2015 Mustang Aquamist HFS-4 Installation Guide

I chose the Aquamist system for my Ecoboost Mustang, despite its considerably-higher expense over the competition, because it seems to be the most comprehensively well-engineered system with the best built-in failsafe. The major competitors' inadequate or non-existent failsafes rendered them non-options for me. There are several gaps in the Aquamist installation instructions, so I am attempting to capture as much of my learning as possible for anyone coming behind me with a Mustang installation.

This is a fairly advanced installation. You'll need to know how to read wiring diagrams and schematics in addition to general mechanical competencies like making holes, measuring, wiring, and so on. You assume and are responsible for any and all risks and any and all damage that occurs from your installation.

Install Time: plan for four full days

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Tools, Materials, and Parts Needed (other than standard tools, wrenches etc.)

- 1. Snow Performance tank <u>https://www.americanmuscle.com/snowperformance-upgraded-reservoir.html</u>
 - a. Fits perfectly in the right side of the trunk.
 - b. You will need a nylon plug from the hardware store and run the tank backwards. I neglected to capture the details on the size of the plug. Sorry.
- Autometer A-pillar for single gauge. Paint it flat/matte black for a better match to the right pillar. <u>https://www.americanmuscle.com/auto-meter-a-pillar-gauge-mount-single-2-16-in.html?utm_content=Interior%20-%20Gauges%7CAuto%20Meter&T5_Var4=394229&utm_source=google-pla&utm_medium=shopping&T5_Var2=shopping&utm_campaign=AMM+Mustang+Ve_hicle+Medium+RLSA&T5_Var3=blue&intl=0&dialogtech=ppc&gclid=EAIaIQobChMI_LiS4pLq4QIVUP7jBx0hagAYEAQYAiABEgKBMfD_BwE&gclsrc=aw.ds
 </u>
- 3. Tubing cutter <u>https://www.amazon.com/Lisle-11420-Hose-</u> <u>Cutter/dp/B0002NYB6O/ref=sr_1_4?keywords=nylon+tubing+cutter&qid=1556157407</u> <u>&s=gateway&sr=8-4</u>
- 4. Crimp connectors
- 5. Solder butt connectors
- 6. Posi-taps (18AWG and 16AWG)
 - a. I know many feel these are a cop-out I disagree. They permit tapping a wire without ruining the harness by cutting and splicing, especially if you might ever want to undo it. Fill the whole thing with dielectric grease and water won't get in (this is a non-issue in the cockpit).
- 7. Fuse taps. Again, the alternative to this "cop-out" is cutting into a second ECU harness. Avoiding this is a no-brainer.
 - a. Mini fuse Add-A-Circuit for the red wire in the ECU harness. Allows connection to fuse #38 instead of cutting into the second ECU harness. <u>https://www.amazon.com/Littelfuse-FHM200BP-mini-fuse-Add-A-Circuit-Kit/dp/B000FIWAP0</u>
 - b. I didn't actually use this, but in hindsight, I should have used a micro2 Add-A-Circuit in the interior fuse box for the red wire in the Molex connector. I ran mine out to the underhood box because no one had a micro2 locally. https://www.amazon.com/Littelfuse-FHM20200ZPA-Micro2-Add-A-Circuit-Kit/dp/B01L46PEDG
- 8. ¹/₄", 3/8", and ¹/₂" split-loom tubing
- 9. Heat shield tubing
- 10. Wire coat hanger for pulling wire/line
- 11. Touch-up paint for preventing rust in holes drilled in the body
- 12. General hardware (screws etc.) of your choice (suggest 8mm heads) and some sheet metal; tin snips if you can't find a precut selection.
- 13. 3/8" thick nylon spacers for the tank straps
- 14. Step drill bit for 22mm holes

Plan Your Installation

- 1. Most provided harnesses and tubing are just barely long enough to fit the Mustang, and I had to redesign my whole plan to ensure they'd fit.
- 2. Controller goes in the glove box.
- 3. Protect all tubing and harnesses in split-loom.
- 4. The Red, Yellow, and Gauge harnesses, and only the black, white, and purple wires of the Molex power harness get routed across the dash to driver's side; Red and Yellow harnesses continue out to the LF fenderwell.
- 5. Red wire of the Molex power harness (must be extended to reach underhood fuse box, or use fuse tap as suggested above), red wire from pump, and the ECU harness into the RF fenderwell.
- 6. 6mm line from tank, to pump, down the right underbody raceway to the *FAV* in the LF fenderwell.
- 7. Pump harness from spare tire well goes down the right door sill.
- 8. There is a round nipple on each large, oval firewall grommet in the fenderwell cut these off for passing wiring through from the cockpit to the front of the car (see photo p. 9). You'll probably need to partially dislodge the grommet to find the path through it.

