Air Oil Separator for BRZ/FR-S/86/GR86

2023-02-13 PSP-ENG-612

Thank you for purchasing this PERRIN product for your car! Installation of this product should only be performed by persons experienced with installation of aftermarket performance parts and proper operation of high performance vehicles. If vehicle needs to be raised off the ground for installation, the installer must use proper jacks, jack-stands and/or a professional vehicle hoist for safety of the installer and to protect property. If the vehicle is lifted improperly, serious injury or death may occur! Please read through all instructions before performing any portion of installation. Always use appropriate personal proection equipment such as gloves, eye and hearing protection for installation of this product. If you have any questions, please contact our tech department prior to starting installation. We can be reached in any of the following methods:

Email Tech@PERRINperformance.com
Instant Chat off the main page of www.PERRINperformance.com
Or simply call our tech team at 503-693-1702

WARNING: This product can expose you to chemicals including Lead which is known to the State of California to cause cancer birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov

GENERAL MODIFICATION NOTE

Modifications to any vehicle can change the handling and performance. As with any vehicle extreme care must be used to prevent loss of control or roll-over during sharp turns or abrupt maneuvers. Always wear seat belts, and drive safely, recognizing that reduced speeds and specialized driving techniques may be required. Failure to drive a vehicle safely may result in serious injury or death. Do not drive a vehicle unless you are familiar with its unique handling characteristics and are confident of your ability to maintain control under all driving conditions. Some modifications (and combinations of modifications) are not recommended and may not be permitted in your state or country. Consult the owner's manual, service manual, instructions accompanying these products, and local laws before purchasing and installing these modifications. You are responsible for the legality and safety of the vehicle you modify using these components.

SPECIAL NOTES:

- **The included foam filter/diffuser is not recommended to be used in climates that drop below freezing temps. Normal water vapor that travels through the engine can collect on this and freeze, causing a restriction in flow through the AOS. The AOS will function perfectly fine with this piece removed. This diffuser is recommended for race cars that can see excessive oil sloshing into the heads during high "G" cornering, as this helps diffuse any massive amounts of oil that could reach the AOS.**
- The PERRIN Air Oil Separator (AOS) was designed to remove a significant amount of the oil and water vapor that normally gets sent to your intake system to be ingested by your engine. There are many variables as to how much oil will make it past our AOS but expect it to remove a significant amount of the crank case blow by. For cars with built engines with excessive blow-by, or have an aftermarket turbo or supercharger, you may still experience oil getting past our Air Oil Separator.
- When installing hoses to barb fittings, a small amount of oil on each fitting will allow hoses to slide on easier.

NPT Notes:

- There are NPT (National Pipe Thread) fittings included with your Air Oil Separator. Throughout the instructions, these notes below will be referred to often. It's important to understand these types of fittings and how they work.
- NPT fittings are a tapered thread that seals when tightened, not bottomed out. Thread fittings in by hand and tighten roughly 1/2 to 1 full turn more until fitting is tight. **NOTE: Use a small amount of Teflon tape or proper thread sealant on threads of each NPT fitting before installing into each part.**
- Angle of the 90 degree fitting can be adjusted after tightening, as long as it is not backed off more than 1/4 of a turn. When in doubt, tighten the fitting versus loosen it.

Included Parts with PERRIN Air Oil Separator:

QTY	Part Number	Description
1	X-ASM-ENG-605	Air Oil Separator Universal w/ 7 Ports
3'	X-HOS-115	5/16" Heater/Coolant Hose
8'	X-HOS-120	1/2" Emissions/Crank Case Vent Hose
1'	X-HOS-104	1/4" Fuel Hose
1	X-PSP-ENG-627	Bracket for BRZ/FR-S AOS
2	X-CON-056BK	Aluminum 3/8NPT -1/2" Hose Barb 90 Degree Black
1	X-CON-058BK	Aluminum 3/8NPT -1/2" Hose Barb Straight Black
1	X-CON-045	Nickel 1/2" Barb 3/8NPT, Straight
1	X-CON-044	Nickel 5/16" Barb 1/8NPT, 90 Degree
2	X-CON-043	Nickel 5/16" Barb 1/8NPT, Straight
1	X-CON-053	1/2" Barb to 3/8NPT Female (EDP 240)
1	X-BLT-00375PPS	3/8NPT Socket Plug Steel
2	X-BLT-M8X10CSB-SS	M8 X 10 Button Head SS Screw
1	X-BLT-M8NF-Z	M8 Nut
2	X-BLT-M8X25WF-Z	M8 Fender Washer
10	X-CLAMP-006	Clamp Size 6 or 12-22mm
5	X-CLAMP-002	Clamp Size 2 or 8-16mm
3	X-CLAMP-17.0	Clamp Oetiker 17.0
1	X-CON-063	Plastic 1/2" to 1/4" Reduction Tee
1	X-CON-038	Plastic 1/2" Y Connector
1	X-CON-039	Plastic 5/16"- 5/16" Straight
1	X-CON-009	Plastic 1/2"-1/2" Straight

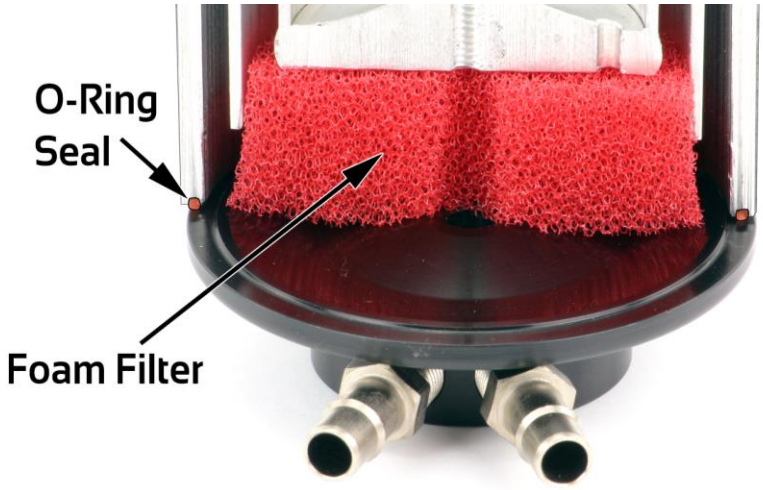
WHICH WAY IS THE RIGHT WAY?

