

S550 2018 - 2023 Mustang GT PWM Fuel System Controller





Important! Must Read First

Congratulations on the purchase of a KPM Fuel System for your [S550 2018 - 2023 Mustang GT V8](#).

To ensure your fuel system is fitted correctly and operates perfectly and reliably, we advise that this kit is fitted by a KPM Fuel Systems Dealer workshop.

If you are unable to access a KPM Fuel Systems dealer, we **strongly** recommend a professional and experienced fully qualified technician to install your new fuel system.

Ask your qualified installer to contact KPM Fuel Systems on any aspect unclear in the instructions provided.

Email: support@kpmfuelsystems.com

As a wide variety of skills, procedures, special tools, and workshop equipment is needed to install this kit:

- KPM will take NO responsibility or give NO guarantees on the operation of this product for fitment not carried out by a KPM Fuel Systems dealer or experienced qualified technician.
- KPM will take NO responsibility or give NO guarantees on the operation of this product due to not fitting this kit exactly as per the instructions provided.
- Ensure correct workshop safety procedures are carried out in fitment of this kit.
- Please read **ALL** instructions before commencing fitment

Guarantee

On satisfaction that **ALL** instructions have been followed as per this document KPM will warrant this KPM Fuel System against any defects or faults for 12 months from the date of purchase.

Operation and Functions

The KPM Pulse Width Modulated (PWM) Fuel System Controller has been specifically designed to support up to 80 amps of continuous current draw.

This gives it the capability of running up to 4x high flow motorsport fuel pumps simultaneously and continuously.

The controller is programmed to run the fuel system at a pre-determined fuel pressure. The fuel pumps will only be run at the duty cycle required and when required. This ensures less current draw, which means less heat, improved reliability and precise tunability.

With this amount of control over fuel flow, we now have the ability to support extreme horsepower with OE level functionality.

The KPM PWM Fuel System Controller is fully programmed from factory to perfectly suit all vehicle models and the many combinations of fuel delivery required.

The PWM Fuel System Controller has the following functions:

- 80-amp continuous current support.
- Fully programmable to control up to 4 fuel pumps by means of one or all of the following inputs
 - Fuel Pressure, MAP, MAF & Throttle position *
- Fully programmable OE factory PWM input, piggy back control.
- Fully programmable pump output and pump staging. *
- Fully programmable system pressure settings. *
- Multiple options for safety settings and pump control. *
- Multiple gauge and warning light outputs. *
- Advanced low temperature electronic circuits for robust motorsport and long-term reliability.
- Supplied with EMI shielded high amperage wiring and connector kit to block out interference with other vehicle electronic modules and devices.
- LED on controller for visual system pass and fault code readout.
- Fully modular fitment to all KPM Fuel Systems

[* To re-program this function please contact KPM Fuel Systems.](#)

The KPM PWM Fuel System Controller will be supplied pre-programmed to exactly suit the model of your vehicle and the level of KPM fuel system purchased.

There is nothing to do, just follow the wiring instructions, plug in the connectors and start the car. Simple! The controller will do the rest.



Vehicle and fuel system specific operation and function

Vehicles with a Factory FPCM Fuel Pump Control Module (S550 Mustang 2018-2023)

The KPM PWM Fuel Module Controller comes complete with wiring to be connected to the vehicles factory FPCM to read the OE signals. The KPM PWM Fuel System Controller uses the OE signals from the FPCM to calculate the correct current required to run the pumps accordingly.

The KPM PWM Fuel Controller can also be programmed utilizing the OE fuel system programming tables.

KPM1500 Fuel System – Primary Module only

Primary module fuel pumps are always running and duty cycle input will vary on load demand. As an example, at idle both the pumps may be running at approx. 40% duty cycle and at part load they may be at 55% and then ramping up to full load at 80% duty cycle.

This cycle will continue as load **increases** and **decreases** while keeping fuel pressure at a constant OE programmed 448 kPa.

KPM2200/2700 Fuel System- Primary and Secondary Module

On every start-up, the secondary module pumps are primed for 10 seconds only. This ensures the circuit is tested and that the secondary module pumps are always ready and primed when required for high load operation.

Primary module fuel pumps are always running and duty cycle input will vary on load demand. As an example, at idle both the pumps may be running at approx. 40% duty cycle and at part load they may be at 55%.

