



## **S650 Mustang GT and Dark horse calibration Notes**

The S650mustang has a factory PWM (FPDM) fuel pump driver module that will only allow a max average switched voltage of 12V to the fuel pump. This is true even with KPM Fuel Systems 1500HP/2200HP/2700HP modules and PWM controlling the system by mimicking the factory FPDM.

The KPM Fuel Systems pump module WILL NOT achieve its highest fuel flow rate if this is left at factory settings.

As the Mustang PCM actually controls the FPDM there are numerous parameters in the calibration. From factory the lowest average voltage is 5v. This is the minimum set point. On KPM twin pump systems this will leave our rail pressure around 67-73psi during idle, cruise, and deceleration. This is normal and acceptable operation of the systems.

For achieving max flow from the KPM Fuel Systems total fuel solution in the higher load range we set the max allowed voltage to 15 to get the most out of the system. This will cause fuel pressure to rise above our desired pressure set point during some conditions. This is normal and acceptable operation.

As the fuel pressure starts to lower under power conditions the PCM will allow this until it reaches the desired pressure then start ramping pump duty cycle up to keep pressure where it has been set. Limitations in the PCM and FPDM are unable to pull the duty cycle down to reach commanded pressures with the allowable voltage clamp lifted which is normal and acceptable operation.

The PCM is only capable of sending out a signal to the FPDM once per second (1Hz) thus being the limitation in response to changes in pressure. However, the volume of the fuel lines and rails provides enough reserve fuel to not have a negative effect.

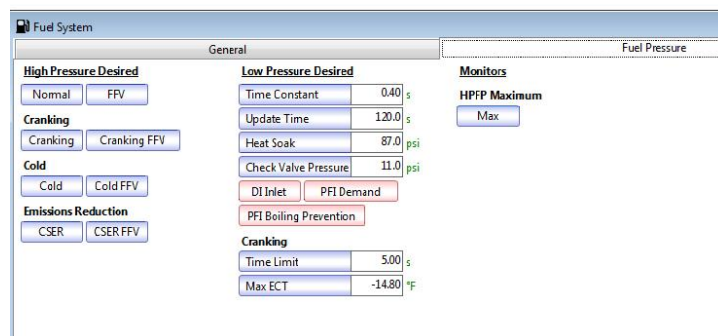
\*The KPM Fuel Systems PWM can also be run as a standalone unit with use of its own fuel pressure sensor and will control fuel pressure faster that will ensure no pressure fluctuations happen at all.\* For more information - [enquiries@kpmfuelsystems.com](mailto:enquiries@kpmfuelsystems.com)

## For KPM PWM controlled fuel systems only.

The following instructions are where to make the calibration changes.

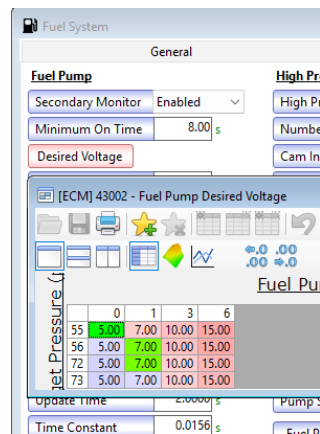
### HP Tuners

13295 – 13289 – 13287 Are our pressure set points. Set these to 67 PSI / 460 KPA.



43002 is a Max Voltage vs Flow vs Pressure table. Set the table as shown.

\*This table CAN be adjusted to finely tune duty cycle control based on vehicle modification but not necessary.



43003 Fuel Pump Max Voltage. Raise this to 15V.

The screenshot shows the 'Fuel System' configuration window with the 'General' tab selected. Under the 'Fuel Pump' section, the following settings are visible:

| Parameter         | Value   | Unit |
|-------------------|---------|------|
| Secondary Monitor | Enabled |      |
| Minimum On Time   | 8.00    | s    |
| Desired Voltage   |         |      |
| Min Voltage       | 5.00    | V    |
| Max Voltage       | 15.00   | V    |

The 'Duty Cycle' section is partially visible below the 'Max Voltage' setting.

