



PERFORMANCE ELECTRONICS

***Internal MAP Water/Methanol
Injection Kit (No Tank)
30-3302, 30-3303***

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Introduction

Congratulations on your purchase of the AEM Water/Methanol Injection Kit. This document will help guide you through the setup and installation process. Please take the time to review its contents prior to installation. Pay especially close attention to any **bolded** text, as it indicates an important note, or step in the process.

Before beginning installation of electronic components please disconnect the ground side of the battery. This is for your safety.

Specifications

- 200 PSI injection pump
- Progressive pump controller with “Boost Safe” feature
- High amperage pump driver with over-current, over-voltage and under-voltage protection
- Error protection output with over-current, over-voltage and over-temperature protection
- Two system status LED indicators; shows pump duty cycle and system errors
- Pump open and short detection and indication; works even if the pump is off
- Test button that manually triggers pump

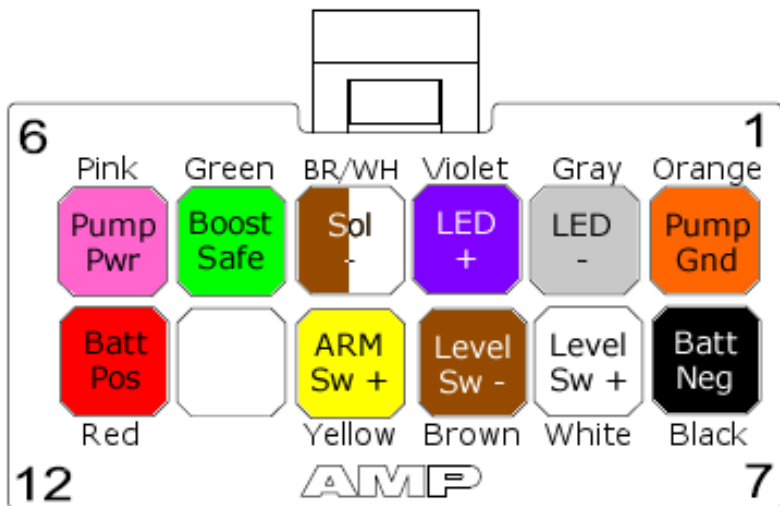
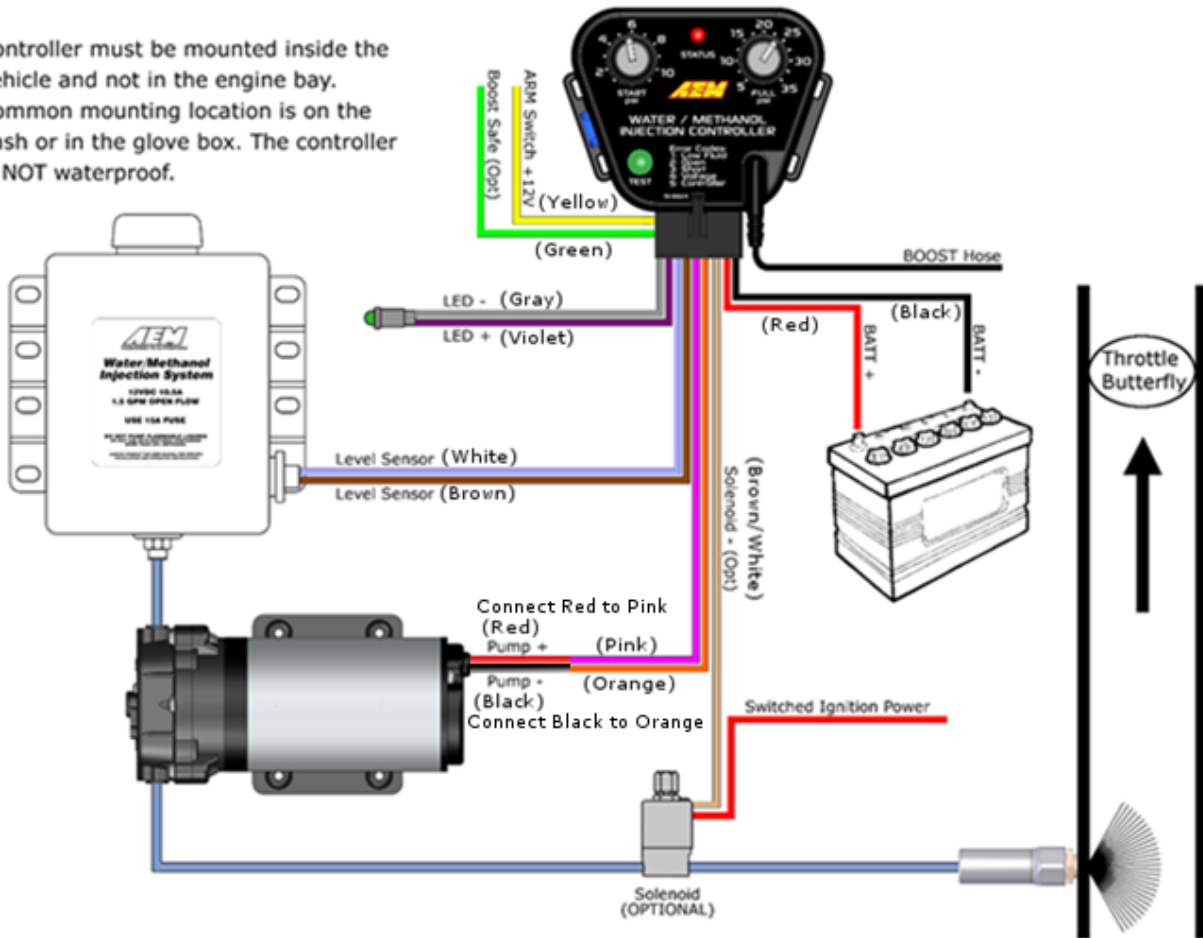
Two dial pump speed control Parts List:		
Quantity	Description	Part #
20 ft	High Pressure ¼" Nylon Hose	35-4500-20
1	200 PSI Pump With Integral Fittings	5843-2S0D-B744AM
1*	Progressive Injection Module (*30-3300)	35-4550
1*	Progressive Injection Module HD (*30-3301)	35-4550-HD
1	12 ft Wiring Harness	35-3451

