

# INSTALLATION INSTRUCTIONS

## Multi-Pump Fuel Surge Tanks (after June 2024)

P/Ns: 20-0443-00, 20-1440, 20-1441, 20-1443

20-1445, 20-1446, 20-1447

Document: 19-0402

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

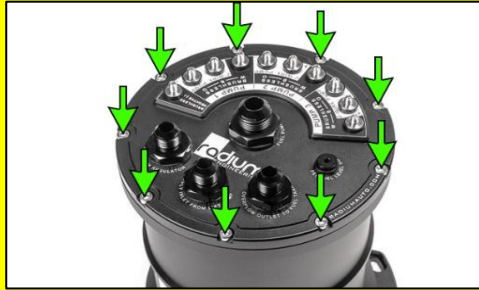

The Radium Engineering Multi-Pump Fuel Surge Tank (MPFST) and Multi-Pump Fuel Surge Tank-Regulated (MPFST-R) is designed to enhance the fuel system by providing resistance to starvation (from fuel slosh) and by increasing the fueling capability of the system. It is designed for fuel injected engines 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 surge tank 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 surge tank operating. Any change in fuel pressure will affect engine performance.

## 20-1440/1441/1442/1445/1446/1447 PUMP ASSEMBLY

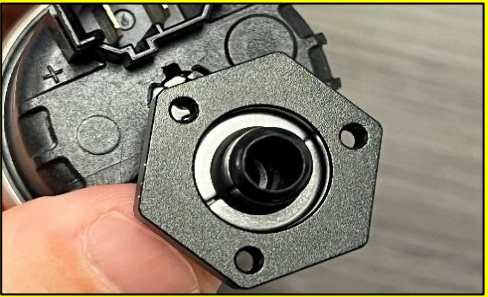


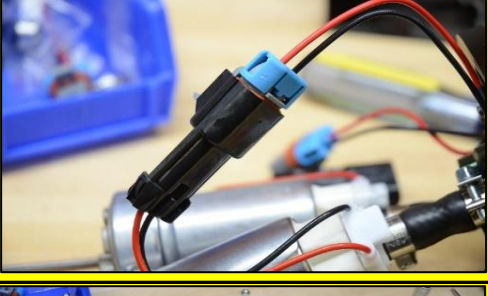

Follow this section for Walbro GSS342, F90000267/274/285, AEM 50-1200, DW440, DW400, and Bosch BR540 pump(s).


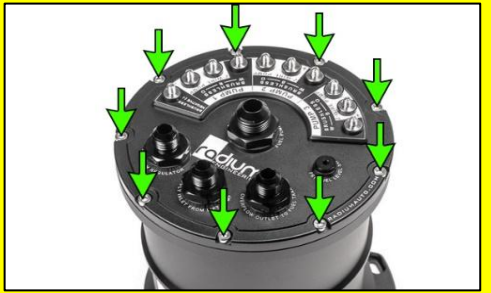
STEP	TOOLS NEEDED	INSTRUCTIONS	PHOTO
1	3mm Allen Wrench	<b>20-1440 / 1441 / 1442 / 1445 / 1446 / 1447 ASSEMBLY</b> <i>For 20-0443-00 Ti Automotive ESLM MPFST, see next section.</i>	
		Remove the 9 perimeter bolts holding the top plate on the surge tank.	
		NOTE: MPFST-R not pictured but same steps apply.	
2		Lift off the top cap and set the assembly on the work bench.	