Tank Installation

- 1. The Snow tank was sourced for its ideal fitment in the right-hand trunk "pocket". The downside is the tank will be more susceptible to sloshing than the Aquamist unit (which will fit somewhere if you're willing to give up significantly more trunk space), and about a gallon of the 2.5G capacity is wasted due to curvature and outlet/level sensor positioning.
- 2. Plug the outlet with a nylon plug from the hardware store. I think it was ¹/₂" NPT, but you'll need to double check because I threw away the wrapper by accident. Use the E6000 sealant provided with the Snow kit and give it at least a full day to cure.



3. Drill a 22mm hole for the outlet opposite from the stock outlet. I centered mine 15mm above where the wall became straight, avoiding the molded curve, and 15mm off to the right to avoid the mold parting line.



4. Drill another 22mm hole on the right side, nestled into the two molding run marks. This is slightly higher than the outlet, and centered fore-aft, which should minimize the impact of fluid slosh.



- 5. Install the outlet and level sensor per instructions.
- 6. Remove the right-hand molded trunk carpet. Position the tank into the pocket in the carpet, and mark where you want the holes with a marker.
- 7. Poke holes however you prefer (I used a utility knife). Insert the bolts/washers from the bottom. Place 3/8" spacer on the bolts, then the tank straps, then the nuts and washers, and secure.
 - a. Add a piece of sheet metal under the carpet for extra security if you feel it's necessary I did not.
- 8. Make a hole in the carpet behind the tank and route the covered level sensor harness down to the spare well.



Methanol Vent Installation

1. The Snow tank's cap is too thick, so you will need to grind/machine it from the inside to make this fit. I used a ¹/₂" flat/square router bit in my drill to remove enough material to make it fit. After that, install per instructions.



2. Cover and route the provided tubing through the same hole in the carpet for the level sensor cable, through a hole in the large plug/grommet in the rear of the spare well, and trim to length. Photo shows the tube from under the car.



Pump Installation

This layout is for the Performance Pack with the fix-a-flat system instead of a spare.

- 1. Cut a piece of sheet metal large enough to mount the pump (or get lucky, like I did, and find this piece of "hobby metal" at Lowe's) and fasten to the floor. Lay out the provided bolts/nuts to fit the pump mount as shown below.
- 2. Mount the bracket assembly as shown in the rear; in the front, use a stack of spacers or washers (~3/4" thick), or double-nut the screw to level. Use two front screws if you insist. Paint all holes to prevent rust. Quick-dry the paint with a hot air gun.



3. Fit the pump and snug the nuts.

6mm Line Plumbing

1. Create a hole in the carpet directly behind the tank outlet and route the line to the pump inlet. Keep it short, but don't stress the line.



- 2. You will need almost all of the provided length of 6mm line to make it to my *FAV* location in the LF fenderwell if you follow my path.
- 3. You may need to gently heat the line end to get it onto the pump fitting. Don't overheat or you'll ruin it just warm it for some extra flexibility. Don't forget to put the compression fitting nuts on the lines before attaching.
- 4. Create an appropriately-sized hole in the floor for the line and a grommet. Locate the hole to prevent stressing the line and pump fitting. Paint the hole, install the grommet, and route/attach the line.



5. I ran my line with the others that go up over the exhaust, through the fenderwell, and into the left side raceway/cable tray. Remove the three raceway nuts and just slide it in place; reinstall the nuts. I used three layers of aluminum foil as a temporary heat shield (I later replaced the foil with real heat shield).



- 6. Remove the LF fenderwell liner.
- 7. Route the line up through the metal bracket, then along the the existing harnesses in the fenderwell to the front, securing with zip ties.





Pump Harness Routing

- 1. Remove the lower interior plastics, from the fuse box cover to the rear seat area, and the RF fender liner.
- 2. Attach the relay to the foam block for the flat tire pump (it works fine and it's one less hole in the body). Plug in the pump and level sensor connectors; attach the ground wire to one of the pump bracket screws. The photo below also shows how the vent tube and wires are routed.



3. Cover the pump wiring with 3/8" split-loom tubing. Route down the right door sill, following existing harnesses.



- 4. The red wire goes through the big firewall grommet into the fenderwell, up to the battery box, and connects to the positive battery cable; cover this portion with ¹/₄" split-loom tubing.
- 5. The blue harness goes up to the glove box.
- 6. These are the only two wires that are too long. Coil and zip tie the blue harness to a manageable length and tuck away.