In ALL situations, when describing left and right sides of the vehicle it is always as though you are sitting in the driver's seat looking forward.
Example of a US Market Vehicle: If standing in front of the car, looking at the engine bay, the Drivers side is described as the LEFT side the vehicle.

1. Assembly of Air Oil Separator (AOS)

a. Each AOS is pre-assembled with M6 bolt, nylon seal, O-ring, and foam filter inside for packaging purposes. To ensure your AOS has an oil tight seal, ensure that bolt is hand tightened before finishing installation. Failure to tighten M6 bolt will lead to vacuum leaks and oil leaking out bottom of can.

b. **See above note regarding the use of the foam filter/diffuser in your AOS, to determine if you should remove it. In most cases it should be removed due to the potential for freezing conditions.**



Cutaway Showing Internals of AOS

c. Removal of bottom will be necessary to accurately tighten fittings. IF this is done, or bolt is loosened too far, the O-ring may become dislodged from the groove in the AOS body. Before tightening bottom, ensure that the O-ring is sitting equally around groove in bottom of AOS body. **NOTE: Some powder coating will be in the groove, and this is ok as the O-ring will seal once tightened.**

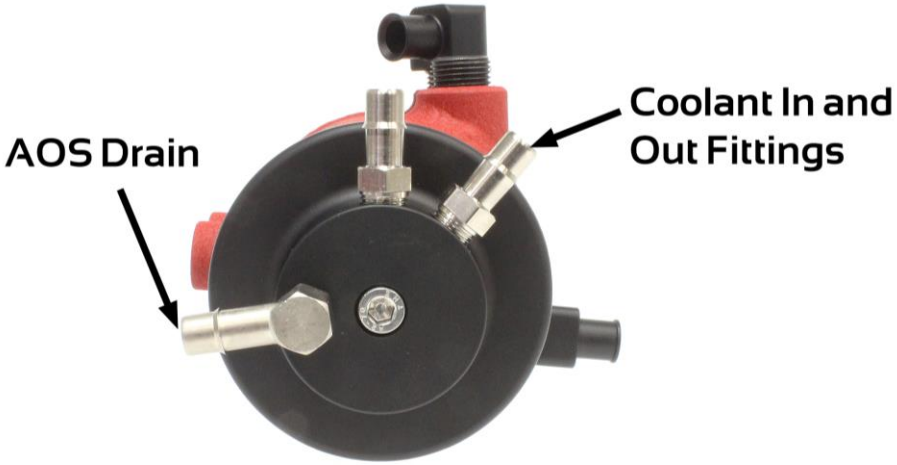
d. Orientate bottom to desired position (based on steps below) and hand tighten bolt. Double check that bottom fits evenly all the way around the bottom of the body. **NOTE: A slight mismatch can occur if bottom is pushed to one side or to the other. Make sure bottom is relatively centered over body while tightening, or an oil leak can occur.**

e. These above steps may need to be done a couple times throughout the installation.

2. Orientation of Fittings on Bottom and Body

a. Using diagram below and NPT fitting notes above, install (2) 5/16" Straight NPT fittings into side ports on bottom. **NOTE: Removal of bottom is recommended to tighten fittings properly in a vise.**

b. Using diagram below and NPT fitting notes above, install 5/16" 90-degree fitting into bottom. It is important to make sure that the fitting is oriented similarly as shown when fitting is tight. If fitting is tight and doesn't line up properly, unscrew fitting half a turn and re-tighten until it lines up. This may take a couple of times until fitting lines up and is tight enough to seal. **NOTE: The orientation of fitting may need to be adjusted after AOS is mounted to chassis. The diagram provided should get you very close to the correct alignment.**



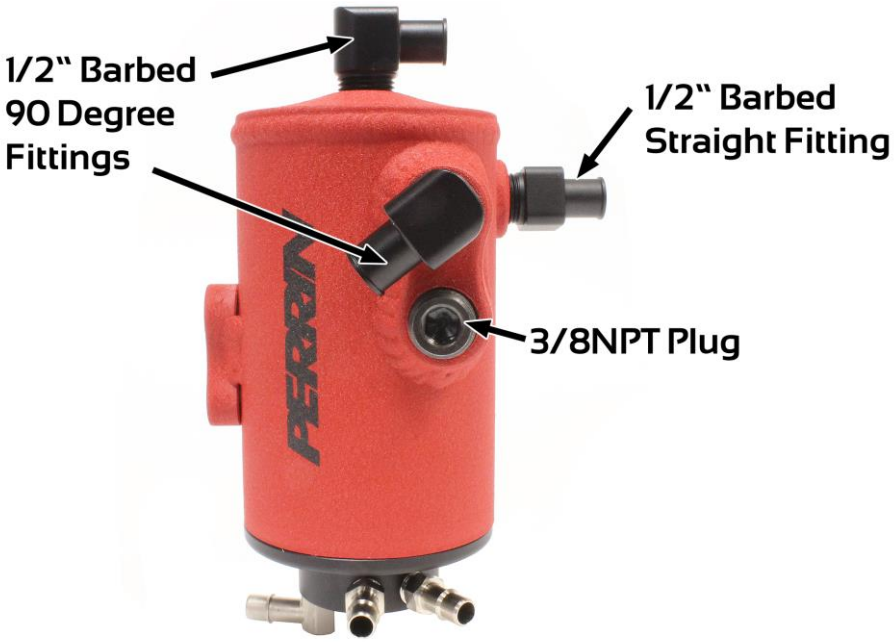
Orient Fittings As Shown

c. Using diagram below and NPT notes above, install (1) 1/2" 90-degree fitting (marked 056) into port on top of AOS, making sure that when fitting is tight, that it aims 180 degrees away from mounting flange.