Hardware Kit:			35-4512HW
Quantity	Description	Part #	
60 in	Vacuum Hose (7/64")	8-161-120	
36 in	3/8" High Temp Wire Wrap	8-169	
6 in	Edge Protector	8-111-E	
1	1/8" Tee Fitting	35-2147	
10	6" Zip Tie	8-113-E	
4	Bolt, Hex Head, 5/16-18 x 1.25"	1-2115	
4	Bolt, Hex Head, 8-32 x 1.5"	1-2116	
8	Screw, Pan Head #8 x 1.0"	1-3048	
4	Screw, Pan Head #6 x 0.5"	1-3049	
4	Nut, Nylock, 5/16-18	1-3055	
4	Nut, Nylock, 8-32	1-2537	
12	Washer, #8 x 3/4"	1-3051	
4	Washer, #8 x 7/16"	1-3050	
4	Washer, 5/16	1-3031-E	
4	Washer, Fender, 5/16	1-3054	
1	5mm Cockpit LED	35-4505	
2	Butt Connector, 14-16 AWG (blue)	8-360	
9	Butt Connector, 18-22 AWG (red)	8-361	
4	Ring Terminal, 14-16 AWD (blue)	8-354	
1	1/4" Hose Routing Strip	35-4500-20	

Injector Nozzle Kit:	30-3300		33-3301	
	#	Part #	#	Part #
Jet, Medium (500 cc/min)	1	35-4514-02	1	35-4514-02
Jet, Small (250 cc/min)	1	35-4514-04	0	35-4514-04
Jet, Large (1000 cc/min)	1	35-4514-05	2	35-4514-05
Nylon Washer	1	35-4517	1	35-4517
Injector Body	1	35-4515-2	2	35-4515-2
H2O Nozzle	1	35-4545	1	35-4545

Installation Diagram

Controller must be mounted inside the vehicle and not in the engine bay. Common mounting location is on the dash or in the glove box. The controller is NOT waterproof.



*Viewed from wire side of Connector

NOTE: THIS KIT INCLUDES NEW STYLE INJECTOR NOZZLES THAT HAVE INTERNAL CHECK VALVES. AN EXTERNAL CHECK IS NO LONGER NEEDED OR INCLUDED IN THIS KIT.

Installation Checklist

The following list of steps is an overview of the installation process. A complete and more detailed list of each step including optional peripherals is defined later in this document.

