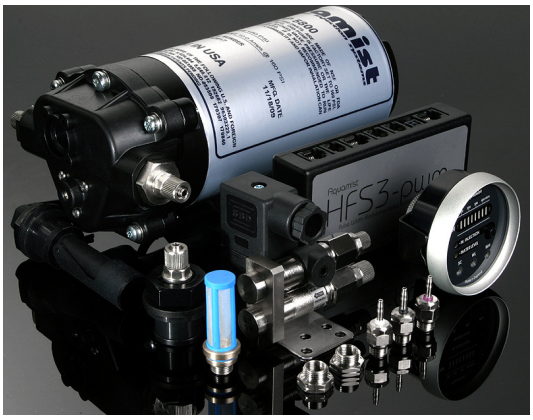
IDC tracking wmi system for Di engine

HFS4-v3.1 pwm



User manual v3.122 s/n:123123 on

Introducing the Aquamist HFS4-v3.1

In keeping with the seamless integration with the Di engines, the latest HFS4-v3.1 has a few additional features to ease with setting up the IDC pre-scaler without soldering. Jumper links is offered. Pre-scaler range has now been extended, ready for the next generation of Di engines. .

The system can now be triggered by boost and IDC% combined, based on the setting of the onboard P/I-R (Pressure/IDC ratio) trimmer. Multiple failsafes remain the same, protecting the engine should air or egt temperature exceed a reset value or fluid flow is interrupted.

A "Fast Acting Valve" (FAV) controls flow from a progressive PWM signal from the controller. This ensures excellent linearity and good atomization across the entire injection range. Constant line pressure (160 psi) is provided by the Aquatec pump. This method is very similar to the conventional fuel injection systems, allowing wide dynamic range and lighten responses to engine load.

The combination of quality components, superior method of delivery and a precision Di signal decoding algorithm, the HFS4-v3.1 continues to be the most advanced and capable water/methanol injection system on the market to date.

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 Aquatec/Aquamist logo.

The white box

- 6M of 6mm OD nylon hose (806-261)
- 2M of 4mm OD nylon hose (806-266)
- HFS-4 Electronic Controller
- 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 Tee compression fitting (806-395) in plastic bag.
- 2x M8 x 1/8 NPT jet adapter with plug (806-357N)
- 1x water tank adapter 1/8 BSP (806-270), 6mm compression fitting and in-tank filter (806-258)
- 4x M5x40mm bolt, washers and fasteners for pump
- 1x M6 grounding stud with washer and nuts and 6mm eyelet for pump ground.
- 2x 6mm to 3/8 BSP-M pump I/O fittings.
- 1x 4mm to 1/8 BSP compression fitting for FAV.
- 1x 6mm to 1/8 BSP compression fitting for FAV.
- Water pump harness. 6M of #12 AWG cable and 6M of multi-core cable (blue harness).
- 1x Fast Acting Valve cable (red harness)
- 1x Turbine flow sensor cable (yellow harness)
- 1x Water level switch with connector (806-281c)
- 1x Dash Gauge with 1.5M x 8-way flat cable
- 1x ECU interface, fail-safe and map switching cable (grey harness)
- 1x Molex type 4-way power-in harness
- 1x Di and Aux input cable (green harness) .
- User manual

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

Before installation guidelines

- The system is designed to be "**trunk**" mounted. Install the water pump below the water tank if possible as the assembly is not water proof.
- Ensure all fittings are tightened and leak proof before filling up with methanol. **Test it with water first.** If a high concentration of methanol mix is used, please vent the tank's breather hole externally. Methanol is poisonous when inhaled.

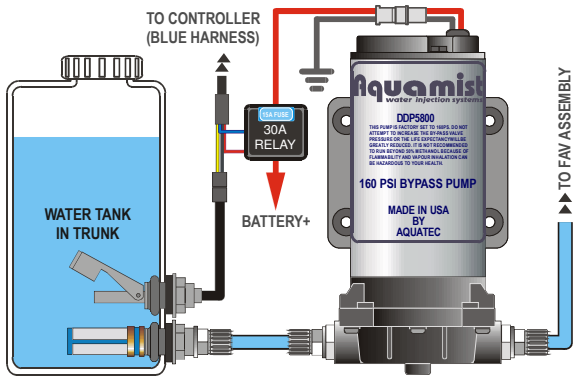
Assembling the pump in steps

- Gently assemble the two 3/8 BSP adapters into the pump without crossing the threads. Ensure the o-ring is properly embedded between the fitting and the I/O port. Do not over-tighten.

Water tank components

- Ensure the outlet is facing the rear or the side of the tank. Drill/bore a burr-free 22mm hole. Clear up all the burred edges and wash the tank thoroughly. No debris or plastic shavings should remain in the delivery system. Locating the outlet 1-2 inches from the bottom of the tank is ideal.
- Screw fit the in-tank filter on the inlet side of the tank adaptor. Insert the assembly into the tank and tighten the M16 plastic nut. Stop the assembly from rotating with a 6mm allen key into the centre of the assembly. Do not over tighten, to avoid splitting the rubber gasket seal.
- Drill the same hole size as the tank adapter for the water level sensor (22mm). If using a washer tank for supply, do not locate the level sensor near the stock washer pump. The float arm should swing upwards when full.

A tall and slim water tank is ideal for this type of application. This minimises delivery surge problems at low water level.



This is the most important section of the HFS-4 chapter. Please do not skip reading this part.

52mm (2 1/16" Dash Gauge:

Location is not too critical as long as it is in view of the driver. There are not many pitfalls on this.

HFS-4 controller box:

Please locate the box in a dry location in the passenger compartment. The glove box is a good place. Please allow plenty of slack to ease accessibility during tuning and diagnostic work.

