FROSTBYTE



V3

w/CANBUS

Water Methanol Controller

User Guide

tunernerd.com


Boost
Pump Active
Line Press.
Flow Indicator
Intake Temp
Peak Boost
CANBUS Active
Engine Speed
Pump
201 PSI
17.00
17 PSI
S1
30
S2
50
75
3006 RPM
CAN
FROSTBYTE

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Hardware Requirements

We recommend that you install **FrostByte** on a gasoline or diesel-powered vehicle with forced induction or nitrous. Naturally aspirated vehicles can be fitted as well but must be tuned by an experienced calibrator. Specific hardware requirements are:

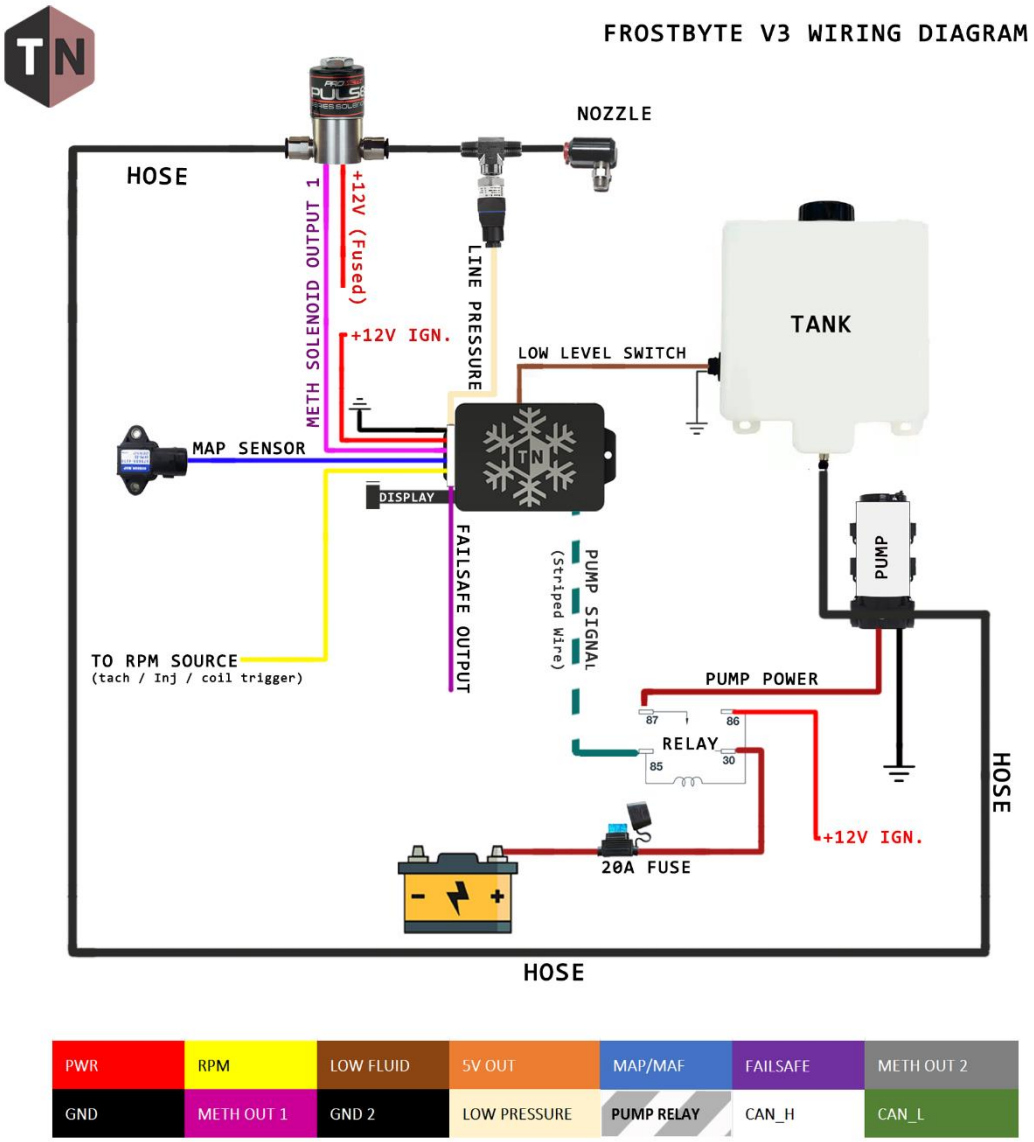
- Switched 12v power source and a solid ground.
- MAP or MAF sensor signal to be tapped.
- Methanol pump and fast acting solenoid already plumbed into system.
- Low level sensor.
- *Low pressure switch or sensor (not required but recommended)*

Installation Location

Do not install inside the engine bay – the unit may not tolerate the heat. Anywhere reasonable inside the cabin should be fine.

WARNING: Never connect the pump directly to the unit. A relay is necessary! See the end of this document for relay wiring instructions!

Wiring



The preceding diagram represents both the pinout at the device connector and wire colour codes. The order of the pins shown here represents the view looking into the device's connector and not the wire harness connector.

PWR –(RED) Ignition key switched 12V supply.

GND – (BLACK) Solid ground spot that ECU uses. Please ground to the SAME ecu power GND wire. This is to get a solid reading from MAP sensor. Connecting to nearest chassis point is actually NOT best practice!

RPM – (YELLOW**)** Engine speed source which can be tacho or injector. If injector duty cycle mode is used for flow calculations, then this RPM source must be from an injector. Direct injectors are not supported for RPM signal.

METH OUT 1 – (PINK) Switched GND signal for the FIRST fast-acting methanol solenoid. The solenoid has constant switched 12V on one wire and the other connects to this wire. Polarity doesn't matter. A regular on/off solenoid can be used here as well.

LOW FLUID – (BROWN) This connects to the low-level sensor. The sensor has 2 wires, one must be grounded and the other connected to this brown wire.

5V OUT– (ORANGE) Optional 5V source that may be used on a dedicated map sensor or the line pressure sensor.

LOW Pressure – (TAN) For low pressure sensor, or low-pressure switch. This is either used as 5-volt low-pressure sensor or low-level pressure switch. To configure for either, refer to appendix 1 at the end of document. By default, it's configured for pressure switch.

NOTE: Low pressure can only be tested under "spraying" on conditions. If the system Is not currently spraying/injecting, then the fault will not be detected. This is because the system only expects line pressure once the pump is on AND duty cycle greater than 1% is currently commanded.

