BRZ / GT86 / FR-S Air Oil Separator (AOS)

Install Manual

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Document Revisions

Rev	Date	Author	Description
01	2016/08/13	E. Hazen	Initial release of install manual
02	2016/08/21	E. Hazen	Revised Coolant Kit Install
03	2016/10/13	E. Hazen	Revised Hose Routing Explanation
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1. Introduction

1.1. Overview: Detailed instructions on installing the AOS for the FRS / BRZ / GT86 chassis.

1.2. Difficulty: Beginner

1.3. Time Required: 1-3 hours depending on optional add ons

1.4. Tools Needed:
1.4.1. Ratchet
1.4.2. 10mm (Socket or wrench)
1.4.3. Scissors
1.4.4. Extension(s)
1.4.5. Wobble Socket
1.4.6. Needle nose pliers
1.4.7. 4mm Allen wrench
1.4.8. 7/8” deep socket
1.4.9. 19mm deep socket
1.4.10. 1/4" allen wrench
1.4.11. Monkey wrench

1.5. AOS Kit
1.5.1. Full assembled and pressure checked AOS
1.5.2. 6 feet of 1/2" hose
1.5.3. 6 inches of 3/8” hose
1.5.4. Bracket
1.5.5. Hardware Bag

1.5.5.1. (1) M6x1.0 x 16mm Stainless BHCS
1.5.5.2. (1) M6 Stainless Washer
1.5.5.3. (1) 3/8” to 1/2” hose adapter
1.5.5.4. (2) 3/8” NPT to ½” adapter
1.5.5.5. (1) 1/2" hose cap
1.5.5.6. (1) 1/2" spring clamp
1.5.5.7. (8) zip ties

1.6. Optional Drain Kit

1.6.1.1. (1) Check Valve
1.6.1.2. (1) Pre-assembled push-lok drain like
1.6.1.3. *Note* - Needs cam block off plate to be a bolt on affair, included in picture below

1.7. Optional Coolant Kit

1.7.1.1. (2) M12x1.50 Banjo Bolt
1.7.1.2. (4) M12 crush washer
1.7.1.3. (2) 3/8" hose banjo
1.7.1.4. (4) 9-16mm hose clamp
1.7.1.5. (5) feet of 5/16" coolant hose

2. Air Oil Separator Install

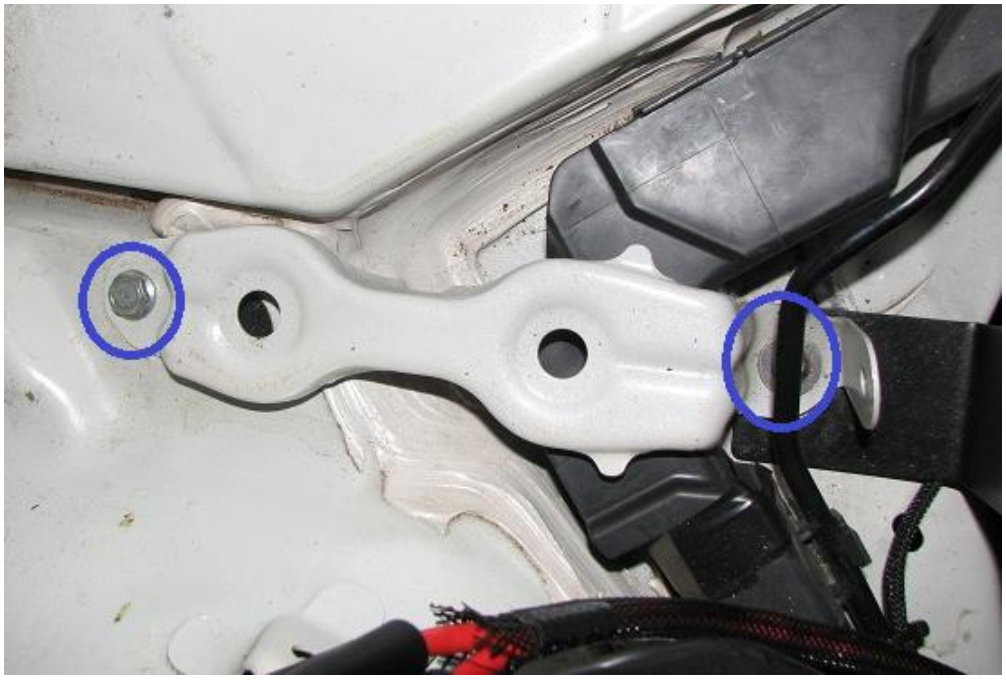
2.1. We are not responsible for damage to you or your vehicle by following this manual and/or installing Verus Engineering products.

2.2. We begin this installation with removing the battery as we need to access a bolt underneath the battery. Remove the negative terminal first (circled in green) and then the positive (circled in red).