d. Using diagram below and NPT notes above, install (1) 1/2" 90-degree fitting (marked 056) into single side port on AOS, making sure that when fitting is tight, that it is aligned as shown pointing toward down and to the left.

e. Using diagram below and NPT notes above, install (1) 3/8NPT plug into the bottom port on the dual port side on AOS.

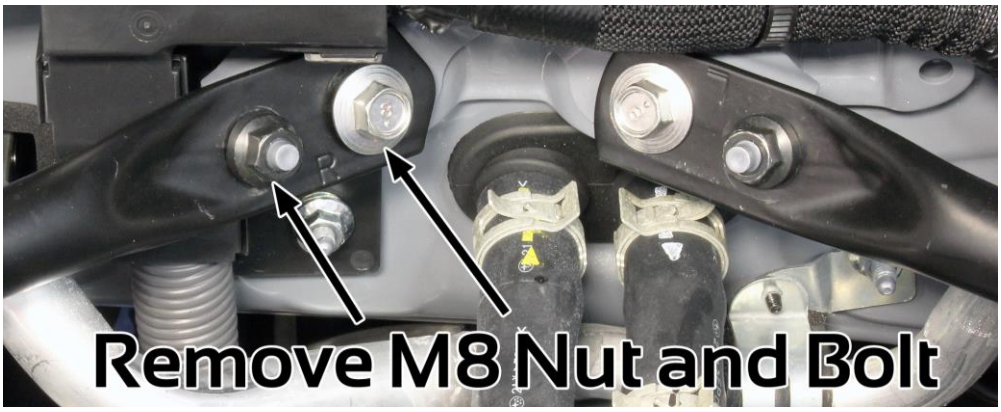
f. Using diagram below and NPT notes above, install one 1/2" straight fitting (marked 058) into remaining side port on AOS body.



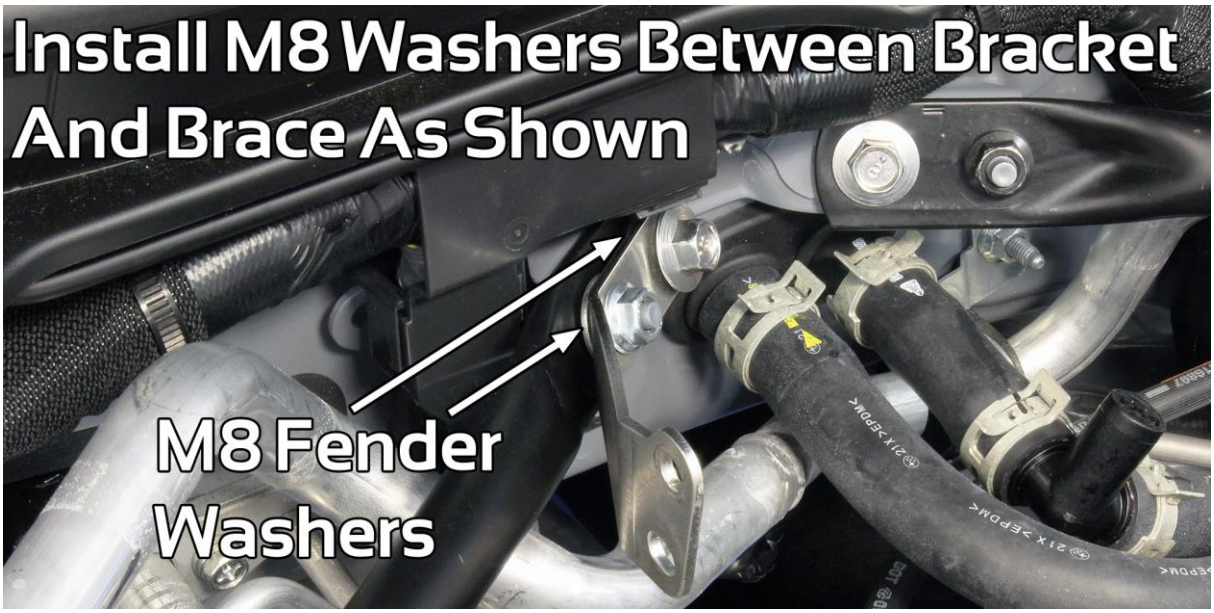
Orient Fittings As Shown

3. Air Oil Separator Mounting Bracket Installation

a. Locate and remove M8 nut and bolt from strut tower brace as shown in picture below.