Fast acting valve and flow sensor assembly (FAV):

The location of this module is most critical to overall system reliability. It is designed to be installed in the engine compartment,

This module must be installed in a cool, dry and well ventilated area and away from any heat source. The bulkhead/fire wall is not always a good location as most heat is flowing towards it during driving. Avoid locations near any electromagnetic components such as the ignition coil, solenoid valves and electronic motors. If possible, locate it not too far away from the water jet/jets.

It is very important that the hose is cut cleanly. It is also vital that the hose is cut perpendicular /square relative to its length. This is because the compression fitting has a short hosetail. An accurate cut will allow full grip on the walls of the hose.

The thin rubber gasket must be placed between the FAV coil and electrical plug (red harness) before tightening. Press the clip of the yellow harness into the centre section of the flow sensor body. Orientation is not important. Ensure the electrical plug's cable outlet is facing downwards. All cables leading away from the assembly must be looped downwards to avoid condensed water trickling into the clip and plug.

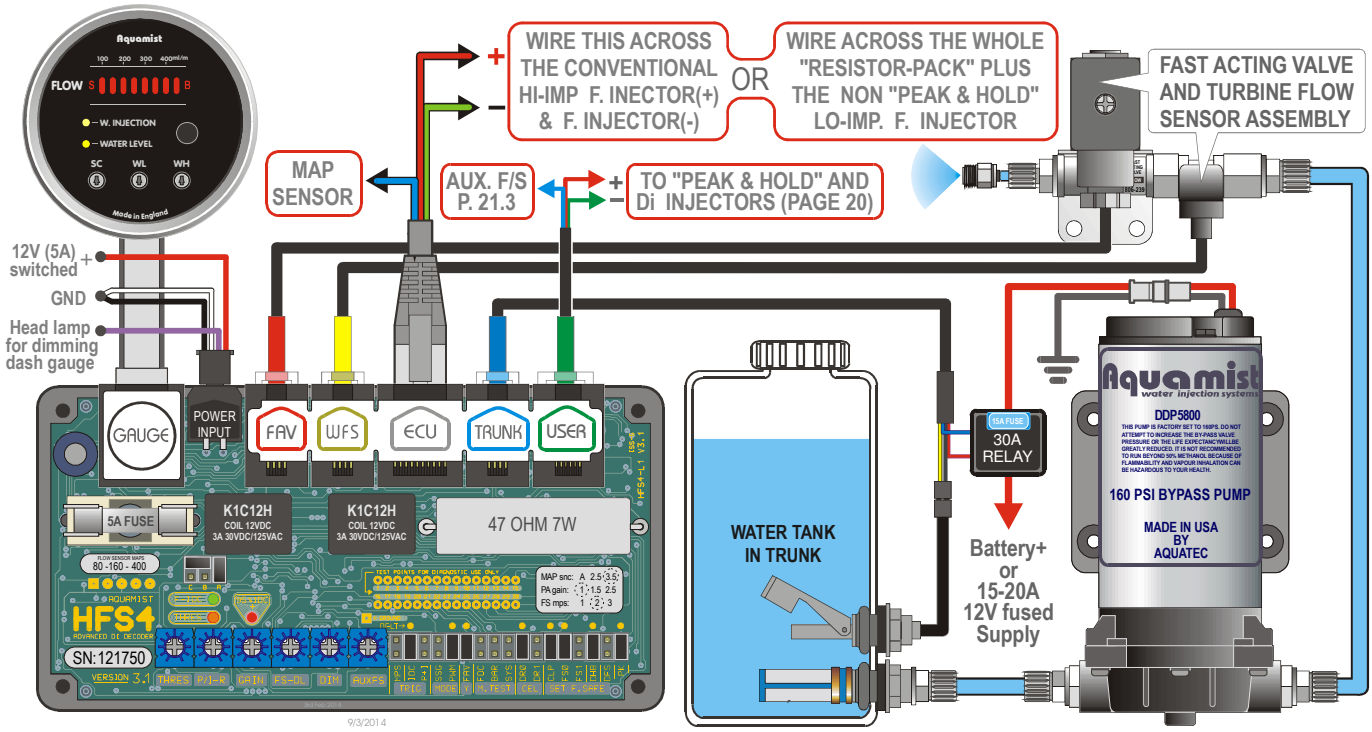
The tank level sensor:

Drill/bore the same hole size as for the tank adaptor for the water level sensor. A 22mm burr-free hole must be used to ensure a good seal. The float arm should swing upwards. Check that there is ample room for the sensor arm to swing before drilling. A tall and slim water tank is ideal for this type of application. This minimises delivery surge problems at low water levels.

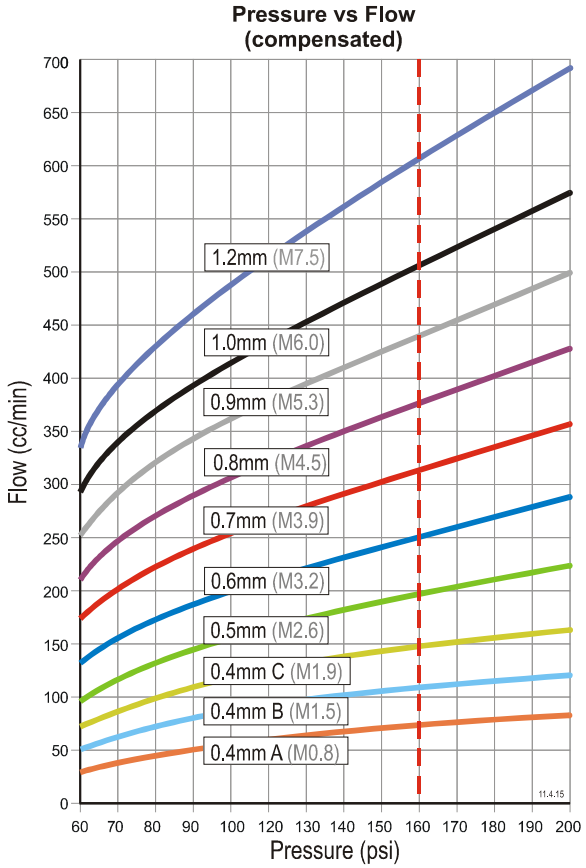
If the stock washer tank is going to be used, do not mount the float near the stock washer pump. The motor magnet will affect the sensor reading properly. The sensor can be installed 3/4 way down the tank, preferably at the rear facing wall of the tank. Never over tighten or the seal will split; just tighten enough to prevent leakage, no more.