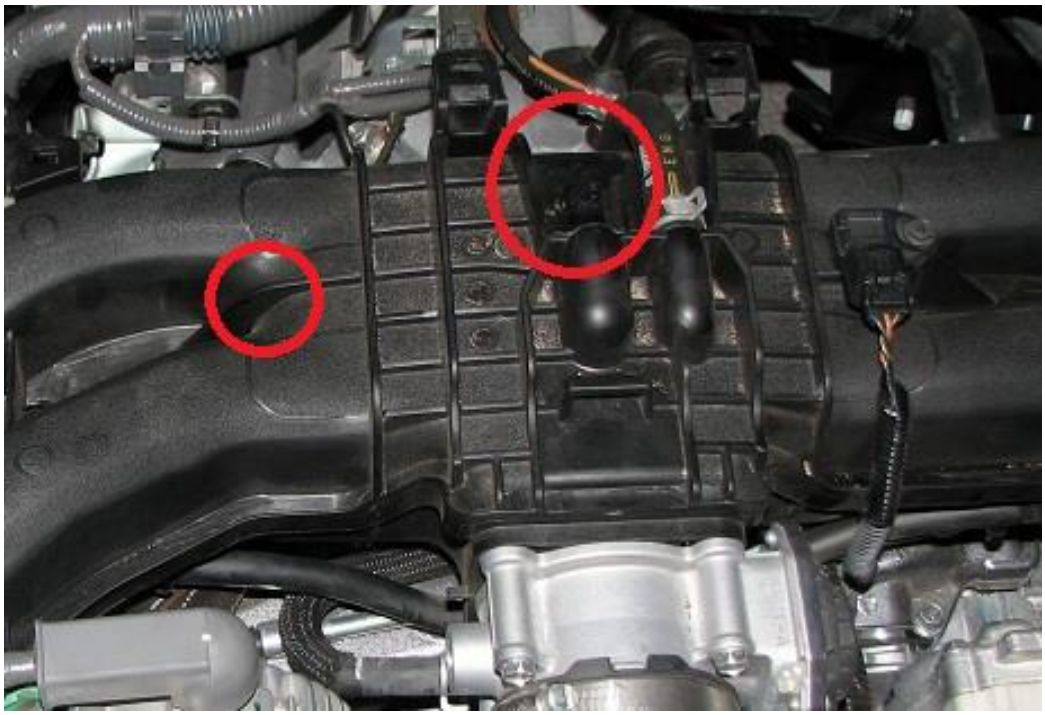
2.3. To fully remove the battery, loosen the 10mm nuts on the top of the two studs circled in yellow below. The j-hook studs will then come off the chassis and you can fully remove the tie-down.

2.4. Fully remove the battery from the engine bay. With the battery out of the way, you'll see a black plastic tray. Remove this as well which is shown in the below photo.

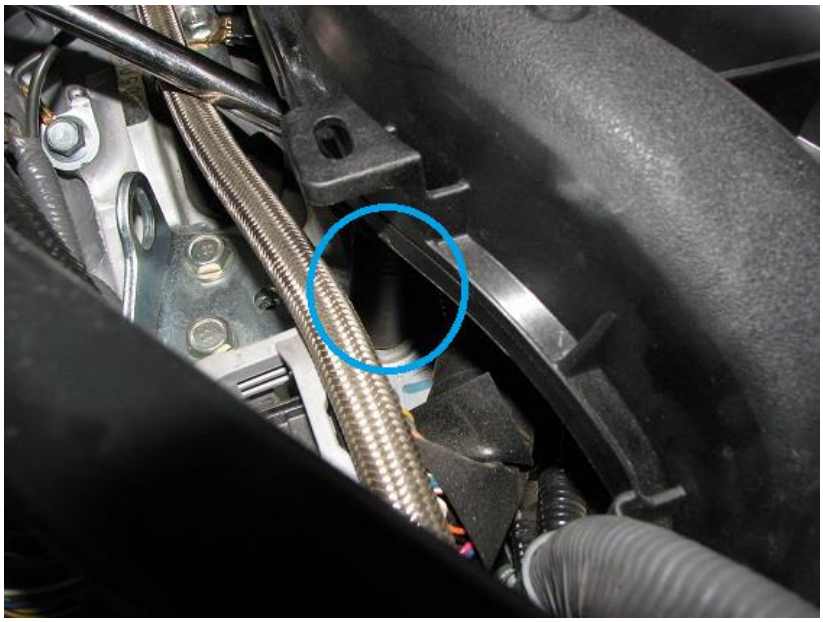
2.5. With the battery tray removed, you'll want to fully remove the bracket shown below. Remove the two 10mm bolts circled in blue and then remove this bracket completely. We will re-use this bracket, do not throw it away.



