

Operating and Installation Instructions

This Product is protected under one or more of the following patents: US 7,810,470

CAUTION!

This product is to be installed only by persons knowledgeable in the repair and modification of vehicle fuel systems and general vehicle systems modification. Only a qualified technician or mechanic who is aware of applicable safety procedures should perform the installation of this product.

GASOLINE AND OTHER FUELS ARE FLAMMABLE AND CAN BE EXPLOSIVE!

Perform the installation in a well-ventilated location only to minimize the build up of fuel vapors. **NO** open flames, smoking or other sources of ignition are to be present during installation, to prevent fire or explosion that can cause serious injury or death. Grinding, cutting, and drilling must be performed with care to prevent ignition. Draining and removal of all fuel and ventilation of vapors in vehicle and fuel system is recommended when performing such procedures. Proper eye and personal protection is required at all times during installation.

WARNING!

The Vehicle's fuel system may be under pressure! Do not loosen any fuel connections until relieving all fuel system pressure. Consult an applicable service manual for instructions to relieve fuel system pressure safely.

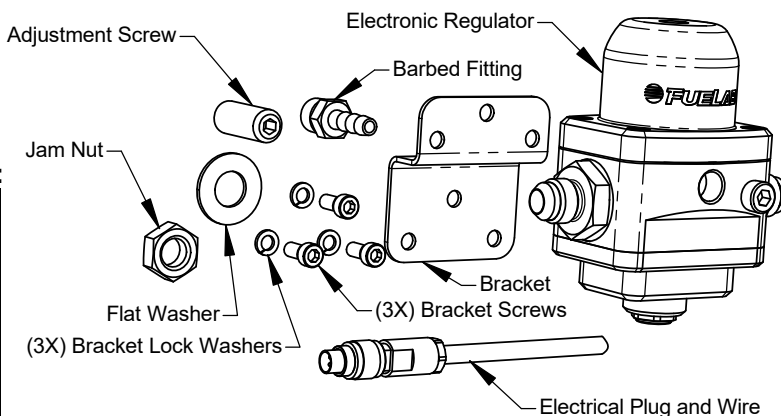
This product is intended for racing, off-road, or marine use only. This fuel system component may not be legal for sale or use on emission controlled motor vehicles; consult local, state and national laws.

Product Contents:

Check the diagram and list of components (right) to ensure that no components are missing from box. Contact your Fuelab distributor immediately for replacement.

52904-c-T Features and Performance Ratings:

Fitting Sizes	-8AN Male Fitting
Seat Size	Standard
Operating Voltage	8-30 Volts DC
Maximum Flow Capacity	6.3 GPM at 25 PSID (1440 LPH at 2.4 Bar)
Pressure Adjustment Range	Pressure Range "T" 15-25 PSID (1.0-1.7 Bar)



WARNING! Exceeding maximum flow capacity may result in an over-pressure operating condition.

Before Installation, Plan Entire Fuel System:

These instructions are limited to general topics of regulator component installation and may not include specific information pertaining to your application. These instructions are written assuming the use of a Fuelab Prodigy Electronic Fuel Pump. This regulator is **ONLY** compatible with Fuelab Models 41401-c, 41402-c, 41403-c, 42401-c, 42402-c, 91901, 92902, all 617xx Series, three-wire 474xx Series, 939xx Series Pumps and Model 72002 External Controller. **NOT** compatible with Model 40501 Fuel Pump and low-pressure Fuelab Fuel Pumps. This regulator has an internal spring that can be changed for other pressure ranges, including "G" range, for 90-125 PSID if required by the specific application. Lower, carbureted pressure ranges are recommended for a different model of non-electronic regulator only. Visit our company website for specific details pertaining to example fuel systems and other solution ideas. Additional information including advanced troubleshooting, any special alerts and FAQ's pertaining to this and other products is also available.