The pump/relay assembly is NOT designed for engine bay installation unless the pump cable entry gland is sealed and the relay harness is insulated. Warranty will not cover this type of installation.

Generic wiring diagram for HFS4-v3



Choosing jet sizes



This is a general guide only:

- 100% water .....1cc/hp.
- 50:50 methanol/water ..... 1.5cc/hpl.
- 100% methanol 2cc/hp

Choosing the jet by calculation:

First determine the target HP and multiply the result by the preferred ratio recommended above.

Pick the nearest jet/jets size to match the flow. Don't forget to subtract the boost pressure from the line pressure of 160psi. For example, if you are boosting 25psi, you should select the jet flow at 135 psi. Allow 10-15% drop due to system loss.

Alternatively, pump pressure can be increased to offset the boost pressure with a 1/16" allen key in the front face of the pump head. 1/2T = ~25psi

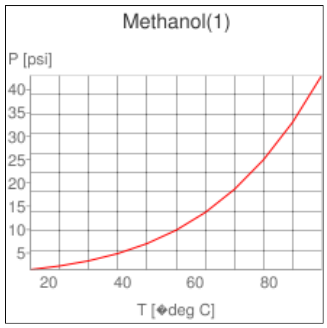
JET	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	PSI
0.4A	46	49	53	56	59	62	65	67	70	72	75	77	79	82	84	FLOW RATE CC / m (compsated)
0.4B	63	69	73	78	82	86	90	93	97	100	104	107	110	113	116	
0.4C	88	95	102	108	114	119	125	130	135	139	144	148	153	157	161	
0.50	120	129	138	147	155	162	169	176	183	189	196	202	208	213	219	
0.60	152	164	175	186	196	205	214	223	231	240	247	255	262	270	277	
0.70	190	206	220	233	246	258	269	280	291	301	311	320	330	339	347	
0.80	229	247	265	281	296	310	324	337	350	362	374	386	397	408	418	
0.90	268	289	309	328	346	363	379	394	409	424	437	451	464	477	489	
1.00	314	339	362	384	405	425	444	462	479	496	512	528	543	558	573	
1.20	370	400	427	453	478	501	523	545	565	585	604	623	641	659	676	

Managing Methanol usage on the system

Since the introdution of the Aquatec 5800 series pump in 2011, we have received no report on any related issues on running high ratio of methanol.
Great care and attention must be taken to ensure the fluid tank is capable of handling methanol and is designed for this type of application. These tanks are normally termed as a Fuel Cell and are available from most reputable racing parts suppliers. Follow the maker's guidelines carefully.

The breather hole on the tank must be vented externally with a suitable hose. All fluid delivery hoses and fittings must be free of all leaks. Ensure the area is well ventilated and isolated from the driver's compartment. Take whatever measures to avoid any methanol fumes building up in trunk area.

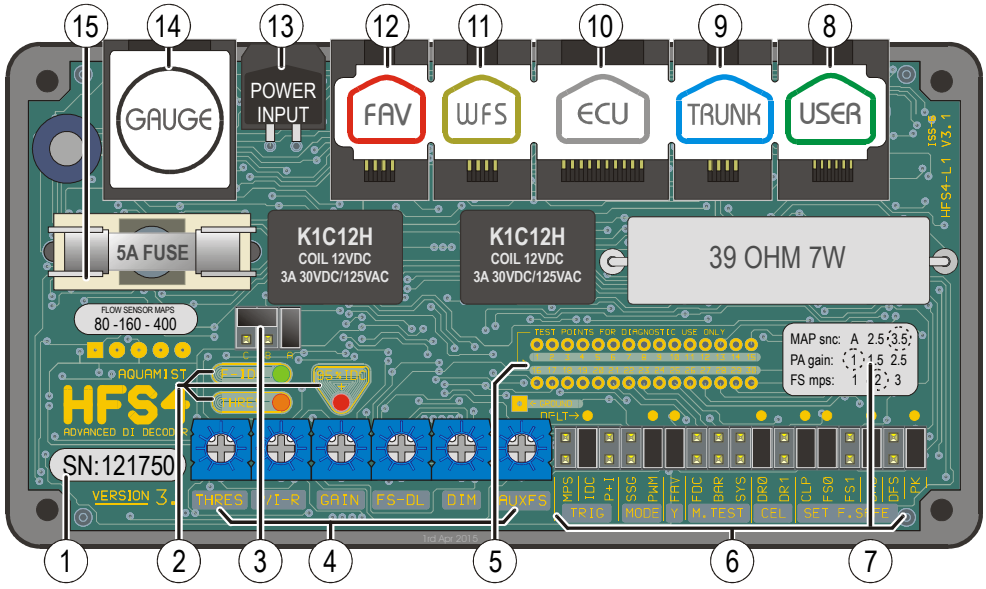
Using a engineered tank cap with an inbuilt checkvalve capsule will not alleviate the fume from escaping out of the tank and into the cabin area. This is because pure methanol has a saturated vapour pressure of 2psi+ at 22C (70F) and over 4psi @35C (95F). It is most likely the cabin will reach those temperatures on a hot day or parked on an open air car park under the sun. Higher crack pressure caps will only allow several psi of pressure trapped in the tank and may causing leaks or cracking...