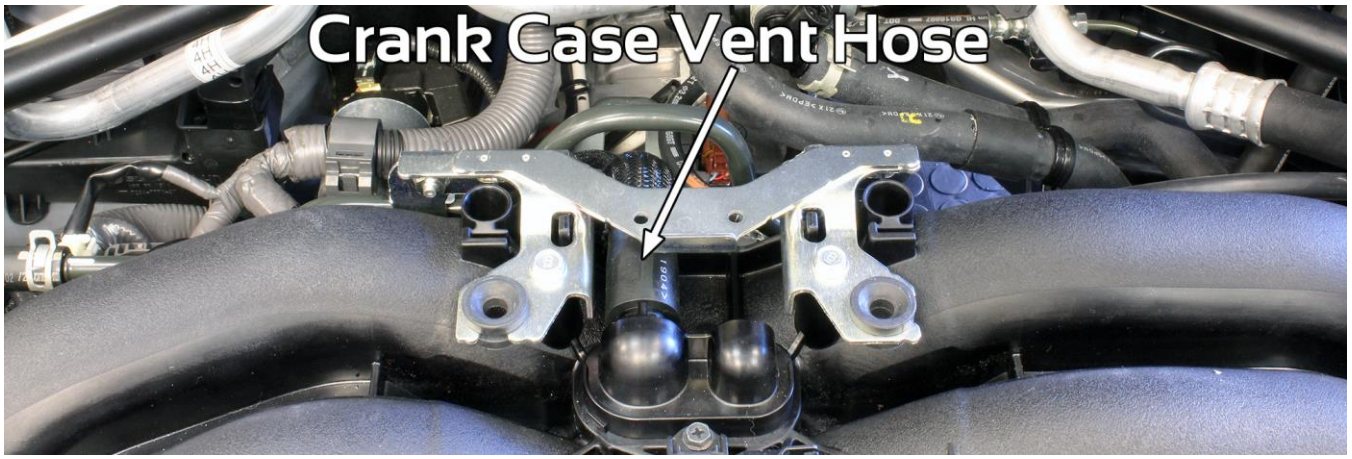


b. Install supplied M8 fender washer over stud, the place supplied bracket over stud and M8 hole.
c. Slide remaining M8 fender washer behind the bracket, then reinstall M8 bolt removed in previous step to secure. Tighten to 15ft-lbs for now as this may need to be adjusted in later steps.

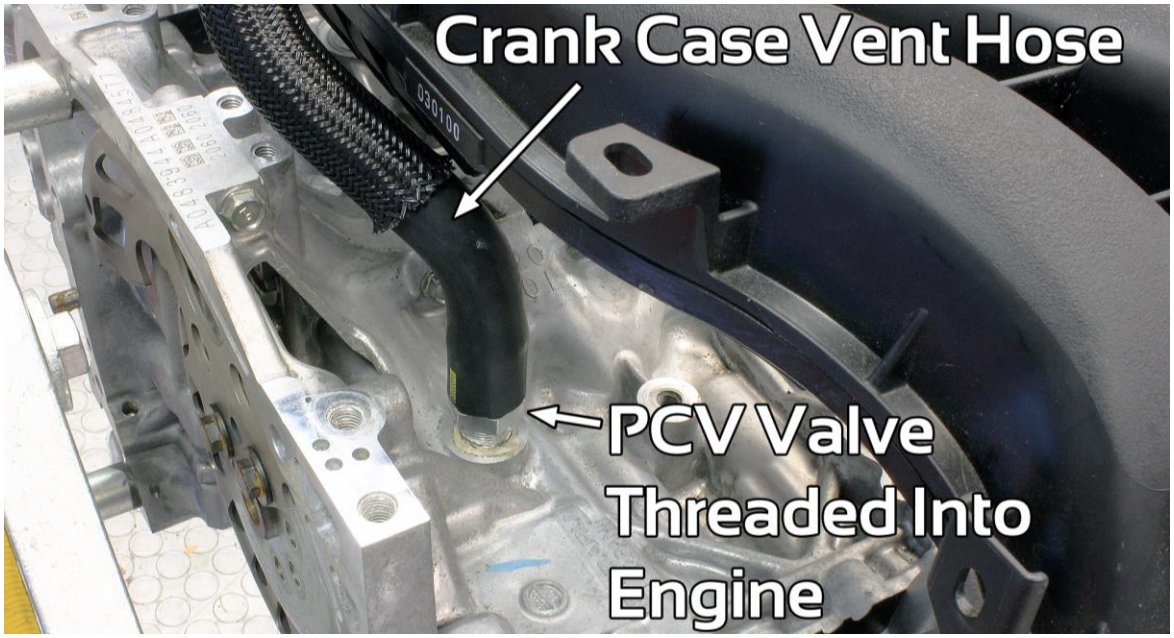


4. PCV Valve Relocate/AOS Drain Fitting Installation

a. Make sure engine has cooled off or been sitting for at least 1 hour.
b. Remove plastic engine cover and locate crank case vent hose on rear of manifold. **NOTE: For 2013-2020 models, the larger of the two hoses is the crank case vent hose. On the 2022+ models there is only one hose (shown in picture below).**