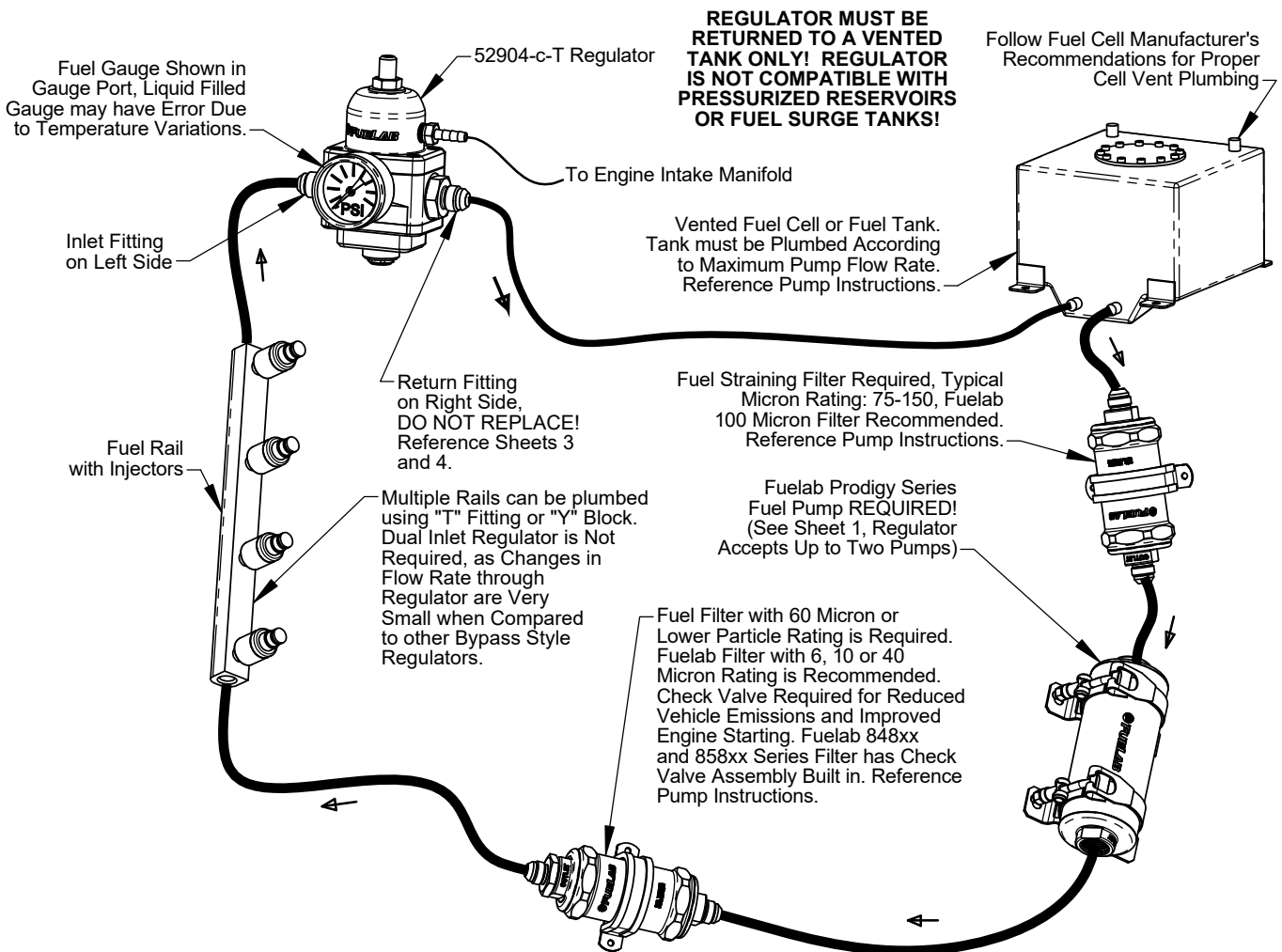
General Regulator Performance Notes:

The notation "PSIG" means pressure in Pounds per Square Inch (PSI) relative to the prevailing atmospheric condition or outside air. This is referred to as Gauge Pressure. The notation "PSID" means pressure in PSI relative to another pressure source or called the Differential Pressure. The intake manifold pressure, when plumbed to the regulator, changes the fuel pressure in a 1:1 ratio. When the engine idles (for example 12 Inches of Mercury or 6 PSIG of vacuum) fuel rail pressure will lower 6 PSI, when compared to the setting with the engine off. For boosted applications, including turbo or superchargers, fuel rail pressure increases at a 1:1 ratio. An engine at 10 PSIG of boost as measured in the intake manifold, will increase the fuel pressure by 10 PSIG.

