



# INSTALLATION INSTRUCTIONS

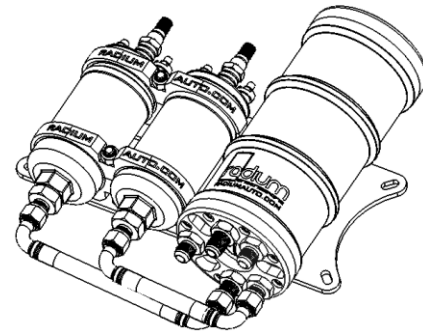
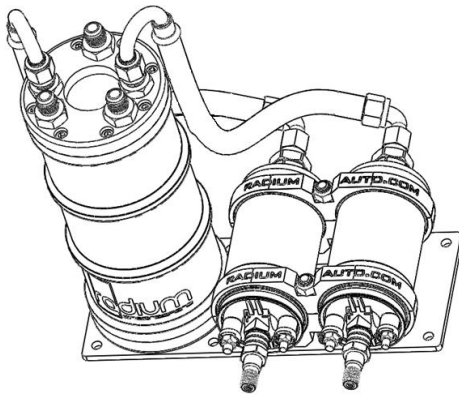
## DUAL EXTERNAL PUMP FST Vertical & Horizontal Mount

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Document: 19-0013

### READ AND UNDERSTAND THESE INSTRUCTIONS COMPLETELY BEFORE BEGINNING INSTALLATION

Radium Engineering Fuel Surge Tanks (FST) are designed to enhance the fuel system by providing resistance to starvation (from fuel slosh) and by increasing the fueling capability of the system.



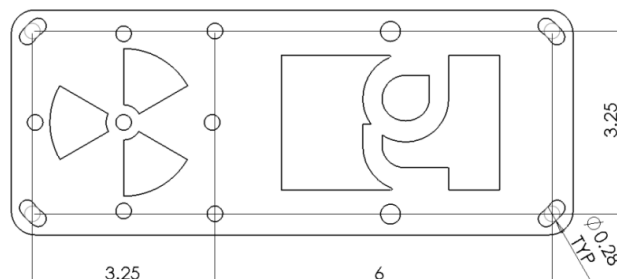
The primary fuel pump in the vehicle's main fuel tank will no longer directly feed the engine. This pump will now be used to fill and maintain the level of fuel in the surge tank. The two external FST fuel pumps will be the high pressure source for the engine's fuel demand. This fuel must be pressure regulated either with a factory fuel pressure regulator (if equipped) or an aftermarket regulator. 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.

When using two external pumps (such as Bosch 044 pumps) **and** the pumps will not be both operating at the same time (staged setup), then a check valve must be used on the secondary pump. Bosch 044 pumps (and the many similar copies) do not have internal check valves. Radium offers compatible check valves, contact [info@radiumauto.com](mailto:info@radiumauto.com) for more details.

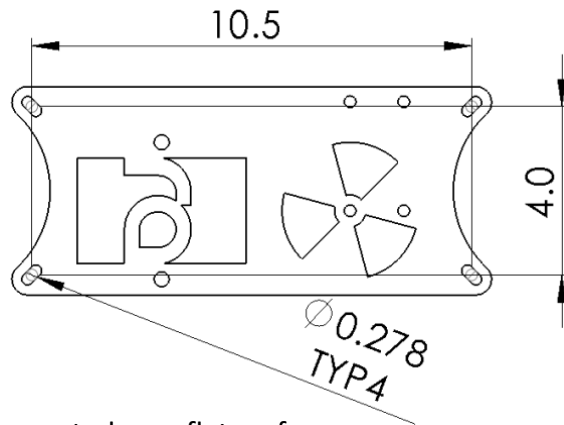
## MOUNTING

For proper use, the FST should be mounted to a stable level floor that is a structural component of the vehicle. Place away from moving parts and excessive heat. The FST should not shake or vibrate excessively during operation. M6 sized mounting holes are provided on the bottom plate. Use blue thread locker on the fasteners that thread into the surge tank. Below are the mounting-hole dimensions for the bottom plate.

Vertical Mount Hole Dimensions



## Horizontal Mount Hole Dimensions



The horizontal version should be mounted on a flat surface.

## ASSEMBLY

### Horizontal Pump Version

1. Attach the surge tank to the bracket with the included four screws. When this is done, the green outlet fittings on the surge tank should be in the bottom-most positions. Attach the pumps using the green brackets as shown. The pump inlets should face the end of the surge tank that has the fittings, as shown. Install adapter fittings and large crush washers into the inlets of the pumps.

