Aeromotive, Inc.   Technical Bulletin #301

From: Aeromotive Technical Department

Date: **12/29/2014**

Re: **Fuel Pump Speed Controller: Detailed Setup Guide.**

Detailed Setup Procedures:

To ensure proper operation, it's vital to install the Fuel Pump Speed Controller (FPSC) exactly per the instructions, especially with regard to *Grounding the Fuel Pump to the Speed Controller* and then *Grounding the Speed Controller to the Battery ground post*, with the provided 10-gauge wire. To ensure maximum pump performance at full speed, provide a 4-gauge alternator charge wire to the battery if using the battery to power the speed controller, or route the included 10-gauge power wire directly from the alternator charging stud to the BAT terminal located on the FPSC. Full alternator current must be available to the FPSC in order for it to correctly power the pump at full speed.
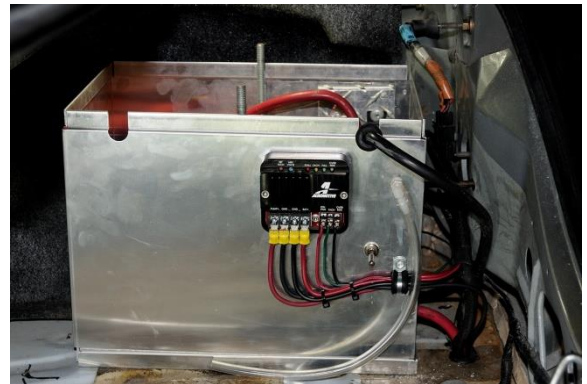
Online link to Fuel Pump Speed Controller installation instructions:
http://aeromotiveinc.com/wp-content/uploads/2009/12/16306.pdf
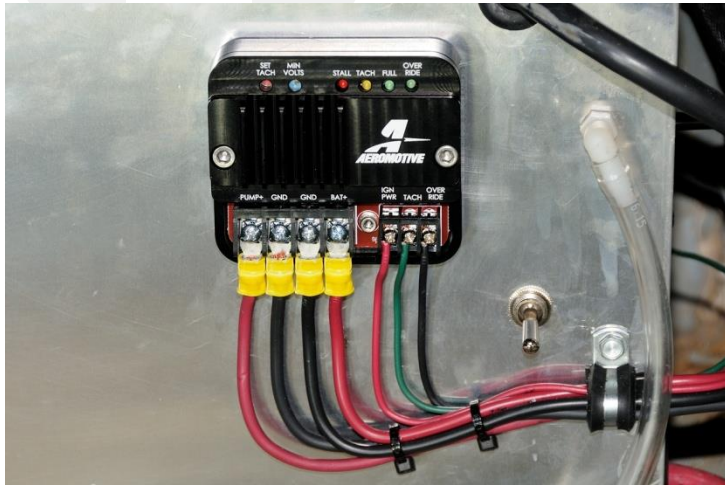
Important: *The MIN VOLTS setting (the slowest fuel pump speed possible) must be set correctly for the FPSC to operate the pump properly across the engine's RPM range. The 16306 Fuel Pump Speed Controller ties fuel pump speed to engine RPM, speeding the pump up and down with the engine.*

Note: The Min Volts setting (minimum pump speed) must be set with the engine off. the lowest engine RPM does not necessarily occur at idle, the pump must run to prime the fuel rail prior to the engine even cranking, which makes zero the lowest engine RPM for the pump to run and hold pressure. To ensure sufficient pump speed to prime the fuel rail to full pressure, and for reliable engine startup, The Min Volts must be adjusted with the engine off. To do so, please use the following setup procedure.

Tools Needed: Digital Volt Meter (DVM), Adjustment Screw Driver (Provided with the FPSC), Fuel Pressure Gauge installed in the regulator, 2 sets 14-gauge or larger jumper wires, with alligator clips or U-type terminals on both ends.

1.) Connect the DVM directly to the fuel pump positive and negative posts if possible. If not, connect it to the terminals on the FPSC marked PUMP+ and GND, using the GND terminal that routes to the fuel pump negative post. Turn the DVM on and set it for DC Volts.

2.) Connect a jumper wire from the FPSC BAT+ terminal to the IGN PWR terminal to turn the FPSC and the fuel pump on. The pump will prime at full speed for several seconds and then drop to the lowest speed setting possible (zero engine RPM).

3.) Bring the pump back up to full speed by closing the toggle switch for the Manual Override. If you have not installed the toggle switch provided, connect a jumper wire from the battery GND terminal to the OVER RIDE terminal on the FPSC. The fuel pump will return to full speed.