For this reasons, please vent the tank to the outside of the cabin. Methanol fume is odourless and extremely toxic when inhaled.

Methanol is highly flammable. The main delivery hose to the engine bay should be routed underneath the car. Ensure it is securely clipped and fastened. Avoid kinks and close proximity of moving parts and heat producing components. Please treat this recommendation seriously. If in doubt, ask advice from a professional person familiar with this kind of application. DO NOT take any undue risks. It is recommended that a suitable fire extinguisher is placed within easy reach of the driver. All electrical connections must be properly tightened to avoid spark production.

HFS4-v3 function directory



1. CONTROLLER'S SERIAL NUMBER
2. FLOW SENSOR MAP IDENTIFICATION (P.22)
3. IDC PRE-SCALER FOR DI & OVERSIZED INJECTORS (P.21)
4. SYSTEM CONTROL TRIMMERS (P.13)
5. 30 TEST POINTS FOR SYSTEM DIAGNOSTIC WORK
6. SYSTEM CONFIGURATION JUMPER LINKS (P.14)
7. CUSTOM CONFIGURATIONS IDENTIFICATIONS LABEL
8. DI INPUT and FLOW SENSOR SIGNAL OUTPUT (P. 20-22)
9. LEVEL SENSOR and PUMP CONTROL: BLUE HARNESS:
10. ECU INTERFACE I/O PORTS: GREY HARNESS (P.7, 18, 20)
11. FLOW SENSOR I/O PORTS : YELLOW HARNESS (P.7)
12. FAST ACTING VALVE (FAV) OUTPUT: RED HARNESS (P.7)
13. POWER INPUT: 4-WAY MOLEX TYPE CONNECTOR. (P.7,11)
14. DASH GAUGE INPUT: RJ45 FLAT CABLE (P.7 & .P15)
15. 5A SYSTEM FUSE (QUICK BLOW). DO NOT REPLACE IT WITH A HIGHER RATED FUSE. (P. 7)

Mechanical work (checklist):
Only after testing with distilled water should methanol be used. BEFORE hooking up line to the jet the system should be manually activated to flush any possibly dirt/debris from the lines.

Wiring work for first four harness only:
The HFS-4 is pre-configured from the factory. Only plug in the following harness for testing the power supply into the controller.

1. 4-way Power-in connector:
- Red ..... Switched 12V (IGN SW/pre-crank)
- Black ..... Chassis ground
- White ..... Chassis ground
- Purple ..... Head lamp (+)switch (optional)

2. Signal to the grey RJ48 connector:
- Red ..... Ignition switched 12V(pre-crank)
- Green ..... Fuel injector (-) pin (conventional)
- Blue ..... MAP sensor (optional)

3. Black flat cable to the Dash Gauge
4. 6-way Green harness for DI engines.

Power-up procedure:
Please follow this procedure "strictly" or permanent damage to the system may result. Do NOT SKIP any steps please....

1. Ignition key in the "OFF" or "0" position:
- Dash Gauge button is depressed (system on).
- No LEDs should be lit anywhere.

2. Ignition key in the "ACC" or "#1" position:
Absolutely no change, same as the above conditions.

3. Ignition key in the "pre-cranking" or "#2" position: -
- Do not crank for 2-3 minutes. Observe the gauge LEDs. Yellow LED on the gauge will stay lit for 5-10s before the rest of the gauge lights up. The pump or FAV should not come on during this whole period.

4. Start the engine and let it idle for a minute or so:
- The green LED on the controller should flicker. The flicker should speed up with engine speed. If the system behaves as stated above, you have successfully wired up the HFS-4! (Plugging in the Green harness is required for DI engines)

Now plug in the rest of the harnesses:
- The "S" LED should confirm the presence of the flow sensor.
- The yellow LED will activate if the tank level is low.

This completes the basic system test. The next stage will be testing the system manually by using the jumper links on the controller board. You will need a small 3/32"slotted screwdriver.

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1. First step - system check & setup list:
a. Tank and pump are fully secured and leak free.
b. The FAV assembly is securely located in a cool and dry spot of the engine bay.
c. The controller is accessible and can be secured down with minimum movement during motoring.
d. The intended jet/jets are securely installed on the windscreen, not in the charge pipe.
e. Dash gauge switched on and in sight.
f. Link "DSF" using the "DHB" jumper to disable the failsafe temporarily. See p14.6.4.

2. Priming and purging of the system:
a. Fill the tank with water half way up.

b. Disconnect the 6mm hose from the FAV assembly and put the hose into a container securely.

c. Ignition switch in pre-crank position and gauge is switched on. Uncover the controller and pull out the "FAV" jumper (disabling the FAV) and put it to the link marked "SYS". The pump should power up and water should come out of the 6mm hose within a few seconds, Let it run for 10-20 seconds so that trapped air and debris are purged.

d. Listen to the pump during the priming period; it should go very quiet after completion of the purging procedure. If not, repeat step "c".

e. Upon successful completion of the above, reinstate the FAV jumper and 6mm hose into the FAV assembly.

3. Test spray pattern and SC setting:
a. Secure the intended jet/jets onto the windscreen and connect it to the outlet port of the FAV assembly.

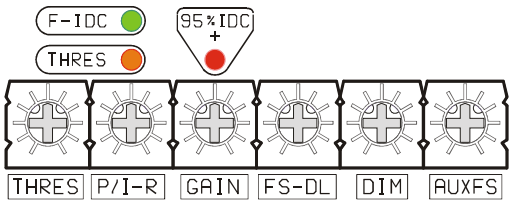
b. Activate the system by linking up the "SYS" with the spare "PRK" jumper (p16.7). You should see an instant full-cone spray at the jet. Do it for a few seconds only. Good time to set the SC (on the gauge) to display 5-6 bars. Remove the "SYS" test link after test. Leave the FAV jumper link in the slot.