MAP/MAF – (BLUE) Map or MAF Sensor signal. Configurable for each in software.

PUMP RELAY – (Striped wire). Use this output to turn on a pump relay. It is a negative output (-12v), so connect this to a relay, and the other wire of the relay to +12V. See the end of this document for diagram.

FAILSAFE OUT– (PURPLE) This wire provides a low side output for failsafe management. You may use this wire to pull down a sensor wire or as the low side input into a relay.

CAN_H – (White) CANBUS high input.

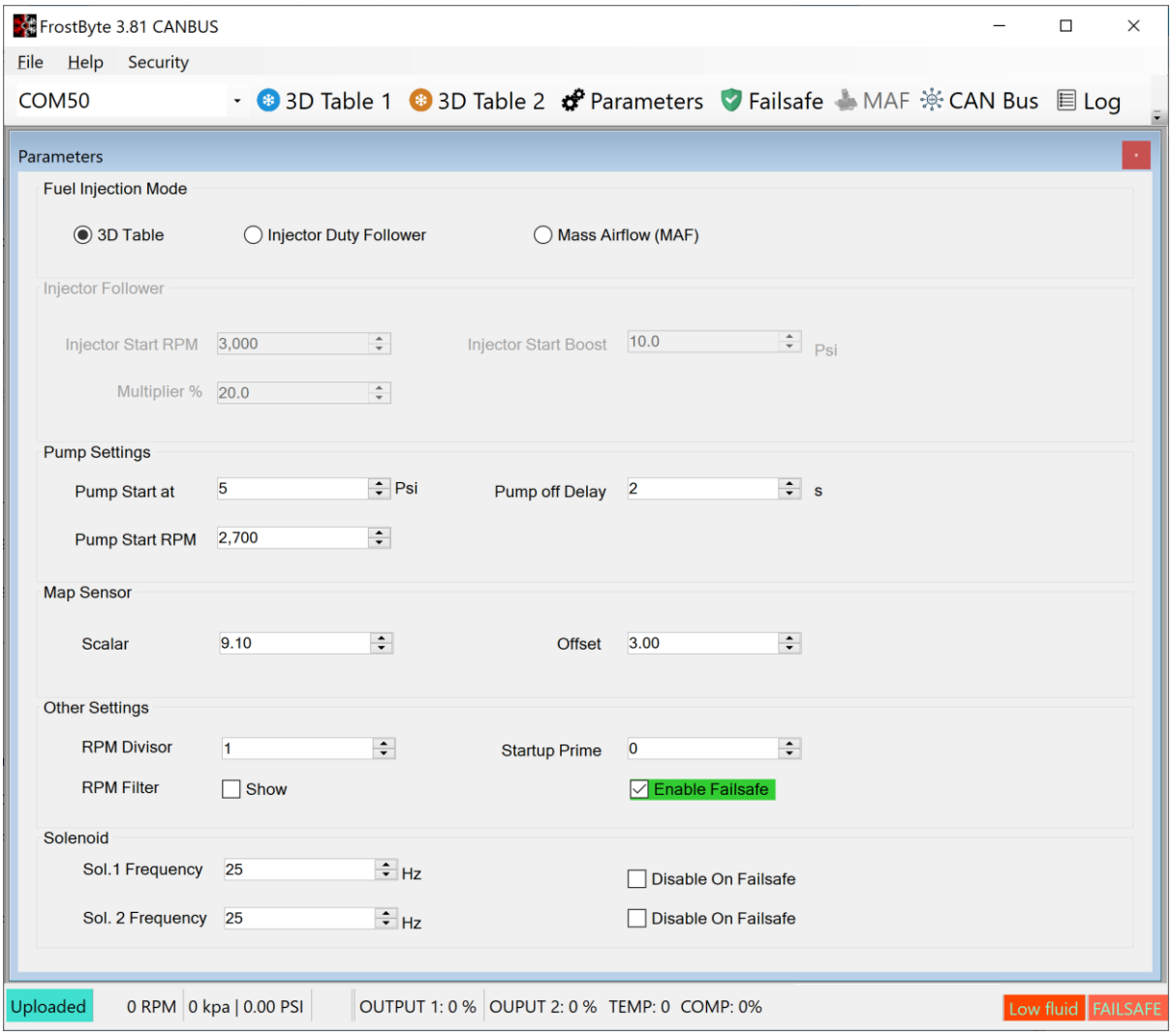
METH OUT 2 –(GREY) SECOND fast-acting methanol solenoid switched ground output.

CAN_L – (GREEN) CANBUS low input.