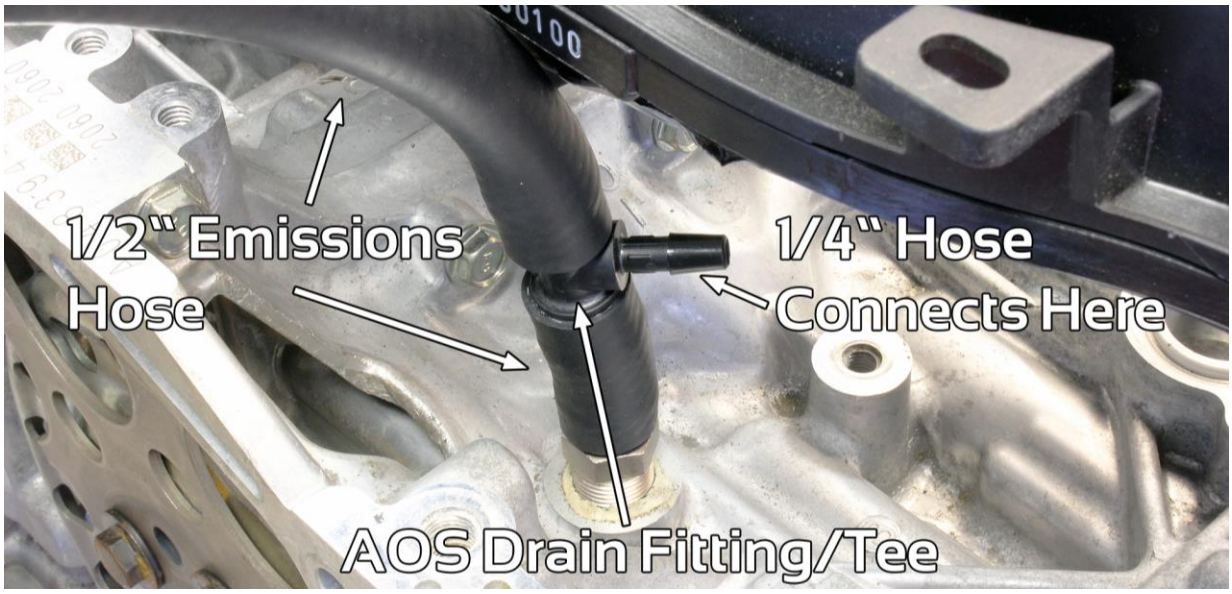


c. Follow hose down behind intake manifold toward the engine block and remove hose from PCV valve. Rotate hose toward left side of vehicle (this may require pliers to “pop” free at the intake manifold).



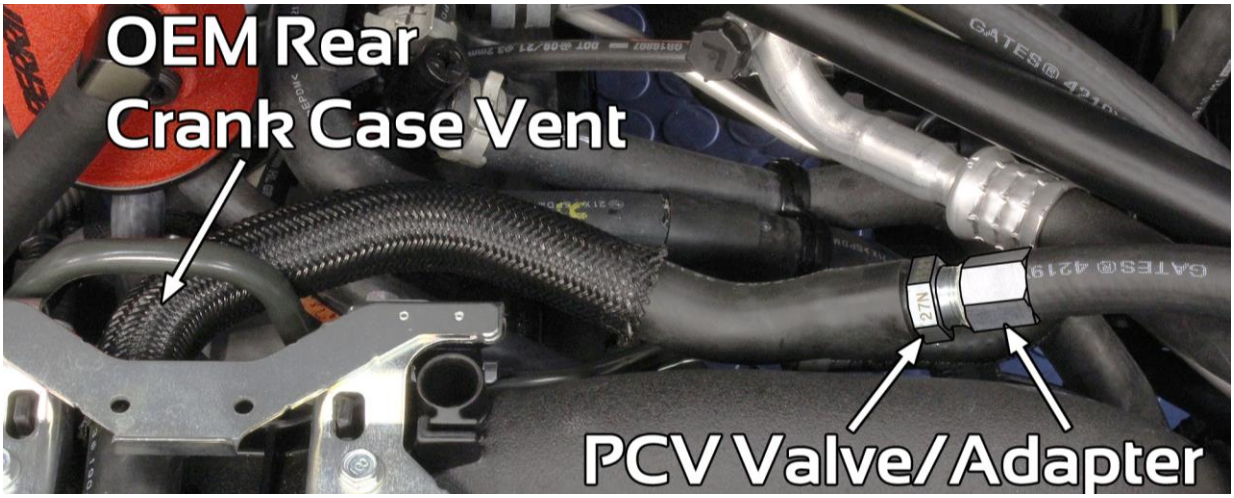
d. Using a universal joint and a 22mm deep socket (or 19mm deep socket for 2013-2020 models) remove PCV valve from engine block.
e. Using NPT notes above, install supplied 3/8” NPT to 1/2” barbed hex fitting into block as shown in pictures below.

f. Cut roughly 2” of the supplied 1/2” emissions hose and install it onto fitting on block, then install supplied 1/2"-1/4” reducer tee into hose on block. Cut roughly 10” of 1/2" emissions hose and install it onto tee fitting. **NOTE: These connections do not require clamps, but if you choose to install them, use supplied size 6 clamps to secure each connection.**



a. Install supplied 1/4" fuel hose to 1/4" leg of supplied 1/2" to 1/4" tee. Hose routing does not matter at this point as it will connect to 90-degree fitting on bottom of AOS in future step. This hose does not require a clamp, but a supplied size 2 clamp can be used to secure it.
b. Using the above NPT notes, install PCV valve into supplied 3/8NPT female to 1/2" bar fitting as shown below.

c. Connect PCV valve side of the above assembly into crank case hose coming off intake manifold. Hose should be rotated as shown below. **NOTE: It is important to make sure that the PCV valve is connected to the OEM hose, NOT the supplied adapter fitting.**
d. Connect supplied 1/2" crank case vent hose to the supplied adapter/fitting and secure hose with supplied size 6 hose clamp. Temporarily route house around engine toward the intake and leave hose long for now.