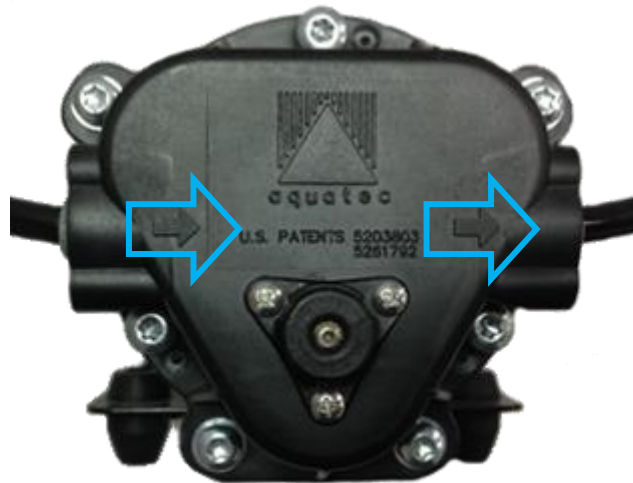
- Install Pump
 - Select suitable location for pump near and below the lowest fluid level of tank.
 - Fasten with 4 of the #8 sheet metal screws along with the 4 small washers or the #8-32 bolts and Nylock nuts.
 - Cut supplied nylon hose with a sharp razor blade and install from tank to pump.
- Install Controller
 - Disconnect ground side of battery during electronic installation.
 - Find suitable location for controller inside driver's compartment.
 - Find location in driver's field of view and install external LED.
 - Follow the wire diagram and connect wires from supplied wire harness.
 - Connect boost hose line to both controller and manifold pressure.
- Connect Nozzle to System
 - Select nozzle and connect to nylon hose.
 - Fill tank with water.
 - Use Test button on controller to test complete system.
- System Check
 - While pushing the Test button ensure that no errors are reported and that the system is producing a gradually increasing flow out of the nozzle.
 - This may require pressing the Test button multiple times to purge the system.
 - Drain tank and fill with desired water/methanol mixture.
 - **DO NOT** use a hydrocarbon fuel. Water/Methanol are the only supported fluids
- Install Nozzle
 - Find a suitable location to install nozzle. Nozzle must be mounted **before** the throttle plate. Nozzle should also be mounted **after** the MAF sensor if present. Nozzle must also be mounted **after** any intercoolers.
 - Install nozzle, follow instructions for modifying intake to accept the nozzle.
 - Cut and install nylon hose from pump to nozzle. Ensure that the hose is not resting, near, or running on any moving or "hot" parts.
- Tune Engine
 - Engine tuning is usually required in order to maximize potential power gain.

Pump

Find a suitable location to mount the pump. The tank and pump must be mounted in the same area. **Pump may be mounted on exterior of vehicle but should be mounted away from wheel wells or other areas where it will come into direct contact with water or road debris. Pump failures that have clearly been caused by exposure to water/mud/debris will not be covered under warranty.** This includes but is not limited to, the bed of a truck, and the inside of the fender wells. Find a location where the pump will remain dry.

The pump must be located in the same area as the tank and should be mounted at or below the lowest fluid level height.

Take note of the direction of flow, indicated by the arrows on the pump body, when mounting the pump.



Use four #8 sheet metal screws along with the 4 small washers or the #8-32 bolts and nylock nuts to mount the pump. The pump can be mounted in any position horizontally or vertically. Once the tank and pump are mounted, cut the appropriate length of tubing needed to connect the outlet fitting on the tank to the inlet fitting on the pump. Make sure there are no sharp bends in the tubing. Cut the tubing to length with a clean perpendicular slice using a sharp razor blade, making sure the ends are clean and square. Push in the hose at the tank and pump to install. Make sure they are pushed in all the way and check with a light tug on the hose. Secure the hose to the chassis using sections of the supplied hose routing strip or with zip-ties.

Controller Install

The progressive controller is **NOT** waterproof and should **NOT** be mounted in the engine bay! Find a convenient location for the controller inside the driver's compartment. The adjustment knobs should remain in an accessible location but still remain protected from possible water incursion. If you need to extend the wires to mount the controller use at least 16 AWG wire for the pump and controller ground circuits and 18 AWG for the remainder. The controller contains an externally accessible fuse, no additional fuses are required. Use the supplied zip-ties to mount the controller.