4. Activate the system by Gas -paddle:
a. Set the "THRES" trimmer to fully counter-clockwise. Start the engine. You should see the green LED on the controller board blinking.

b. Blip the accelerator paddle sharply to induce an artificial load. The amber LED should respond. A faint but noticeable spray should develop at the jet. This may not work with very large capacity injectors. A test drive under load is necessary in this case.

5. Road test the system:
Still with jet on the windscreen, make a short drive and confirm the spray is progressive with load. After a successful road test, The system is now ready for dialling in

The onboard trimmers functions: (default=12 o'clock)



The system requires no trimming from factory. If the user wants to alter the flow and other parameters, just use a small screwdriver to complete the task.

Below are the working details of each trimmer. (left to right).

1. LED panel:

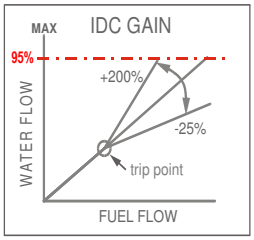
- Green (F-IDC): Blinks upon successful detection of fuel injector duty cycle signal. The blink rate and brightness increase with engine speed and duty cycle respectively.

- Amber (THRES): At 42% F-IDC (default), this LED will activate, confirming the system is triggered and delivery commences.

- Red (95% DC): When the water/methanol duty cycle is approaching 95%, the red LED begins to turn on, indicating that you have almost reached the maximum flow of your system. More flow requires additional jets.

2. Trimmers for fine tuning:

- THRES: Factory set to 42% (12 o'clock), User adjustment range is between 12 to 72% (fully clockwise).



- GAIN: Increases/decreases the rate of ramp relative to the incoming signal after trigger point. No flow increase is expected when the 95% IDC+ red LED is activated.

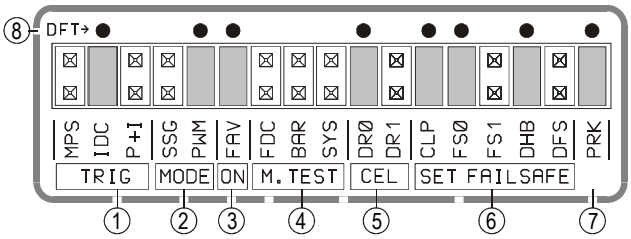
- P/I-R: Alter the flow relative to boost or fuel. For 100% boost controlled, set the trimmer fully counter-clockwise. Vice versa for fuel. Flow is shared equally when trimmer at mid point between pressure and fuel flow.

- FS-DL: Fail-safe delay to minimise undue fail-safe activation due to spikes and noise signal. The factory default setting is 0.4s. User can adjust between 0.2 to 0.6s.

- DIM: Activated when the purple wire of the power connected is connected to a 12V source. Headlamp (+) is an ideal location.

- AUXFS: Setting the "over-range" of Auxillary Failsafe input (Page: 21.3). Additional failsafe for third-party signal to active the HFS4's onboard failsafe relay to reduce boost. Useful for engine equipped with a WBO2 sensor or EGT probe. Input range is 0-5V. It can also be used to detect high inlet air temperature.

Knowing the function of each jumper link:



1.TRIG:
The system factory set to trigger by IDC%, 12-72% or MPS (boost). P+I trigger (boost and IDC combined) is tied to the P/I-R trimmer setting. If trimmer is set to fully MPS biased, IDC signal will have no effect.

2. MODE:
- PWM mode (factory default): Flow can be progressive with IDC, Boost or Both (P/I R trimmer P.13.2).
- SSG (single stage) mode: "all on" or "all off"

3. ON: Enabled FAV (default) or disable FAV.

4. M. TEST:
- FDC: Link to display F-IDC on gauge (testing only)
- BAR: Link to test bargraph with the "SC" trimmer.
- SYS: This link can be used to activate the system for testing. For "pump activation only", unlink the #3 (FAV) to disable FAV to avoid hydro-locking.

5. CEL:
Boost cut without CEL (check engine light) activation. This is only used in conjunction with internal relay fail-safe output. DR1 = No CEL.

6. SET FAIL SAFE:
- CLP (factory default): Output voltage is clipped from 8V to 5V.
- FS0 (factory default): Fail-safe output to ground upon activation.
- FS1: Fail-safe output switches from 0 to 5V or 8V upon activation.
(this fail-safe output option is on the orange wire of the grey harness.

- DHB (default=linked):"Disable High Boost". When the gauge is switched off, all fail-safe outputs become activated. This safe guards any engine damage. If the DHB is "unlinked", the yellow LED (water level) will be lit when the gauge is switched off, giving the user a reminder that the engine is not protected againist "High Boost".

- DFS (default=unlinked):"Disable Fail-Safe". Link to stop all fail-safe activation during test or preliminary test run prior to finalizing fail-safe window. .

7. PRK: Parking for unused jumper link.

8. DEFAULT: Factory default setting (gold dots)

Setting up the fail-safe

Setting up the fail-safe should only be done after the jet or jets sizes are finalised and road tested or engine dyno tuned.

Setting the fail-safe will not affect any previous flow delivery settings. It is an independent operation performed by the DASH GAUGE trimmers.

Recommended steps to set up the fail-safe
(SC, WL and WH trimmers are on the dash gauge)

1. Ensure the DSF jumper link is relocated to DHB.

2. Re-check "SC" is set to display 5-6 bars at full power from before. This is vitally import. Recal. if necessary.

3. Set the WL trimmer to fully Counter-clockwise and advance 10 clicks.

4. Set the WH trimmer to fully Clockwise and wind back ten clicks.

5. This give a reasonable window width for the moving bars before tripping the failsafe.

6. Test drive and fine tune the WL and WH trimmers. Allowing a few sessions under different loads before switching to a more aggressive map.

What do you want the system to to do upon a failsafe activation?

The most common way to minimize engine damage in the absence of flow is to reduce the boost pressure.