2.6. Remove the PCV hose which runs from the intake manifold to the PCV valve. These hose ends are located in the below picture, circled in red. To remove the cover that typically goes on top of the manifold, push rearward on the front part and pull up.

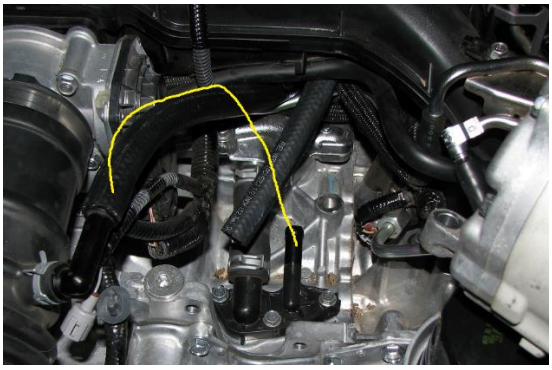


2.7. Remove the PCV valve using the 19mm deep socket, extension, wobble socket, and ratchet.



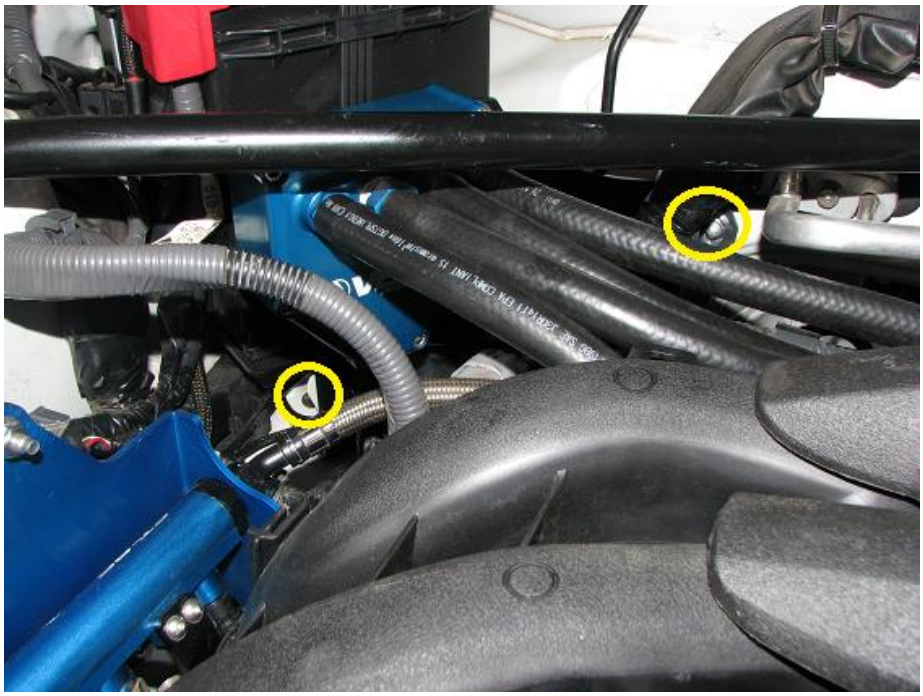
2.8. Install the supplied 3/8NPT to 1/2" adapter fitting. You'll need a 7/8" deep socket to install this. It is recommended to use some Teflon tape or sealant to ensure a leak free seal as shown below. Install this adapter to 12-18 ft-lbs.

2.9. Remove the other side of the PVC system, which goes from the block to the intake tube in a stock vehicle. It would be the hose drawn in yellow and circled in yellow below.



2.10. Now we're going to install the bracket onto the car. Loosen the 10mm nut on the wiring loom as shown below circled in blue. The bracket will slip behind this. This is on the firewall, near the starter.

2.11. Using the supplied M6x1.0 BHCS and washer on the bottom point, slide the top/side bracket behind the above mentioned point. You will have to install the stock bracket removed in step 5. Securely tighten these two points when the bracket is nicely installed.



2.12. Remove the (3) BHCS and washers on the AOS (circled below) and install the AOS on the bracket. Tighten these bolts to 10 ft-lbs max.

