Single stage water injection system + DDS3

HFS-1

Instruction manual v10w

GETTING TO KNOW THE AQUAMIST HFS-1

The HFS-1 is designed with one aim in mind - deliver fluid to your engine with reliability and safety.

Utilising the most powerful motor Shurflo offered on their 8000 series diaphragm pump range. The 150W motor will deliver beyond two litres of fluid per minute at 125psi with ease. Bypass switch is replaced by three 125psi internal by-pass valves, allowing the pump to operate at a smooth system pressure without pressure spikes. Most similar systems offered has pressure spikes as much as 20psi!

Since the system is designed for high flow, high power applications, continuity of flow is vital to the health of your engine. We have integrated the well proven DDS3(v10) dash display system to monitor the flow full time. In the event of a flow discrepancy, the system will lower your boost or switches map (if available).

Single point injection system has been proven to give a more consistent result than the progressive pump speed system due to it well defined rate and is not plagued by response speed and operational range. The HFS-1 can be upgraded to a PWM-valve system very easily in the future.

Contents:

Checking the contents of the box carefully

This is a "must do" immediately after unpacking ....

Water pump

Unpack the corrugated sheet carefully. The pump should be labelled with the original custom Aquamist label.

The white box

- 6M of 6mm OD nylon hose (806-261)
- 2M of 4mm OD nylon hose (806-266)
- 15A Fused water pump harness with 40A relay
- Inline valve (806-234) with 6/4 mm hose connector and mounting bracket)
- 0.8 mm water jet (806-323) in plastic bag
- 0.9 mm water jet (806-324) in plastic bag
- 1.0 mm water jet (806-325) in plastic bag
- 1x 4mm Y-piece (806-362) in plastic bag
- 2x M8 x 1/8 NPT jet adaptor with plug (806-357N)
- 1x water tank adapter 1/8 BSP (806-270) + 6mm qck-fit elbow (806-376)
- 100 micron inline water filter (806-257)
- 4x M5x 40mm, nuts, washers and fasteners for pump
- 1x M6 grounding stud with washed and nuts and 6mm eyelet for pump ground
- 2x 3/8 BSP-M to 6mm 1/8BSP-M elbow.

DDS3v10 fluid monitoring system box

- Assortment of 22 AWG coloured hook-up wires
- 1x DDS3 Dash Gauge with 1.5 M x 8-way cable
- 1x Version 10 Junction box
- 1x water level switch with connector (806-280c)
- 1x Digital flow sensor (806-428)
- HFS-1 instruction booklet
- 3A inline fuse link

Note: Please contact your supplier immediately should you discover any missing parts.

Getting started on installation

Before installations guidelines

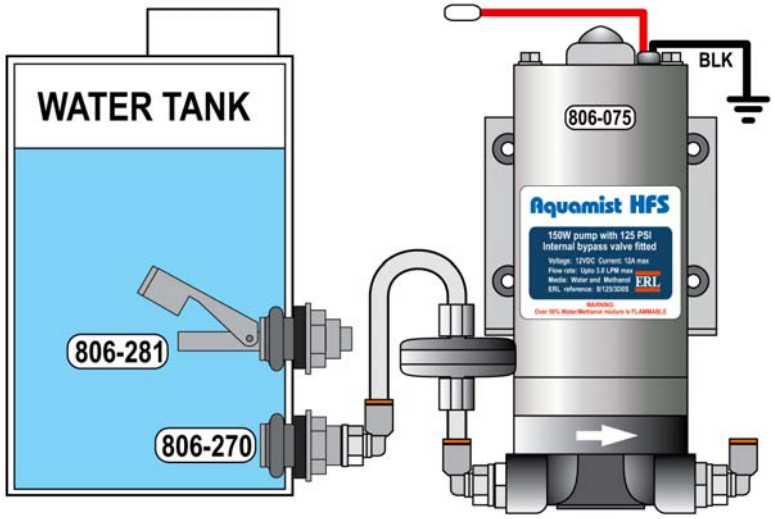
- The pump and water tank is designed to be fitted in the trunk. Install the water pump and inline filter below the water tank.
- Ensure all fittings are tighten and leak proof before filling up with water/methanol, test it with water first. If high concentration of methanol is used, please vent the tank's breather hole externally. Methanol is poisonous at high concentrations.

Assembling the pump in steps

- Gently assemble the two 3/8 BSP adapters into the pump without crossing the threads. The female one going into the inlet of the pump. Flow direction is moulded onto the plastic pump head. Ensure o-ring is properly seated inside the pump.
- Assemble the accumulator supporting bracket with the metal band supplied.
- Assemble the rest of the 1/8 BSP elbow fittings and blanking plugs. Ensure all o-ring type fittings are not overly tightened.
- Mark (dyes smeared on the bottom of the pump's rubber feet) and drill four holes for the pump.

Water tank components

- Ensure the outlet is facing the rear or the side of the tank. Drill/bore a burr-free 7/8"hole. Clear up all the burred edges and wash the tank thoroughly. No debris or plastic shaving should remained in the delivery system. 1-2 inch from the bottom of the tank is ideal.
- Same size hole for the water level sensor. Do not place the level sensor near the washer pump, it will not operate properly. The float should swing upwards. Tank venting hole must be re-directly externally if high alcohol concentration is used.
- A tall and slim water tank is ideal for this type of application. Minimise delivery surge problems at low water level.



System component installation

Reference to wiring diagram
(page 13,14)

Trunk area component :
Water pump
Water tank (not supplied),
Inline filter (806-257)
Water level sensor (806-281)
40A relay (806-276)

Main harness assembly consists of a pre-terminated red power cable (#12AWG) and a black 4-core cable (to DDS3 junction box). Put the relay somewhere between the tank and water pump. Plug in the main harness to the relay. Run the harness inside the passenger compartment leaving the 4-core wire in the dash area. The #12 gauge cable continues its journey to the battery in the engine bay through a suitable opening.

-6mm nylon hose: It may a good idea if the 6mm fluid delivery hose be routed at the same time as the main harness.
It should go directly to the engine bay without any splicing.
The reminder of the 6mm hose will be used to link the tank and pump.

Dash area components
DDS3 gauge
Junction box

DDS3 gauge to be installed somewhere in view with the driver. Route the 8-core cable towards the location of the junction box.

The junction box is the heart of the system and should be located in a position easily accessible and plenty of cable length left so the box and be pull out for future inspection. You should have the following cables run to/from various locations:

- DDS3x10 gauge: 8-core cable (from dash gauge)
- Main harness's 4-core cable (from trunk) please label it.
- Flow sensor: 4-core cable (from Engine bay) please label it.
- Solenoid valve: 2-core cable (to Engine bay)
- Fuel injector+: Single 18AWG red cable (to ECU/E.bay area)*
- Fuel injector-: Single 20AWG green cable (to ECU/E.bay area)*
- System ground: Single 18AWG cable to chassis ground
- Pin 17: Single 22AWG cable (to ECU/E.bay area)*
- Pin 8 - 22AWG black cable (to ECU/E.bay area)*
- Pin 9 - 22AWG grey cable (to ECU/E.bay area)*
- Pin 10 - 22AWG grey cable (to ECU/E.bay area)*

* Note: "to ECU/E.bay area" will depending on where the ECU is located. If possible, Connecting the cable closer to the ECU to obtain better signal rather splicing them in the engine bay.