When the primary module reaches 90% duty cycle, the fuel controller will then turn on a *duty cycle signal* to the secondary module fuel pump and continue to ramp duty cycle up or down accordingly as required.

When load decreases and the controller see's the primary module requiring a duty cycle of only 80% it will then slowly ramp down the *duty cycle signal* to the secondary module and eventually turn it off.

This cycle will continue as load **increase** and **decreases** while keeping fuel pressure at a constant OE programmed 448 kPa.



Important

This fuel system is engineered to operate perfectly as a complete system, when used with all components as supplied only by KPM Fuel Systems.

Depending on the level of KPM Fuel System you have purchased, included in the kit will be the following;

- 1) KPM PWM Fuel System Controller - (for precise electronic control over fuel module/s operation)
 - 2) KPM Plug and Play EMI safe wiring kit (for correct, reliable and safe current supply).
- KPM Fuel Systems will take NO responsibility for the operation of this fuelsystem if any of the components listed are not utilized with this package.
 - KPM Fuel Systems will take NO responsibility for the operation of this fuel system if any of the components listed are replaced with a non-KPM approved component.

Dismantle vehicle for fitment

- 1) Remove the RHF wheel.
- 2) Remove the RHF inner fender trim by removing the 5 hold down clips.



- 3) Remove the RH front seat.
- 4) Remove the RH footwell panel.
- 5) Remove the RH inner sill panel trimming.



6) Pull back the RH footwell carpet



7) Remove the rear seat base.

8) Remove RH rear inner cabin panel.

- **If the vehicle has already** been fitted with a KPM Fuel Module, you can disconnect the wiring at the fuel module by unplugging the grey Anderson connectors.
 - a. Proceed to remove and discard the rest of the previous KPM wiring and relay that leads to the battery (this will be replaced with the new #MUS41 wiring section supplied)
- **If the vehicle is now** being fitted with the KPM Fuel Module/s you will need to read the separate instruction section on the relevant [KPM Fuel Module Fitment](#).

PWM Fuel Controller Mounting

- 1) Place your PWM controller just below the RH rear $\frac{1}{4}$ window with the cables facing downwards as pictured.
- 2) Use a marker pen to mark the 4 holes required for drilling.
- 3) Drill the 4 marked holes carefully with a 3.5mm drill bit and use the supplied screws to mount into position.
- 4) Be sure to mount the PWM controller small black earth wire/eyelet and screw down into one of the appropriate holes.



- 5) You will need to remove the insulator from the RH rear inner cabin panel and mark out for cutting as shown.



- 6) Test fit and check the trim panel and foam insulator fits correctly over the PWM.
- 7) Final fit the foam insulator with the hold down clip and hot glue on one side and totally hot glue the other side of the insulator back onto the trim panel.