Progressive Controller Installation

Pin #	Description	Wire**	Color	Connection
1	Pump Ground	16 AWG	Orange	Connect to ground (black) wire of pump.
2	LED -	20 AWG	Gray	Connect to ground (black) wire of external LED.
3	LED +	20 AWG	Violet	Connect to positive (red) wire of external LED.
4	Solenoid -	20 AWG	Brown/White	1.5A Low Side output. Connect to optional flow control solenoid.
5	Boost Safe LS Out	18 AWG	Green	1.7A Low Side output. Grounded when error condition exists.
6	Pump Power	16 AWG	Pink	Connect to the positive (red) wire of pump.
7	Ground	16 AWG	Black	Main ground connection, connect directly to battery ground.
8	Level Switch+	20 AWG	White	Connect to the white wire of the fluid tank level sensor*
9	Level Switch-	20 AWG	Brown	Connect to the black wire of the fluid tank level sensor*
10	Arm Switch +	20 AWG	Yellow	Arms injection system. Connect to a switched 12V source.
11	Empty-Not Used			Not Used
12	Power 12V	16 AWG	Red	Main Power Connection, connect directly to positive battery terminal.

*Note: If fluid tank is equipped with previous generation level sensor, identified by having two black wires, then pins 8 (white) and 9 (brown) may be connected to either of the two black sensor wires. The polarity is unimportant.

**Note: If you need to extend the wires to mount the controller use at least 16 AWG wire for the pump *and* controller ground circuits and 18 AWG for the remainder.

External LED Install

Find a suitable location in the driver's line of sight to mount the external LED. Mount the LED and run the wires to the controller. The LED indicates the operation of the controller. If the pump is off and there are no errors the LED will be off. If there are no errors and the pump is on the LED intensity will vary with the pump speed. If there are any errors they will be indicated by flashing the LED.

Boost Pressure Hose

Using the supplied vacuum tee and rubber hose, tap into a manifold pressure (vacuum/boost) line.

Pump/Tank Flush

After all wires are hooked up, add water to the tank and with the hose pointed into a container, press and hold the "TEST" push button on the controller module. The "TEST" button can be used to test the system. The pump speed will gradually increase from zero to full speed over 3

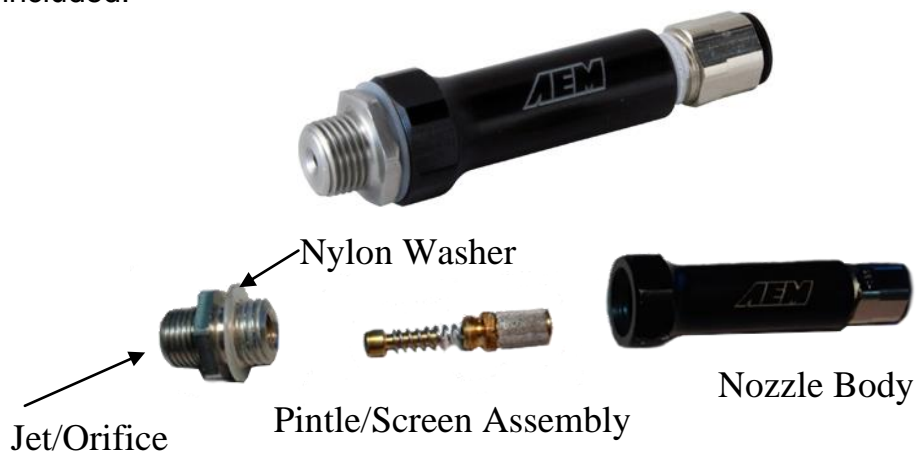
seconds, and then remain full for another 3 seconds before stopping. Repeat the “TEST” button procedure until you are sure the system is free of any debris that may have been in the lines or tank. Drain the water out of the tank and refer to the next section on installing the nozzle.

Nozzle Selection and Assembly

This injection kit includes three different sized injection jets that cover a very large range of horsepower levels. Use the following chart to select the appropriate jet for your power level. The kit comes with one medium nozzle already preassembled.

HP	Fuel Flow N/A (.5 BSFC)	Fuel Flow F/I (.7 BSFC)	W/M Flow N/A	W/M Flow 5-10psi Boost	W/M Flow 10-25psi Boost	W/M Flow 25+psi Boost	Nozzle
150	788	1101	95	220	275	330	250
200	1050	1469	126	294	367	441	500
250	1313	1836	158	367	459	551	1000
300	1575	2203	189	441	551	661	1000 + 500
350	1838	2570	221	514	642	771	1000 + 1000
400	2100	2937	252	587	734	881	
450	2363	3304	284	661	826	991	
500	2625	3671	315	734	918	1101	
550	2888	4038	347	808	1010	1212	
600	3150	4406	378	881	1101	1322	
650	3413	4773	410	955	1193	1432	
700	3675	5140	441	1028	1285	1542	
750	3938	5507	473	1101	1377	1652	
800	4200	5874	504	1175	1469	1762	
850	4463	6241	536	1248	1560	1872	
900	4725	6608	567	1322	1652	1983	
950	4988	6976	599	1395	1744	2093	
1000	5250	7343	630	1469	1836	2203	

The nozzles are serviceable and can be disassembled for cleaning. If you find excessive debris in the screen, check your tank for contamination. When installing the screen it is only necessary to be slightly tighter than finger tight. **Do not over-tighten.** The nylon washers are reusable but a spare is included.