FAV Installation

- 1. Remove the top nut and reconfigure the FAV as shown below.
- 2. Install the *FAV* bracket. This location is right next to the cold-side charge pipe, permitting a very short line to the nozzle. The metal here is thick and the provided screws don't work. I used some self-drilling, stainless screws and a cordless impact to force the issue. Remove the screws to paint the holes, force dry, and install the bracket.
- 3. Mount the *FAV* to the bracket.
- 4. Terminate the 6mm fluid line and attach the red and yellow harness connectors.
- 5. Routing the 4mm line to the nozzle and wiring are discussed later.



ECU Harness Installation

- 1. Ensure you have the correct diagrams for your car. I scoured the internet and worked with Richard to identify v2 as correct; yours may be different. The Aquamist v2 drawing is for the Ford ECU harness with 15-pin width (C1551E); v3 is for 16 pin width.
- 2. Cross reference your Aquamist diagram with a Ford diagram to ensure they match (function, color, and AWG). Tapping the wrong wires could end in disaster!
- 3. Route the Aquamist ECU harness from the glove box, through the firewall grommet, along the top of the fenderwell, and into the engine bay by the ECU.

- 4. Unlatch and remove the top ECU plug (C1551E). Access the wires by cutting the zip tie off the end cap and working it off with a small screwdriver. Cut back the tape as far as necessary.
- 5. I used dieletric grease-filled Posi-taps for all connections at the ECU, except for the brown and white Aquamist wires for the boost controller failsafe, where I used heat shrink solder butt connectors and a heat gun. Protect everything behind the target or you'll melt it.



6. Break out the red wire from the Aquamist ECU harness and route to an Add-A-Circuit on fuse #38 (the blue wire on pin 101 of the bottom ECU harness (C1551B) leads to this fuse). This allows you to avoid tampering with a second ECU harness. I used a 3A fuse in the top position, with the factory 20A fuse in the bottom position.



7. Replace the tape you removed on the Ford harness, reinstall the end cap with a zip tie, and reinstall the plug to the ECU.

Left-side Harnesses

- 1. Work backwards from the FAV.
- 2. Red and Yellow Harnesses
 - a. Route these along the existing harnesses in the fenderwell, through the firewall grommet, and into the driver's footwell. You need every inch of these harnesses made available in the glove box plan accordingly.



- 3. Power Harness
 - a. Tape all but the red wire into a harness. The red wire goes to a different place.
 - b. "Neck down" your black and white harness wires into a single 18AWG wire to connect to the headlight switch harness.
 - i. Strip and twist the black and white wires together, and crimp on a 16AWG male spade connector.
 - ii. Crimp a female 18AWG spade connector on one end of a short length (~2") of 18AWG black wire; mate the connectors.
 - c. Remove headlight switch.
 - d. Route the Molex end of the harness through the headlight switch hole so it comes out in the footwell.
 - e. Using 18AWG Posi-taps, Strip and mate your black and purple wires to the headlight harness BK-BU (pin 4) and VT (pin 15) wires, respectively.



4. Connect your gauge harness to the gauge (the installation instructions provided with the A-pillar are adequate), route down the gap exposed by the removed a-pillar trim, and into the footwell. Leave some slack.



5. You will now have four harnesses in the driver's footwell – Red, Yellow, Black, and Molex. Combine all four into ½" split-loom tubing, and pull through the gap on top of the transmission tunnel with a straightened coat hanger, and into the passenger side footwell. Adjust and route along the bottom of the dash (avoiding all pedals), securing with zip ties.



Controller Installation

- 1. You should now have all your harnesses available in the passenger footwell.
- 2. Drop the glove box by disconnecting the strut, and squeezing in the sides of the bin to release the two rubber stops.
- 3. Route the harnesses through the gap behind the glove box, up and over the rear of the glove box, connect to the controller, and secure the controller where it fits best.
 - a. I secured mine with adhesive Velcro strips. Command strips won't stick.





Silicone Hose Adapter/Nozzle Installation

- 1. Select the hose adapter thickness on the high side. Ex.: if you measure 5.5mm silicone thickness, select the 6mm adapter. You cannot force the smaller size.
- 2. Mark the installation location before removing the charge pipe. I put mine just above the intercooler outlet.
- 3. Support the backside of the hose with a piece of wood. I used an old bat.
- 4. Position the punch at the mark and whack it with a hammer until it's through.



5. Lube the hole and adapter liberally with silicone spray and pull the adapter through from the inside. You may have to complete the fitment by tucking the outer surface of the hose under the outer flange with a very small screwdriver.





6. Reinstall the charge pipe.



- 7. Route, trim to length, and cover an adequate length of 4mm line from the *FAV* to the nozzle location.
- 8. Install the nozzle on the line first the silicone charge pipe will just squish around if you try to push the line onto the installed nozzle.
- 9. Install the nozzle with a wrench, route the line back to the *FAV*, and terminate.