1. For engines with an electronic boost control valve: The "grey harness" consists a set of relay contacts that goes open circuit when the fail-safe is triggered. See page 18.2 and 19 for more details.

2. For engines with MBC (manual boost controller): The onboard fail-safe relay can be used to control a 3-port solenoid valve to by-pass the MBC or a stepper motor type of boost controller. Contact Aquamist for further instructions.

3. For an engine with MAP switching capabilities: The orange wire on the grey connector has a dedicated output to perform such a task. This pin can be user configured to match the signal requirement of the "third party" ECU to switch MAP. See page 18-1 for more details. This pin is factory configured to give a 5V for "OK" and "0v" is "flow fault"

Maximum current of this output is 5mA.

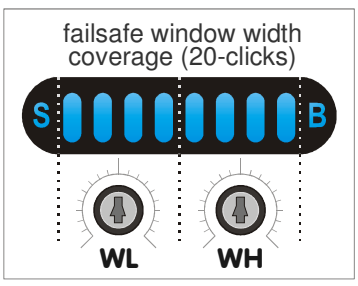
Dash Gauge Functions cont.

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 a 20-stepped potentiometer is employed. Each click represents a fixed portion of the window width of 8-bars.

WL covers the lower 4 bars of the display 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 2-7 bars. This is a good starting point.

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

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

1. "B" led (right of the bargraph) will only stay activated if the flow is inside the fail-safe window during injection period.

2. The two "yellow" leds Both leds will activate when fail-safe is triggered. Only the lower led illuminates during low tank level.

As soon as the "fail-safe" is tripped, there will be a 3 second reset period before it reset while the fail-safe drops boost.

When gauge is switched off, expect low boost and safe map unless the board is re- configured. (page 12.7)

This final stage should be quick, simple and effective. Please read it before proceeding. It will save you time in the long run.

If fluid flow falls inside the fail-safe detection window after triggering, no action will be taken. Setting up the width of the window to accommodate the full fluid flow is vital.

Setting up the fail-safe should only be done after the car has been tuned or the jet/jets sizes are finalized.

Recommended steps to set up the fail-safe:

1. Adjust the "SC" to display 6 bars at manual test. jJets are placed outside the engine to avoid hydrolock.

2. Rinstate jet/s into the engine. Mental note the number of bars displayed on the at spool up & WOT.

3. Set the WL to match the number of spool-up bars. It is recommended to allow 2-3 clicks below that point to avoid false triggering. Full span of WL is 20 clicks, covering from 0 bar to 4 bars.

4. Same procedure is used to set up the WH, allowing 2-3 clicks above 6 bars. Full span of WH is 20 clicks covering 4-8 bars.

This completes the fail-safe set-up ...

Options after the fail-safe is triggered:

The most common way to minimize engine damage in the absence of injection is to reduce the boost pressure.

1. For engines with an electronic boost control valve: The grey harness contains a set of relay contacts that goes open circuit when the fail-safe is triggered. See page 18 and 19 for more details.

2. For engines with MBC (manual boost controller): The onboard fail-safe relay can be used to control a 3-port solenoid valve to by-pass the MBC or a stepper motor type of boost controller. Essentially, this directs full boost to the wastegate.

3. For an engine with MAP switching capabilities: The orange wire on the grey connector has a dedicated output to perform such a task. This pin can be user configured to match the signal requirement of the "third party" ECU to switch MAP. See page 18-1 for more details. This pin is factory configured to give a 5V for "OK" and "0v" is "flow fault"

Maximum current of this output is 5mA.

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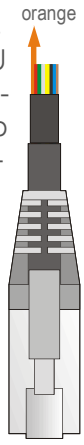
1. The MAP Switching Channel:



The orange wire from the grey RJ48 connector is a voltage based MAP Switching for an ECU equipped with this input. This wire is factory configured to send out a voltage of 4.7V DC under a "no fault " condition, from idle to full boost. This voltage will switch to 0v upon a fail-safe activation or the gauge is switched off.

Other voltages such as 0, 5V or 8V can be user configured. This is by far the most effective method to save your engine from lack of water injection. A jumper link can invert the MAP switch output if necessary.

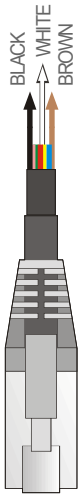
Although it is simple and convenient to use a single wire to communicate a fail-safe activation, this can only be achieved "as long as" the system is powered up properly. The alternative way is to use the on-board relay to convey a fail-safe activation since the relay will guarantee a "make or break" circuit when system's power is lost or a blown system fuse.

2. Change-over relay: (HFS-3)

The HFS-3 has an onboard relay to supply a set of voltage-free, change-over contacts for the sole use of fail-safe activation. It can be used to perform various tasks to save your engine. Contact rated up to 1 amp.

Please refer to page 19 for full switching sequence under various conditions.

Example1: OE boost control valve (BCV):



Disabling the OE boost control valve. "Cut and splice" the boost control circuit. White to "ECU side". Brown to "BCV side". You will need to link the "Anti-CEL" option on page 12.6 to avoid the onset of CEL during fail-safe activation. Dummy resistor replaces the BCV.

Example 2: (third party boost controllers)

Disabling the third party electronic boost control system. "Cut and splice" the pulsed wire to the BCV. White to the "Controller" and Brown to the "BCV" side.

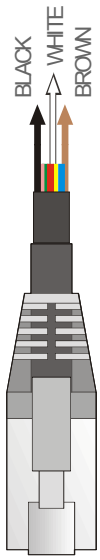
This option will not work with EBC (Electronic Boost controller) utilizing a stepper motor to control boost. HKS-EVC is such an example. Use the MAC valve option on page 17.

Note: During the initial testing period soon after the installation, you can disable the fail-safe from activation by connecting the "DFS" (Disable Fail Safe) jumper link.

