



Failsafe - FSR1

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Introduction

Alcohol/Methanol/Water Injection systems are design to provide cooling or additional fuelling, especially in turbo charged or super charged vehicles.

A failsafe monitor's line pressure and calculates faults based on certain criteria. This is especially important with vehicles that have been re-mapped, and the methanol injection system is used as additional fuelling, as running lean is extremely problematic and can cause catastrophic engine failure.

If using the injection system just for cooling it is not as important as the standard vehicles ECU already takes into consideration the normal intake temperature range however a fault in an injection system with a "runaway" pump, and depending on valve/solenoid control setup, may cause the system to continuously inject fluid and that could cause the engine to hydro lock.

Note: This is why it's important to regularly inspect and check an injection system.

Technical Summary

The DevilsOwn™ FSR1 was designed and built to pack in as much usability and quality in a package as possible but keep it affordable.

We listened to feedback from users, tuners, and distributors to find a failsafe that would work for as many systems as possible.

- Intelligent Processor Control.
- Wide Ranging Input Voltage 10v to 30v.
- Negative Edge Triggered.
- Short Circuit Protection.
- Inbuilt Power Filter.
- Stable 5v output (future development).
- Pressure Switch
- Detects: -
 - Running Out of Fluid.
 - Popped Off Pipe.
 - Significant Leaks.
 - Block/Failed Check valve, Solenoid, Pusle Solenoid or Race Valve.
 - Kinked Line.
 - Pump Issue - Not working or Runaway.
 - Blocked Filter.
 - Blocked Nozzle.
- Internal Relay
 - Common, Normal Open and Normally Closed Connections.

The Failsafe is designed to protect the vehicles engine when the system has been mapped with the methanol/alcohol injection considered. The minimum Nozzle Size is 2 (180cc @ 200psi). This is because generally the smallest nozzle size before systems is mapped with methanol/alcohol.

Note: Smaller sizes can be considered if multiple smaller nozzles are used, especially with direct port injection.

Installation Guide

The DevilsOwn™ Failsafe FSR1 is a standalone failsafe system. It is designed to work alongside any methanol injection system and provide a point of failure when a fault condition arises.

It monitors the methanol injection system activation with the aid of a pressure switch calculates faults based on the two signals. The pressure switch is placed between the valve and the nozzle. The valve can be a check valve, solenoid, pulse solenoid or race valve.