Nozzle Mounting

Select the location where the nozzle will be installed. **Nozzle should be mounted such that it is higher than the tank.** Nozzle must be mounted **before** the throttle plate. Nozzle should also be mounted **after** the MAF sensor if present. Nozzle must also be mounted **after** any intercoolers. In most instances, mounting the nozzle 6-8" ahead of the throttle body provides an excellent combination of air charge cooling and combustion control.



In most instances, the air charge piping can be drilled and tapped for 1/8" NPT to directly mount the nozzle. If using thin walled tubing it's suggested that a bung be welded to the piping. Mounting hole should be tapped deep enough to allow the end of the nozzle to be nearly flush with the interior of the intake once the nozzle is fully installed.

Pump/System Check

The "TEST" push button on the controller module can be used to test the system. Press and hold the button to activate the pump. The pump speed will gradually increase from zero to full speed over 3 seconds, and then remain full for another 3 seconds before stopping. When the button is released the controller will return to normal operation.

Add water to the tank and with the nozzle pointed into a container, press and hold the test button. The flow will start gradually and increase to a steady amount. If this happens then your system is connected properly. Check and repair any leaks. Drain the water out of the tank and install the nozzle.

Fluid Compatibility

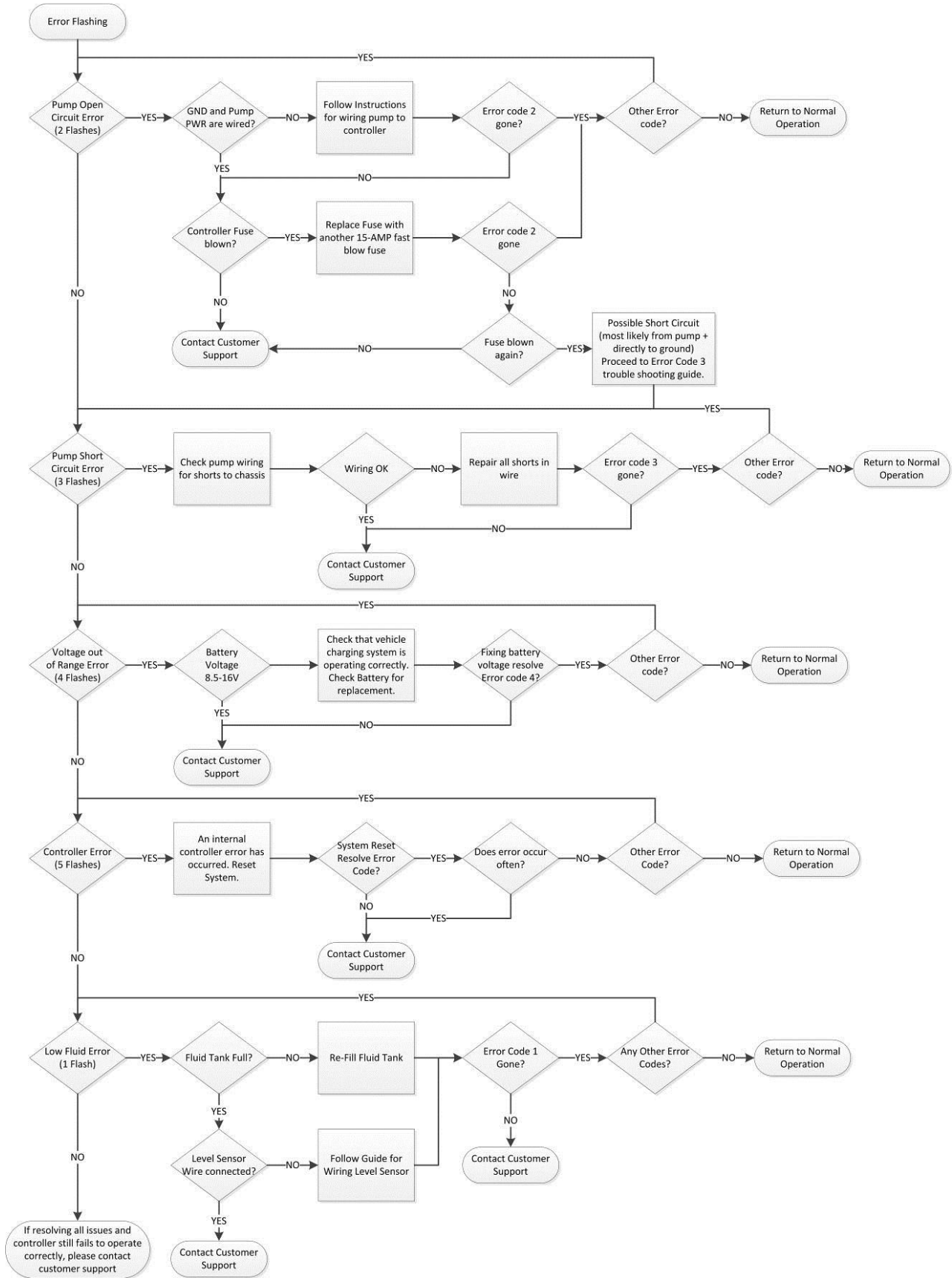
Under **NO** circumstances should any **hydrocarbon based fuel** ever be used with this system. **Water** and **Methanol** are the **ONLY** fluids to be used.