9		<b>Walbro GSS342, F90000267/274/285, and AEM 50-1200 ONLY</b>	
		Tubing will need to be installed between the pump outlet and the triple pump block collector inlets. The provided fuel tubing is pre-cut to an exact length to match the specific pump(s) in the kit.	
		NOTE: For the 20-1440 MPFST, there are 2 different lengths of fuel tubing, as shown. Use the longer tubing for Walbro GSS342 pumps and the shorter tubing for AEM 50-1220 pumps.	
10	Oil Lubrication	<b>Walbro GSS342, F90000267/274/285, and AEM 50-1200 ONLY</b>	
	Heat Gun	First, apply oil lubrication to all associated barbs.	
		Low heat is required to temporarily soften the tubing. This can be achieved using boiling water or a heat gun. Be careful not to over-heat and melt the tubing. If the tubing becomes too soft and deformed, replace it with a new piece.	
11	9/32" Nut Driver	<b>Walbro GSS342, F90000267/274/285, and AEM 50-1200 ONLY</b>	
		Gently apply force to push the tubing onto the fuel pump outlet barb. NOTE: Care must be taken not to kink the tubing. If too much force is applied, replace the tube.	
		As shown, secure using one of the EFI hose clamps. If applicable, repeat this process for the other pumps.	
12	Oil Lubrication	<b>Skip this step for Bosch BR540 and DW400 pumps</b>	
	9/32" Nut Driver	For each fuel pump, slide over a second EFI hose clamp. Use lubrication as previously mentioned and install to the triple pump collector until fully seated. Rotate each fuel pump so the electrical connectors are facing outward.	
		Check the orientation of the pumps by installing the pump inlet retaining plate. Rotate the pumps until the inlets and pegs align with the holes in the plate. Secure the EFI clamp(s).	
13		<b>Bosch BR540 and DW400 pumps ONLY</b>	
		Because the Bosch BR540 and DW400 pumps are so tall, the pump outlet adapters (shown) will be used instead of tubing or hose.	
14		<b>Bosch BR540 and DW400 pumps ONLY</b>	
		First inspect the pump outlet hose barb. If the hose barb is deformed, modified or damaged, the pump outlet adapter will not install correctly and the fuel pump cannot be used.	
		First, slide the black collar over the pump outlet with the flat surface upward, as shown.	