Software Interface

Overview

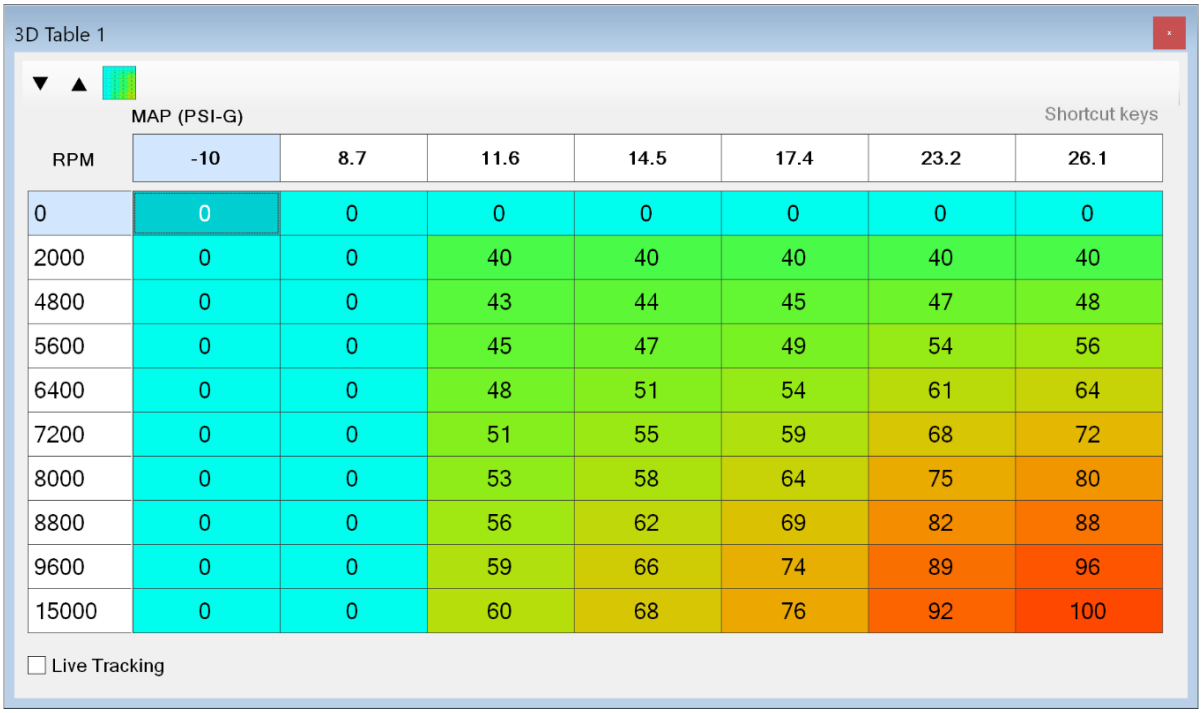
Connection



The software uses USB COM port to communicate with the device. Please select the correct port. COM5 in the photo above is just an example, your PC may assign a different number to your device. If more than one port is in the list, try each until you get a connection.

3D Tables

There are two 3D tables that can be used for fluid flow control. The 3D tables are based on boost vs RPM. The number in the table is the flow %. We call this the duty cycle. The higher the duty cycle the more methanol will spray.



RPM	-10	8.7	11.6	14.5	17.4	23.2	26.1
0	0	0	0	0	0	0	0
2000	0	0	40	40	40	40	40
4800	0	0	43	44	45	47	48
5600	0	0	45	47	49	54	56
6400	0	0	48	51	54	61	64
7200	0	0	51	55	59	68	72
8000	0	0	53	58	64	75	80
8800	0	0	56	62	69	82	88
9600	0	0	59	66	74	89	96
15000	0	0	60	68	76	92	100

Shortcuts

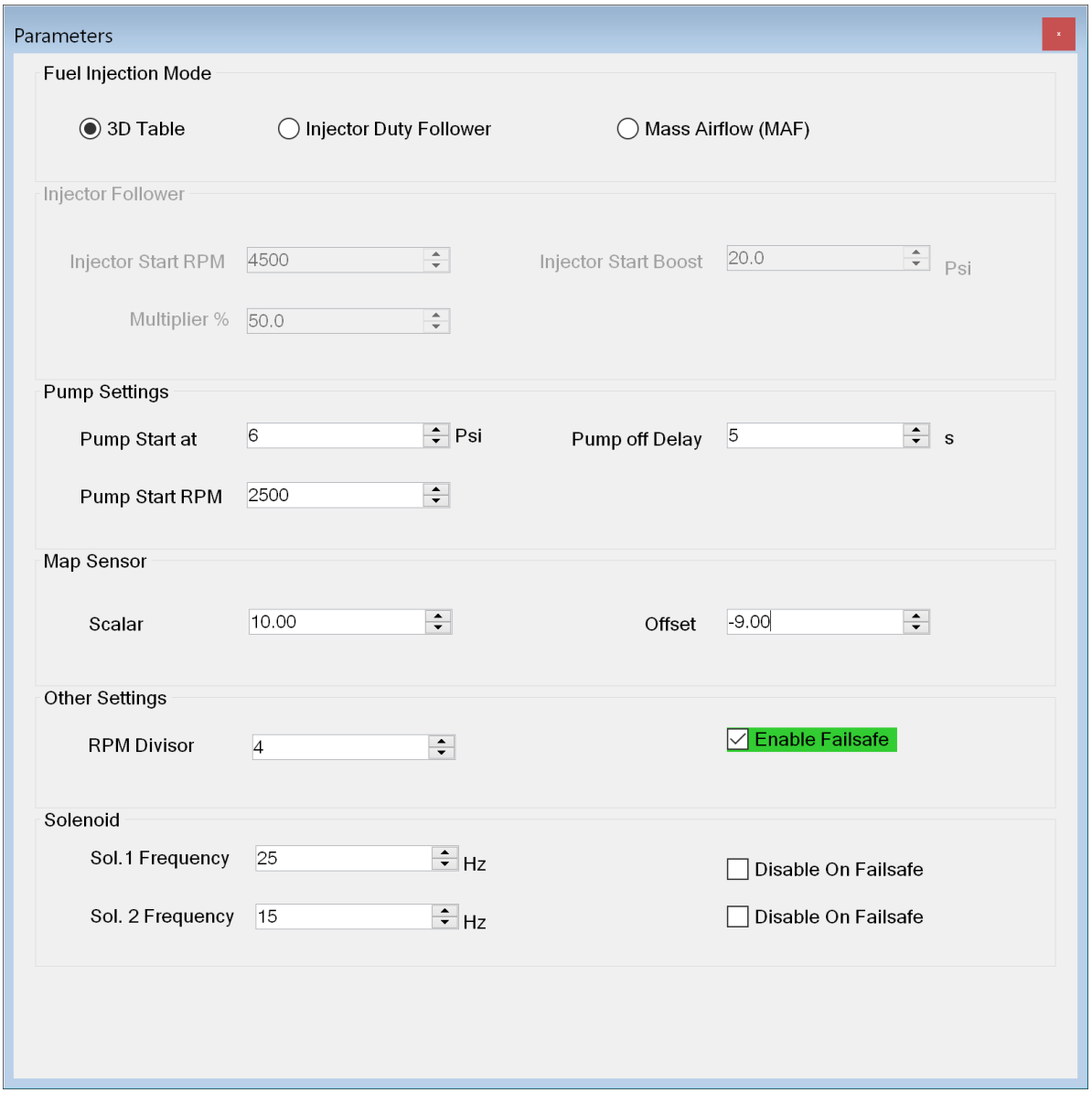
To quickly change values in the 3D table:

Increase value: SHIFT+ UP arrow

Decrease value SHIFT+DOWN arrow

Interpolate – \

Parameters (General Settings)



The parameters page has a number of settings which will determine how the device works.

Fuel Injection Mode

- 3D table (default) - Methanol will be injected as per duty cycle of a 3D table.
- Injector duty follower - this will read your injector duty cycle and apply a multiplier that will determine the water injection duty. The Frostbyte RPM source must be at the injectors for this to work.
- MAF – use the mass airflow sensor to determine methanol output.