System Errors

The controller will continuously check for errors; when an error is detected it will be reported to the user by a flashing sequence of the external LED, as well as a corresponding red flashing sequence of the status LED. Damage to vehicle or engine may occur if these faults are not resolved immediately. The water-injection system may not operate properly or at all while an error condition exists. Please refer to the table below for further information.

# of Flashes	Error	Description	Controller/Pump Status	Recommended Action
1	Low Fluid	The amount of fluid in the tank has been detected to be below the level of the sensor.	- BoostSafe Enabled - Pump will continue to run	Refill fluid reservoir.
2	Pump Open Circuit	An open circuit has been detected in the circuit (wiring) that drives the pump.	- BoostSafe Enabled - Pump will NOT continue to run	Check for a blown controller fuse and pump wiring for disconnects.
3	Pump Short Circuit	A short circuit has been detected in the circuit (wiring) that drives the pump.	- BoostSafe Enabled - Pump will NOT continue to run	Check pump wiring for shorts to the chassis.
4	Voltage Out of Range	The voltage powering the controller has been detected to be outside the range of 8.5V - 16V.	- BoostSafe Enabled - Pump will NOT continue to run	Check power connections to controller and that vehicle charging system is operating properly.
5	Controller Error	An internal controller error has been detected.	- BoostSafe Enabled - Pump will NOT continue to run	Call AEM Tech Support @ 1-800-423-0046

Troubleshooting Diagram



Controller

Settings

The AEM Water Methanol Injection Controller is a progressive type controller. This means that fluid will be injected in proportion to the amount of boost that is detected by the internal MAP sensor. In other words, more boost equals more fluid. It is therefore imperative that the vacuum/pressure connection be made properly and securely or vehicle/engine damage could occur. In addition, the controller will automatically compensate for any fluctuations in battery voltage variations to ensure consistent flow under all conditions.

The two knobs on the face of the controller dictate at what manifold (boost) pressure minimum fluid injection starts and at what pressure maximum/full fluid injection occurs. Fluid injection will 'progressively' increase between these two points as set by the adjustment knobs.

The "Start PSI" dial has a range from 1 psig (full counterclockwise rotation) to 11 psig (full clockwise rotation). The "Full PSI" dial has a range of 5 psig (full counterclockwise rotation) to 35 psig (full clockwise rotation). It is suggested to adjust the "Start PSI" value by setting the dial to approximately 25% of the vehicles maximum boost. Adjust the full-in value to your maximum possible boost. These are only suggestions; improper use or setting could result in engine or vehicle damage -- please consult your tuner.



Status LED

The controller has an on-board Status LED. This will mimic the operation of the external LED. Upon startup the current mode is flashed in green on the status LED. It will flash error codes in red as well as illuminate with varying intensity as a function of flow in green.

Fuse

The controller has an externally accessible fuse. The controller itself will turn on and function, but the pump will not run without the fuse. If the controller is reporting an open circuit it may be that the fuse has blown, and or is not installed correctly. Use a 15 amp fast blow fuse for replacement purposes.