Plumbing Planning Notes:

Minimize plumbing restrictions between fuel rail(s) and regulator for peak performance, use -6AN (3/8") to -10AN (5/8") line as required per flow rate requirements of the vehicle's engine and fuel pump. EFI applications can use a "Y" block or "T" fitting to split the output of the fuel pump into one end of each fuel rail (for dual fuel rail application) then plumbed into the single inlet port. Use of a -6AN (3/8") to -8AN (1/2") return line is typically recommended for this model of regulator. See diagram on next sheet as well as diagram below, to identify the ports used on the regulator. The fuel line used must handle high pressure. The use of fuel line such as stainless steel braided line and "AN" style fitting connections is recommended. The fuel ports (one -8AN Inlet and one -8AN Return) use "AN" or "military" style fittings. This plumbing standard is commonly used with racing and high performance applications. See step 6 on next page for additional information on this port standard. A fuel filter with a 60 micron or lower particle rating is required to be used upstream of regulator and downstream from fuel pump to protect it and the fuel injectors from foreign object damage. Reference the Schematic Diagram below for filter locations. Use of a liquid filled gauge exposed to engine compartment heat is not recommended as the liquid inside the gauge may exert measurement errors. **DO NOT** plumb gauge port to any gauge mounted inside the vehicle or in passenger compartment. A line burst can spill fuel inside passenger compartment and on occupants, possibly causing serious injury or death. An electric gauge or pressure transducer system is recommended for readings in a passenger compartment.

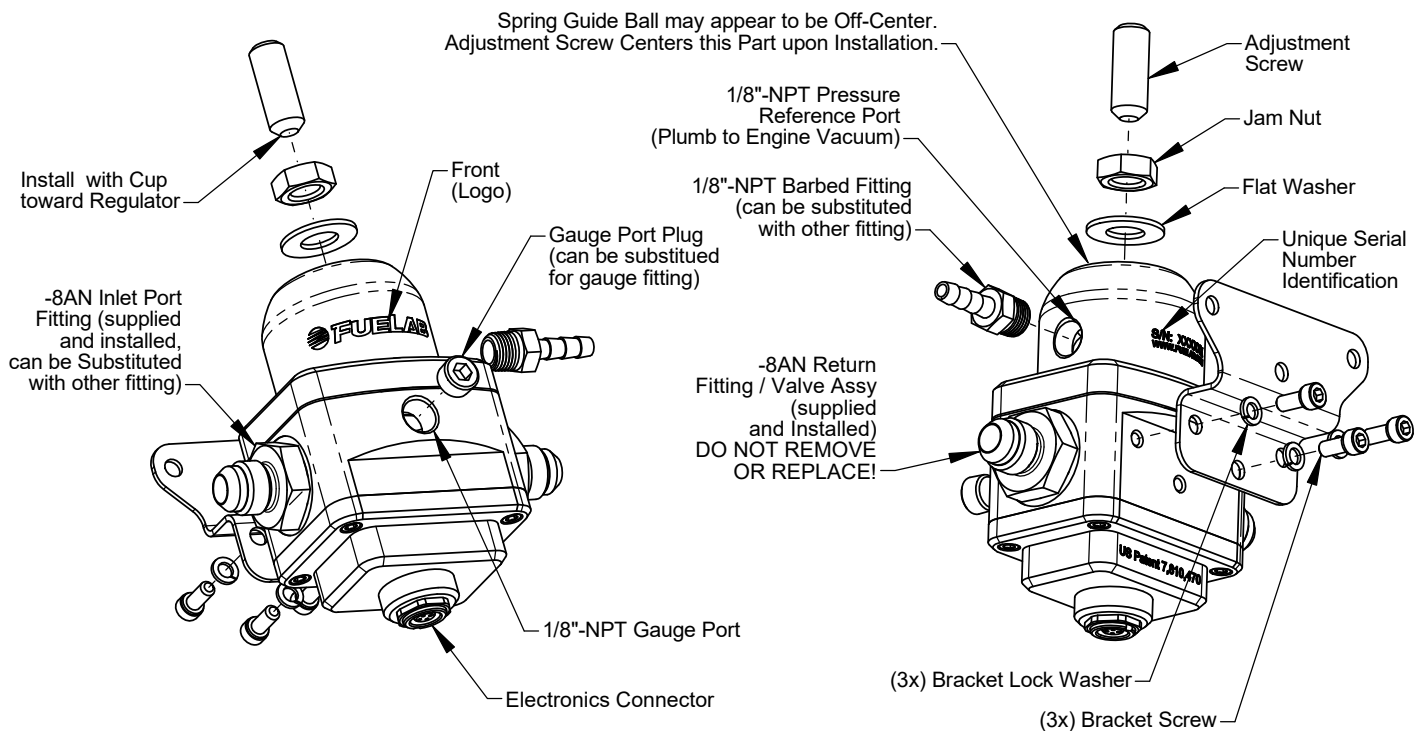
Typical EFI Fuel System Schematic Diagram:



Installation Steps:

1. Disconnect the ground terminal from battery and allow the vehicle's engine and exhaust system to cool. Relieve fuel system per applicable service manual. Follow all Warnings and Cautions written on previous page of these instructions.
2. Modify, remove, or replace other fuel system components as required per established build plan (reference notes on previous page and above).
3. Use the supplied bracket as a drilling template to mark holes for mounting bracket. Choose a location that minimizes exposure to excessive heat, near fuel rails. Mounting bracket can be modified as required. Use clear or colored enamel paint to protect bracket surface after any modification.

4. Apply light oil onto the threads of the Adjustment Screw. Small amounts of air leakage in the adjustment hardware may be present during operation. This is a normal operating condition. Thread the Adjustment Screw by hand until a slight tension is felt, this position is the minimum pressure setting. Do not tighten screw any further. Pressure is to be adjusted later in these instructions. Install the Flat Washer, then the Jam Nut. Tighten the Jam Nut hand tight for later adjustment.
5. Install Bracket to regulator using supplied Bracket Screws and Bracket Lock Washers. Tighten Bracket Screws between 25-40 in·oz of torque (snug, do not over tighten screws). For mounting directly to high vibration source such as the vehicle's engine, use rubber vibration dampening mounts for attaching bracket to vehicle.
6. Refer to Page 5, Electrical Planning Notes. Wire provided Electrical Plug and Wire, as shown in notes. Use solder and shrink wrap for all wire splices. Follow all instructions provided with Prodigy Fuel Pump as well, referring to all proper electrical connections.
7. Use Teflon® tape or thread sealant on all 1/8"-NPT fittings to be used for the Gauge Port and Pressure Reference Port (see diagrams, below). Install fittings or plug as required. If pressure reference port is not plumbed to the intake manifold (for typical EFI applications, port is plumbed to the intake manifold) then install the Barbed Fitting (supplied) and allow fitting to vent to atmosphere (do not plumb or plug port). Do not use Teflon® tape or thread sealant on inlet or return fittings. Return Fitting can **NOT** be substituted, if fitting end is damaged, then valve assembly must be replaced (contact Fuelab for replacement).
8. Install regulator assembly into vehicle, fastening the bracket to the vehicle. Attach fuel lines, Gauge Port line (if external pressure gauge is used in application) and Pressure Reference Port line (if applicable). Boosted applications (such as turbo or supercharger) will require a hose clamp on barbed fitting to prevent hose from coming loose. Use of -3AN or -4AN fitting and line can also be used as a substitute to the barbed fitting.