4.) With the pump at full speed, check the fuel rail or carb pressure and adjust the regulator if necessary for the desired, base fuel pressure.

5.) With base pressure set, open the Manual Override switch (turn it off), or remove the jumper from GND to OVER RIDE, allowing the pump to drop to the lowest possible speed for which the controller is set.

6.) Check the fuel rail/carb pressure again. This should not have changed. If the pump stalls or fuel pressure falls more than 2 PSI below your base setting at full speed, increase the minimum fuel pump voltage using the MIN VOLTS adjustment pot. The fuel pump must run fast enough with the engine off to prevent significant pressure droop in the fuel rail, or at the carburetor, when the engine is not running. If additional pump speed is necessary to raise pressure, using the provided screw driver tool, turn the adjusting pot clockwise until the fuel pressure is within 2 PSI of true base pressure, and stable.

7.) If the fuel pressure is the same with the manual override off as it is on, reduce pump speed by turning the adjusting screw counter clockwise, until the fuel pressure droops. Do not allow the pressure to droop more than 1-2 PSI from full speed base pressure. If necessary, turn the adjustment pot back in the clockwise direction to minimize pressure droop. Fine tuning the MIN VOLTS setting for the lowest speed that maintains desired base pressure allows the FPSC to be most effective.

8.) While the pump is running at low speed, check the reading on your DVM, connected per step one above. At this time the DVM should be reading a minimum of 8.0-Volts, to as high as 9.5-Volts. If below 8.0-Volts, continue turning the MIN VOLTS adjustment pot clockwise until voltage is stable at 8.0-Volts or higher. If 10.0-Volts or more are necessary to stabilize pressure with the engine off, this is a likely indicator of other fuel system installation issues. These could include substantial flow restrictions between the pump and fuel rail or carburetor, forcing excessive voltage settings to be used to offset this. Contact the Aeromotive Tech Department at 913-647-7300 to discuss this or any other questions or problems you have along up to this point.

Having established your low voltage setting, you must now set the high RPM cross-over point, where the pump will achieve full speed and provide maximum flow volume for full power operation. This is done in the following steps:

1.) Start the engine, after several seconds the pump will audibly slow down as FPSC enters reduced speed mode. Ensure the vehicle is in park or neutral, with the parking brake set, and prepare to free-rev the engine up to the RPM where you want full voltage. Remember, the FPSC increases pump speed progressively, with engine RPM, and you want to set the full voltage point at a high enough RPM that, during cruise, you are not running the pump unnecessarily fast. For example, if the car cruises at 2,500 RPM, consider setting the speed controller at least 1,500 RPM higher, or in this example 4,000 RPM, to keep pump speed low during cruise. Note: A good RPM point for full pump speed would be at peak torque. This is commonly between 3,500 and 6,000 RPM, typically above 4,000 RPM with today's modern, high horsepower small-block engines.

2.) Obtain the small screw-driver included with the FPSC and locate the "set-tach" button accessible through the hole in the upper left corner of the FPSC, labeled "SET TACH". The button is red. Have an assistant or helper rev the engine to the desired, full voltage RPM and hold it while you press and release the button with the screw driver. This teaches the FPSC where you want the pump to be at full speed.

3.) Now, let the engine return to idle and then rev it back up to the high RPM set point. Watch the green LED on the FPSC marked "FULL", it should illuminate when the full RPM point is reached. This confirms the pump will build to full speed with the engine. If the "FULL" LED does not illuminate, repeat steps 1-3 or proceed to the Trouble Shooting section below.

To read the actual output frequency or PWM produced by the Fuel Pump Speed Controller requires an oscilloscope, which though nice, is both a complex and expensive tool not commonly found in most of our toolboxes! A DVM, while not showing the actual output frequency, will read and display the average voltage this frequency produces. Reading the average voltage is perfectly fine for verifying FPSC function, and for establishing minimum fuel pump speed settings.

The Aeromotive FPSC will not harm the pump motor with reduced voltage. Using an on-board processor to control the pump with PWM (pulse width modulation), the FPSC uses a frequency of on/off. Using a tach reference, the on/off frequency is varied by the processor onboard the FPSC in-sync with changes to engine RPM. Using engine RPM to anticipate fuel demand, the FPSC is programmed to slow the pump down at low-load idle and cruise RPMs, while progressively increasing pump speed and volume available as engine RPMs increase. Full pump speed is achieved at an engine RPM set by the user, where no pulse modulation is used and the FPSC allows full voltage to pass directly through to the pump, just like a relay.