Engine bay components

Inline solenoid valve
(806-234)

This valve controls the flow of water and should be installed away from high heat, vibration and direct water splash areas. If possible locate the valve in close proximity of the flow sensor and water jet.
Inlet port: 6mm. Outlet port: 4mm, Do not connect the 6mm hose to the valve just yet until water line is primed.

Water flow sensor
(806-428)

This component should also be placed away from heat, vibration and strong magnetic field areas such as the ignition coil, wiper motor etc.

Water jet adaptor
(806-357)

Great care must be exercised when installing the Jet adaptor. The wall between the external and internal thread is very thin so after drilled (8.8mm) and tapper the 1/8NPT thread onto the inlet tract

Drill and tap two 1/8NPT (8.8mm drill) holes about 6“ apart and loctite the adaptor in position. ONLY figure tightening the adaptor in position or it will snap through over -tightening.

Once the above is completed, the installation is pretty much done and just strip and terminating the wires into the junction box and splicing a few wires to the appropriate components.

Water jet location

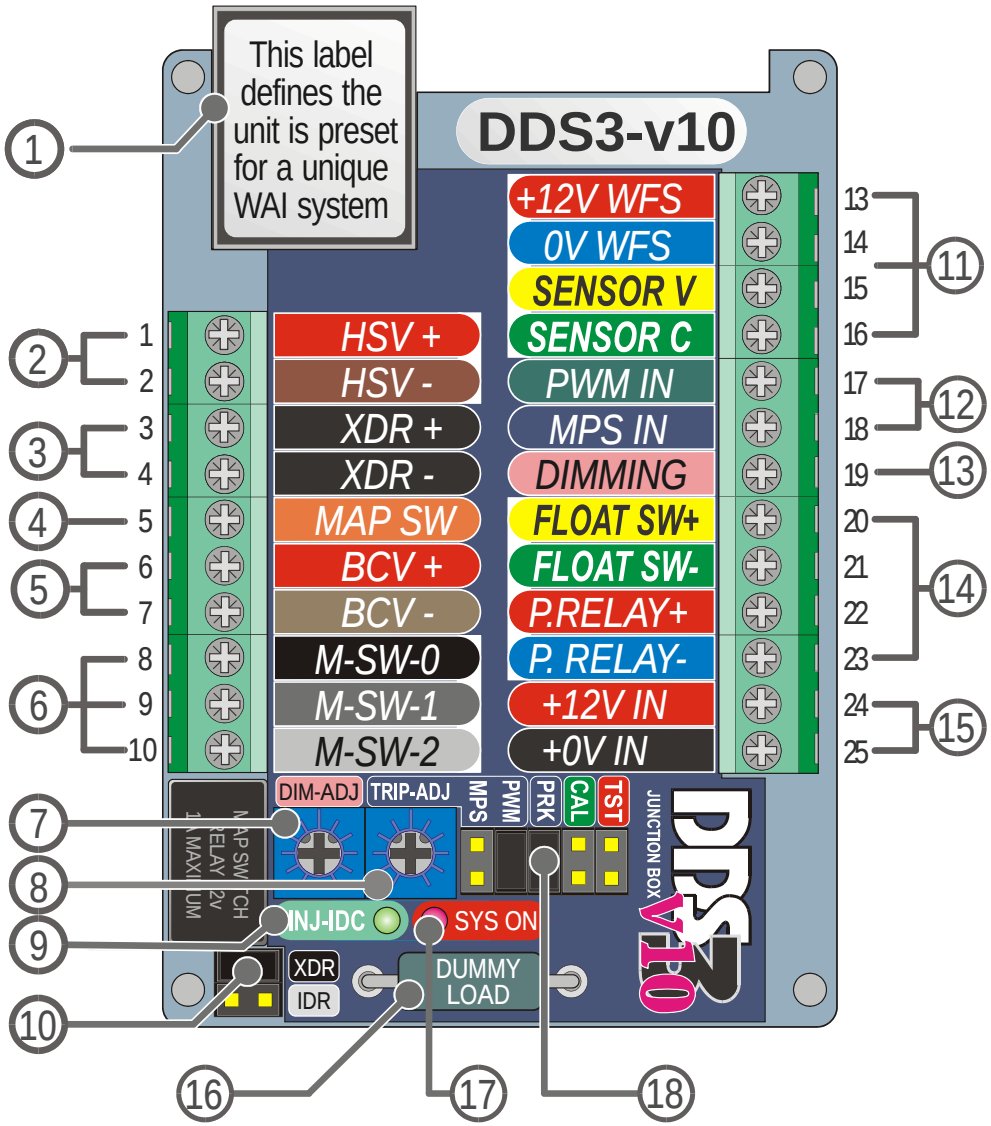
The HFS-1 comes with three jets, Y-piece and two 1/8NPT to M8 nickel plated brass adaptors. Select a suitable location preferably not too far from the exit of the intercooler.
This is to allow more time for mixing and evaporation, thus promoting better inlet-tract cooling even in-cylinder distribution.

Water jet size selection
(W50/M50)

For mild application with no tuning, water to fuel ratio should be limited to 10-15%. This will normally allow an increase of 3-4psi boost from stock, power increase yields between 5-10%. Higher % methanol wil allow higher boost, should be expecting 10-15% power increase from stock. This require some mild tune on ignition and fuel.

Running between 15-25%+ will require a more aggressive tune but will allow great power increase.

DDS3v10 pinout function directory



1, RJ-45 socket for dash gauge (p.9)
2. Inline flow control valve (p.9)
3. External Anti-CEL dummy load resistor (p.9)
4. MAP switching signal output (p.9)
5. Boost Control valve output (p.9)
6. Voltage free relay outputs (p.9)
7. Led brightness for night driving (p.10)
8. System trigger point adjustment (p.10)
9. LED (green) to monitor IDC (p.10)
10. Selecting external dummy resistor (p.10)
11. 4-core cable to turbine flow sensor (p.11)
12. System trigger signal input (p.11)
13. +12V input to enable led dimming (p.11)
14. Tank level/pump control output (p.11)
15. Main power input (fused), IGN.SW#2 (p.11)
16. Internal Anti-CEL dummy resistor (p.11)
17. LED (red) to show system activation (p.12)
18. User selectable system configuration (p.12)

1. RJ-45 socket for dash gauge:
The DDS3v10 uses a RJ45 connector to link up with the Dash gauge,

2. Inline flow control valve:
This output can be used to switch an inline solenoid valve to control flow. Output current is limited to 1 Amp. It is activated by the signal applied to the PWM (pin17) or MAP (pin18) input.
User can set the triggering point by using the "Trip-adj" potentiometer near the bottom of the junction board.

3. External Anti-CEL dummy load resistor:
A more powerful anti-CEL dummy resistor can be connected to this output when excessive heat is produced by the on-board dummy resistor. This option only applies if pin 9-10 is used for cutting the PWM signal to a boost control solenoid valve in the event of failsafe or prolonged "gauge-off period".

4. MAP switching signal output:
Fail-safe output for map switching usage. This output is about 5V and switch to 0v upon fail-safe activation. The signal is short circuit proof with a current limit of 5mA. If an alternative or an inverted output signal is required. this output pin can be reprogrammed via a set of soldering pad on the underside of the circuit board.
Please go to page 15, section C/D for a more detailed description of how this can be done.

5. Fail-safe window output (SW GND)
When flow signal falls inside the fail-safe window, pin7 will switch to ground immediately. This output can be used to activate a solenoid valve to increase boost pressure. This output can also be used to switch MAP (GND active) on an ECU.

