pump outlet. Apply a petroleum-based lubricant to the O-ring.</p> <p>Slide the black collar upward and tuck the O-ring into the groove, as shown.</p>	
9		<p>Place the O-ring onto the check valve plunger groove, as shown.</p>	
10		<p>Place the provided spring around the plunger rod, as shown.</p>	
11		<p>Insert the plunger rod through the internal center hole of the green adapter fitting, as shown.</p>	

12	2.5mm Allen Wrench	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.	
	Thread Locker		
13	Oil	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.	
	1" Wrench		
14	Oil	Apply a petroleum-based lubricant to the check valve O-ring. Tighten the fuel pump check valve(s) to the 6AN ORB port(s).  NOTE: these 6AN ORB ports are intentionally at a slight angle.	
	15mm Wrench		
15	4mm Allen Wrench	Rotate the fuel pump(s) so that the connector(s) are the furthest outside away from the center of the surge tank.  Secure the fuel pump bracket.	
16		Press the fuel filter sock(s) down onto the fuel pump inlet(s) until fully seated.  NOTES: 1. Depending on the brand or style of strainer(s), the orientation may need to be adjusted with respect to the surge tank canister. 2. Radium Engineering P/N: 14-0543 fuel filter socks (shown) have been confirmed to be perfect for this application.	
17	Diagonal Cutters	Cut the wires to lengths around 3.5" (89mm).  Strip the wires.  Slide the provided heat shrink to each wire as shown.	
	Wire Strippers		

18	Wire Crimpers	Crimp the provided ring terminals to the end of each wire.	
	Heat Gun	Slide the heat shrink over the crimped area. Apply heat to the shrink the insulation.	
19	3/8" Wrench	Connect each ring terminal to the corresponding wire color terminal depicted on the top of the FCST plate.  R = Red G = Green W = White B = Black  The assembly of the pump module is now complete.	
20		Make sure the o-ring is properly seated in the MPFST canister groove, as shown.	
21		Tuck wires and filter sock(s) inwards and carefully lower down into the canister.	
22	3mm Hex Wrench in-lb Torque Wrench	The orientation should be considered for optimal hose plumbing and electrical routing.  Install the 9 perimeter bolts and tighten in an alternating cross pattern to 30 in-lb.  <b>Assembly Complete</b>	