Notes on Initial Testing

- 1. The Aquamist manual is mostly sufficient. They insist the green harness must be connected, even though it is unused. I connected it for testing and then removed it.
- 2. Ignore step 2, p. 12 (pushbutton start has no ACC position).

- 3. Ensure you have plenty of water in the tank. I tried to put in "just enough", so there'd be less to siphon out later, but then I almost immediately ran it below the trigger level for the level sensor; once this is tripped, the system is inoperable until refilled.
- 4. The pump never went "very quiet", as the manual states, or even so much as changed volume or pitch, under testing. It sounded like this: <u>https://youtu.be/BfEpZc0dmps</u>, which is normal. The good news is you can't hear it once your interior is reassembled (maybe if you have quiet exhaust).
- 5. The dimmer will turn the gauge lights off completely if you turn it all the way down.
- 6. I was surprised to not feel anything upon the first road test, but I believe that was due to the Ford ECU dialing back the fuel injection to accommodate the methanol and maintaining an ideal air-fuel ratio. You can (should) test whether you're getting spray by datalogging WOT runs with and without methanol, and comparing the STFT% results. *STFT%* will be much lower with the methanol. See:

http://stratifiedauto.com/blog/detecting-wmi-failure-using-fuel-trims/

- 7. The SC trim setting is unstable at first, so don't try to lock it in until you've begun tuning. I adjusted mine to six bars repeatedly and it just wouldn't stick. As best I can tell, this is another effect of the STFT% offset, tricking the Aquamist system into spraying less. Just leave the SC trimmer where you set it during testing, until tuning is underway.
- 8. Complete all the testing steps in the Aquamist manual, and then tune the engine. Only set the failsafe after tuning is complete. Leave DFS linked throughout the tuning process.
- 9. My red 95% IDC LED on the controller board would not light at any RPM, so I adjusted the GAIN potentiometer to $\sim 150\%$ (see photo below) to make it come on around the same time as the injectors reached 100% IDC. I don't know if this is truly necessary, but it seemed like the ideal setup to ensure full flow from the system while maintaining full progressive control. Incidentally, cranking GAIN to max (+200%) did result in a slight additional decrease in STFT%, but my tuner and I decided the progressive control and full bandwidth were more important.
 - a. Set the gauge to display IDC by placing the *PRK* jumper in the *FDC* position.
 - b. Make several WOT runs, tweaking the gain until the red LED lights just a little before 100% IDC is displayed on the gauge.

Setting the Failsafe

1. Unlink both DHB and DFS once tuning is complete, enabling the failsafe. Store the link somewhere safe and secure. This setup enables the failsafe but prevents it from tripping when the system is turned off. Since I have a non-WMI tune on one slot, and the WMI tune on another, this setup allows me to turn the Aquamist system off and switch to the non-WMI tune for full drivability. Turning the system off with DHB linked, as the manual recommends, would trip the failsafe and put the car into low boost mode, regardless of the tune slot chosen. Here's what my board looks like at completion.



- 2. I settled on five gauge bars for full spray, at first, because just one click clockwise for *SC* would take it to seven bars. More on this later.
- 3. The gauge ramps up so fast, especially in lower gears, it can be hard to tell if you're tripping *WL* or *WH*, so I found that setting *WH* all the way clockwise and focusing on *WL* alone, to start, worked best.
- 4. Do some very slow rolls of the throttle and some throttle stomping, creating different load profiles, for setting *WL*. Keep clicking the trimmer counter-clockwise until you stop tripping the failsafe.
- 5. I also found that hills matter for *WL*, so make sure you get some uphill, low-speed, rollon throttle action before you decide you're done with *WL*.
- 6. Only after you're sure *WL* is set, shift your focus to *WH*. I found this easy to do on the highway with varied throttle application in fourth and fifth gear pulls.
- 7. Start *WL* with ten clicks back from fully-clockwise, and adjust it until you get the failsafe to trip. You should also confirm the failsafe is working when you get it to trip on the highway, because it's harder to feel the boost drop in the lower gears.
- 8. Only after you've confirmed the failsafe is actually cutting boost, set *WH* two clicks clockwise from the trip point.
- 9. At this point, it struck me that only using five bars of the gauge and having *WH* to the left of 12:00 seemed like a lot of wasted gauge resolution, so I gave *SC* one more click clockwise, resulting in seven bars max, and I reset *WH* accordingly. A second clockwise click of *SC* would put me at eight bars, so I left it at seven. I like this a lot better, even

though the manual says to set *SC* for five or six bars. Here's what my gauge trimmers look like at completion.



10. When tuning is complete and the failsafe is set, you're finally done!