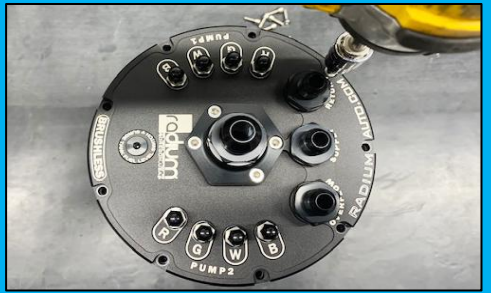






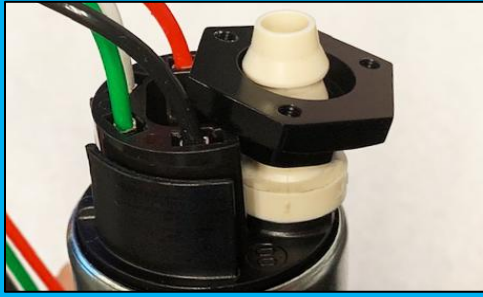

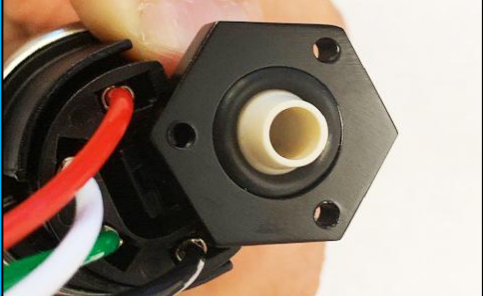

15		<b>Bosch BR540 and DW400 pumps ONLY</b>	
		Slip the stainless steel retainers between the 2 large hose barbs. When assembled, it will lodge itself under the hose barb ridge closest to the end of the pump outlet opening.	
		Pull the collar up to confirm the retainers lock into place, as depicted.	
16	Oil Lubrication	<b>Bosch BR540 and DW400 pumps ONLY</b>	
		As shown, place the included O-ring on the pump outlet while applying a small amount of pressure upwards on the black collar.	
		Press the O-ring down into the groove.	
		Drop a small amount of the lubrication on the O-ring.	
17	2.5mm Allen Wrench	<b>Bosch BR540 and DW400 pumps ONLY</b>	
		Line up the green fitting holes to the black fitting threads.	
		As shown, secure and tighten all screws evenly.	
18	15mm Wrench	<b>Bosch BR540 and DW400 pumps ONLY</b>	
		Lubricate the external O-ring on the male 6AN green fitting. Install the fuel pump(s) into any of the available ports on the triple pump collector block.	
		Rotate each fuel pump so the electrical connectors are facing outward. Check the orientation of the pumps by installing the pump inlet retaining plate. Rotate the pumps until the inlets and pegs align with the holes in the plate.	
19		Plug in the wiring connectors to the pumps. This may look different depending on the fuel pump model.	
20	Allen Hex Wrench	Reinstall the 6 screws removed from the earlier step.	
		The assembly of the pump module is now complete. Tuck any wires in close to the pumps.	

21		Make sure the O-ring is properly seated in the surge tank canister groove, as shown.	
22	3mm Allen Wrench in-lb Torque 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>	


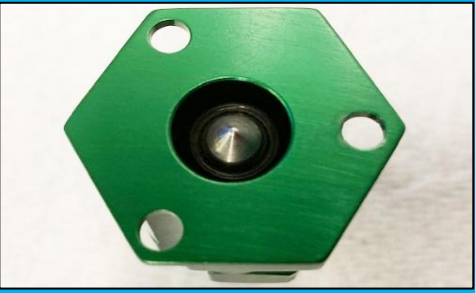




## 20-0443-00 BRUSHLESS E5LM ASSEMBLY







Follow the section below for assembling Ti Automotive E5LM pump(s).

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 surge tank top hat.	


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		To install the check valve, first slide the black collar over the pump outlet with the flat surface upward, as shown.	
7		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.	
8	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.	
9		Place the O-ring onto the check valve plunger groove, as shown.	



10		Place the provided spring around the plunger rod, as shown.	
11		Insert the plunger rod through the internal center hole of the green adapter fitting, as shown.	
12	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.	
13	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.	
14	Oil 15mm Wrench	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.	
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).	
	Wire Strippers	Strip the wires.	
		Slide the provided heat shrink to each wire as shown.	
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 top hat.	
		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 surge tank canister groove, as shown.	
21		Tuck wires and filter sock(s) inwards and carefully lower down into the canister.	



22	3mm Hex Wrench	The orientation should be considered for optimal hose plumbing and electrical routing.	
	in-lb Torque Wrench		
		Install the 9 perimeter bolts and tighten in an alternating cross pattern to 30 in-lb.	
		Assembly Complete	

## MOUNTING

The surge tank should be firmly mounted to a stable, structural component of the vehicle away from moving parts, excessive heat, and collision prone areas. The surge tank should not shake or vibrate excessively during operation. It 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 surge tank using the provided M6 x 1.0mm mounting bolts (shown). If necessary, rubber isolating sandwich mounts (not included) can be used to reduce noise/vibration transmission to the chassis.



## PLUMBING

### Supply

The SUPPLY port receives fuel from the lift pump to fill the surge tank.

This port is female threaded for 8AN ORB (3/4"-16). A 6AN male adapter fitting is included (20-0443-00 MPFST is shown). If a different adapter fitting is 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.



### Overflow

The OVERFLOW port allows excess fuel to drain back to the main tank. If installing in a vehicle without a return port, the OVERFLOW port needs to enter the tank through some other means (installing a fitting on the filler hose, pump module, fuel tank, etc.)

This port is female threaded for 8AN ORB (3/4"-16). A 6AN male adapter fitting is included (20-1440 MPFST is shown). If a different adapter fitting is 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.



### Return

MPFST-R: there is no external return port. The built-in regulator returns fuel internally.

