Installation and Tuning of the BEGi Fuel Pressure Engine Management System

The function of this system is to supply the engine with additional fuel when operating under boost. By varying the pressure at the injector, greater fuel flows are created to meet the air/fuel requirements of the turbo/supercharged engine. This system is composed of two major components; the rising rate regulator and a high pressure fuel pump. BEGi views the practical upper limit of fuel pressures as 110 psi. This pressure will not cause any injector, fuel line, filter, or other problem provided all components are in serviceable condition and properly installed. The limitation of maximum fuel pressure, coupled with stock fuel injectors, restricts this system to boost pressures of 9 psi or less.

➤ Note: Some fuel will be spilled in this process. Keep all drop lights and other sources of ignition well away from the work area.

The success of this installation will be determined by a variety of factors. These instructions should be adhered to unless reasonable cause for deviation exists. The vehicle must be in excellent condition and proper tune prior to starting the installation. Care and attention to detail by the installer are of extreme importance. The daily operator of the vehicle must become familiar with, and observe all operational guidelines.

It is not necessary that the installer has any previous experience with forced induction. The mechanical skills required for a successful install are roughly equivalent to that needed to properly remove and replace the exhaust header and tailpipe. If one has no mechanical experience, it is strongly suggested that help be sought from a hobbyist or professional mechanic.

All components should be inventoried with respect to the packing lists. Shortages will not be honored in excess of twenty days after the shipping date.

If clarification of these instructions is required, please call Begi at 830-438-2890. Suggestions for improvements of these instructions are welcome. Send an e-mail to info@bellengineering.net. Or, Please make notes on the instruction set and mail to: BEGi, 203 Kestrel Dr., Spring Branch, Texas. 78070. Fax: 530-438-8361

These instructions and the operational requirements for this system must be reviewed with the owner-driver prior to delivery of the vehicle to the end user.

THE INSTALLER SHOULD PASS THESE INSTRUCTIONS ON TO THE OWNER-DRIVER.

Please read the statement of warranty at the end of these instructions prior to starting the installation.
**Tool and equipment requirements**

The following tools and equipment will be required to conveniently accomplish this install:

- General metric open/box wrenches
- Floor jack
- General metric socket set
- Jack stands x 4
- General sae open/box wrenches
- Hand drill and assorted bits
- Assorted slot and phillips screw drivers
- Clean rags
- Wire Hanger

**Preliminary**

- A clean engine is pleasant to work on. If needed, wash both top side and bottom very thoroughly. The high pressure car wash does a good job.
- Wearing latex gloves, can help keep the installer as clean as a nice engine.
- Position the car on jack stands. High enough to work conveniently beneath the car.

**Fuel Pump Installation**

Remove the fuel filler cap to eliminate the slight residual pressure in the fuel tank.

The pump will mount at the fuel filter location. This is under the car, and just behind the passenger seat. It is covered by a black plastic panel. A small pry bar, such as screw driver, will easily pry the fasteners loose.

Note: When wrenching a fitting into the end of the pump, anti-torque must be applied to the hex at the neck of the pump. Do not hold onto the body of the pump as the internals will be dislodged. The pump is not warranted for this kind of failure / user error.

1. Install a 1/8NPT 90° Brass Elbow into the pump exit. Use a drop of loctite or a smudge of permatex to seal the threads. These threads do not truly match, but will engage and seal completely. Refer to picture #1.

2. Install a 1/8 NPT X 5/16 Hose Barb into the 1/8NPT 90° Brass Elbow. Permatex or loctite to seal. Refer to picture # 1.

3. Add the 2.0" segment of ½" ID inch hose to the inlet boss on the pump. Secure with the hose clamp. Place second clamp on hose and push the 1/2" hose barb to 1/4 NPT into the hose. Tighten hose clamps. Screw the 1/4 NPT Elbow into the hose barb end. Screw 1/4 NPT to 5/16" hose barb into the 90° brass assembly. Permatex or loctite to seal. Refer to picture # 2.

4. The pump anchors to the bracket, which in turn attaches to the fuel filter, and just above it. Hose clamps (SAE 44) are used to hold everything together. The pump discharge should be on the outboard end. Refer to picture # 3.
5. Remove the original fuel line from the filter that arrives from the tank. Push this line onto the 90° brass assembly at the pump inlet. Secure with a hose clamp. Add the new hose from the pump discharge, to the open end of the filter.

6. Remove the two stock clamps from the filter exit hose, one at the filter, one at the hard line on the frame. Place new clamps on the four hose connections and secure properly. Refer to picture # 4.

Wiring the Fuel Pump

1. Roll back the carpet on the shelf behind the seat. You will find a service cover attached by six phillips head screws. Remove the screws and set aside for use later. Pull the cover off. Refer to picture # 5.

2. Near this cover is a blue wire with red stripe. Sever the wire at a convenient spot, strip about 3/8 of an inch of insulation from each end, and splice the wire harness (p/n 60046A) provided into the blue/red stripe wire. This wire provides the new pump with the same rollover cut-off protection as the stock pump.