Relay Fail-safe output switching tables

● NORMAL SYSTEM OPERATION
● FAIL SAFE ACTIVATED

		DHB LINKED (DEFAULT)	DHB UNLINKED	DFS LINKED	DFS UN-LINKED (DEFAULT)
1	IGNITION SW. KEY - OUT	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK
2	IGN.SW - ACCESSORY	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK
3	GAUGE OFF IGN.SW @ PRE-CRANK/RUN	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK
4	GAUGE ON IGNITION @ PRE-CRANK/RUN	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK
5	GAUGE ON (NOT TRIGGERED) IGNITION @ PRE-CRANK/RUN	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK
6	GAUGE ON (TRIGGERED) FLOW INSIDE FAILSAFE WINDOW	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK
7	GAUGE ON (TRIGGERED) FLOW OUTSIDE FAILSAFE WINDOW	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK
8	GAUGE ON (FAILSAFE TRIGGERED) RESET AFTER ~3 SECONDS	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK	WHITE — BROWN / BLACK

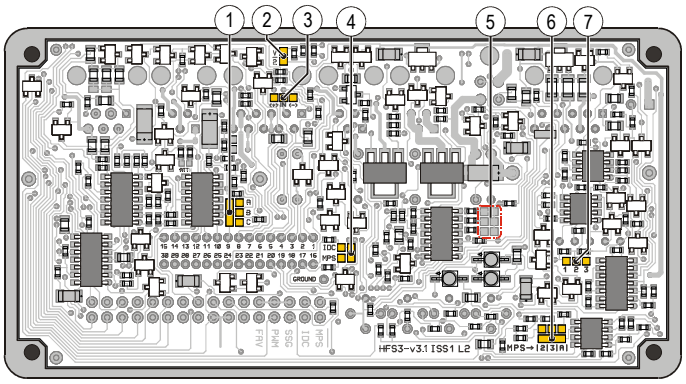


Fail-safe relay output truth table:
The above table is created to simplify the fail-safe relay switching status under all circumstances.

White, Brown and Black wires are located in the grey harness. The relay contacts are capable of switching 1A@30V continuous and 3A pulsed due to the 24awg wires used.

Based on the table above, you can use these contacts to either connect or disconnect electro-mechanical components such as a wastegate control valve or third party fail-safe devices. The contacts are gold flashed so it can be used for low current signal switching.

Advanced system configurations (optional)



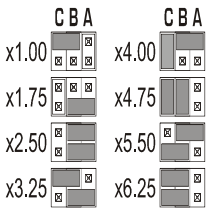
1. System configuration (factory use)
Reserved

2. Rescale flow signal output:
Solder link this a reduce the flow signal by 50%

3. IDC signal detection polarity:
Solder link to change edge detection to positive.

4. Configuring 70% IDC & 30% MPS:
(a) 100% IDC: system default from factory
(b) 70% IDC / 30% MPS: If MAP sensor signal is available. Solder link MPS.
(c) 100% MPS: Cut IDC link and solder link MPS link.

5. IDC pre-scaler (topside):
The option allows the system to match the incoming IDC signal. Can be used for oversized injectors with low duty cycle. Select x2.5 for all direct injection engines.



6. Select MAP sensor range:

(a) Absolute: This can be used for any sensors with 0-5V output, such as throttle position, mass air flow sensors etc.

(b) 2.5 bar MAP sensor: Select this link to convert a 2.5 bar MAP sensor to read from atmospheric to 22psi full scale 0-5V output.

(c) 3 - 3.5 bar MAP sensor (default):
Select this link to convert a 3.5 bar MAP sensor to read from atmospheric to 36psi full scale 0-5V output.

6 Flow map table:
(a) Unlinked: two large jets (default).
(b). Solder link 1&2 for single jet.
(c) Solder link 2&3 for three very large jets .

HFS-3 flow sensor range configuration

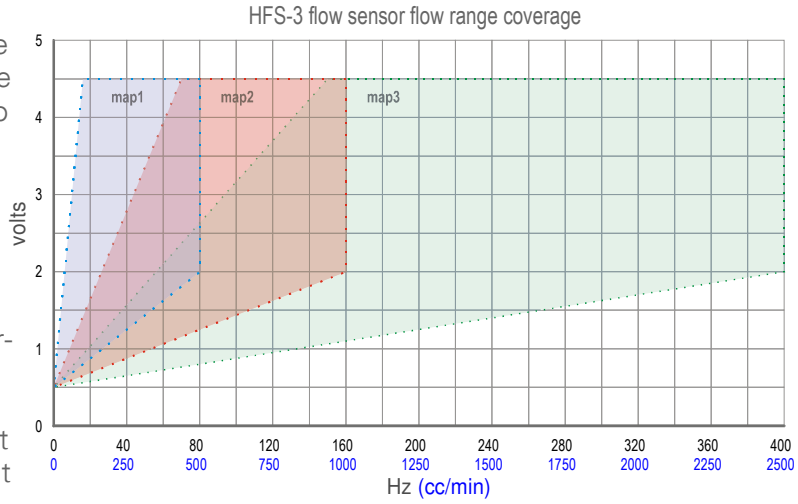
The HFS-3 flow sensor:

Extensive progress has been made over the last few years to stretch the operating range of the new flow sensor assembly, now up to 2,500cc/min coverage.

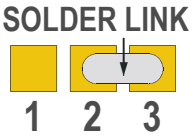
In order to maximise the output resolution from one to multiple jets, we have created three flow tables for single, twin and four jet applications.

Changing the table requires a simple under-board "Cut and solder link" operation.

The image on the right shows a factory default (map2) table.



There is no need to modify the board if you intend to run two jets, flowing within the region of map2 (see chart: up to 1000cc/min). However, if you are running three or more jets, you need to modify the circuit board by depositing a solder blob covering pads 1 and 2. See diagram on the right. 1+2 for one jet or 2+3 for three jets.