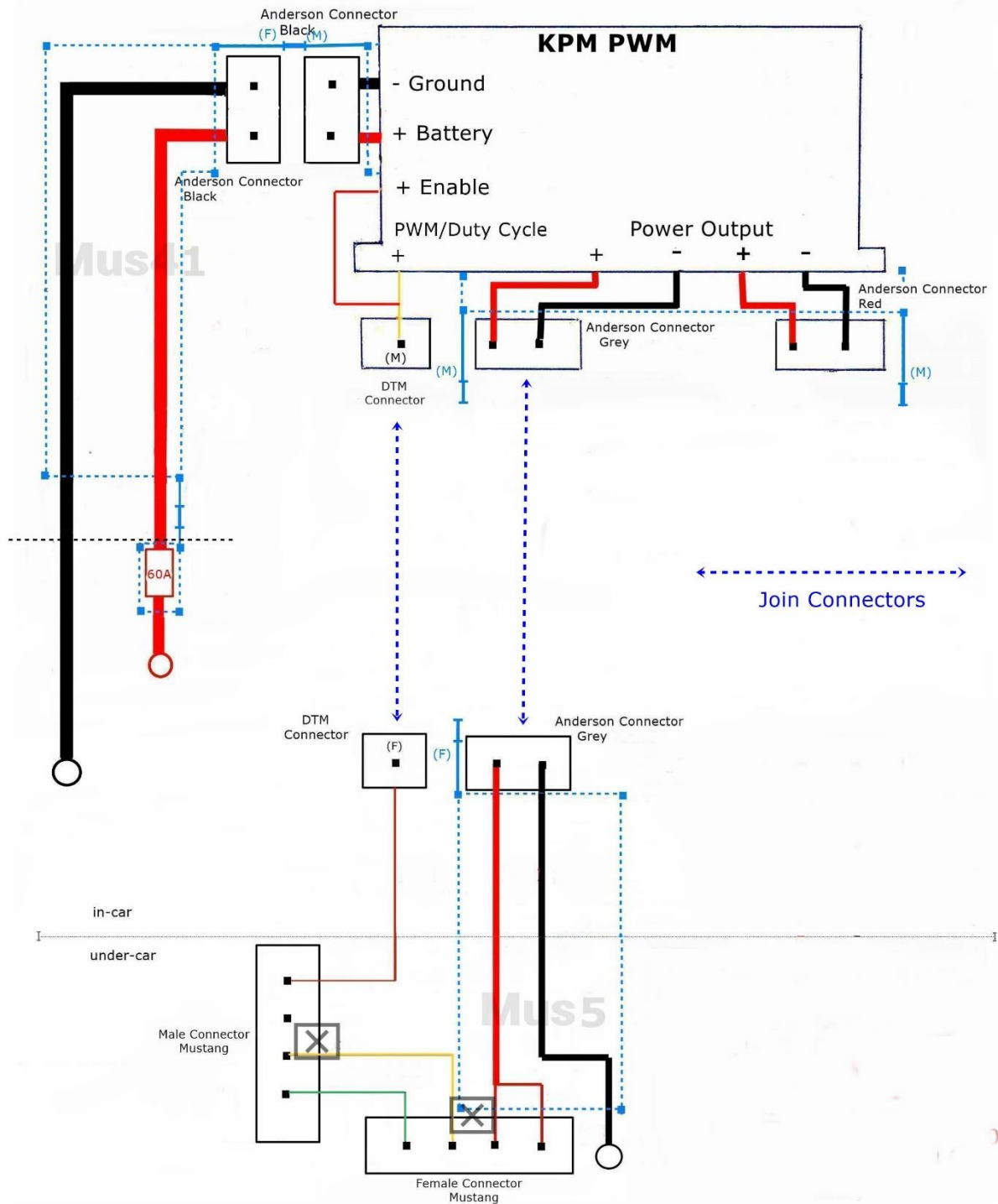


PWM Fuel Controller Wiring

- 1) Depending on the level of KPM Fuel System you have installed – either [KPM1500 HP](#), [KPM2200 HP](#) or [KPM2700 HP](#) you will need to follow the appropriate wiring diagram below.
- 2) All Anderson wiring connectors are color coded to ensure correct connection orientation as per wiring diagram.
- 3) Route the supplied wiring as per your specific fuel kit and as per appropriate wiring diagram and pictures listed below.