6. Voltage free relay outputs
There are three terminals representing a set of voltage-free "change-over" contacts from a relay if anti-CEL -dummy resistor jumper link is un-used. (p10.6). M-SW1 is the "wiper" or "common" pin.

M-SW1 and M-SW-0 contacts are opened normally until fail-safe is triggered or gauge is switched off

M-SW1 and M-SW-3 contacts are closed normally until fail-safe is triggered or gauge is switched off.

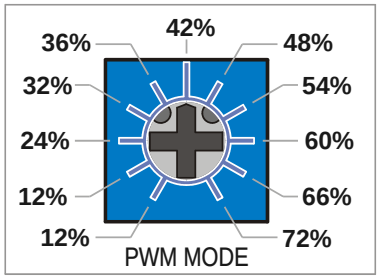
7. Led brightness for night driving (p.9)

When pin 19 is linked to the headlamp switch, this potentiometer enables user to adjust the brightness level of the gauge leds.

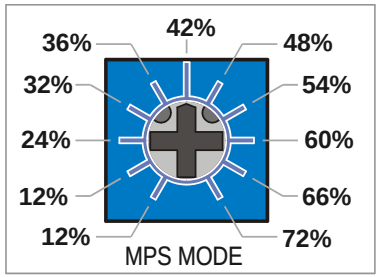
8. System trigger point adjustment (p.9)

This potentiometer sets the triggering point of the injection system.

In PWM mode, the figure on the left indicates the IDC trip point in 6% steps.
Most common onset point is 42%, (12 o'clock).



In MPS mode, the figure on the left will help to identify the trip point of a 12 to 72% Manifold Pressure Sensor. To translate the signal % to PSI, please see the table below:



Trip-adj	12	18	24	30	36	42	48	54	60	66	72	%
2-bar	-11	-9.3	-7.6	-5.8	-4.1	-2.3	-0.6	1.2	2.9	4.6	5.6	PSI
3-bar	-9.3	-6.7	-4.1	-1.5	1.7	3.8	6.4	9.0	11.6	14.2	16.8	PSI

MAP sensor conversion table: from % to PSI (shaded = vacuum)

9. LED (green) to monitor IDC

This led will active when a PWM signal is successfully detected on pin17. It should pulse in unison with the frequency and grows brighter as the duty cyle % increases. This led should not be lit before cranking. After the engine has started, it should pulse in time with engine speed,

If the DDS3 is used as a fail-safe to a third party WAI system, this led will only pulse when the PWM pump is activated under normal injection events.

10. Selecting external dummy resistor

Selecting ext/int dummy resistor. The on-board Anti-CEL resistor is rated for intermittent usage during fail-safe activation. In the event of prolong activation, it will get very warm. To avoid excessive heat build up, it is recommended to use an external dummy resistor for this purpose,

The external resistor is not supplied with the kit but it is widely available in electronics store. The resistor should be 39 ohms, 10W-25W in metal body.

NOTE: If anti-cel is not necessary, please leave it on the XDR position or remove the link completely.

DDS3 junction board pin-out descriptions cont.

11. 4-core cable to turbine flow sensor

Please ensure the stripped wires are twisted without any loose strands before insertion into the terminal block connector.

12. System trigger signal input

Choice of two system triggering signal inputs. Selectable by jumper links (13.8)

PWM IN (pin17): It reads and translates any negative going pulses such as fuel injector or PWM based pump speed controller in to a reference signal to trigger the system and fail-safe circuitry.

The system is factory set to detect negative PWM signals. Some pump speed controller uses a positive PWM switching mode, you need to re-configure the DDS3 circuit board manually, (p13.8).

MPS-IN (pin18): 0-5V input signal for triggering the system instead of PWM. This type of signal is normally associated with MAP, MAF and TPS sensors.
The trigger point of the above is set by the Trip-adj potentiometer (#8).

13. +12V input to enable led dimming

A 12V signal at this input enables the uses to set the brightness of gauge (p8.7). It is normally wired to the head lamp switch so the gauge will automatically dim during night driving.

14. Tank level/pump control output

These four connections controls the delivery pump and detects water tank fluid level. Control signals are transmitted via a ~5M of 4-core cable to the trunk area.

15. Main power input (fused), IGN.SW#2

It is important the 12V power is only active at ignition switch position #2. Ideally, it should be wired to the same +12V supply to the fuel injectors.

16. Internal Anti-CEL Dummy resistor

If the stock ECU-controlled boost valve is disconnected by the DDS3 during a fail-safe activation, a CEL (check engine light) is often illuminated.
To prevent this from happening, A dummy resistor is used to create an artificial load of a boost control valve.

During this period, the resistor will warm up. If heat is a concern, use an external resistor, see p8.3.

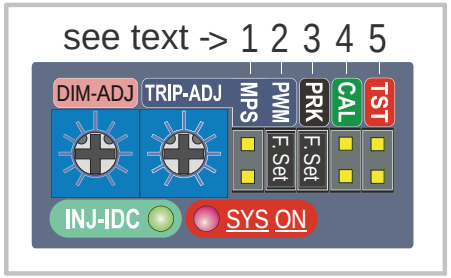
DDS3 junction board pin-out descriptions cont.

17. LED (red) to show system activation

This "SYS ON" red led actives when the PWM/MPS input signal reaches the "trip adj" setting. The system will commence injection.

18. User selectable system configuration

Figure on the right shows a set of default user selectable jumper links for setting up the triggering mode and manual system test. Read on for further details



1. MPS (Manifold Pressure Sensor) MODE link:
Selecting this link instead of the default "PWM" link changes the system's triggering mode. Now the system will be looking at the MPS signal (0-5V) at pin 18 to turn the system on.

2. PWM (Pulse Width Modulation) MODE link:
PWM MODE (Factory set). The system looks for "switch to ground" PWM signal from the pin17 to turn the fail-safe circuitry and W/A injection on. For "positive edge trigger" see "Advance setting" (Page21.F). Upon successful detection of PWM pulses, the Green led will pulse in time with the incoming PWM signal.