Pump settings

- Pump start boost – The relative PSI that will trigger the pump to turn on. This does not spray but only pressurizes the line.
- Pump start RPM – While Over this RPM the pump will always be on.
- Pump off Delay – How long does the pump stay on AFTER the RPM and boost is below their threshold.

Map Sensor

- Scalar - This is the map sensor scalar (multiplier) value.
- Offset – This is the map sensor offset value. If map pressure values are not matching the ecu's map pressure, adjust the offset until they say the same thing.

Other Settings

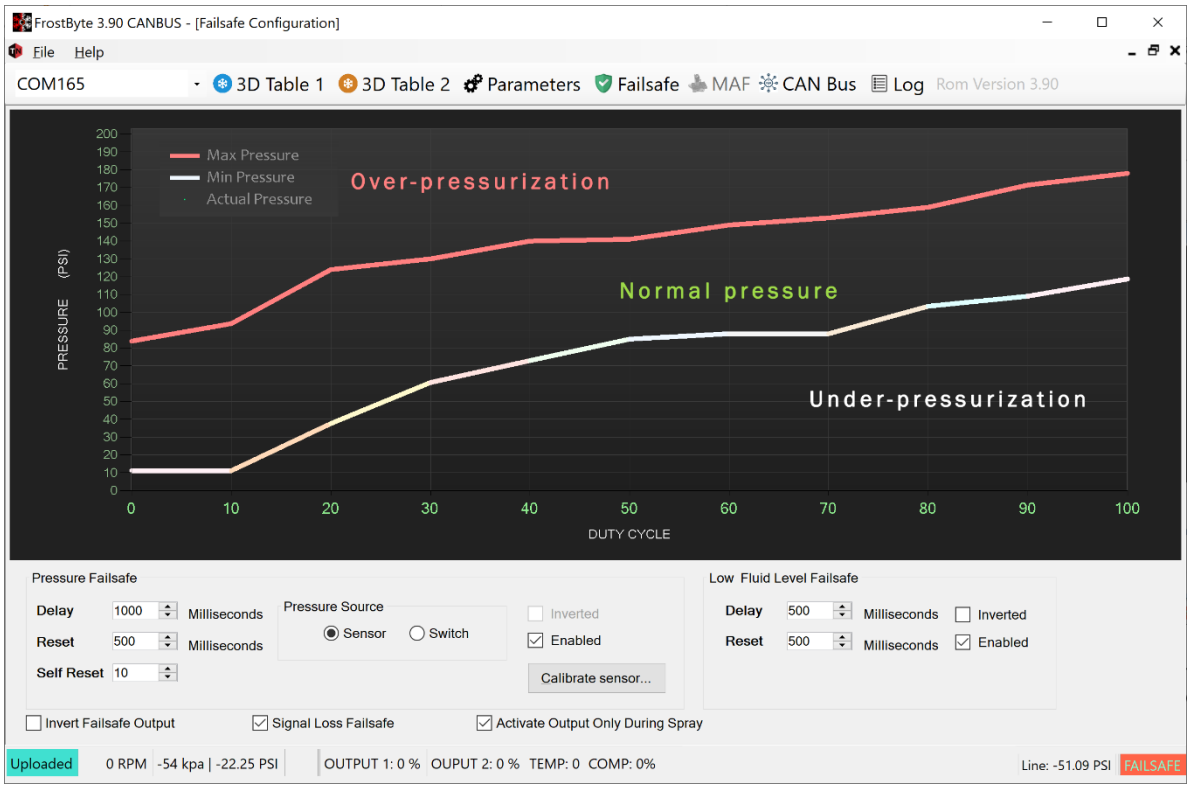
- RPM Divisor – Adjust this value until the correct RPM reading is displayed.
- Enable Failsafe – This enables the failsafe output (BCS)
    - Invert low level – For example, if the tank is full and the software is showing a low-level error, then the switch is giving an opposite reading. Flip this checkbox to invert the reading.
    - Invert low pressure - Same as above. If pressure is giving opposite reading, flip this checkbox to correct it.

Solenoid

- Frequency - This is the frequency that the fast-acting solenoid output will pulse at. The default is **20Hz** as this gives a good response across many solenoids.
- This output can be used as pump speed control, but a DC current solid-state relay is an **absolute MUST**. Otherwise, this will burn the device output. For pump flow control the frequency should be much higher, around 100 Hz.
    - Note: Some solid state relays do not work well above 100hz

Failsafe

FrostByte can interrupt signals to the boost control solenoid or electronic sensor in the event of a failsafe condition. These include low fluid, low-pressure or open/short circuit conditions.



In the photo above you will notice that there are two pressure profiles traced by red and white lines. Users will set their pressure profiles based on what the device does in previous logs. The lines can be clicked-dragged to form the correct safe pressure boundary.

Above the red line will trigger a high-pressure failsafe

Below the white line will trigger a low-pressure failsafe

Failsafe Configuration screen determines how the system handles low fluid and low-pressure situation.

- **Pressure source**
    - Pressure switch or sensor. Configurable via a jumper on the circuit board. (see appendix)
    - NOTE: The pump must be triggered by the device before a low-pressure fault can be detected. To trigger the pump and test the low-pressure fault refer to the testing procedure a few pages below.

- The system can detect a failure in the sensor and throw a failsafe. Requires a sensor that has an offset of >0.5v to detect sensor disconnection failure.

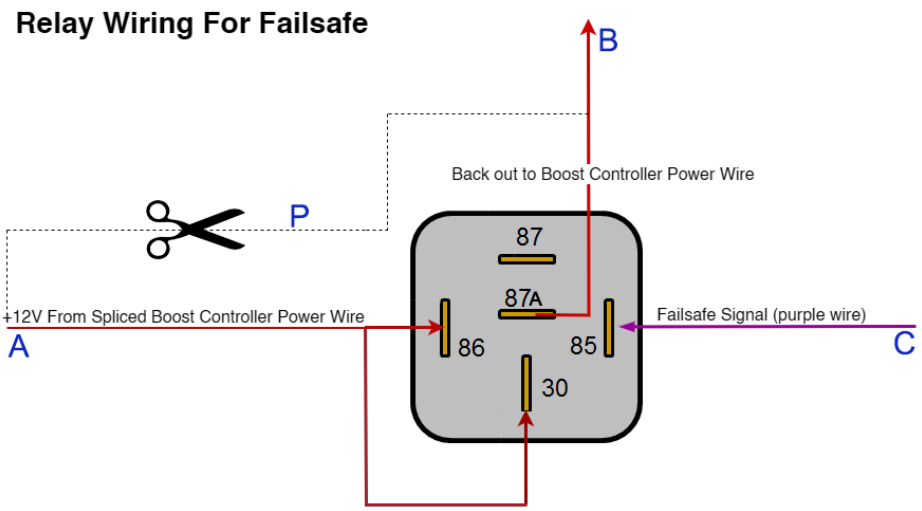
- **Delay**
  - How long after detecting an adverse situation that it waits before triggering the failsafe.
- **Reset**
  - How long after normal operation is restored before removing failsafe.