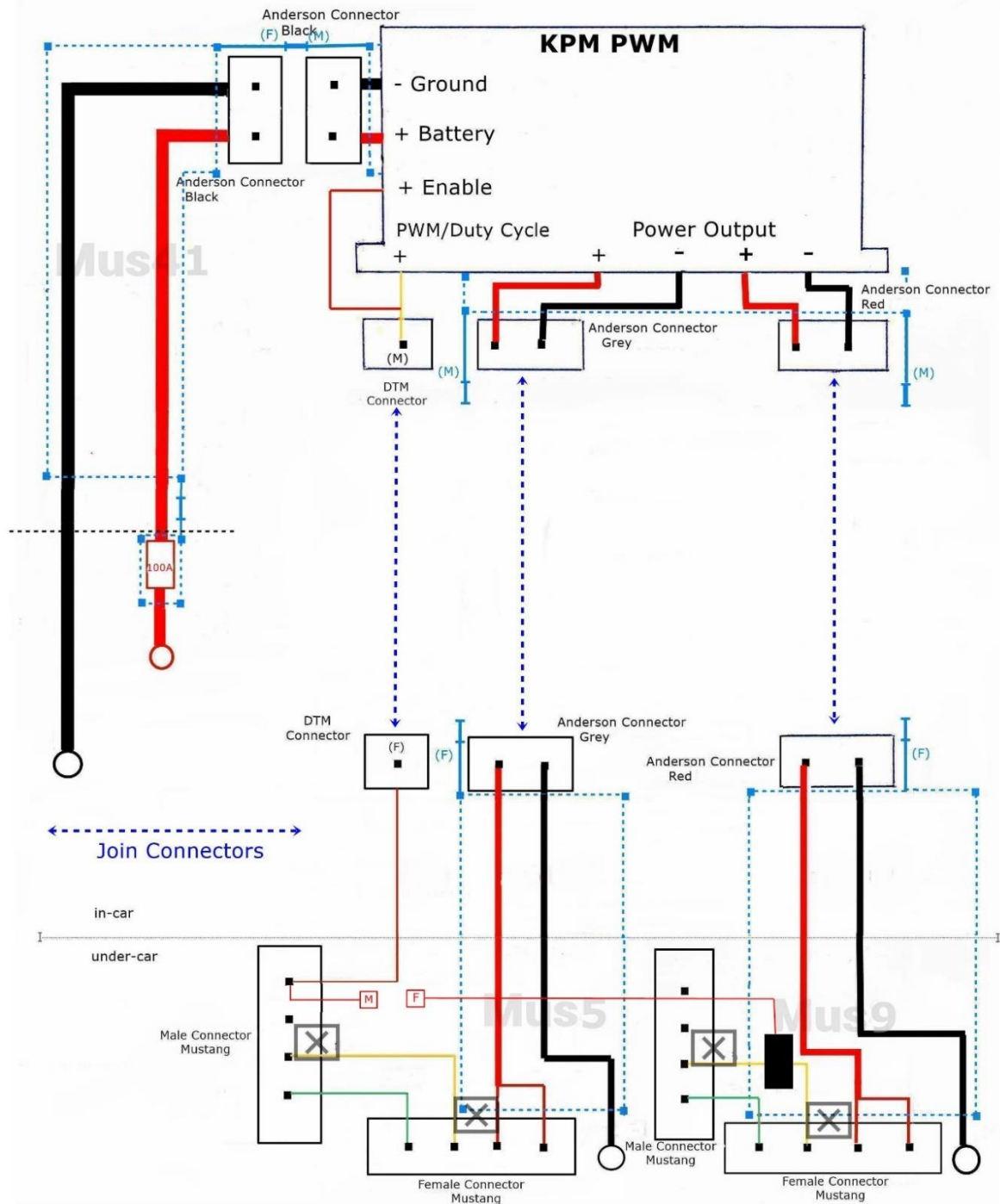
*Note – The PWM Fuel controller wiring is made with a stainless-steel shielding incorporated. This is to prevent EMI (electro-magnetic interference) from disrupting other vehicle systems and control modules. It is very important that the grounding wire connectors that link together every section of the supplied wiring are connected as per wiring diagram.

PWM 1500 HP Mustang GT 2018-2023 PWM and Wiring Schematic 1500



PWM 2200/2700HP

Mustang GT 2018-2023
PWM and Wiring Schematic 2700



Wire and cable routing

- 1) Remove the black Anderson connector surround from the #Mus41 wiring loom end.
- 2) From under the hood and using a tracer wire/tool, feed the #Mus41 wiring loom through the hole above the RH chassis rail area below the battery and out the hole into the RH inner fender cavity area.