“Test” Button

The Test button feature is available to test the systems functionality. This feature should be used **ONLY** with the nozzle disconnected from the engine. This is to prevent unintentional pumping of fluid into the engine. To operate the test button press and hold. The pump speed will gradually increase from zero to full speed over 3 seconds, and then remain full for another 3 seconds before stopping. Flow should begin gradually and then hold at full pressure for a total test time of 6 seconds.

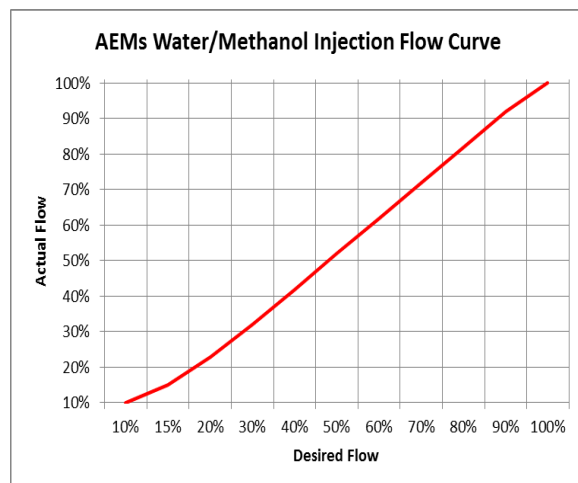
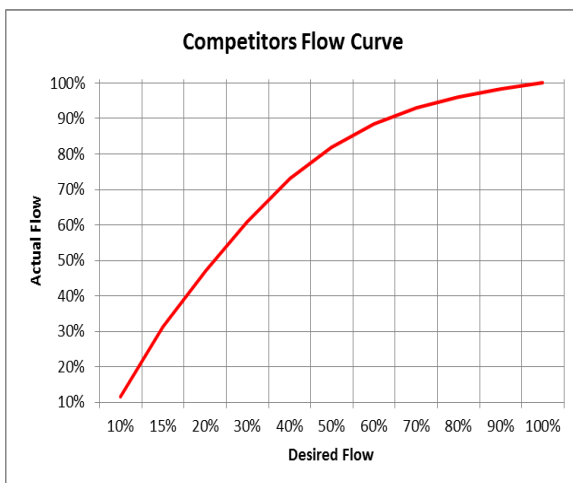
Short circuit self-diagnostics

There are two modes of pump-driver short circuit protection available. One can detect a short at any time but produces a slight buzzing in the pump. This should not be noticeable under most conditions, but can be turned off if it is objectionable. If turned off, a short circuit can only be detected when the pump is running.

To enable or disable this diagnostic (and the buzzing): Press and hold the “Test” button while applying power to the controller. The change is acknowledged by a single long flash of the status LED output and the external LED. Once the button is released the controller will continue to function normally. You can also tell what mode has been selected by listening for the buzzing sound in the pump. Repeating this operation will toggle between the two modes.

A More Linear Flow Output

AEM’s Water/Methanol Injection system delivers a linear flow rate as pump speed increases. This is unlike competitors’ systems that simply have a linear pump speed drive between start and full setting which results in a non-linear delivery of water/methanol. AEM’s system linearizes the flow, giving you better flow control and a more progressive delivery of water/methanol.



Boost-Safe Output (optional)

The progressive controller includes a Boost-Safe output (grounded when active) that activates whenever the system is armed and runs out of fluid or an error code is flashing. The green wire on the controller is the 1.7 amp switched ground. This wire can be hooked up to a solenoid that will vent waste gate pressure when activated. Apply 12v to the other side of the solenoid (AEM P/N 30-2400 or equivalent). This output can also be used to trigger a timing retard function in a standalone ECU or a CDI whenever the system runs out of fluid, thus protecting your engine. It is highly recommended that this feature be utilized.

Solenoid Driver (optional)

The progressive controller includes a Solenoid output (Brown with white strip wire grounded when active, 1.5A max) that activates whenever the system is pumping. The wire should be connected to the ground side of a solenoid, with the other end of the solenoid connected to switched ignition power. The solenoid should be installed after the pump and before the nozzle. For best results install the solenoid close to the nozzle.

Non-Progressive Operation (optional)

The progressive controller is capable of operating in a non-progressive manner, acting as a full on or full off type system. To set this up the "Full PSI" knob must be set to a lower value than the "Start PSI" knob. This means as soon as the boost exceeds the "Start PSI" threshold the pump will begin pumping at its maximum flow since it has passed both the start and the full requirements.