Note: For the benefit of third party controllers, fail-safe and data logging purposes, raw pulses and signal conditioned voltage from the flow sensor are available on yellow (voltage) and white wire (5V pulses) of the green harness.

Trouble shooting

New installation power up issues
(failsafe disabled)

1. System does not power up at "pre-crank":
- Check gauge button is depressed
- Check the red wire of the grey harness is connected to a 12V source.

.2. System does not power up at "pre-crank" but water led is lit:
- Check water tank level.
- Check level sensor is installed the right way up.

3. System powers up but green led does not blink with RPM:
- Check the green wire of the grey harness is spliced Into the fuel injector's "pulsed" wire (PI)
- Check the green and red wire of the green harness is spliced Into the fuel injector's wires (DI).

.4. THRES led lit on throttle blip but no spray:
- "THRES" should be set to fully counterclockwise.
- IDC pre-scaler is set to match PI's IDC max.
- IDC prescaler is set to x2.5 for DI engines.

.5. Failsafe triggers during acceleration:
- Disable failsafe by moving "PRK" jumper to "DFS" Failsafe should only be set after system is setup and tuned,

System running issues
(failsafe activated)

6. Flow bar display surges and drops:
- Reduce hose length to the jet/jets.

7. Failsafe trips at the WOT:
- Set gauge's S/C to only display 5-6 bars at WOT.
- If still trips, set WH clockwise until it settles. Advance two more clicks.

8. Failsafe trips at the start of acceleration:
- IDC prescaler is not set correctly. See #4
You can check the incoming IDC% on the gauge by linking "FDC" (fuel duty cycle) %
- If it still trips, set gauge's WL counter-clocwise until it settles. Advance two more clicks.
- If it still clicks, "THRES" on the controller is set too low, set it to 10am. Then recal "WL" on the gauge

9. System blanks out during activation:
- Water tank level is dropped below permitted level for ~20 seconds. System will trigger failsafe. The system will not reset until the tank is refilled.

The water level led should flash long before this.

Appendix

Pin	Colour	Size	Description	Electrical parameter
Molex Microfit power harness (1.5 M): Main Power supply and Dimmer control				
1	red	20awg	+12V Power supply (switched)	250mA max@12v
2	purple	20awg	Gauge dimming input to head lamp switch+	0-5 VDC @10mA
3	white	20awg	0V Ground (signal ground)	250mA max@12v
4	black	20awg	0V Ground (Power ground)	-1A @12V max.
Red Harness to Engine bay (2.5M): To Flow Control assembly				
1	red	24awg	+12V PSU to Fast acting valve	1A max @12v
2	yellow	24awg	+12V PSU to Fast acting valve	1A max @12v
3	blue	24awg	PWM ground switch to Fast acting valve	1A max @0v
4	black	24awg	PWM ground switch to Fast acting valve	1A max @0v
Yellow Harness to Engine bay (2.5M): To Flow Control assembly				
1	red	24awg	+5V Power supply to Turbine flow sensor	5mA max @5v
2	yellow	24awg	Turbine fow sensor signal output	1mA max @5v
3	blue	24awg	Feedback signal (return ground)	1mA max @0v
4	black	24awg	0V/ground power supply	1mA max @0v
Grey Harness to EMS (2.5M): IDC/Boost detection and Fail-Safe / Map-Switching interface				
1	===	24awg	Future extension I/O channel1	----------
2	red	24awg	Ignition Switching detection	30mA max@12v
3	green	24awg	Fuel injection IDC detection	10mA max@12v
4	pink	24awg	Map switching interfacing	0, 5V, 7.5V @1mA
5	white	24awg	Failsafe Relay contact (COM, Wiper)	1A @24V max.
6	yellow	24awg	Reserved for internal communication	Signal level
7	blue	24awg	Map Sensor Signal input	0-5 VDC @1mA
8	black	24awg	Failsafe Relay contact (N/C contact) or DR	1A @24V max.
9	brown	24awg	Failsafe Relay contact (N/O contact)	1A @24V max.
10	===	24awg	Future extension I/O channel 2	----------
Blue Harness to Trunk Area (6M):				
1	red	24awg	+12V Power supply to 40A relay	0.5A max @12v
2	yellow	24awg	Water level sensor signal	signal ground 0.5A
3	blue	24awg	Pump relay activation (ground switch)	----------
4	black	24awg	Water level sensor ground	----------
9	Red	12awg	12V Power cable to water pump relay	38A @12V max.
10	Black	12awg	0v ground for water pump	38A @12V max
Green Harness to EMS (2M): Direct, P&H Injection systems, Common Rail Diesel Interface				
1	red	24awg	Fuel injector (+) signal detection	600V 8mS dc<50%
2	green	24awg	Fuel injector (-) signal detection	600V 8mS dc<50%
3	blue	24awg	Spare port for custom interface	----------
4	yellow	24awg	Flow sensor signal (analogue 0-5V)	0.5 - 4.5V @1mA
5	white	24awg	Water/Methanol IDC monitor (analogue) output	0 - 5V @1ma.
6	black	24awg	Signal ground	0.2A max.

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.

LIABILITY

We shall not be under any liability whether in contract, or tort or otherwise and whether or not resulting from our negligence or that of our employees, in respect of defects in goods supplied or for any damage or loss resulting from such defects.

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.

In no event shall any breach of contract on our part or tort (including negligence) or failure of any time on our part that of our employee give rise to liability for loss of revenue or consequential loss or damages arising from any cause whatsoever.

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

Useful Aquamist technical links

Aquamist owners have been pretty good in supporting each other. Most experienced users will help new users with questions, not necessary to email or make long distance phone calls and wait on hold to get help. Here are a list of forum links where users can seek help and advice from others:

- http://www.waterinjection.info (general)

END