Loosely install the 90 degree hose ends on the pump inlets and the green fittings on the surge tank as shown.

2. Locate the vapor shield hose included in the kit. Measure and cut small pieces that are the correct lengths to connect the hose ends installed in the previous step.

Extra hose is provided in case it is needed.

3. Remove the hose ends and install them into the pieces of hose from the previous step. Some lubrication may be necessary. Do NOT install hose clamps on these connections.



4. Reinstall the assembled hose ends and tighten the ends to the fittings on the pumps and surge tank.



#### Vertical Pump Version

1. Assemble the surge tank as shown. Install the pump inlet adapter fittings using the large crush washers.

Line-up and secure the fuel pumps to the mounting plate using the billet clamps and 2 sets of M8 bolt/nut. Mount the canister to the bottom plate using the 4 short M6 countersink screws, but do NOT over tighten. Using a non-marring aluminum wrench, attach the 2 included fuel hoses from the FST green ports to the pumps and tighten. Tighten the M8 bolts/locking nuts to 20-30 in-lbs to avoid warping the mounting plate. Fully tighten the rest of the hardware.



#### 4-Port Manifold Assembly

Remove the Bosch check valves from the pump outlets and install the adapter fittings and crush washers. Make sure there are O-rings installed on the 6AN side of the adapter fittings and are lubricated with some oil.

If check valves are required (such as with staging the pumps), contact Radium Engineering for check valves that are compatible with the 4-port manifold.



Rotate the pumps to screw them into the manifold and hand tighten. The pumps can now be installed into the green brackets and attached to the mounting plate.



## System Plumbing for Vertical Version

NOTE: Fuel entering the FST from the primary pump must be filtered. If the FST will be mounted in the cabin, it is recommended to use non permeating fuel hose to eliminate non volatile fuel vapor.

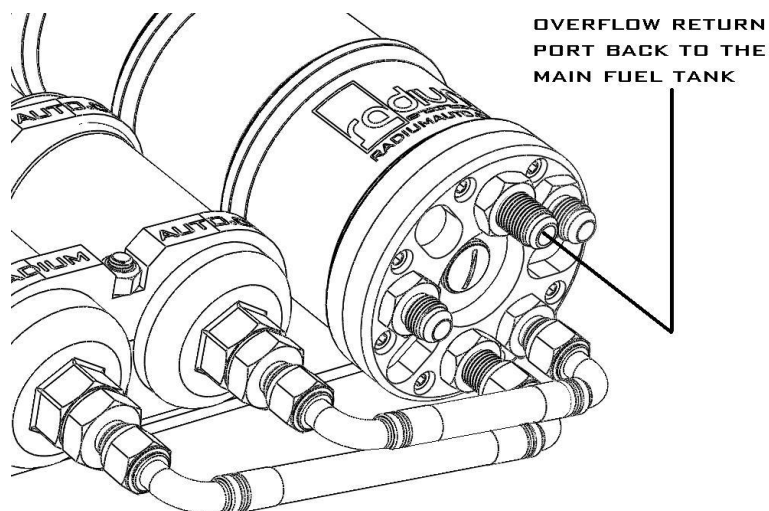
The 2 green port fittings are feed ports for the 2 pumps. These are the only 2 important ports which utilizes long tubing that pickup fuel from the bottom of the canister. Connect the two included hoses to these ports, as shown. Note: The 180deg hose end may need to be clocked for proper fitment. Simply use two wrenches and spin appropriately.

There are three extra -6AN port fittings on the surge tank that are interchangeable and directly access the internal fluid volume of the surge tank. One of the port fittings connects to the main fuel tank's return port. One of the port fittings connects to the factory fuel pump in the main fuel tank. The last port fitting connects to the fuel pressure regulator's discharge.

## System Plumbing for Horizontal Version

Fuel entering the surge tank from the primary fuel pump must be filtered. If the FST will be mounted in the cabin, it is recommended to use non permeating fuel hose.

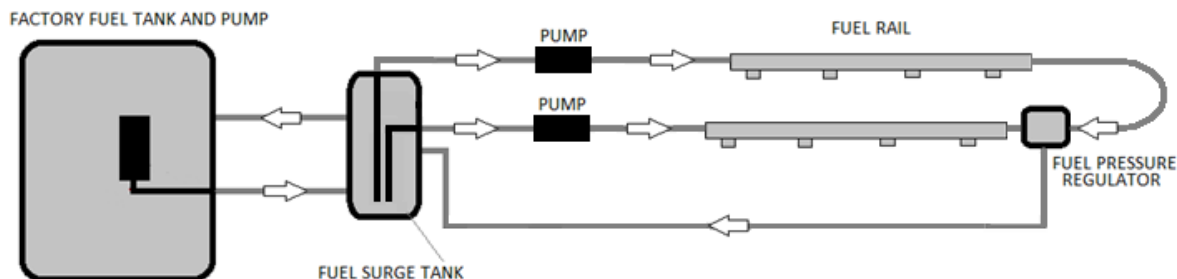
There are three extra -6AN port fittings on the surge tank that directly access the internal fluid volume of the surge tank. The highest top port (shown in picture) should be connected to the main fuel tank's return port.