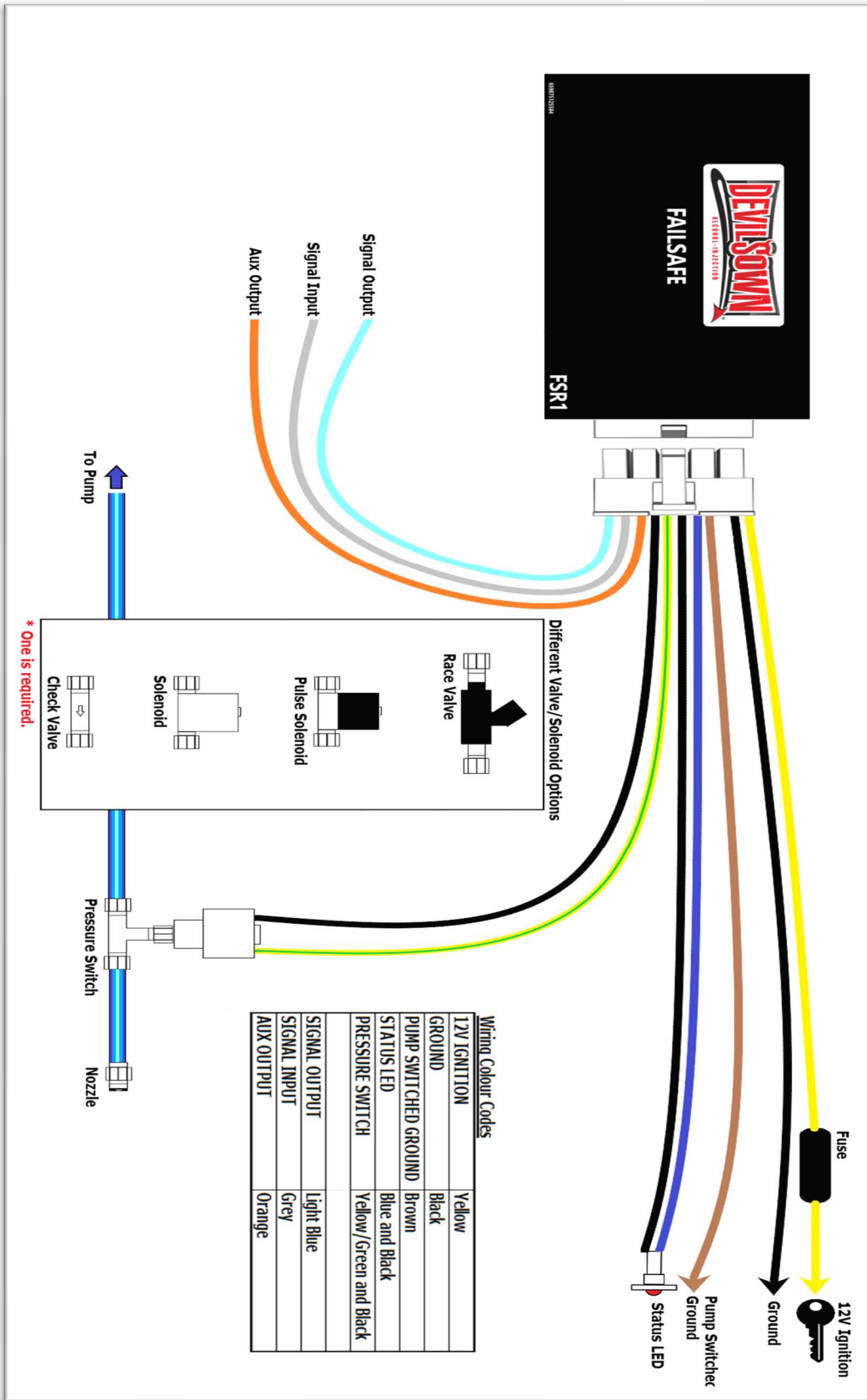
Wiring Guide

The wiring is very simple and each section within this manual describes in detail how to connect and best practices. The table below lists the technical wiring for more advanced setup and configurations and as well as the common setup.

The installation diagram follows the common setup.

TECHNICAL	COMMON	COLOUR
12V IGNITION	12V IGNITION	Yellow
GROUND	GROUND	Black
ACTIVATE	PUMP SWITCHED GROUND	Brown
STATUS LED	STATUS LED	Blue and Black
PRESSURE SWITCH	PRESSURE SWITCH	Yellow/Green and Black
Relay		
FRS NORMALLY CLOSED	SIGNAL OUTPUT	Light Blue
FRS COMMON	SIGNAL INPUT	Grey
FRS NORMALLY OPEN	AUX OUTPUT	Orange

Installation Diagram



Power

The system can be connected to an ignition feed through an optional inline fuse; if the ignition feed is already fused then the inline fuse is not required. It has reverse polarity protection. The system has a very low power usage, typically only 0.4A. The inline fuse is there to protect the car power system if there is a major fault with the system. When running cable please route the cable so it will not get pinched or cut. This damage could cause the system to short and blow the fuse.

The system has a green power LED located at opposite end of the main connect. It is easily visible through a hole.

NOTE: Please check that the system has power on a regular basis as if power fails then the Failsafe will become redundant and will NOT protect the engine.

Methanol Activation Signal

The activation signal is negative edge triggered. This is because the majority of methanol/alcohol injection system use a switched ground to control the pump. Using this signal the failsafe can monitor the system when it activates and deactivates.

Pressure Switch

The pressure switch needs to be fitted in-between the nozzle and the control valve. The control valve can be one of the following: -

- Check valve.
- Solenoid.
- Pulse Solenoid.
- Race Valve.

The system requires a valve to only monitor a small piece of pipework and keep the system accurate. Not having a valve would increase time for low pressure monitoring and increase time for blocked nozzle detection. This would produce many false negatives and make the system unusable.

LED

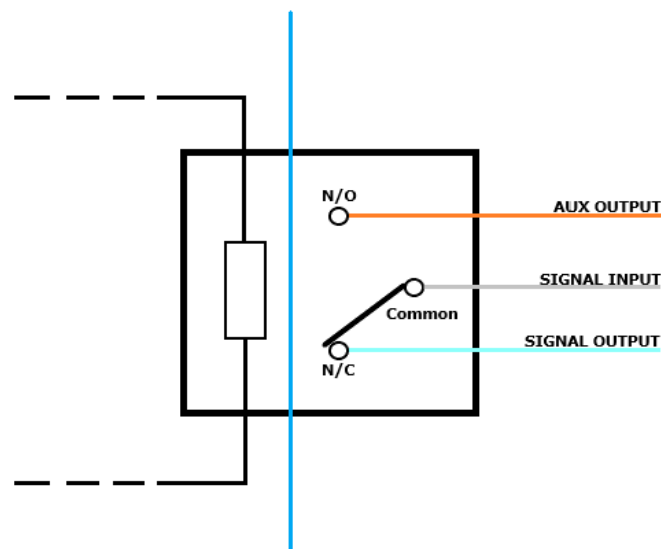
The billet LED can be placed anywhere within the vehicle where it can be seen quickly and easily to ascertain the type of failure that has occurred. Whilst the LED is active the Failsafe is in Fault mode and the following LED status indicates the fault that has occurred: -

Solid Light – Low Pressure Level.