5. Air Oil Separator Mounting

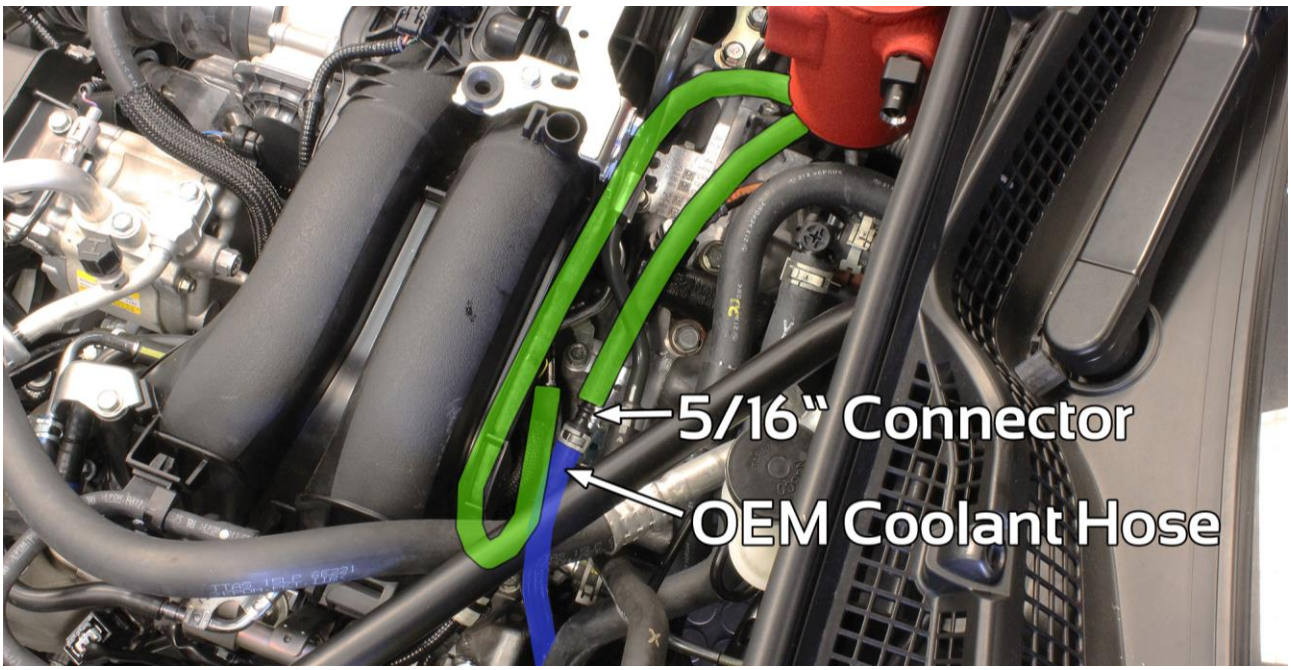
a. Double check AOS orientation and that bottom has been assembled correctly.
b. Using supplied M8x10 screws, mount AOS to bracket as shown below. Before final tightening of screws, make any adjustments to align AOS as vertical as possible. Once bracket is aligned, tighten M8 screws to 15 ft-lbs. **NOTE: If M8 nut and bolt need to be loosened to adjust the bracket where it mounts to the chassis, make sure to retighten them to 15 ft-lbs.**

6. Coolant Feed Connections

The coolant connection is necessary as it helps reduce water vapor and sludge that can build up in AOS. Do not skip this step or AOS will not function as it was designed. **NOTE: Installing coolant connection will cause some coolant loss and coolant spill. Make sure to top off coolant after installation is complete.**

a. Install supplied 5/16" straight connector to one end of the supplied 5/16” coolant hose.
b. Behind intake manifold on left side of engine, locate small coolant hose and pipe that feeds coolant to the throttle body.

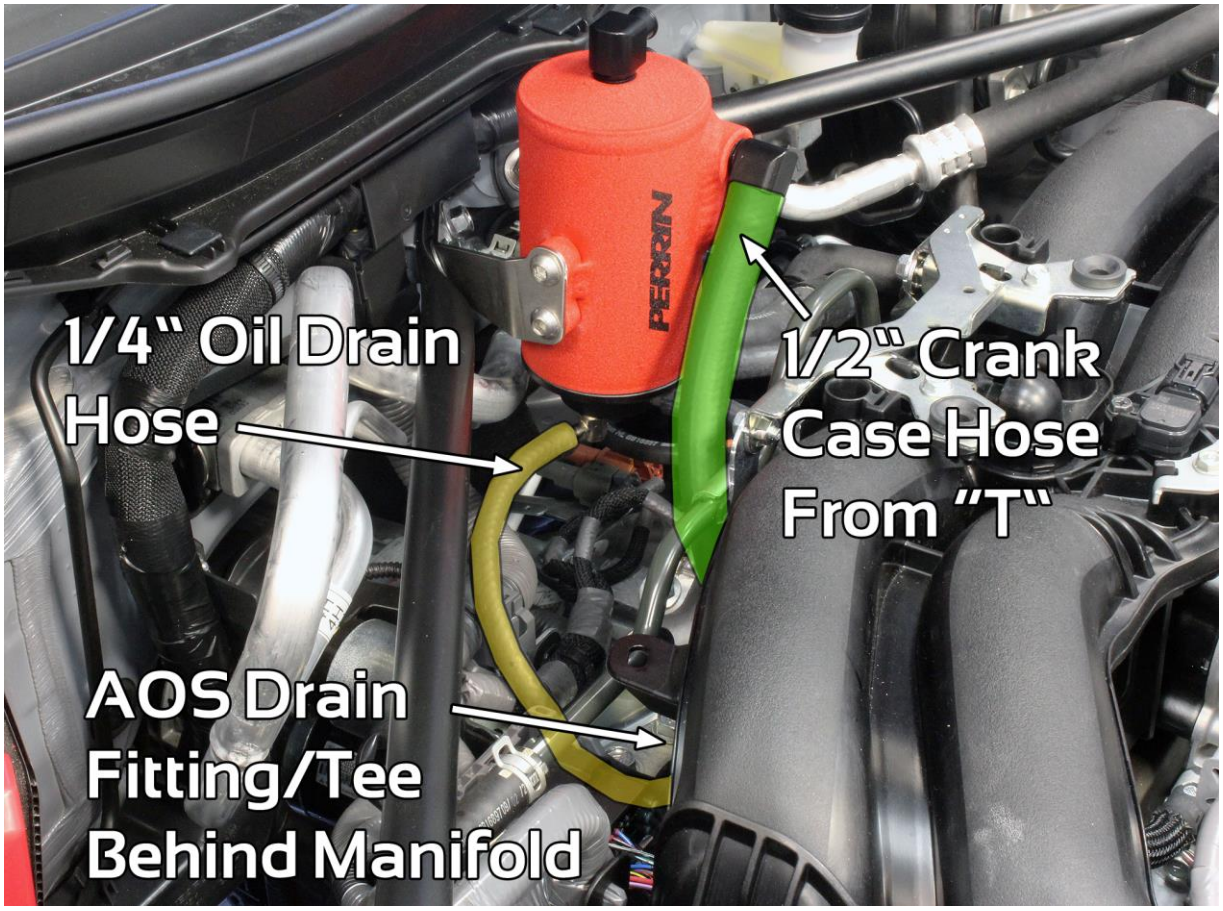
c. As fast as possible (to reduce any coolant spillage) slide back pinch clamp, remove rubber hose from small coolant pipe and install it onto the plastic 5/16" straight connector, then connect remaining side of supplied 5/16” coolant hose to left over fitting on block. Slide pinch clamp over hose to secure it to the coolant pipe.
d. Route hoses (leave it in a loop to control coolant loss) toward the AOS, making sure they are routed in a smooth way and away from moving parts. See picture below for a rough diagram of how this should look.