3. PRK (Parking unused jumper link)
This link space is for parking an un-used jumper link socket. No other usage.

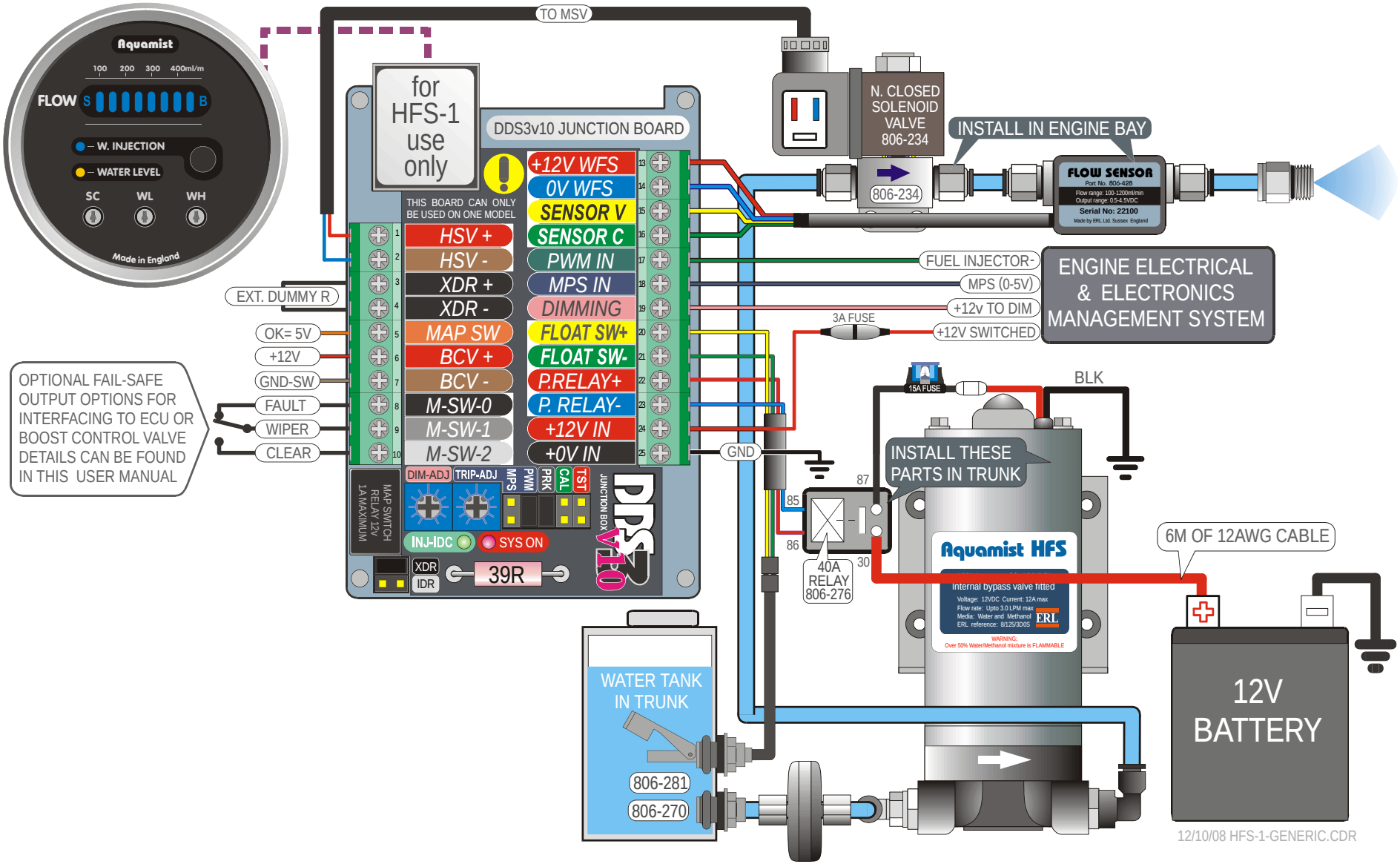
4. CAL (Calibration Simulation. Default = unlinked)
Linking this pin turns the "SC" potentiometer into a flow sensor simulator. Fully clockwise for minimum water flow. Useful to check the fail-safe window width. "B" led will activate when the simulated flow is inside the window

5. TST (Manually test. Default= unlinked)
This link is useful for testing the system without driving the car at full boost and RPM. When this link is shorted, it simulates a 100% IDC signal appearing at the PWM input terminal (pin17).

Warning!!! Linking this pin will start the pump and energise the Inline valve, resulting in 100% maximum fluid delivery to the water jet/jets.
Do not activate this link for more than 5-10 seconds at a time for risk of burning up a solenoid valve designed for pulsing purpose use only.

Remove this link as soon as the manual system test is completed.

GENERIC WIRING DIAGRAM FOR HFS-1 with DDS3v10



Generic Wiring Diagram

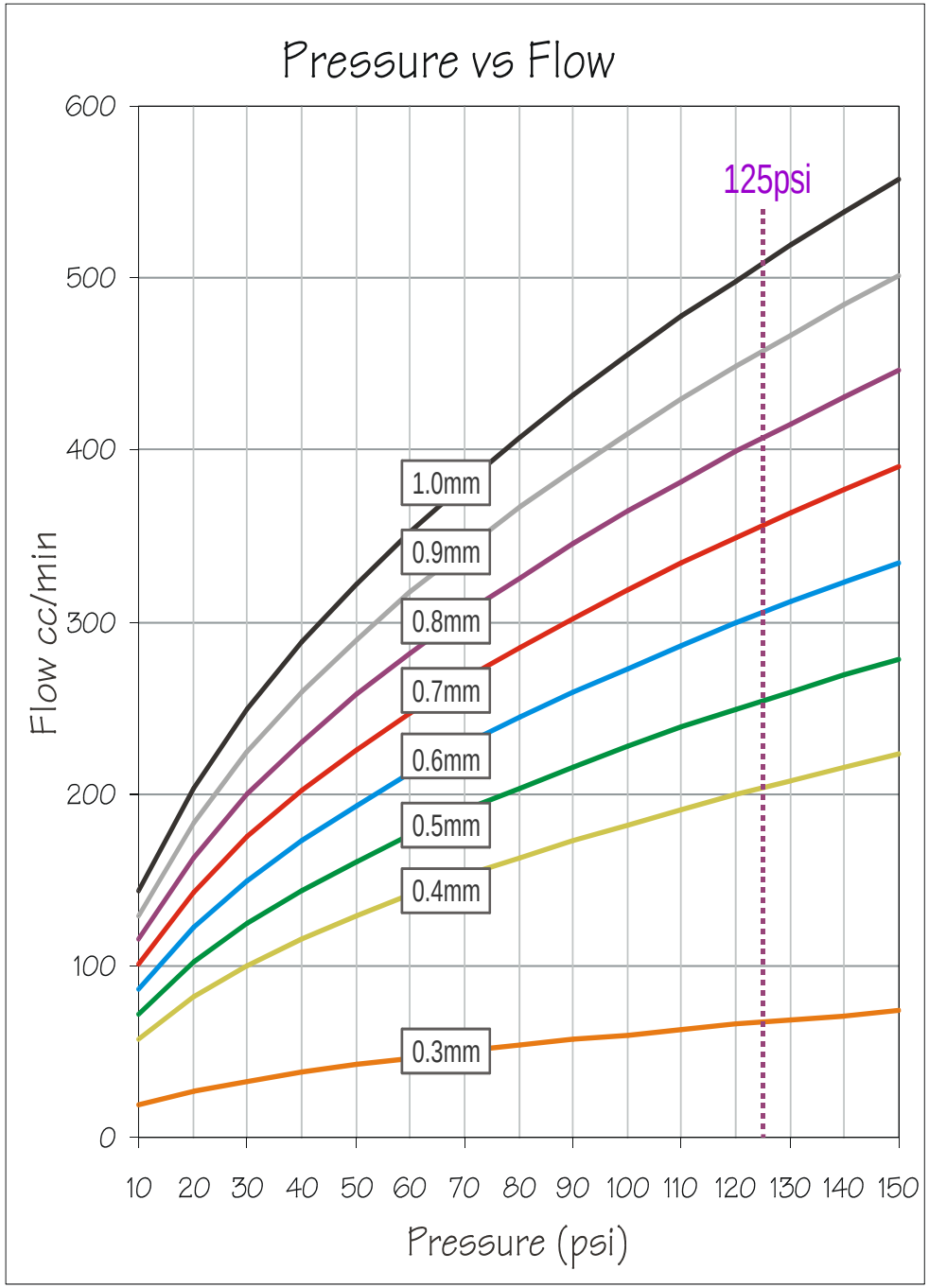
The wiring diagram in the left can be used for most installation. It does not include the "failsafe" connection. This is because it will be specific to a "third part" boost controller or third party ECU which has "MAP switch " capabilities. It is important that the +12V power supply to the DDS3 (pin 24) is taken from the fuel injector's 12V supply. This prevents the water injection from activating until the car is ready to be cranked.