The other two ports are interchangeable. One of the port fittings connects to the factory fuel pump in the main fuel tank. The other port fitting connects to the return line from the pressure regulator.

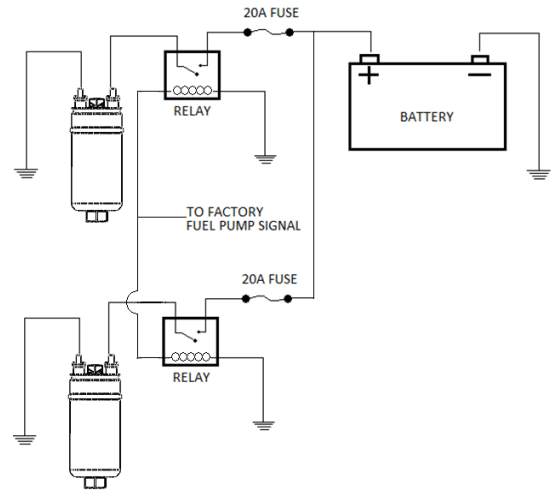
## FUEL SYSTEM EXAMPLE

The following diagram shows a typical routing scheme that can be used when installing the dual external pump fuel surge tanks. However, there are many other options for plumbing depending on the vehicle. There are many other ways to configure the fuel system, this is just one example.

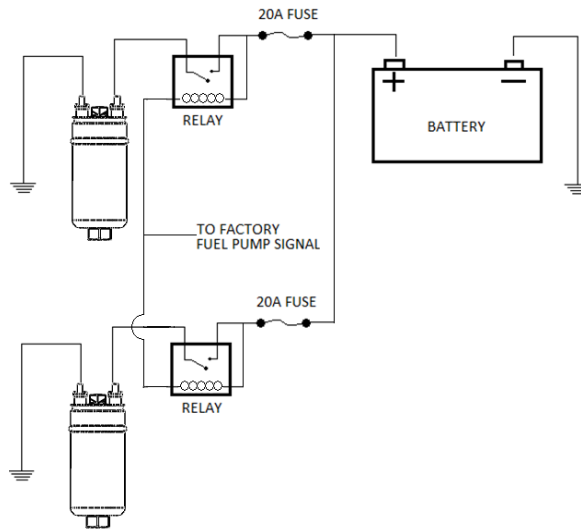


## WIRING

The fuel pumps must be wired to a 12VDC power source and chassis ground using 12AWG (minimum) wires. It is highly recommended to activate both pumps with individual 20A fuses and relays that are triggered by the same signal as the primary fuel pump in the main tank. The diagram below assumes that the primary fuel pump signal is positive 12V. This should be verified with a multi-meter.



If main fuel pump signal uses a ground trigger, the relay should be wired as shown in the diagram below.



**NOTE: For Bosch pumps, the two M6 lock nuts are used for the 12V power terminals and the two M5 lock nuts are used for the ground terminals on the fuel pumps.**

## START UP

The surge tank must be fully primed with fuel before the engine will start. This can be accomplished by manually filling the surge tank through one of the fittings on the top. The adapter fitting should be removed from any one of the ports. Using a funnel, carefully add the proper amount of fuel.

Another method for priming the system is to remove both FST pump fuses and cycle the vehicle's ignition power several times. This will activate the primary fuel pump for a few seconds each time. After 3-4 cycles it should be ready to start. Replace both of the FST pump fuses.

## SERVICING

The Radium FST can be serviced by following the steps below:

1. Unscrew and disconnect both of the fuel pump wiring terminals.
2. Carefully loosen the hoses and dispose all remaining fuel in the hoses.
3. Remove the eight M5 bolts on the perimeter of the fuel surge tank's top cap.
4. Carefully remove top cap with the pickup tubes still attached.
5. Replacement parts are available. Contact Radium Engineering for details.
6. Assemble in reverse order.
7. Carefully reassemble.
8. Replace the end cap gaskets. Service kits available from Radium Engineering.
9. Torque M5 bolts to 30 in-lb in a cross-pattern order.
10. Test for leaks before putting surge tank back in use.