- **Inverted**
  - Gives the option to invert the signal. Low becomes high, and high becomes low.
- **Signal-loss failsafe**
  - If a signal wire is shorted or open failsafe will be triggered.
- **Activate Output Only During Spray**
  - When this is enabled the failsafe signal output wire will only become energized during spray.

In the event of a failsafe condition the boost control solenoid will be bypassed and the boost will drop to wastegate spring pressure. The solenoid will therefore not engage higher boost beyond the wastegate pressure.

Failsafe Output Wiring

Here is an example for wiring the failsafe into your car's boost control electronics.



Wire **P** is the boost control power wire (12V) which is cut into two parts - becoming wire **A** and **B**. Wire **A** is the energized side of the wire: this is coming from the ECU and should have 12V when the car is switched on. Wire **B** is the other wire from the cut that goes to the boost control device.

Connect wire **A** to Terminal **86**. Connect wire **B** to terminal **87A** (not 87). Connect **C** to the Frostbyte failsafe signal wire (purple wire).

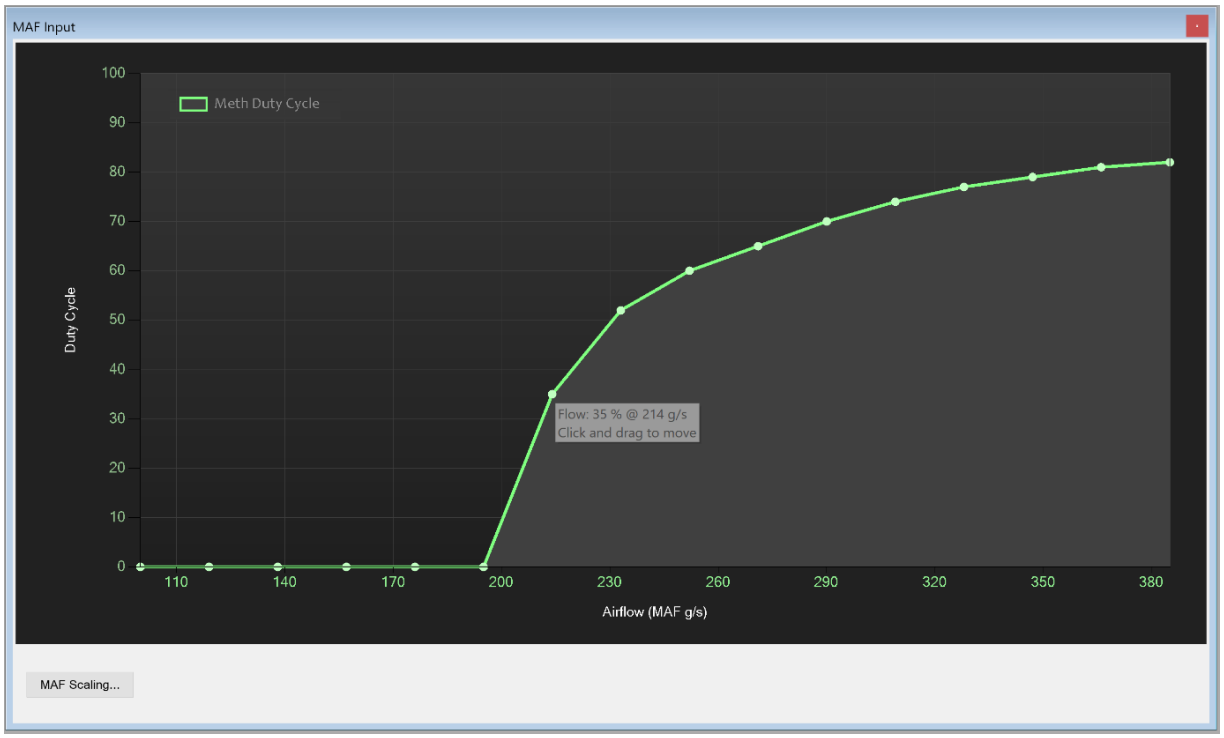
On the relay, connect Terminal **30** to wire **A.**

It is important to enable **Activate Output Only During Spray** on the failsafe options page. Otherwise, the ECU will throw a constant check engine light (CEL) on the dashboard during failsafe engagement.

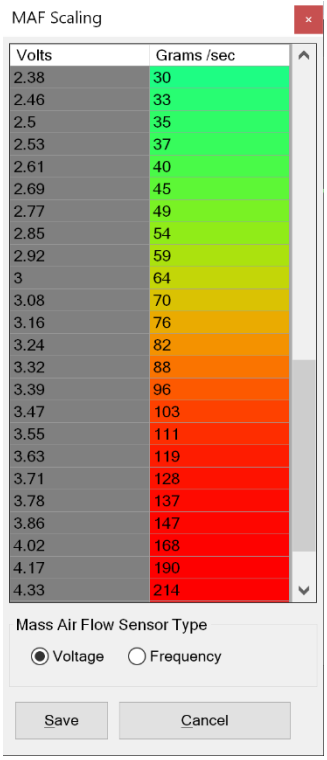
Please note that this relay isn't supplied in the kit. The relay in the kit is for pump control. Any standard automotive relay will work.

MAF - Mass Airflow Sensor

A lot of cars are equipped with Air flow sensors that measures the approximate amount of air entering the engine. Frostbyte can use this sensor to determine how much fluid to flow. This graph allows you to configure fluid flow vs airflow. In the photo below, the user is hovering over a point that indicates 35% flow @ 214 grams of air per second.