All strands of the stripped wires must be twisted before inserting into the terminal block. Ensure no loose stands are present to cause short circuits between the terminals.

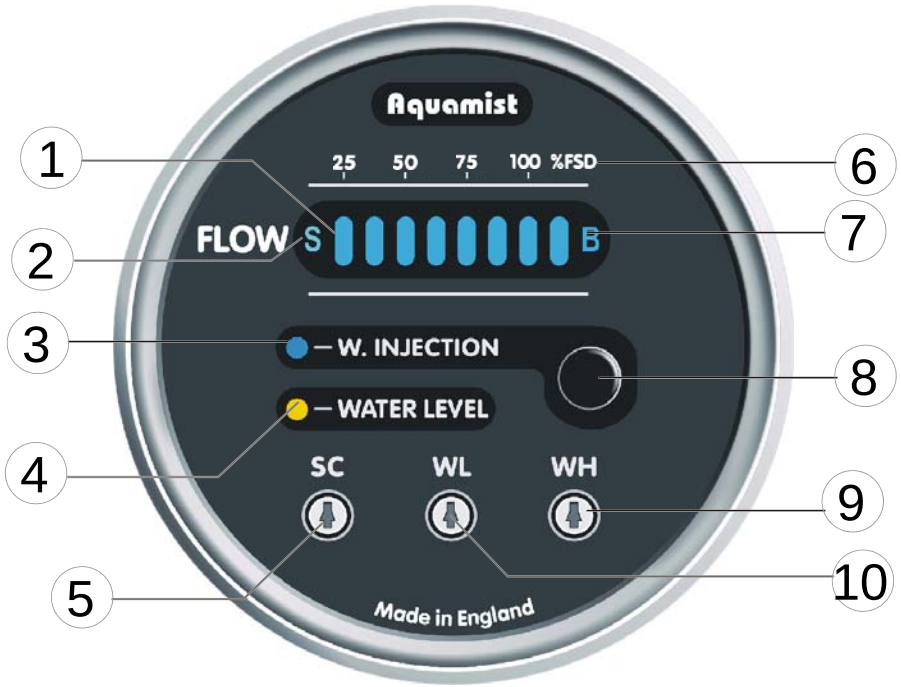
Flow chart of water jets:

Please note the flow rate of the chart on the right is rated at 1 atmospheric. In order to get more accurate flow, please subtract the maximum boost pressure from the 125psi line.
For example, 1mm jet flow 520cc/min at 125psi but only flows 470cc/min. At 105psi.

The standard kit comes with 0.8, 0.9 and 1.0mm jet. A Y-piece is provided with twin jet applications.



DDS3v10 Dash Gauge Functions



1. 8-element Bargraph Display (80-1800ml/min)
Each segment is equivalent to a percentage of the total flow of the sensor scaled by the SC potentiometer.

2. "S" indicates the presence of sensor.
The letter "S" (sensor) must be lit after power up and stay on to show the sensor is functioning correctly.

3. Water injection system ON led
This led comes on the when the system is switched on and in readiness to inject. .

4. Water Level led (yellow)
(This LED has three functions)

a. During "power on delay" period:
This LED will activate for approximate for 10 seconds during the system-on delay (v10) before the main system turns on.

b. During normal operation period:
- This LED is on during the safe-fail activation
- Water level low (intermittent flashes)

c. Led lit after the gauge is switched off:
- If the water level sensor is activated for over 20 seconds.
- Fail-safe output is activated.

5. SC (Sensor Calibration)
20-stepped potentiometer allow user to scale the flow sensor to give an ideal visual indication of a given flow rate. Ideally set the led to display 5-6 bars at full flow.

6. Backlit flow legend
Legend displays % of full scale of 8-bars

7. "B" Boost Enabled led
When the flow falls inside the fail-safe window after system trigger, this "B" led will activated. Useful indicator of the WL and WH setting.

8. Water injection enable button

Due to extra power level achieved under WI, user may want to reduce the power to the wheels in less than ideal driving conditions. Disabling the WI will reduce boost to wastegate bleed valve setting (if fitted) as well as switching to a less aggressive MAP on custom engine management.

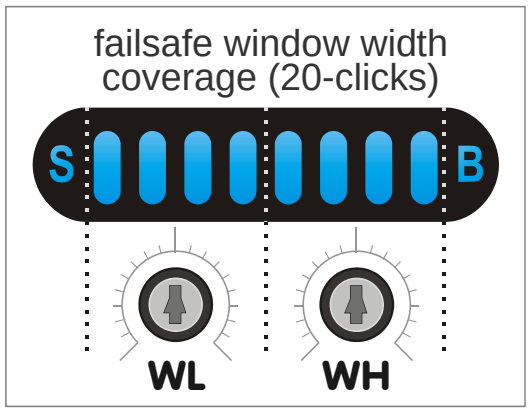
9. Over-range setting potentiometer (WH)

It is just as important to monitor over-range conditions as well as under-range flow conditions. If a leak develops close to the water jet and starves the engine of the water, the user must know this condition. A 20-stepped potentiometer allows accurate and repeatable adjustment range.

10. Under-range setting potentiometer (WL)

This setting can indicate partial blockage and trapped air inside a delivery hose. Again 20-stepped potentiometer is employed. Each click represents a fixed portion of the window width of 8-bars.

WL covers the lower 4 bars and the WH covers the upper 4 bars. Figure on the right illustrates the span of the coverage. Setting is very simple once SC is calibrated.



NOTE:
In order to make the fail-safe adjustment easier, it is recommended to set the bargraph to display 5-6 bars at maximum flow. This way, the fail-safe window can span from the centre outwards.

If the WL and WH is set at 12 O'clock, the fail-safe window is approximately spanned between 2-7bars. A good starting point.

Minor trimming for the WL is necessary if the water injection trigger point is set to commence earlier.

The v10 gauge will display the activation of the "fail-safe" with two leds:

Further useful hints:
"B" led (right of the bargraph) will active if the flow is inside the fail-safe window during injection period.

The yellow led (water level) will activate if the flow is outside the fail-safe window during injection.

As soon as the "fail-safe " is tripped, there will be a 4 second reset period before it resets. If the fail-safe drops boost, expect 4 seconds of low boost. The same will apply for fail-safe-induced map switch.

When gauge is off, expect low boost and safe map unless the board is re- configured. (page 22.B).

Wiring Check and powering the system up for the first time

The HFS-1 can be triggered by either fuel injector duty cycle (PWM mode) or a MAP sensor (MPS mode). Other load sensors with 0-5V output can also be used (eg.MAF, TPS). You must first select which operating mode before correcting a signal to pin 17 of the DDS3 junction box.

Step 1: Power supply to the DDS3 (important)

The DDS3 must only be powered up whilst the fuel injector is switched on. This is to avoid false triggering of water injection and fill the engine up with water. The +12V supply to the fuel injectors is an ideal source.

Step 2: Powering up test and System check

Remove the water jet and direct it into a container, Ensure the pump and the DDS3 remains off at key position #1. At key position #2 without the engine running, switch the DDS3 on via the dash gauge button. Two leds should illuminate - "S" (sensor OK) and "water injection". The water pump should remain off and no injection should occur. Start the engine.