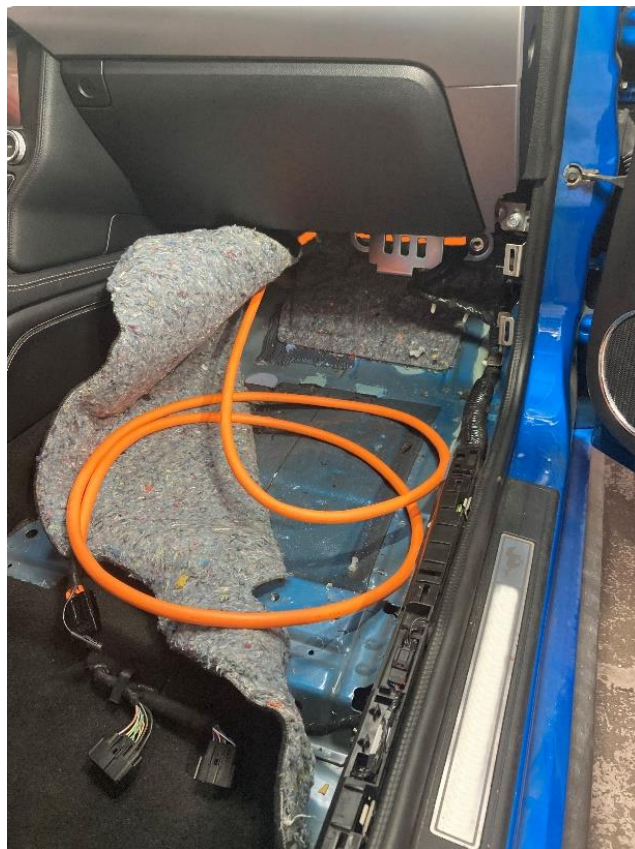


- 3) Pull most of the #Mus41 wiring loom through the chassis hole onto the ground, while leaving enough length under the hood to comfortably connect the other end to the battery.
- 4) Mount the new fuse section in the battery box area in an appropriate position to clear the battery.
- 5) Make a small incision into the rubber grommet located in the inner fender cavity and feed the #Mus41 wiring loom through the rubber grommet into the RH footwell and floor area.

- 6) You may need to lubricate the wiring loom with some silicone spray to ensure it slides through the grommet easily.



- 7) You will now have the majority of the orange cable (Mus41) inside the cabin ready to route to the PWM fuel controller.



- 8) Continue to route the #Mus41 loom from the footwell along the RH sill panel alongside the existing OE loom towards the PWM.



- 9) Connect the black Anderson connector on cable (Mus41) to the black Anderson connector on the PWM.



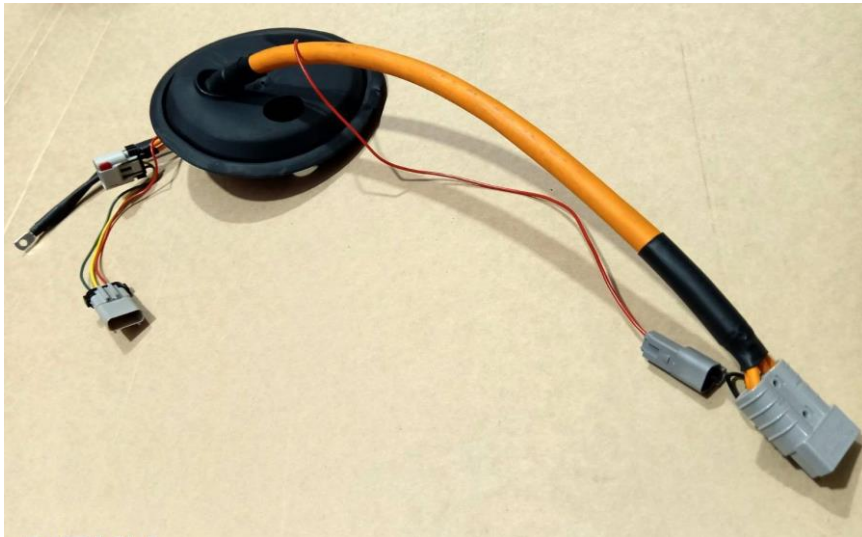
10) Remove your primary (OE) fuel pump grommet cover and drill a 30mm hole as shown.



11) Fit the new supplied 30mm grommet as shown.



- 12) Remove the grey Anderson connector surround from the primary module cable (Mus5) and feed the cable through the new grommet.



- 13) Connect all the primary fuel module connectors as per the wiring diagram. Be sure to securely tension the earth cable eyelet to the pump.

- 14) Refit the grey Anderson connector surround and route neatly towards the PWM.
Connect to the grey Anderson connector on the PWM.



- 15) If you are fitting a secondary fuel module for a 2200HP or 2700HP KPM fuel system, locate the fuel module grommet cover on the RH rear seat floor and repeat all the steps 10 to 14 utilizing the (Mus9) cable and connecting the red Anderson connectors to the PWM.



- 16) You can now go along the cable/s and tidy up and neaten the inside cabin fitment with cable ties securely alongside existing looms and fittings.

- 17) Refit the RHF wheel.

- 18) Refit the RHF inner fender trim

Start Up and Checks

- 1) When you are satisfied your PWM Fuel Controller is fully installed, you are now ready to start your vehicle.
- 2) Simply start and run the car as normal.
- 3) On one end face of your KPM PWM Fuel System Controller you should see a green LED flashing approximately once per second. This means that all systems are working normally.