23033 Fuel ump update time. Set to 1.5 s

23030 Fuel pump voltage deadband. Set to .001 v

The screenshot shows the 'Feedback' configuration window with the following settings:

| Parameter        | Value   | Unit |
|------------------|---------|------|
| Adaptive Voltage | Enabled |      |
| Update Time      | 1.5000  | s    |
| Time Constant    | 0.0156  | s    |
| Voltage Deadband | 0.0010  | V    |
| P Gain           | 0.0300  |      |
| I Gain           | 0.0300  |      |
| D Gain           | 0.0000  |      |

## PCMTEC

Tables auF61311 – auF61313 – auF61321 Are our pressure set points. Set these to 67 PSI / 460 KPA.

| Pressure - psi   |    | Pressure - psi |    | Temperature - °C |     |    |    |    |    |    |    |     |
|------------------|----|----------------|----|------------------|-----|----|----|----|----|----|----|-----|
| Temperature - °C | 0  | ulb/min        | 0  | 0                | -40 | 20 | 50 | 60 | 70 | 80 | 90 | 100 |
| -50              | 67 | 0              | 67 | 0                | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |
| -10              | 67 | 20000          | 67 | 50               | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |
| 0                | 67 | 20000          | 67 | 400              | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |
| 20               | 67 | 20000          | 67 | 500              | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |
| 50               | 67 | 20000          | 67 | 1000             | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |
| 80               | 67 | 20000          | 67 | 2000             | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |
| 150              | 67 | 20000          | 67 | 3000             | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |
| 200              | 67 | 20000          | 67 | 3500             | 67  | 67 | 67 | 67 | 67 | 67 | 67 | 67  |

Table auF30958 is a Max Voltage vs Flow vs Pressure table. Set the table as shown.

\*This table CAN be adjusted to finely tune duty cycle control based on vehicle modification but not necessary.

|                |    | lb/min |   |    |    |
|----------------|----|--------|---|----|----|
|                |    | 0      | 1 | 3  | 6  |
| Pressure - psi | 55 | 5      | 7 | 10 | 15 |
|                | 56 | 5      | 7 | 10 | 15 |
|                | 72 | 5      | 7 | 10 | 15 |
|                | 73 | 5      | 7 | 10 | 15 |

Scalar auF61353 is a Max Voltage final Clamp. Raise this to 15V.

|                 |   |       |       |     |
|-----------------|---|-------|-------|-----|
| auF45185        | Max positive delta from ending sync speed during overrun to run normal max detect | 0     | 0     | rpm |
| auF45186        | Max positive delta from ending sync speed to run normal max detect                | 0     | 0     | rpm |
| <b>auF61353</b> | Max pump control voltage acceptable to PEM.                                       | 15    | 12    | v   |
| auF47704        | Max Pump displacement (cc/rev)  | 24.25 | 24.25 |     |

Scalar auF32741 adjusting the slope for the output DC to be closer to the command.

|                 |  |       |       |       |
|-----------------|--|-------|-------|-------|
| auF32835        | Slope for the FRP transfer function (from V to PSI).                               | 1033  | 1033  | PSI/V |
| <b>auF32741</b> | Slope for transfer function between FPC command DC and actual fuel pump voltage DC | 1.5   | 2     |       |
| auF0117         | Stoichiometric Air Fuel Ratio  | 14.08 | 14.08 |       |

Scalar auF41728 reduce the deadband to allow faster response.

|                 |  |       |       |         |
|-----------------|--|-------|-------|---------|
| auF37167        | OVI Enable RPM Min                                 | 1000  | 1000  | rpm     |
| <b>auF41728</b> | Returnless fuel pump feedforward deadband.         | 0.001 | 0.125 | v       |
| auF32777        | RFP feedback gain for derivative of delta-P error. | 0     | 0     | V*s/PSI |

See next page for Multipliers.



## Injector multipliers

As KPM Fuel Systems fuel modules are rated down to the lowest operating pressure being 51 PSI / 350KPA the Fuel injector slopes, breakpoint and offset multipliers should be adjusted slightly to scale the injectors correctly if and when running down to 51 PSI / 350KPA.

*\*For aftermarket calibrations such as Whipple where the port injectors are scaled at different pressures we recommend not adjusting. As those multipliers are scaled to go far lower in fuel pressure than recommended for any vehicle and not high enough for even factory pressures.*

*\*If you are using different fuel injectors and have the fuel injector tuning data that is using the factory multipliers then adjust the following.*

## HP Tuners

**32060** Injector High slope multiplier

change pressure 55.1 to 50.76 and the multiplier .88 to .84

**32062** Injector Low slope multiplier

change pressure 55.1 to 50.76 and the multiplier .88 to .84

**32064** Injector Break point multiplier

change pressure 55.1 to 50.76 and the multiplier .88 to .84

**32052** Injector Offset multiplier

change pressure 55.1 to 50.76 and the multiplier .936 to .9189

## DTC Removal

As the factory PWM no longer can see a load from the fuel pump you will need to switch off P0627