Step 3a: Test the DDS3 in PWM mode

Jumper link on PWM mode and pin 17 is spliced into the fuel injector's pulsed terminal. For ease of testing purposes, the "TRIP ADJ" potentiometer is set to the minimum (fully counter-clockwise (~12%). This will allow some triggering to take place by blipping the throttle. The red led below the trip potentiometer confirms this and the DDS3 gauge should show some reading.

If there are no sign of flow at the jet but pump is running, we need to prime the system. Instead of repeating this procedure to prime the water through, it would be easier to manually trigger the spray by grounding the pin 17. (make sure the wire that goes to the injector is disconnected or you will fill one of the cylinders with fuel.

Step 3b: Testing the system in MPS mode.

Engine off. Put the jumper link on MPS link before powering the system up and pin 17 is spliced into the MAP sensor (or similar load sensor). Advance the "TRIP ADJ." potentiometer fully clockwise so that the system does not spray water until the trip point is reached.

Start the engine. Slowly rotating the potentiometer counter-clockwise until the system triggers for a short moment, Visually confirming with your eyes fixed at the nozzle or the DDS3 gauge. Proceed to set the trip point to the desire load point. Depending on the sensor used, the final setting has to be set experimentally.

Step 4: Final check-up before going for a drive

Clip the water jet on the windshield and take it for a drive. Observe the jet pattern is cone shaped during spray and no splatter due to trapped air. Reconnect the hose to the manifold jet . You have now successfully installed the system.

Step 5: setting the DDS3 to perform fail-safe:

This can be regarded as the most important part of the entire system especially your car is tuned to work with high percentage of water/methanol.

Setting up the DDS3 in five easy steps:

It should be relative straight forward if you following the procedures as set out below:

1. Manually trigger the system with the jet/jets you iintend to use. It will be better if you can do this jet spraying externally.

2. Adjust SC (sensor calibrate potentiometer) whilst spraying to register around 6 bars on the gauge.

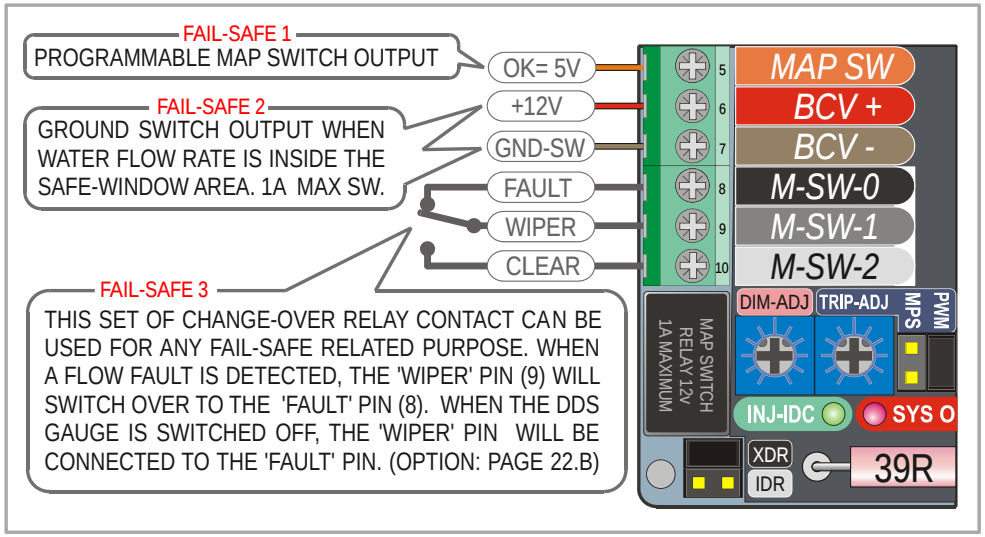
3. Temporarily set the "WL" (window low potentiometer) fully counter-clockwise and the "WH"(window high potentiometer) fully clockwise.

4. Trigger the system and turn the WL clockwise until the "B" led distinguishes. Wind back 2-3 clicks after the "B" led comes back on and leave.

5. Wind the "WH" counter-clockwise until the "B" led distinguishes. Wind back 2-3 clicks further after the "B" comes back on and leave.

You have now set the fail-safe window properly. The system is now ready to perform full-time flow monitoring tasks. You may need to fine tune the window after the jet/jets are spraying against manifold pressure as flow will be slightly lower. Perhaps a click or two clockwise (more gain) on the "SC" potentiometer will do the trick.

Figure below explains three fail-safe output options:



Fail-safe wiring for MBC

Upon detection of water flow fault, the HFS-1 can reduce the boost pressure of a MBC to wastegate setting with a 2-way Low Current Solenoid valve (not supplied) - A typical supplier is MAC valve (36A-AAA-JDBA-1BA - www.macvalves.com) or Clippard valve (ECO-3-12-L-M5- www.Cippard.com).

Figure below shows two common type of MBC (manual boost controller) used on most turbo cars.

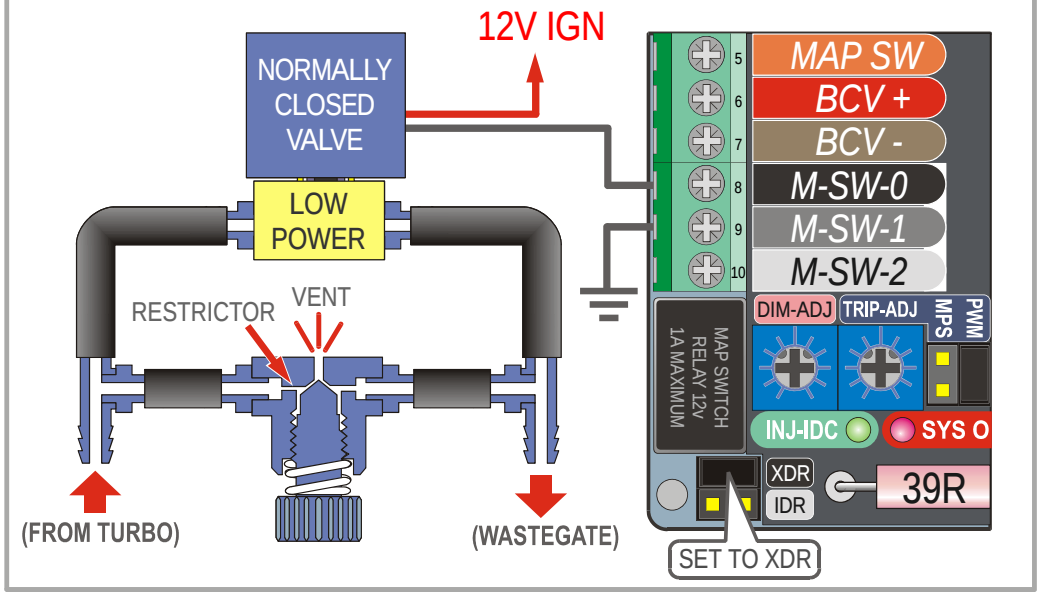
Type 1: pressure from the turbo to the wastegate is vented to the atmosphere via a restrictor and a vent. Boost increase is proportional to the amount vented.

Type 2: Boost increase is proportional to the spring pressure of the MBC.