3. Now, raid your closet for a wire hanger. Straighten it out and secure the fuel pump wire to the hanger. Route the wire downward between the tank and chassis. Pull hanger all the way thru and remove the wire from the hanger. Replace the service cover and secure with original screws. Replace the carpet.

4. Attach the wire harness (p/n 60046A) to the positive terminal at the pump, replace the nut to secure. This is the smaller terminal. The designation is just below the terminal, located on the side of the pump. Refer to picture # 6.

5. Add the second wire harness (p/n 60046B) to the larger, negative terminal on the pump. Route the ground wire to a bolt on the parking brake cable support located about 3.0 inches from the new fuel pump. Clean the mating surfaces very well for good contact. Replace the rubber covers over the pump terminals. Use the zip ties to group the power wire to a fuel line in a couple places. This keeps the wires from wobbling in the breeze. Refer to picture # 6.

Note: Ground wires are the most frequent source of electrical trouble.

Installing the Fuel Pressure Regulator

The Fuel Pressure Regulator (FMU / FPR) installs into the fuel system return line. It receives boost/vacuum signals directly from the intake manifold via a dedicated vacuum line. The following instructions are for Miatas without anti-lock brakes. If your Miata has anti-lock brakes, please see the note below. Do not use Teflon Tape to seal threads at the fuel pressure regulator.
1. The intended mounting place for the fuel pressure regulator is on the firewall at the rear of the engine, close to the windshield wiper motor. Keep it near the upper edge, but low enough to miss the hood. Install two of the 1/8 NPT 90° brass elbows at the base of FPR. Seal with permatex or loctite. There is no magic position for the fittings, but it is convenient to point them downward, and forward slightly. Make sure the hose barbs can be installed into the elbows, and that nothing interferes with the mounting bracket. Refer to picture # 7.

   Note: The use of Teflon tape voids the warranty on the fuel pressure regulator.

   Install the 1/8 NPT x 5/16 hose barbs into the 90° brass elbows. Use a smudge of loctite or permatex to seal. Take note of the “IN” port. It is stamped on the side or base of the FPR.

2. Attach the mounting bracket to the FPR with the two 1/4-20 flat head cap screws.

3. Position the fuel pressure regulator and bracket assembly on the firewall and mark the two hole locations with a permanent marker. Set aside. Drill the mounting holes with a .270/.310 bit.

4. Bolt the fuel pressure regulator and bracket assembly up to the firewall using the two 6 mm hex head screws, washers, and nylon lock nuts. Refer to picture # 7.

   Note: For Miatas with ABS brakes: Move the regulator inboard, bend the brake line slightly and mount it as far inboard as possible.

5. Locate the fuel line exiting the stock regulator. The stock regulator is at the aft end of the fuel rail. The fuel line exits the regulator toward the front, swoops down below the manifold and turns outboard. It then attaches to the forward most of the two steel lines attached to the frame. Refer to picture # 8.

   Caution: some fuel will spill, but it is not under pressure.

6. Remove the return fuel line from the steel line at the frame. Removing the factory clamp as well. Do not pull on the hose without holding onto the steel line as well. If you do, it will bend and crimp. This end of the fiber line from the stock regulator must go to the IN port on the fuel pressure regulator. If the fiber line is not quite long enough, a splice is provided. Secure all hose ends with the hose clamps provided. The output of the stock regulator is now connected to the IN port of the fuel pressure regulator.

7. Use the new 5/16” fuel line to install the fiber hose from the OUT port of the fuel pressure regulator to the steel line at the frame. Secure with hose clamps.

**The Boost/Vacuum Signal Line**

The best source for the signal line is the unused port at the front of the intake manifold. Two ports are located about an inch aft of the throttle/manifold joint on the top inboard side. One has a cap. Use this port for the fuel pressure regulator, as no other item will then share the signal, thus damping its clarity to the fuel pressure regulator. Neatly route the 30” vacuum line from this port to the port on
the fuel pressure regulator. The correct port on the regulator is the barb placed directly into the body of the fuel pressure regulator. It is the one pointing directly at the center line. It is NOT the barb on the needle valve. Refer to picture # 9.

The restrictor installs into the signal line just before the regulator.

Place the black and white check valve onto the barb on the needle valve. Use a 2" segment of vacuum line and put the white side of the valve toward the regulator. This check valve eliminates the vacuum leak that would result through the needle valve. It also allows the fuel pressures to return to stock for cruise conditions. Take the third piece of vacuum line, about 10 " long, and attach it to the black side of the check valve and tuck the end somewhere out of sight. It MUST stay open to the atmosphere. Refer to picture # 10.

**The Fuel Pressure Check Gauge**
The pressure gauge is needed to initially monitor the function of the fuel pressure regulator and assist in tuning the system. Refer to picture # 8.

Caution: Some fuel will spill, and this line will have some pressure inside. Wrap a rag or two around the hose as you pull it from the steel line.