Flashing Light – Blocked Nozzle.

Failsafe Relay Contacts

The system contains an internal relay that separates the failsafe hardware from the car/lorry electrical system and as such can be used in a variety of different ways. For ease and to accommodate the most common failsafe configuration the internal relay is wired as follows: -



For the system to act as a failsafe the vehicle needs to be inhibited by some method to protect the engine.

Note: When interrupting any solenoid or sensor is best practice to use the ground rather than the power supply or signal to not introduce interference into the system due to extending the cable lengths.

Example 1: Boost Cut

The easiest and most common way is to interrupt the signal to the boost solenoid/mac valve. Once this signal has interrupted the vehicle will only be able to generate boost up to the preset wastegate spring pressure, this should be well below the max boost level and easily be noted by the user.

Example 2: Sensor

Some modern cars do not have a Boost Solenoid/MAC valve to control boost so another method must be found.

Any sensor that can inhibit the cars operation can be used. This may put the car into limp mode or throw an engine warning light and should be cleared after a system reset and the vehicles power has been cycled.

The three most common sensors to use, but are not limited to, are: -

- MAP
- TPS
- AFM

Operation

Initial startup

After the first power on when methanol system is not active and pressure switch is high then a blocked nozzle has been detected. It is rare this will ever happen if a methanol system has not been active for some time as even a blocked nozzle will allow the pressure to decrease eventually.

First Activation

When the methanol system activates and after a preset time for the pressure to build and the pressure switch is switched on. If the Pressure switch fails to become on, then the system fails with low pressure.

Continued Activation

The system continues to monitor the pressure switch and if it even switches off then the system fails with low pressure.

Deactivation

When the system deactivates it waits a predefined time to check the pressure switch. If it fails to switch off, then the system fails with a blocked nozzle fault.

Low Tank Fluid

When the system has failed due to low tank fluid the pipework will now be filled with air. Air in the system causes incorrect failures both low failure and even blocked nozzles. To clear this air the system would have to be primed. If not, then the system will continue to fail until all the air has been expelled.

An example on how to prime the system: -

NOTE: you can remove the failsafe ignition fuse to stop the system from activating, but this is not recommended if your car is mapped for methanol injection.

- Remove a hose as close to the nozzle as possible.
- Place the end into a container to collect the fluid that will eventually come through.
- Activate the pump manually.
 - Some controllers have a test function.
 - If you have a boost switch you can push the microswitch.
 - Connect power to the pump.
- Note: The sound the pump makes will change when air is replaced with liquid.
- When Fluid starts to come through the reconnect the hose.
- Refit failsafe fuse if removed.
- Make sure the Failsafe has power via Power LED.
- Test the system.

Note: It may take a few cycles to remove all the air from the system and false negatives may happen.

Troubleshooting

Failsafe returns faults although methanol injection system is switched off.

On/Off Switches that contain LED's can cause issues where they allow the activation signal to route through the switch LED diode.

Remove the ground from the switch.

Unable to run methanol system as failsafe always activates.

This can result from several issues.

Using a nozzle below size 2. Increase Nozzle size.

System not yet primed and thus air in the system. Remove hose from nozzle holder and force pump to run until fluid comes out of pipe. Reattached hose.

The system always fails once with low pressure when the methanol injection system first switches on.

This can be caused by pump pre-pressurisation. The installed controller primes the fluid up to, but not past the valve where the failsafe pressure switch is located, to not inject fluid when not required.

This is normal operation and will stop this will only occur once.

After the methanol injection system has run out of fluid the system will no longer run and the failsafe keeps generating low pressure faults.

This is simply caused by air and a lack of fluid in the system. The failsafe keeps going into fault mode due to no fluid and the system can't fill the fluid as the failsafe keeps going into fault.

The system will have to be primed via the controller's instructions or the failsafe can be unplugged for a few gentle pulls to allow the system to refill all the pipe work.

Note: The gentle pulls will start by spraying no fluid and increase to normal function once primed.