9. Inspect fuel system for any contact of fuel lines or wires with other components that can cause chafing or rubbing. Secure all components and fuel lines.
10. Connect the vehicle's battery. Turn on fuel pump (typically by bypassing fuel pump relay) without engine operating. ECU or engine management computer may be controlling the relay. The ECU may only operate pump for a few seconds each time ignition switch is set to on. The pump will have to operate several seconds (30+) to prime and drive air out of the fuel system. Fuel system pressure should read about 15 PSIG (use an external gauge for adjustment if a permanent gauge is not used). Inspect vehicle for any leaks. Turn off fuel system and repair any leaks that may be present before continuing.
11. When adjusting pressure, be sure that fuel pump is operating to monitor pressure. Increase pressure by rotating adjustment clockwise. Do not thread Adjustment Screw past jam nut within 1/8". Over tightening the adjustment screw can damage the regulator. It is recommended to use a "baseline" pressure reference when adjusting the pressure (adjusting the pressure with engine off or Pressure Reference Line unhooked). The vehicle's engine may not produce consistent vacuum during idle to have repeatable readings.
12. After final adjustment of fuel pressure, tighten Jam Nut. Road test vehicle, and retest pressure upon return to ensure accurate adjustment.

How does the Electronic Regulator Work?

Just like standard EFI regulators, these regulators begin to relieve pressure (back to the fuel tank) once the set pressure is achieved. As more flow is sent through the regulator (pressure climbs a little higher with extra amount of flow), the regulator relieves the excess flow back to the fuel tank. Our Patented Electronic Regulator (per U.S. Patent 7,810,470) takes this action one step further by placing a restriction valve along the return line (a special valve is incorporated into the return line fitting of the regulator, **DO NOT REPLACE** this fitting with another component, as this will force the operation of the system to go into high-speed pump operation only).

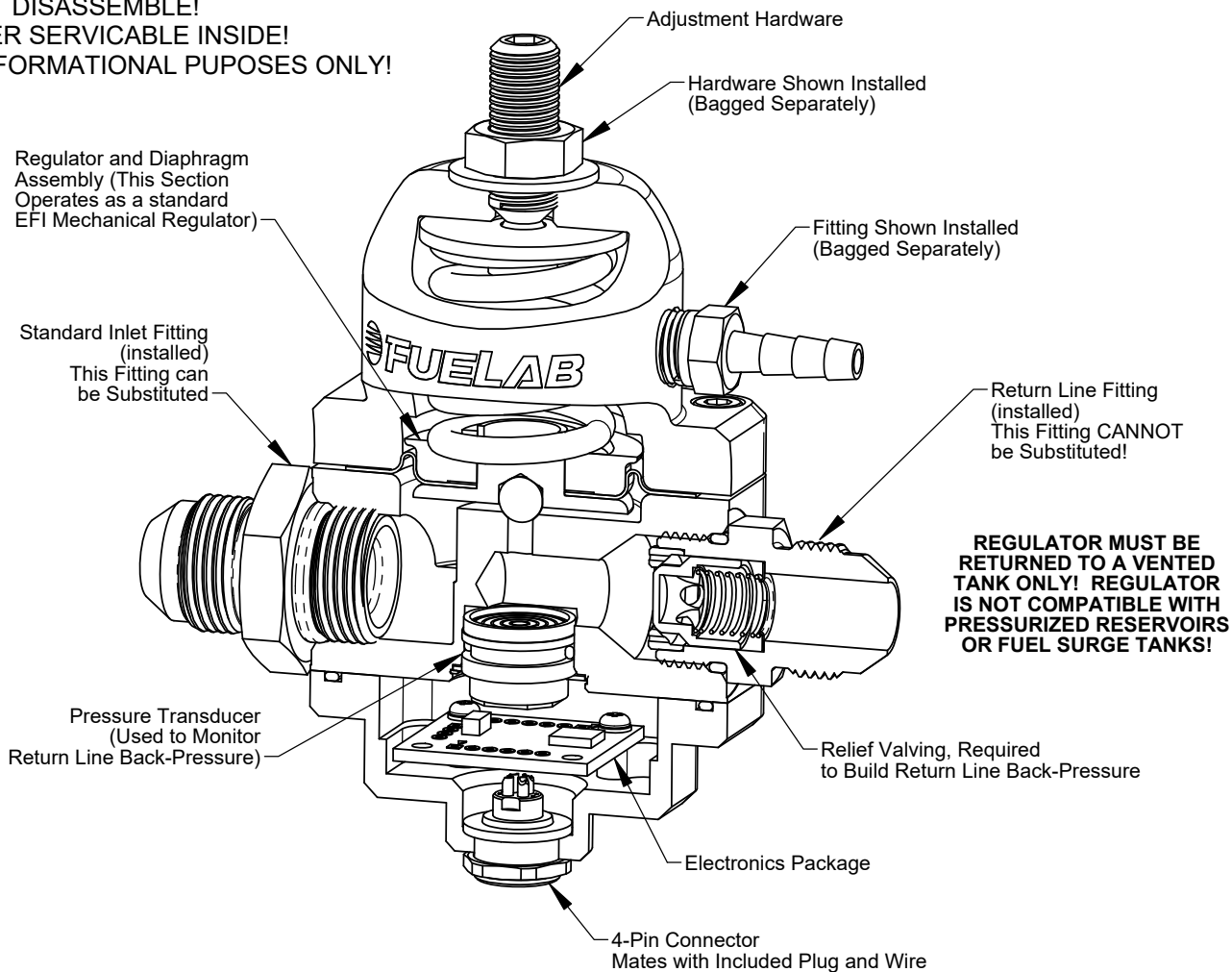
The electronics monitors the built-up pressure and controls the Fuel Pump accordingly. If the pressure that is being read is too high, then the Pump is signaled to slow down. If the pressure is too low, then the Pump is signaled to speed up. This action not only allows the pump to operate at a reduced amount speed with low engine demand, but also allows the return line flow rate to be relatively constant. This has an effect of negating the regulator's inherent mechanical regulation slope. This value is the amount of fuel pressure change per amount of flow rate difference through the regulator. Therefore, the regulation slope characteristic is omitted in the specifications.