Note: The Aeromotive FPSC uses a progressive speed control strategy, meaning as the engine RPM increases the fuel pump speeds up with it. Each new FPSC is fully tested from the factory and preset for full pump speed at 2,500 engine RPM. It's important to calibrate the high RPM set point for your unique engine combination. Since pump speed increases with the engine RPM, raising the RPM point for full speed still feeds the engine properly in the midrange while vastly reducing the fuel recycle rate at idle and cruise to keep fuel cool during long drives.
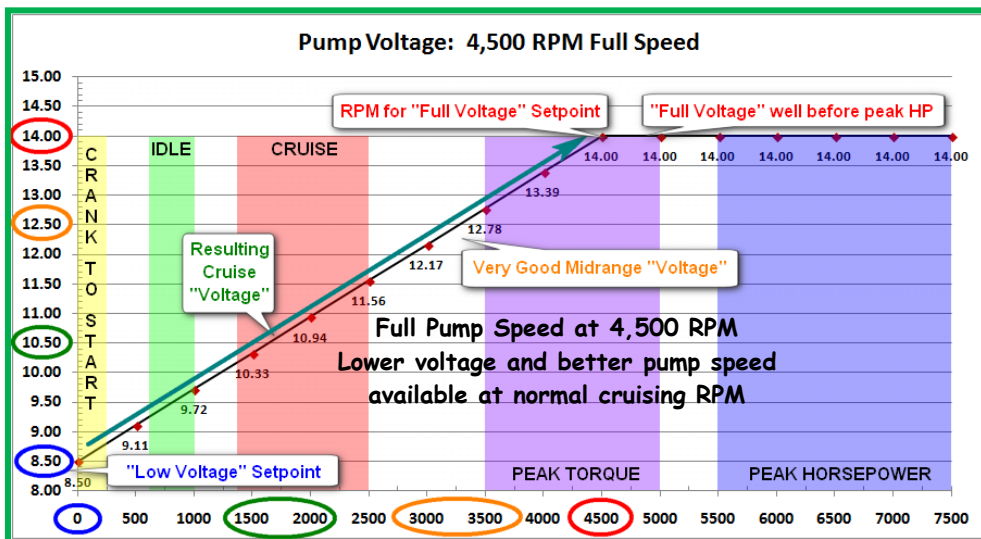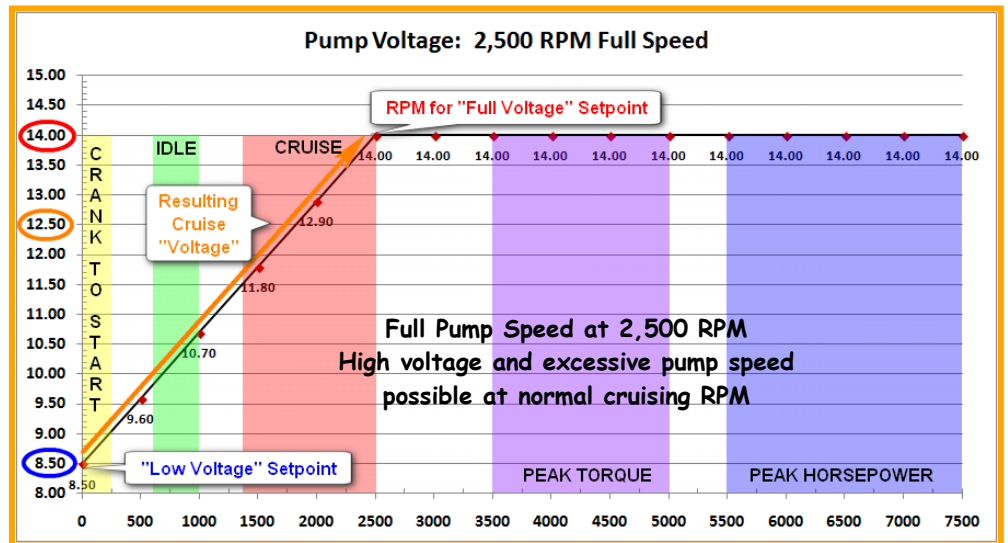
IMPORTANT: The FPSC is not a voltage booster, though theoretically one could be used in conjunction with the FPSC (done by connecting the output from a voltage booster to the FPSCs BAT terminal), maximum voltage output from the FPSC can never be more than the voltage input. Maximum voltage input should not exceed 20-volts and current draw is limited to 30-amps continuous.
Note: In application, it's possible to see a 0.1-volt to a 0.3-volt drop through the FPSC, but no more.