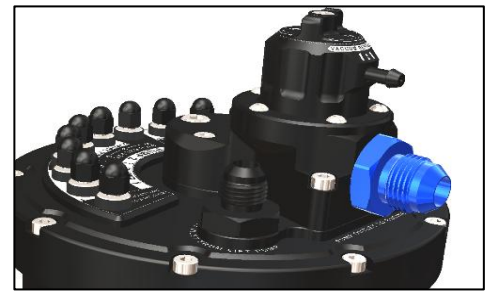
MPFST: the RETURN port accepts fuel from the FPR to fill the canister. This port is female threaded for 8AN ORB (3/4"-16). A 6AN male adapter fitting is included (20-1443 MPFST is shown). If a different adapter fitting is needed, it must be purchased separately. Visit [radiumauto.com](http://radiumauto.com) and click the product page labeled "8AN ORB Fittings" found in the universal fittings section of the website.



### Fuel Pump Outlet

This port is the single merged outlet for all internal fuel pump(s). It is female threaded for 10AN ORB (7/8"-14). An 8AN male adapter fitting is included (20-1445 MPFST-R is shown). If a different adapter fitting is needed, it must 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.

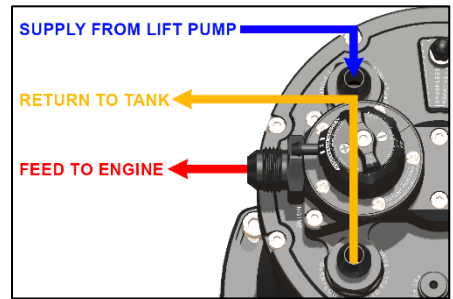
NOTE: If the installed fuel pumps have check valves, it is acceptable to stage the pumps. No fuel will back-feed through a non-running pump.



### MPFST-R Plumbing Schematic

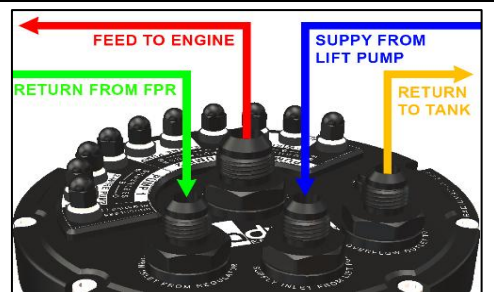
Shown is a general schematic for hose plumbing for the 3 MPFST-R ports.

There is an 1/8" NPT plug provided to block-off the 1/8" NPT port (MPFST-R only). However, a gauge, sensor, etc. (not included) can be installed here to measure fuel pressure. When installing pipe thread fittings, apply PTFE paste to the threads. Next, hand tighten the fitting, then add 1.5-3 turns with a wrench.



### MPFST Plumbing Schematic

Shown is a general schematic for hose plumbing for the 4 top hat ports.



## WIRING

### Power Leads

Each fuel pump has dedicated power wiring. The wiring terminals are labeled on the top hat. 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 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)

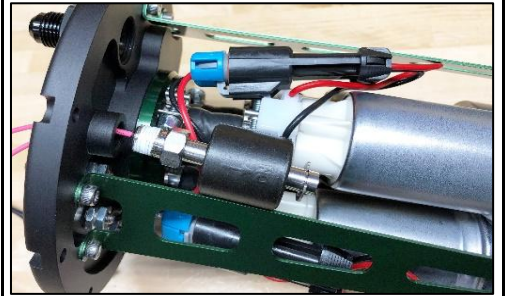
To install the optional fuel level switch, use an 1/8" Allen wrench to remove the preinstalled plug (shown) from the FST FUEL LEVEL SWITCH port.

Next, remove the top plate from the surge tank canister.

The float on the switch can be flipped for Normally Open (NO) or Normally Closed (NC) configuration by removing the E-clip. For the switch to be closed during low fuel, the arrow on the float should be pointing downward.

Apply a small amount of PTFE paste 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 top hat 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.