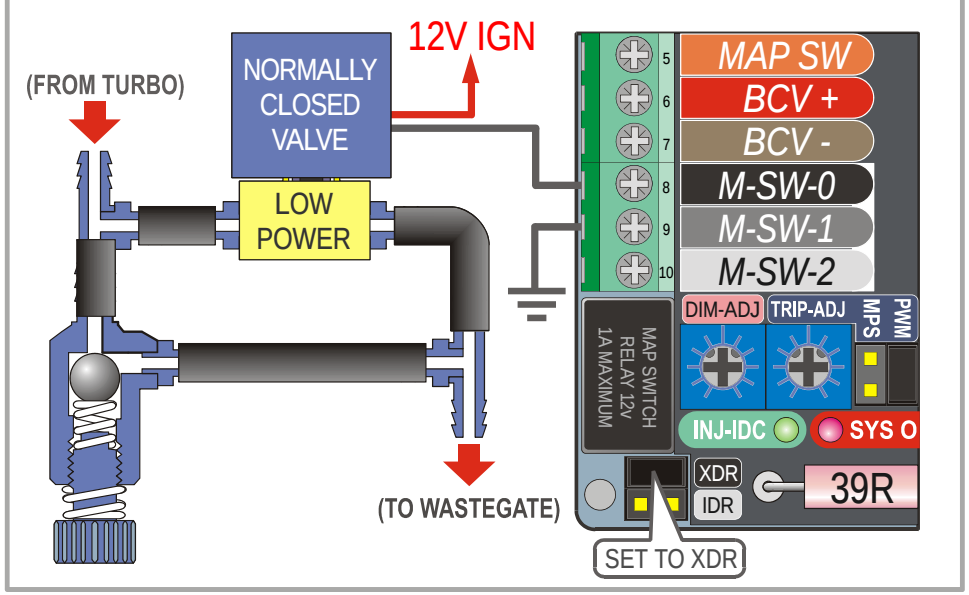
When the solenoid valve is energised, pressure from the turbo is diverted to the wastegate directly. When MBC is by-passed, the boost pressure will drop down to wastegate setting.

It is important to use a solenoid valve with a low power coil winding to avoid over heating during the by-pass mode. A typical coil power between 3- 6W is acceptable when installed in a cool place.

TYPE 1: MANUAL BLEED OFF MBC



TYPE 2: MANUAL BALL/ SPRING MBC



Failsafe wiring for OE boost control valve

Since almost all turbo car's boost pressure is controlled by the engine management. Under normal driving ideal conditions, extra boost is dialled in by the ECU by means of a solenoid valve (BCV).

This process is quite simple, by altering the duty cycle of the pulses sent to the valve, boost pressure can be increased beyond the standard wastegate setting. When the operating condition is less than ideal the ECU and lower the boost to protect the engine.

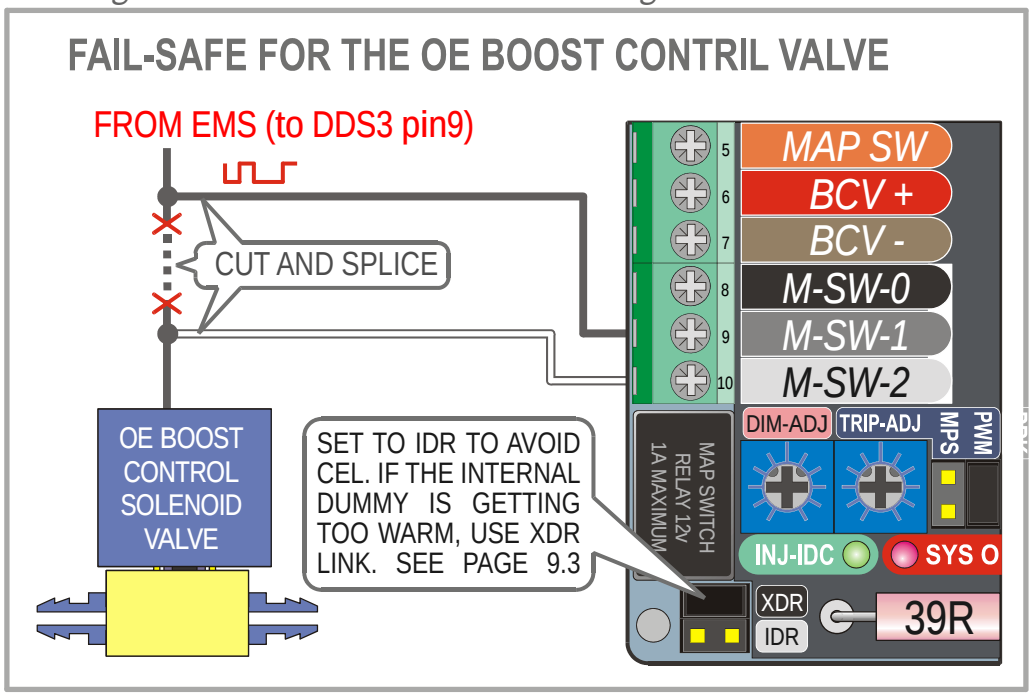
When a car is being modified beyond the factory's designed power output, this section is also being changed quite drastically, both in terms of software, hardware and mechanical parameters. The ECU's ability to control boost pressure is often limited.

The commonest way to increase power is by increase the boost pressure accompanied with fuel octane and flow increase or water/methanol injection. If anyone of the two mentioned component is being interrupted, the ECU is often unable to modified the ignition timing or fuelling to react to the onset of knock, if this condition is allow to persist, engine failure can result,

The HFS-1 will revert the boost pressure to watergate pressure should water/methanol injection is interrupted.
For extra safety, the ECU should be mapped to run without any risk at a suitable wastegate pressure. This regardless of how highly the engine is modified.

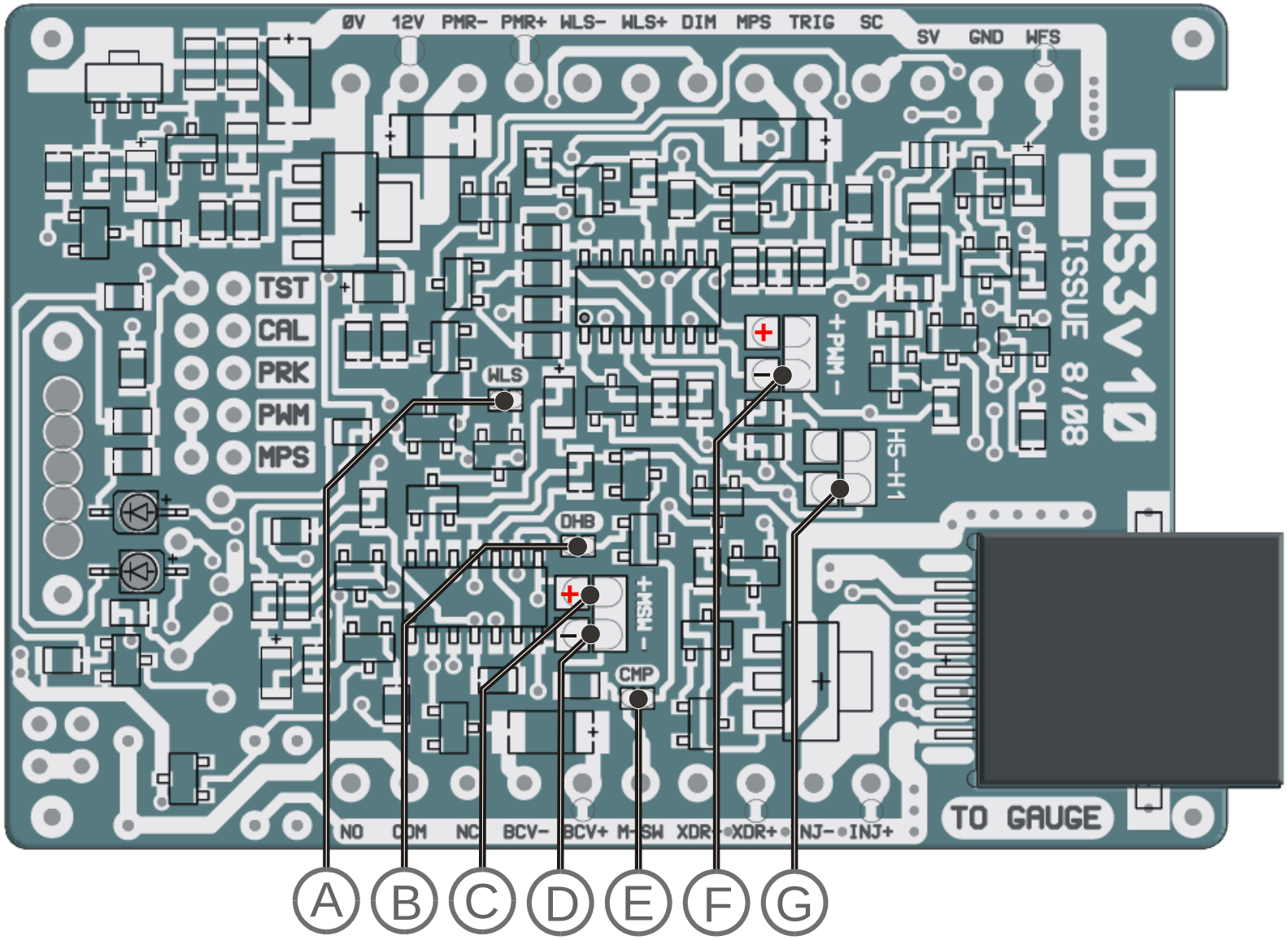
Dummy resistor prevents the onset of CEL if one would prefer not to see it whilst the HFS-1 is switched off.