e. Cut hoses to length to fit to each of the coolant fittings on the bottom of the AOS. **NOTE: It does not matter which hose goes to which fitting.**
f. Install supplied size 2 clamps over hoses, then install hoses to fitting and secure with clamps. **NOTE: Included with each kit are two different types of clamps, a worm drive type and a lower profile crimp type. The crimp type clamp requires the use of a nipper/single ear crimping tool to secure. If you are not familiar with this type of clamp, install the supplied worm drive clamp.**
g. Using supplied zip ties, secure coolant hoses along engine components to make sure they are secured out of the way.

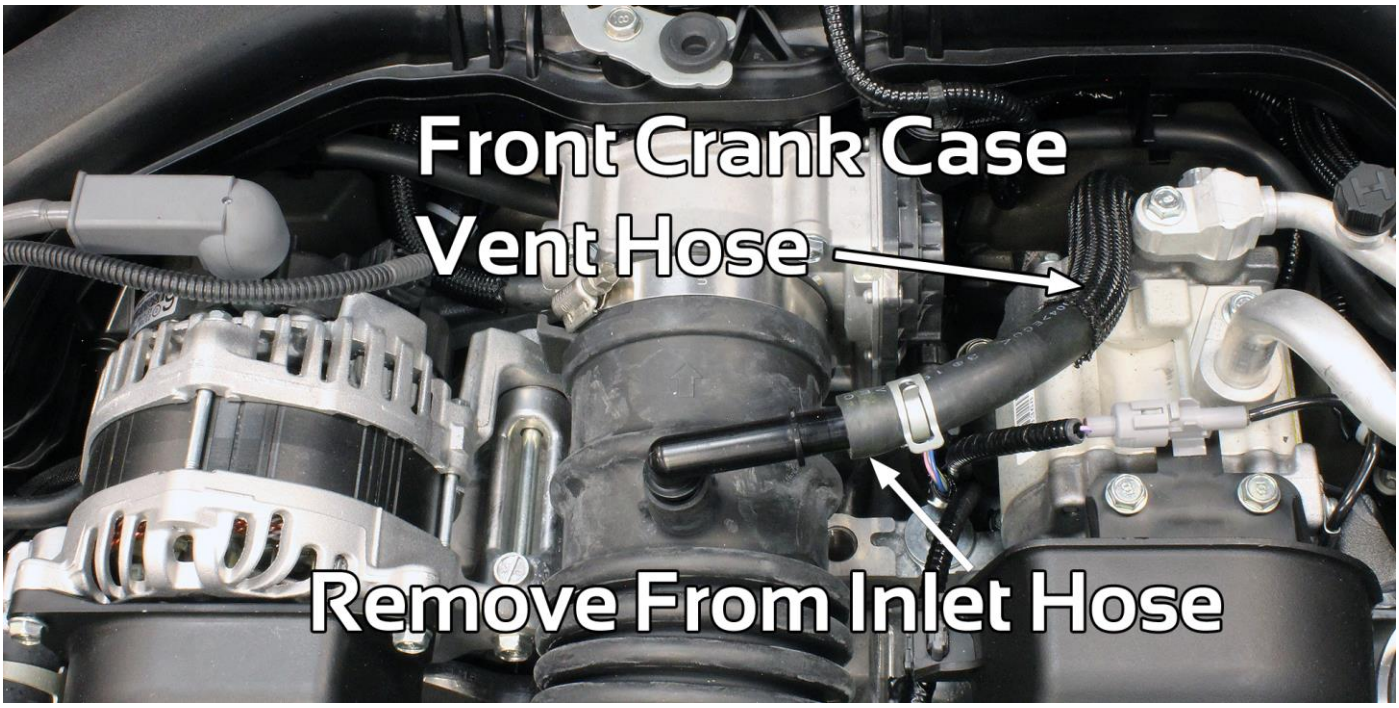
7. Rear Crank Case Vent/AOS Drain Connection

a. Using picture below, install and cut to length the rear crank case vent hose to front fitting on AOS as shown, then secure with supplied size 6 hose clamps. **NOTE: Make sure hose has no kinks in it after it is connected.**
b. Install and cut to length the AOS drain hose to the 90-degree fitting on the bottom of the AOS. Make sure that drain hose does not go up hill or has any sharp bends to it, or the AOS will not properly drain. **NOTE: This connection to the bottom does not require a clamp to secure, but if you would like to, secure this connection with one of the supplied size 2 hose clamps, or lower profile crimp type clamp.**