Note* If your LED is not flashing green approximately once per second or is flashing any other color, you may have a system problem. Please contact KPM Fuel Systems.

Refit interior

- 1) Refit all your interior sill panel trimmings.
- 2) Refit you modified rear trim panel.
- 3) Refit your footwell panel.
- 4) Refit your RH footwell carpet.
- 5) Rear fit your front seat.
- 6) Refit your rear seat base.
- 7) You may need to cut the underside plastic section of your rear seat base as pictures to allow room for the new wire sections.



Congratulations, you have successfully fit the KPM PWM Fuel System Controller.

S550 18-23 Mustang GT calibration Notes

The S550 18-23 Mustang has a factory PWM fuel pump controller 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 PWM.

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 PWM 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 460-500KPA 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 13.5 which is where all the KPM Fuel Systems are tested and rated. 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 factory PWM 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 factory PWM 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

The following instructions are where to make the calibration changes.

PCMTEC

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

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

Table auF30958 is a Max Voltage vs Flow vs Pressure table. Set the 0 column to 5V and raise the rest to 13.5V.

		lb/min			
		0	1	3	6
Pressure - psi	55	5	13.5	13.5	13.5
	66	5	13.5	13.5	13.5
	72	5	13.5	13.5	13.5
	73	5	13.5	13.5	13.5

Scalar auF61353 is a Max Voltage final Clamp. Raise this to 13.5V.

auF37079	Max PM (alcohol) at which PI may occur in FSA0 E100 apps .	0.75	0.75			Max PM (alcohol) at which PI may occur in FSA0 E100 apps .
auF61353	Max pump control voltage acceptable to PEM.	13.5	12	v		Max pump control voltage acceptable to PEM.
auF21124	Max purge Of fuel allowed during Air/Fuel Imbalance monitoring.	0.4	0.4	%		Max purge Of fuel allowed during Air/Fuel Imbalance monitoring.
auF53538	Max pvipc road resistance ramp rate	1750	1750			Max pvipc road resistance ramp rate

HP Tuners

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

The screenshot shows the 'Fuel System' configuration window with the following settings:

- High Pressure Desired:** Normal, FFV
- Cranking:** Cranking, Cranking FFV
- Cold:** Cold, Cold FFV
- Emissions Reduction:** CSER, CSER FFV
- Low Pressure Desired:**
 - Time Constant: 0.40 s
 - Update Time: 120.0 s
 - Heat Soak: 87.0 psi
 - Check Valve Pressure: 11.0 psi
 - DI Inlet: PFI Demand
 - PFI Boiling Prevention
- Cranking:**
 - Time Limit: 5.00 s
 - Max ECT: -14.80 °F
- Monitors:** HPPF Maximum, Max

43002 Fuel Pump Desired Voltage. Set the 0 column to 5V and raise the rest to 13.5V.

	0.0	7.6	22.7	45.4
Max Voltage	5.00	13.50	13.50	13.50
Duty Cycle	5.00	13.50	13.50	13.50
Min DC	5.00	13.50	13.50	13.50

43003 Fuel Pump Max Voltage. Raise this to 13.5V.

Fuel Pump

Secondary Monitor: Enabled

Minimum On Time: 8.00 s

Desired Voltage: [button]

Max Voltage: 13.5 v

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 when running down to 51 PSI / 350KPA.

PCMTEC

auF30941 Injector High slope multiplier

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

auF30942 Injector Low slope multiplier

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

auF30940 Injector Break point multiplier

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

auF30943 Injector Offset multiplier

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

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 form the fuel pump you will need to switch off P0627

IMPORTANT INFORMATION

KPM strongly recommends that you have your engine tune checked by a professional tuning workshop!

Depending on the previous fuel system your vehicle has been tuned to, your car may run differently with the new KPM Fuel System pressure and extra supply.

This can cause rich or lean fuel mixtures and possibly be detrimental to your engine!

It is your responsibility to have your vehicle checked and/or re-tuned by specialist methods to ensure correct fueling and engine safety and reliability.

It is your responsibility to have your vehicle checked and/or re-tuned by specialist methods to ensure any fault codes in the vehicles electronic management system/s are corrected.