1. Remove the fuel line from the second steel line at the frame. Again, hold onto the steel line to avoid bending or crimping. Obviously, this is the aft line of the two. This is the fuel line from the pump to the fuel rail. Remove the stock clamp also.

2. Plug in the Tee assembly that feeds the gauge and place all new clamps on the fuel lines. Refer to picture # 11.

3. The gauge can best be observed when driving, by running the hose out the back of the hood and tucking it under the wiper blade. For now though, leave it coiled up under the hood at the moment, as the first tuning steps are at idle.

**NOTE: THIS GAUGE DOES NOT BELONG IN THE COCKPIT! SHOULD IT BLOW A LEAK AT THE SAME TIME AN OCCUPANT IS SMOKING A CIGAR, THE RESULT COULD BE SPECTACULAR. DON’T EVEN CONSIDER PUTTING IT INSIDE THE CAR.**
Tuning the Regulator

There are two aspects to tuning the regulator; maximum fuel pressure at the intended 8 psi boost, and the fuel pressure as the system passes into boost. Passing into boost is zero on the boost gauge, or the same as atmospheric pressure.

Fuel pressure passing zero is adjusted by the center screw on the fuel pressure regulator. This condition can be conveniently simulated at idle by pulling the vacuum / boost signal line off the fuel pressure regulator. With the line removed, the fuel pressure regulator sees atmospheric pressure which is the same as zero on the gauge.

The fuel pressure regulator has been calibrated at BEGi to 50 psi with an atmospheric signal and 100 psi at an 8.0 psi signal. This tuning procedure will yield similar results, but further checks such aspects as ground wire integrity, pump function, and installation errors.

The maximum fuel pressure is controlled and adjusted by the needle valve.

The first step is setting the zero point pressure. Start the Engine and let it idle.
   Observe the fuel pressure. It should be 28/30 psi.
   With the engine idling, pull the signal line from the BEGi fuel pressure regulator.
   Observe the fuel pressure again. It should rise to about 47/49 psi.
   If different, loosen the jam nut and adjust the center screw until the pressure is 47/49 psi.
   Clockwise is more pressure.
   Snug up the jam nut.
   Plug the signal line back unto the FPR. The fuel pressure should return to the 28/30 psi figure.

The second step is setting the fuel pressure at 8 psi boost. An approximate setting can be made with the engine idling and giving the fuel pressure regulator an 8 psi signal from another source. However, it is more accurate to set the fuel pressure with the engine running under load.

Drive the car and while adding boost increments with the throttle, watch the gauges to match 8 psi boost with 100 psi of fuel pressure. If the needle valve needs adjusting, clockwise is more pressure.

If using an air / fuel meter, adjust for values in the 12.8 to 13.3 range.

When done tuning, remove the pressure gauge line by removing the tee and replacing the fuel line to the fuel rail back into the steel line at the frame.

General Rules of Operation

- Use premium octane fuel at all times. Higher, if available. Lesser octane fuels can be used successfully, but will require minor tuning changes. All generic programming is based on 92/93 octane fuels.
- Do not apply maximum boost for more than 30 second durations.
- If any sounds of rough combustion occur, cease using boost until the cause is identified and corrected.
- Engine oil change interval for mineral base oils is 2500 miles. Synthetic base oils may extend the interval to 5000 miles. The synthetic oils are strongly recommended.
- It is the responsibility of the installer to review these general rules of operation with the owner/driver.
Warranty Information

• All items made by BEGi are warranted for workmanship and function for one year from the date of receipt. All other items are subject to manufacturer’s warranty.
• If problems arise from using a BEGi part in a manner other than intended, or a part is installed incorrectly, BEGi reserves the right to refuse warranty coverage for damages.
• BEGi will not warranty any kits, parts or items purchased thru an online auction that is not purchased from an authorized dealer. The customer must be able to provide proof of purchase for any warranty repairs.
• BEGi reserves the right to inspect any item before any warranty will be granted. BEGi will not reimburse for any labor charges on warranty items that occur without prior, written consent.
• BEGi extends no warranty nor accepts liability to any original, stock, or replacement components on the vehicle.
• Warranty may transfer. BEGi must be notified within twenty days of sale to continue warranty coverage.
• Shipping / freight charges are the responsibility of the end user for all warranty consideration.

Terms of Sale

• All shortages from the parts list must be reported to BEGi within 20 days of receipt.
• BEGi does not pay any towing expenses.
• All returned items are subject to a 25% re-stocking fee.
• BEGi accepts no liability for death or injury to any person or persons under any circumstance.
• The re-seller assumes all responsibility for the end user’s knowledge of this warranty.
• Turbo Kits sold by BEGi or by a BEGi authorized distributor must be registered with BEGi within twenty days of receipt by the end user.
• BEGi does not guarantee that turbo kits will pass smog tests. For California residents, some BEGI kits have been provided a C.A.R.B. Executive Order Number. However, BEGi does not guarantee that the end user’s car will pass.
• Acceptance, re-sell, or use of any BEGi part constitutes full agreement by the re-seller/end user, that the terms of sale and warranty are fully understood and accepted in full.