Engine Tuning

Water/methanol injection is generally not considered a bolt-on power adder for forced induction gasoline applications. Engine tuning is usually required in order to maximize potential power gain. Water/methanol injection allows for a more aggressive tune to be used while still using pump gas as your base fuel.

Using a 50/50 mix of water/methanol is recommended for the best combination of air charge cooling and detonation control. With conservative boost and timing, establish a base AFR that is one point higher than your final target AFR. For example, if your final target AFR with water/methanol injection is 11.0:1, set your base AFR to 12.0:1. Once the base AFR has been set, start injecting water/methanol and adjust the injection flow rate to achieve your final target AFR. For example, if before injection your base AFR is 12.0:1 and then during injection your AFR drops to 10.5:1, reduce the water/methanol flow rate until your final target AFR is reached. It is generally recommended that the flow rate of the injection system be changed in order to reach your target AFR and **NOT** your primary fueling. Injection flow rate adjustments can be made by changing your nozzle selection or by adjusting the "Start PSI" and "Full PSI" settings.

Once the injection flow rate is set to deliver your desired final AFR, boost and ignition timing can be increased to take advantage of the additional air charge cooling and detonation control. When injecting the correct amount, a 50/50 mix of water/methanol has been shown to provide an effective octane of over 110 when using a base fuel of 91-93 octane pump gas. A properly tuned water/methanol injection system will usually support a typical "race gas" engine tune.

Important Safety Notice Regarding Methanol

AEM strongly recommends that users never exceed a 50% methanol concentration when using any AEM Water Methanol system or component.

All AEM water/methanol injection systems and components (pump, lines, fittings, filter, flow sensor, tank, and nozzles) are 100% chemically compatible with methanol. However, for safety reasons we strongly recommend that users never use more than a 50% methanol concentration in our systems.

Methanol is a toxic and highly flammable chemical. 100% Methanol ignites easily and burns vigorously with an almost undetectable flame. Methanol can be absorbed through the skin and even small amounts can cause blindness or even death. Using this fluid at high pressures, without dilution, in an under-hood environment with nylon lines and push-to-connect fittings is very unsafe. The performance advantages of using greater than 50% methanol concentrations are small, if they exist at all. However, the safety issues are very real and far outweigh any perceived benefit of running high concentrations of methanol.

Note: AEM holds no responsibility for any engine damage or personal injury that results from the misuse of this product, including but not limited to injury or death caused by the mishandling of methanol.

Cold Weather Operation

A Water/Methanol mix will also lower the freezing point of the fluid. Below is a chart with freezing points for different percentages of water/methanol mixtures.

Temperature	Methanol Concentration % by volume
20 deg F	13
0 deg F	24
-15 deg F	35
-40 deg F	46

Maintenance

The injector nozzle should be cleaned periodically. Disassemble the nozzle and clean it with a suitable cleaner until all debris is removed. If excessive contamination is found check the rest of the system for the source.

Optional System Upgrades

Water/Methanol Injection FAILSAFE Device AEM P/N 30-3020/30-3020M



Actively monitors the entire flow curve independent of pressure, continuously collecting flow vs. injection rate data so that any deviation from your established flow curve will trigger an alarm output that can be used to reduce boost or timing, change maps, add fuel, trigger a two-step or perform practically any action you choose to save your engine. It is PC programmable (with USB connectivity) which eliminates the guesswork when setting min/max threshold parameters. **HIGHLY RECOMMENDED** for all water/methanol injection systems

Water/Methanol Injection Flow Gauge – AEM P/N 30-5141/30-5142



Displays flow rate data on a smooth moving needle-type gauge that allows you to accurately monitor the status of your injection system in real time. Available in max flow rates of 500 cc/min or 1000 cc/min with a black or white face. The AEM water/methanol injection filter is **HIGHLY RECOMMENDED** when using this flow gauge.

Water/Methanol Injection Filter – AEM P/N 30-3003



Inline filter that uses a micron mesh screen to filter out particles as small as 40 microns. Allows a cleaner flow of water/methanol into the injection pump, lines, and nozzles increasing overall system longevity. Injection filter is **HIGHLY RECOMMENDED** when using the AEM water/methanol injection flow gauge.

Additional Nozzle Kit – AEM P/N 30-3012



Includes one nozzle body, two jet sizes, and the necessary hardware to run a second nozzle in your injection system.

5 Gallon Tank – AEM P/N 30-3010



Upgrade to a 5 gallon tank to maximize your fluid holding capacity. Includes level sensor and mounting hardware.

[Performance Air Intake Systems](#)