8. Front Crank Case Vent Connection to AOS

a. Using picture below, locate and remove front crank case vent hose from OEM plastic fitting on inlet hose.
b. Install supplied 1/2" straight connector into OEM hose and secure with pinch clamp removed. **NOTE: You can replace the OEM hose at the engine block but this requires removal of the AC compressor and other additional steps.**



c. Connect some of the supplied 1/2" crank case vent hose to plastic fitting and route hose around engine back to side fitting (straight fitting) on AOS body. Trim hose to length and secure with supplied size 6 hose clamp. See picture below for how this will look.

9. AOS Outlet and PCV Connection

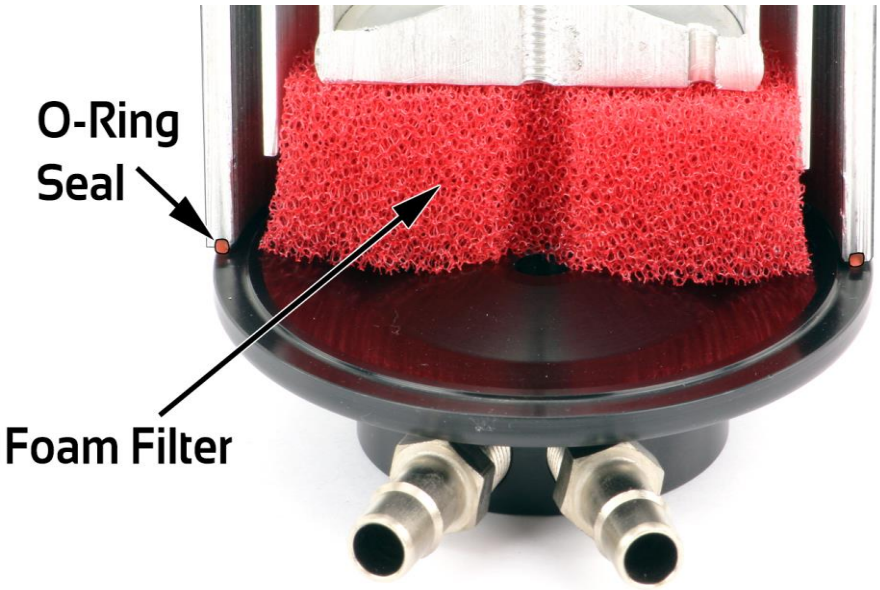
a. Cut roughly 5” of 1/2" crank case vent hose and connect it to the OEM plastic fitting on the inlet hose.
b. Install supplied 1/2" Y fitting to end of 5” long hose as shown in picture below.
c. Connect and trim to length the 1/2" crank case vent hose from the PCV Valve/Adapter to one of the legs of the Y connector.
d. Using remaining supplied 1/2" crank case hose, connect the last leg of the Y fitting to the top port on the AOS and secure with supplied size 6 clamp.

10. Final Checks and Testing

a. Use supplied zip-ties secure all hoses away from extremely hot parts and moving parts of the engine.
b. Reinstall plastic engine cover.
c. Start car and listen for any vacuum leaks and look for any check engine lights. If no check engine lights appear, let car warm up completely and check for any leaking coolant from hoses and fittings. If no leaks are found, take car for test drive.
d. After roughly 30 min of driving stop and recheck that there are no leaks found. Fix any leaks before continuing to drive car.
e. After 2-3 weeks of driving check all fittings for leaks (mainly for oil leaks) and fix any leaks before continuing to drive car.

Maintaining your Air Oil Separator

- There is very little maintenance required with the PERRIN AOS. From time to time you may want to remove it and clean out some of the oil residue from the inside. Before taking apart, double check you have the spare O-ring in case you find the O-ring is damaged.
- Leaving coolant hoses and oil drain hoses attached to bottom, remove bolt in bottom of AOS using an M5 wrench and remove AOS Body from car. Take note of nylon washer under head of bolt or located in AOS bottom. If this is damaged or missing, please call tech support and order another one.
- If foam filter/diffuser was installed, remove and use a biodegradable degreaser, liberally spray and let it sit for a few minutes. Wash out with warm water until it rinses clean water and is free of oil. Do NOT use brake cleaner on this part as it will destroy the foam.
- Using a biodegradable degreaser, liberally spray inside can and let it sit for a few minutes. Wash out with warm water until inside of AOS is clean and free of oil.



Cutaway Showing Internals of AOS

- Remove and inspect O-ring thoroughly and even remove from bottom to ensure it is not cut or cracked. **Note: Do NOT use brake cleaner to clean O-ring as damage may occur.**
- Install O-ring into groove on into AOS body, making sure it is fully seated in groove and not sticking out.
- Reinstall foam filter/diffuser into AOS body. **NOTE: Remember this is not recommended in climates that drop below freezing.**
- Reinstalled AOS body to bottom, making sure to secure with bolt and nylon washer under head of bolt. Hand tighten bolt, making sure that bottom is lined up with body and O-ring is not sticking past it.

Questions, Comments and Suggestions Contact: Tech@PERRIN.com
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