An additional output from the Electronic Regulator can be used to track the fuel system operating condition. This 0-5 Volt analog output allows the user to use a data acquisition system, Engine ECM, general data logger, or simply a voltmeter, to track how fast the pump is signaled to operate. The voltage is typically at about 1.5 to 2.0 Volts (depending on Pump Model used and other factors such as baseline fuel pressure) while engine is operating at idle condition. Typical full capacity has an output of approximately 4.5 Volts.

This regulator controls the fuel pump directly. Because of this, variation of pitch and sound quality radiating from the fuel pump is to be expected, that is normally absent from traditional EFI fuel systems. Some small amounts of oscillation during operation may be present at various operating conditions. Initial starting typically calls to the pump to start in a full speed condition, until fuel pressure is achieved, when speed is greatly reduced. This too is a normal operating condition. If oscillation is considered excessive, please contact Fuelab.

A Look Inside:

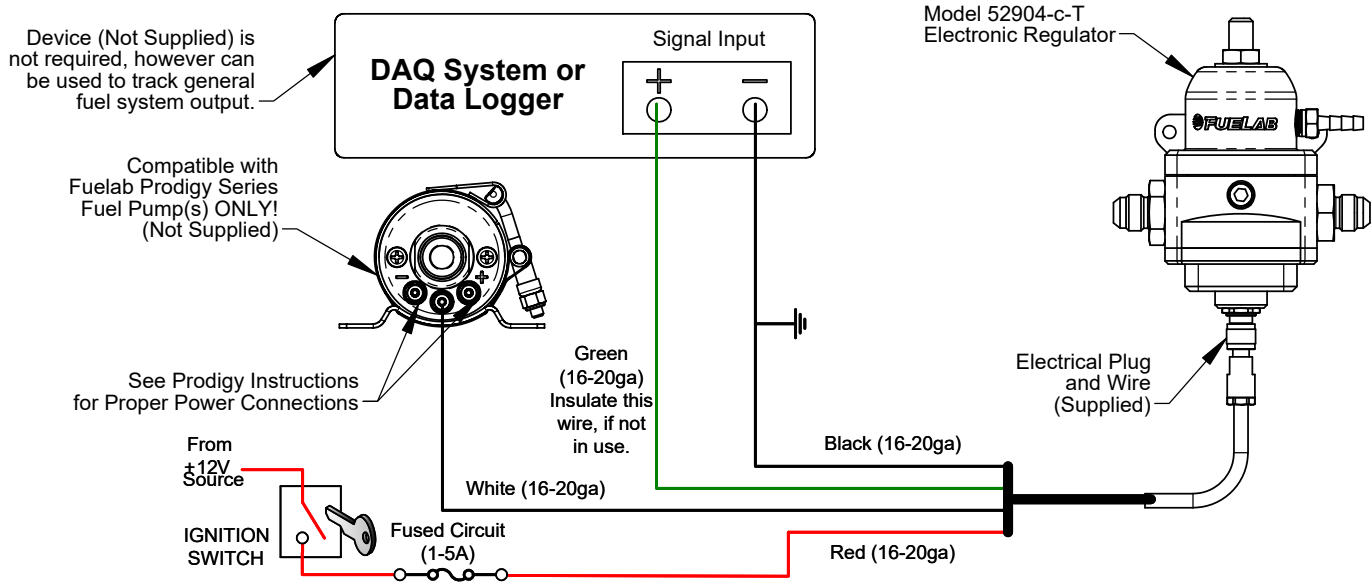
DO NOT DISASSEMBLE!
NO USER SERVICABLE INSIDE!
FOR INFORMATIONAL PUPOSES ONLY!