Figure below shows the the wiring for the OE failsafe



Advance system configuration (solder link)

(Links are factory preset - no need to alter the setting unless customising)



Advanced system configuration (solder link)

The DDS3v10 is pre-configured at the factory for a specific application. When in doubt, please check the round label on the lid of the box or the small label on the RJ45 socket at the top right of the junction board. (factory default: "for Universal fail-safe use")

If the user wishes to change the original setting, this is the section to explain it all. You will require a small tipped soldering iron and a small pointed tool.

As seen from the PCB figure on the left. All the user configurable links are marked with alphabetised circles.

Some pads are pre-linked from factory. If you need to change those, pick off the thin track (pointed tool) and solder link the alternative solder pads.

A: WLS - Water Level Sensor (default=linked)

Pick off the thin circuit track if you do not wish the tank level sensor to disable the system after 10-20 seconds of low level reading. (not recommended),

B: DHB - Disable High Boost (default=linked)

Pick off the thin circuit track if you want to retain high boost or "Aggressive MAP" after the system is switched off at the gauge, only if you are using pin 9/10 to reduce boost to wastegate setting after fail-safe activation,.

C/D: MSW - Map Switch polarity (default= D-linked)

The factory default output is preset to give a 0V output upon a fail-safe activation. Otherwise the output will stay at ~8V.

To invert this output to give out a ~8v signal upon a fail-safe activation, un-solder the pad D(-) and solder link pad C(+) to the long soldering pad.

E: CMP Clamping MSW signal (default=clamped)

Solder linking this pin will clamp the above MSW signal down to 4.7V, suitable for most digital devices. It is factory linked to give 4.7V.

F: PWM MODE polarity (default=negative switched)

To change the PWM detection polarity to positive, pick off the thin track and solder-link the "+" pad to the long pad. This mode is rarely used except the DDS3 is used for monitoring WAI system using a positive PWM signal to control the water pump speed. (For example, Snow and Devilsown system)

In Car Dash Gauge (8-core cable)

Pin	Colour	Size	Description	Electrical parameter
1	-	24awg	+12V power supply to gauge	250mAmax@12v
2	-	24awg	Flow Sensor output voltage	0-5 VDC @10mA
3	-	24awg	0V power supply to gauge	250mAmax@12v
4	-	24awg	Internal communication signal	-
5	-	24awg	Float Sensor from water tank	Ground active
6	-	24awg	Flow Sensor calibration output voltage	5-0 VDC @1mA
7	-	24awg	Night driving dimming connection	+12V active
8	-	24awg	Wastegate bleed valve option (SW-)	1A

@12V max.

Flow Sensor (4-core cable)

Pin	Colour	Size	Description	Electrical parameter
1	Red	24awg	+12V power supply of Flow Sensor	30mA @ 12v
2	Blue	24awg	0V power supply of Flow Sensor	0V Ground
3	Yellow	24awg	Flow Sensor output voltage	0-5VDC@10mA
4	Green	24awg	Flow Sensor calibration input voltage	5-0VDC@1mA

DDS3 Junction Box (25-ways - Pin 1= top left corner. Pin 25 bottom right corner)

Pin	Colour	Size	Description	Electrical parameter
RJ45	------	8-core	Same as Dash Gauge Above	------
1	Red	22awg	+12V power supply to Solenoid valve	+12V, 1A fused
2	Brown	22awg	Switching to ground for Solenoid Valve	1A maximum
3	D.Grey	22awg	Extending Dummy resistor (+12V side)	1A maximum
4	D,Grey	22awg	Extending Dummy resistor (EMS)	1A maximum
5	Orange	22awg	Programmable Map switch signal	5mA signal
6	Red	22awg	Boost control valve +12V supply	1A max
7	Brown	22awg	Boost control valve switch to ground	600mA max
8	Black	22awg	Normally closed relay contact (fail-safe)	1A max
9	Grey	22awg	Wiper/common relay contact	1A max
10	White	22awg	Normally opened relay contact	1A max
11-14	------	4-core	See 4-core cable description above	------
15	Green	22awg	FIDC detect or MAP sensor	Wave input
16	Blue	22awg	MAPsensor or 0-5v based sensor	0 to 5V input
17	Pink	22awg	Night driving dimming connection	+12V active
18	Yellow	22awg	To ground when tank is empty	0.25A maximum
19	Green	22awg	Common ground	0.25A maximum
20	Red	22awg	Priming pump +12V supply (0.5A FUSED)	0.5A maximum
21	Blue	22awg	Priming pump ground switch (active)	1A maximum
22	Red	20awg	+12V switched power supply for all	3A maximum
23	Black	20awg	0V ground supply for all	3A maximum

GUARANTEE

ERL guarantees, at our option, to replace faulty goods supplied or repair the same, subject to the claim made in writing to us within 12 months after the sale by us, or for such other period as may be indicated by us for specific products in lieu of any warranty or condition implied by law as to the quality or fitness for any particular purpose of the goods.

Any claim against us must be made to us in writing within the period of 12 months after the sale by us , or our agents, or our distributors of goods in question (or such other period as may be indicated by us) and any goods to which the claim relates must be returned to us within that period suitably packaged and cleaned and, with any particular instructions which we may have notified to you at the time of supply. Original invoice, the nature of any claimed defect must accompany the goods in question prior to despatch to us.

If these requirements are not complied with our Guarantee shall not apply and we shall be discharged from all liability arising from the supply of defective goods.

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We shall not be under any liability for damage, loss of expense resulting from failures to give advice or information or giving the incorrect advice or information whether or not due to our negligence or that of our employees.

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Note: ERL reserves the right to make changes to our products without notice in order to improve design performance and reliability.

THE END

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