MAF Scaling



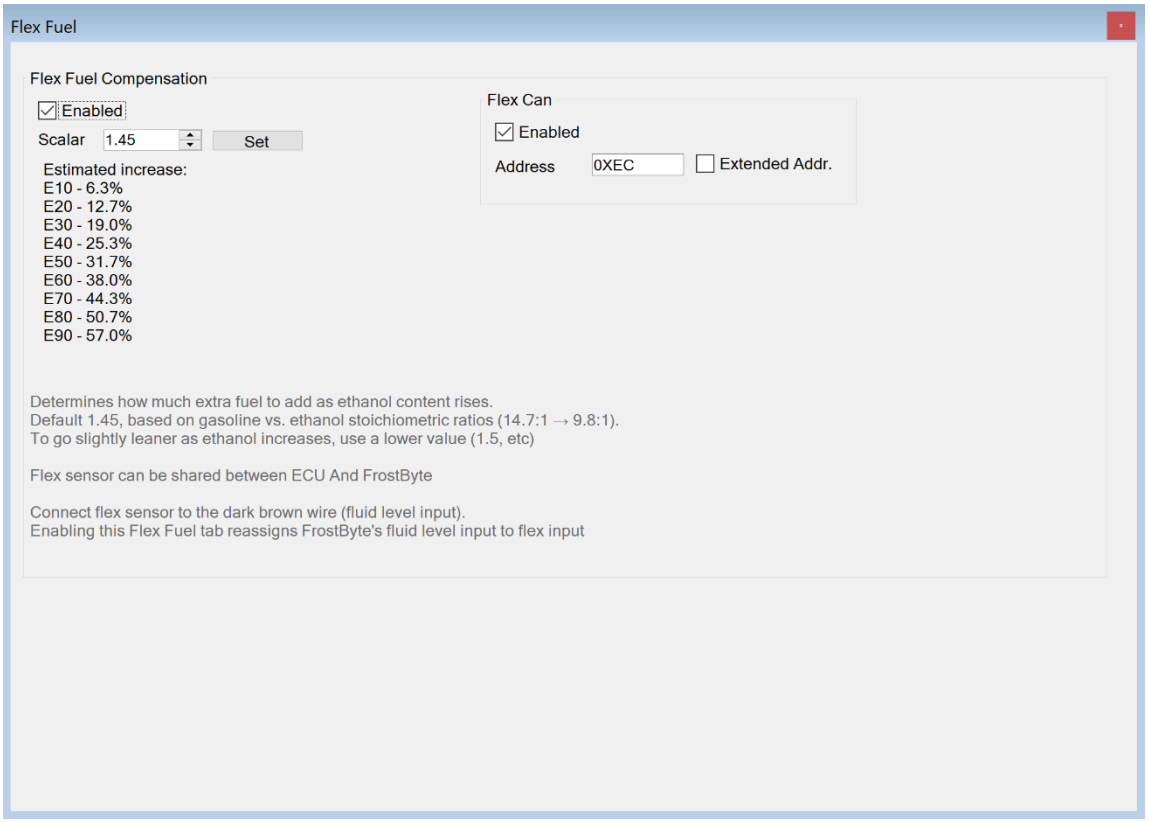
We allow the user to input their own MAF scaling. This may be done by copying the table from their ECU into excel sheet. Or simply making a table in excel and copy/paste into the table here.

Two types of sensors are supported: voltage and frequency based.

Flex Fuel Option

When used as an auxiliary fuel controller, FrostByte can be connected to a **flex fuel sensor** to continuously monitor the ethanol concentration in the fuel. As the ethanol content increases, FrostByte automatically compensates by increasing the additional fuel flow required to maintain the correct air-fuel ratio.

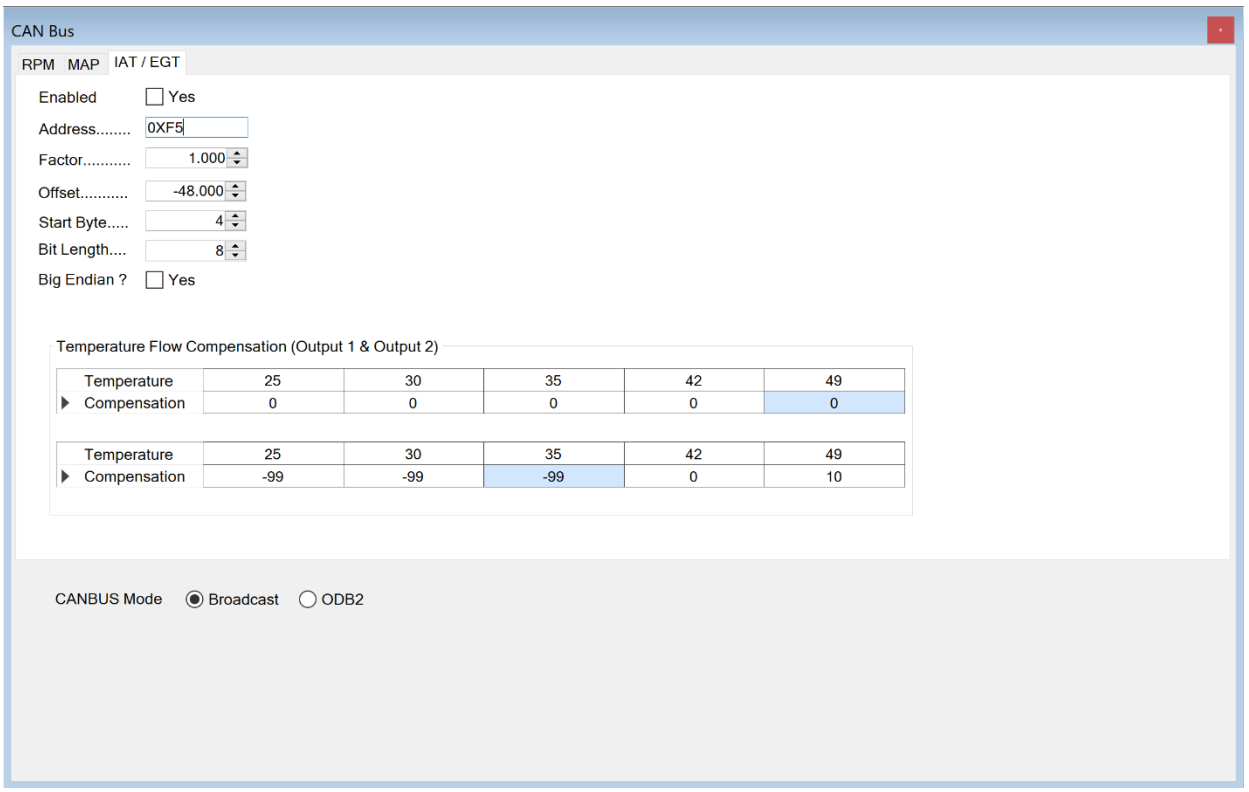
The amount of compensation is controlled by a single scalar value, with the default setting of 1.45 based on the stoichiometric difference between gasoline (14.7:1) and ethanol (9.8:1). Lower scalar values can be used to command a slightly leaner mixture at higher ethanol concentrations. The **flex fuel sensor** can be shared with the main ECU, or connected directly to FrostByte's flex input, allowing seamless ethanol-based fuel compensation without requiring separate fuel maps.