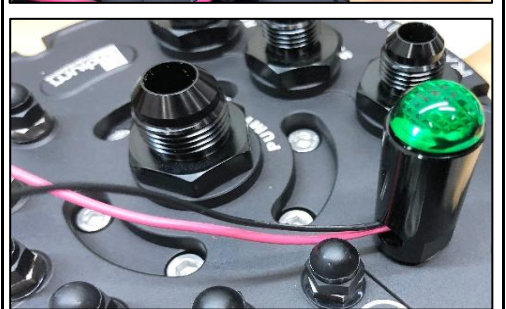
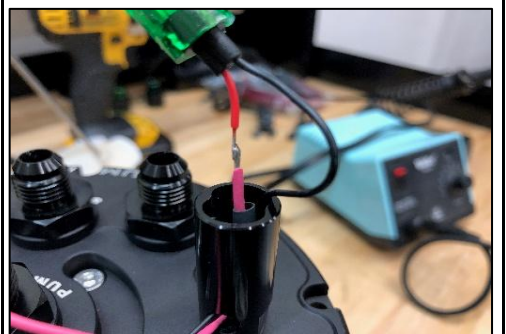
### Diagnostic Indicator Kit (20-0508)

Route the 2 pink wires (from the 20-0461 fuel level switch) through the included black aluminum tube. Next, thread the tube into the top hat 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.

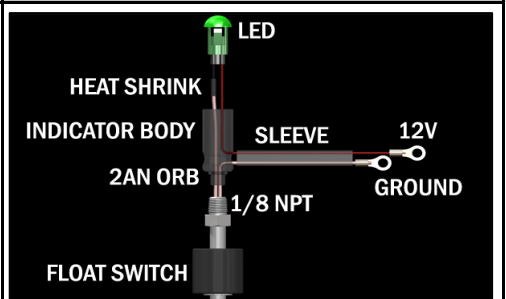
Push the LED down into the tube until it is fully seated. Cover both loose wires with the protective sleeving and route to the power source. For simplicity, this can be the pump #1 power terminals.

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.



### Fuel Level Switch and Diagnostic Indicator Schematic

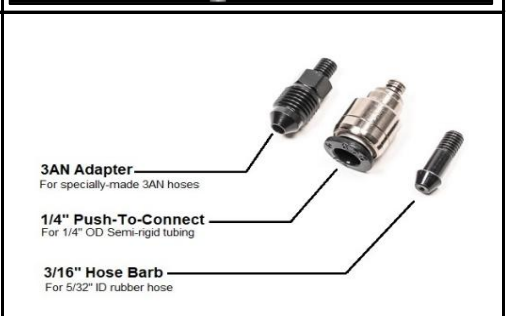
NOTE: The wiring described above puts the switch on the positive side of the LED. The switch can also be put on the negative side of the LED, as shown in this schematic



### MPFST-R (ONLY)

Install 1 of the 3 fittings (shown) if a 1:1 reference is required. NOTE: For constant pressure (used in all returnless fuel systems), plug the reference port using the provided screw (not shown). Use a wicking thread locking compound, such as LOCTITE 290. Take care not to allow the thread locking compound in the air passage of the vacuum adapter.

Simply finger tighten the fitting. If installing the 3AN fitting, do NOT over torque. Be sure to hold the fitting with a wrench when securing the hose end. These are manufactured from high strength steel, but are very small.





**Start Up**

The surge tank must be primed with fuel before the engine can start. Remove the surge tank pump fuse(s) 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 fuse(s) and start the engine. Fix any potential leaks and adjust fuel pressure.

**MPFST-R (ONLY)**

The regulator is NOT pre-set. Install a gauge or sensor as close to the fuel rail(s) as possible. Disconnect and plug the vacuum line from the vacuum port. Activate the pump manually or start the engine. Tighten the knob (clockwise) to increase pressure, loosen the knob (counterclockwise) to decrease pressure.

**NOTES:**

1. No tools are necessary to lock pressure. Don't attempt to the tighten the Allen screw.
2. It is not uncommon for pressure to bleed down after the pump is turned off. This behavior does not imply there is a regulator issue.