Electrical Planning Notes:

Use Male Connector with wire (Provided with Regulator), to allow a sealed electrical connection to the Electronic Regulator. The regulator requires very little power and does not control the input power to the fuel pump. Follow the Wiring Schematic Diagram provided with the Fuelab Prodigy Series Fuel Pump, to properly wire power and ground leads to pump.

Electrical Wiring Schematic (Less Power Supply and Ground to Pump):



TROUBLESHOOTING:

Problem	Possible Cause	Possible Solution
Not operating or slight “clicking” sound from pump when turned on.	<ul style="list-style-type: none"> Faulty fuel pump relay. Faulty, dirty, or corroded terminals or improperly sized wire. Debris from tank or plumbing lodged inside pump. 	Check voltage to fuel pump, at power terminals. If voltage is steady and consistent (within ½ Volt of battery) then contact Fuelab for repair. If voltage is inconsistent as described, repair or replace electrical components as required.
Speed of pump changes up and down very noticeably and erratically.	<ul style="list-style-type: none"> Incorrect wiring of speed control as specified in wiring schematic. Loose terminal or wiring of speed control circuit. 	Unhook speed control wiring from yellow terminal of pump. Turn on pump; if operation is consistent, then repair or replace components as required.
Loss of fuel pressure or erratic pressure pulsation after several minutes of operation.	<ul style="list-style-type: none"> Cavitation (vapor lock) due to overheating or restricted inlet. 	Check temperature of pump right after failure. If pump is hot to touch (cannot leave hand on pump due to it being too hot), then follow proper speed control wiring example, or look for other sources of heat such as exhaust. If pump is not hot to the touch, check for inlet restrictions such as improperly vented tank, kinks in the fuel line, or too small of plumbing for application. Contact Fuelab, as pump may be damaged due to improper operating condition.
Not building up fuel pressure.	<ul style="list-style-type: none"> Incorrect fuel system initial priming procedure. Loose inlet fuel fittings or leaking plumbing on inlet side. 	Repeat procedure for proper priming. If condition continues, check all plumbing upstream (on inlet side) of fuel pump.
Fuel pressure drops off under heavy engine load, particularly in higher gears.	<ul style="list-style-type: none"> Incorrect wiring of speed control as specified in wiring schematic. Loose terminal or wiring. Insufficient fuel capacity. 	Make sure pump is operating at full speed while under high engine load. If condition continues, upgraded pump capacity is required.