CANBUS

Interface

FrostByte can be configured to source it's engine signals from the vehicle CANBUS stream. Channels supported are RPM, MAP and temperature (IAT or EGT). The temperature input is determined by the CAN address you choose to monitor. Whether that is IAT, coolant, EGT or any other temperature stream.



- **Enabled** – Enable this CANBUS data channel
- **Address** – The address of the channel (vehicle dependent).
- **Factor** – The incoming CANBUS value will be multiplied by this factor.
- **Offset** – In broadcast mode this offset is added to the incoming value.
- **Bit Length** – In broadcast mode this is used to determine length of the data frame.
- **Big Endian –** Endianness of the data. Leave this unchecked if unsure.

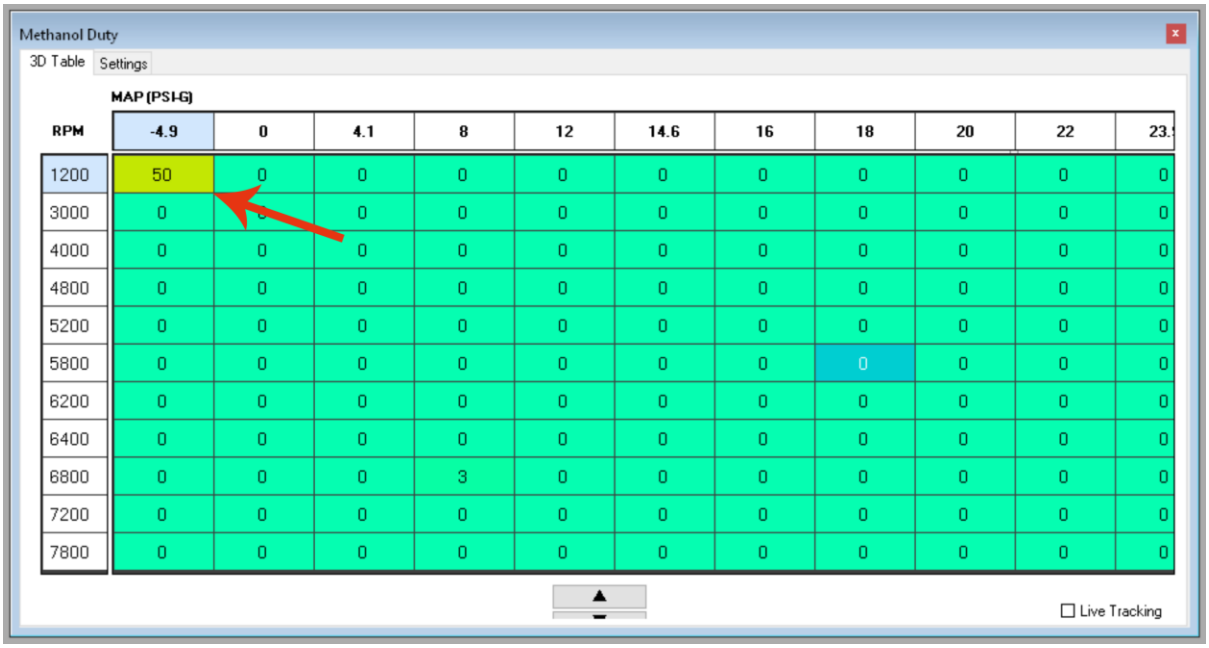
Temperature compensation

Frostbyte can compensate flow from intake air temp readings. In the photo above the first output remains consistent across temperate ranges while the secondary output is effectively disabled until after 35 to 42 degrees.

Testing

Testing Pump output

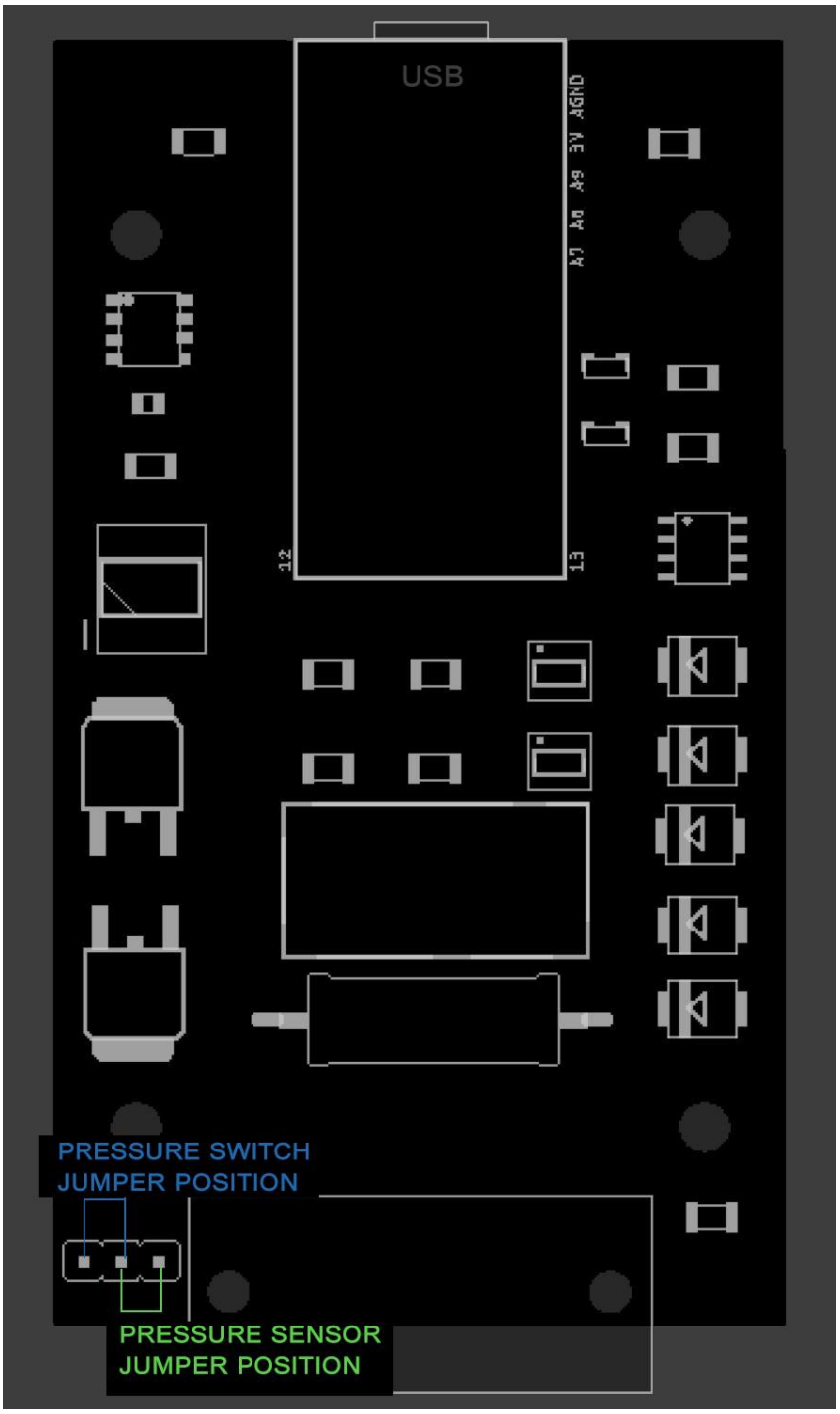
The pump will be triggered in two ways. Once the RPM or boost threshold is passed, or if the active Methanol Duty cell contains a positive value. IF the car is idling or even just ignition on, the pump will be triggered if a positive value is placed in this cell as shown below:



Testing Solenoid

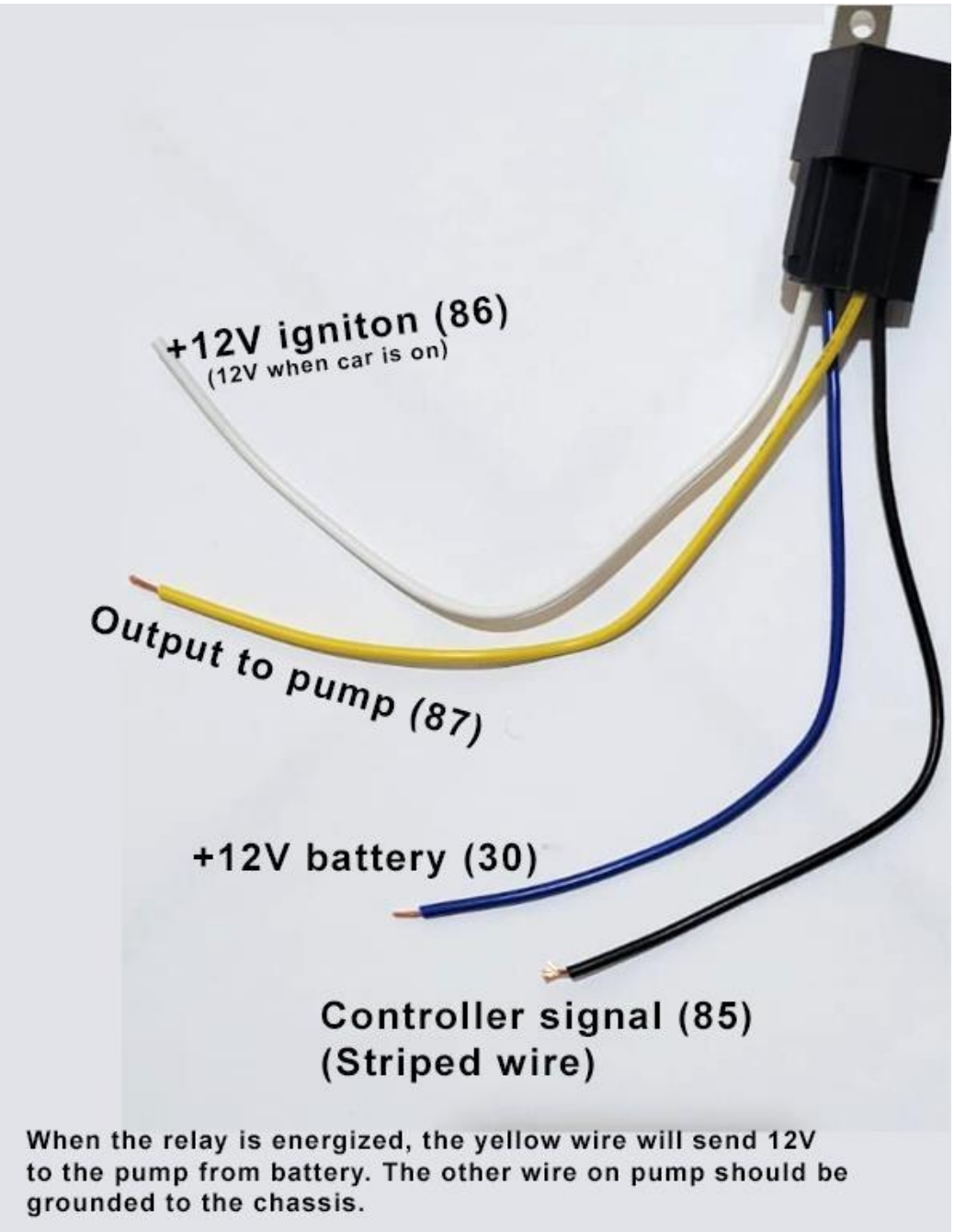
Likewise, the solenoid will start pulsing once a positive value is entered here, or if the active cell has a positive value. Please note, due to the mechanical limitation of the solenoid some solenoids won't begin to pulse until after 20% is entered in the cell. Also, the higher the set solenoid frequency the higher this threshold will be.

Appendix



Appendix 1 - Low Pressure Jumper

Pump Relay connection



- Note: the "+12V battery (30)" wire is expected to be connected directly to battery
- The +12V ignition (86) wire should go to the key on 12V source, meaning only when car is on should this wire be getting 12V.
- Output to pump goes directly to pump positive wire
- The pump's black wire (not in the picture) should be grounded to chassis.

Appendix 2 – Pump output