LIMITED LIFETIME WARRANTY

FUELAB, a division of FCP, Inc., having its principal place of business at **1605 Eastport Plaza Drive, Suite 125, Collinsville, IL 62234, USA** ("Manufacturer") warrants its **FUELAB** products (the "Products") as follows:

1. Limited Lifetime Warranty

Manufacturer warrants that the Products sold hereunder will be free from defects in material and workmanship from the date of purchase for so long as the original purchaser owns the Products. This Limited Lifetime Warranty does not extend to any subsequent owner or transferee of the Products. If the Products do not conform to this Limited Lifetime Warranty during the warranty period (as herein above specified), Buyer shall notify Manufacturer in writing of the claimed defects and demonstrate to Manufacturer's satisfaction that said defects are covered by this Limited Lifetime Warranty. If the defects are properly reported to Manufacturer within the warranty period, and the defects are of such type and nature as to be covered by this Limited Lifetime Warranty, Manufacturer shall, at its option and own expense, furnish replacement Products or replacement parts for the defective Products or refund the purchase price. Removal of Products from vehicle, shipping to Manufacturer and installation of the replacement Products or replacement parts shall be at purchaser's expense. (*Vehicle means any automotive, bike or marine transportation device powered by an internal combustion engine to which the Product is attached. This Product is **NOT** intended or designed for use on aircraft, experimental or otherwise.*)

2. Other Limits

THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. This Limited Lifetime Warranty does not cover any damage due to: (a) transportation; (b) storage; (c) improper use; (d) failure to follow instructions for the Products or to perform any preventive maintenance; (e) modification; (f) unauthorized repair; (g) normal wear and tear; or (h) external causes such as accidents, abuse, or other actions beyond Manufacturer's reasonable control. This Limited Lifetime Warranty also does not apply to Products upon which repairs have been effected or attempted by persons other than pursuant to written authorization by Manufacturer. This Limited Lifetime Warranty is not extended if we repair or replace the Products.

3. Exclusive Obligation

THIS LIMITED LIFETIME WARRANTY IS EXCLUSIVE. The sole and exclusive obligation of Manufacturer shall at its option be to repair or replace the defective Products in the manner and for the period provided above or to refund the purchase price. Manufacturer shall not have any other obligation with respect to the Products or any part thereof, whether based on contract, tort, strict liability or otherwise.

4. Other Statements

ORAL OR OTHER WRITTEN STATEMENTS BY MANUFACTURER'S EMPLOYEES, REPRESENTATIVES AND/OR RESELLERS DO NOT CONSTITUTE WARRANTIES, SHALL NOT BE RELIED UPON BY BUYER, AND ARE NOT A PART OF THE CONTRACT FOR SALE OR THIS LIMITED LIFETIME WARRANTY.

5. Entire Obligation

This Limited Lifetime Warranty states the entire obligation of Manufacturer with respect to the Products. If any part of this Limited Lifetime Warranty is determined to be void or illegal, the remainder shall remain in full force and effect.

6. Warranty Service

How Do You Get Service?

If something goes wrong with your Product, contact FUELAB at 618-344-3300, or send an e-mail with proof of purchase to: info@fuelab.com for a Return Authorization Number (RMA). After receiving your RMA send the product postage paid, fully insured, with a brief written description of the problem to:

FUELAB Warranty Department, 1605 Eastport Plaza Drive, Suite 125, Collinsville, IL 62234

We will inspect your Product and contact you within three business days of receipt to give the results of our inspection and an estimate of the labor and/or parts charges required to fix the Product, if applicable. If covered under this Limited Lifetime Warranty, Manufacturer will repair or replace the Product and return it to you at no cost or refund the purchase price. If the Product is NOT covered under this warranty and if you authorize repairs, we will return the repaired Product to you COD, or prepaid via credit card, within three business days. If we find no issues with the returned product and it meets all performance specifications, there will be a \$25 charge to cover technician labor and inspection time. Additional return shipping charges will apply. We will return the repaired Product to you COD, or prepaid via credit card, within three business days.

Limitation of Liability

THE REMEDIES DESCRIBED ABOVE ARE YOUR SOLE AND EXCLUSIVE REMEDIES AND OUR ENTIRE LIABILITY FOR ANY BREACH OF THIS LIMITED LIFETIME WARRANTY, OUR LIABILITY SHALL UNDER NO CIRCUMSTANCES EXCEED THE ACTUAL AMOUNT PAID BY YOU FOR THE DEFECTIVE PRODUCT, NOR SHALL WE UNDER ANY CIRCUMSTANCES BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL OR PUNITIVE DAMAGES OR LOSSES, WHETHER DIRECT OR INDIRECT.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.