2.13. At this point, you need to decide if you're going to install it in an OEM type fashion (recommended for NA for simplicity) or a vacuum style install (recommended for Forced Induction installs). **THE INSTALL IS EITHER/OR, THE UNIT CANNOT BE HOOKED UP IN BOTH WAYS.**

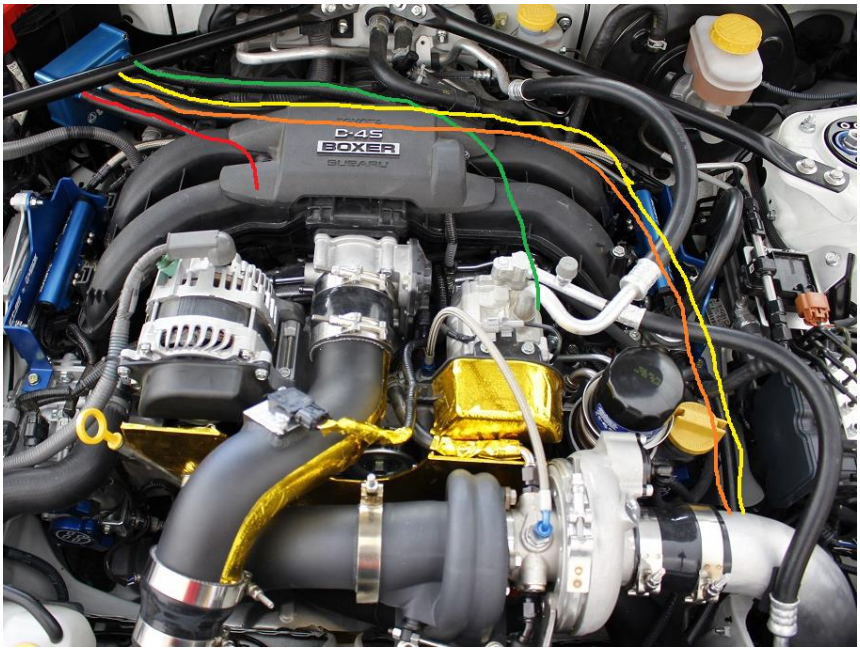
2.13.1. Forced Induction Install – Blocking off intake manifold port completely, for vent to atmosphere or when both outlet ports of the AOS are going to a vacuum source.

2.13.1.1. We will want to block off the intake manifold port on the rear of the plenum completely. There is a supplied 1/2" nipple and clamp, use those to seal this rear port as shown below. If the nipple puts up a bit of a fight, warm it in some hot water and that should allow it to slip on.

2.13.1.2. On the AOS itself, you'll want to install the other 3/8" NPT to 1/2" hose barb adapter. Again, it's recommended to use Teflon tape, liquid Teflon, or a type of sealant to ensure leak free sealing.

2.13.1.3. For hose routing, typically we use the outside two ports as inlets and the inside two as outlets, but as long as you keep the left and the right as a system, it does not matter (AKA you don't want both engine ports, which are inlets into the AOS, going to the left side of the AOS).

2.13.1.4. Ultimately you can route the AOS however you'd like beyond the above rule, but typically the routing is as follows. The point from where the PCV valve used to go on the block typically is routed to the far left location (shown in RED below). The front block location is typically routed to the far right location (shown in GREEN below). The two inner ports, which are the outlets of the AOS, will go to a vacuum source, preferably, or can be vented to the atmosphere (shown in YELLOW and ORANGE below). Vacuum sources include intake or exhaust scavenging through Bernoulli's principal.



2.13.2. Naturally Aspirated/OEM type Install – Continues to use Intake Manifold Port

2.13.2.1. On the AOS itself, you'll want to install the **stock PCV valve** in the last open port. Use Teflon tape, liquid Teflon, or a sealant to ensure a leak free seal.

2.13.2.2. For hose routing, below are the two possible ways to route the hoses to the AOS. The hoses from the engine are inlets into the AOS, and the outlets go to the intake manifold and intake.

2.13.2.3. For routing, the below diagram depicts how to run the lines. The point from where the PCV valve used to go on the block, goes to the far left location (shown in RED below). The front block location is routed to the far right location (shown in GREEN below). The intake manifold hose goes from the inside left point to the intake manifold (shown in YELLOW below). The intake hose goes from the inner right point on the AOS to the intake tube (shown in ORANGE below).

2.13.2.4. For the intake manifold hose (YELLOW line above), the following needs to take place. The outlet of the stock PVC valve is 3/8". Use the short piece of 3/8" hose supplied, along with the supplied 3/8" to 1/2" adapter, and then the 1/2" hose to the intake manifold.

2.14. At this point in the install, you have fully installed AOS that can be ran and capture oil in a typical operating environment. It will need to be manually drained, which you can use a Fumoto drain valve if interested (same size as stock FRS/BRZ). Any questions, comments or concerns can be directed to Verus Engineering through e-mail, ***sales@verus-engineering.com***.

3. Optional Drain Back Kit Install

3.1. You will want to uninstall the flare cap on the bottom of the AOS. Use the 11/16" wrench to remove this.

3.2. Remove the plug in the rear cam cover block off plate. This should be a 1/4" Allen wrench. This can be removed on car easily as well.

3.3. The check valve needs to be installed into this port we just removed. The arrow needs to point into the cam block off plate. Oil needs to flow into the engine, but we do not want the air to come out of the engine. **Install the supplied o-ring on the arrow side as shown below.**

3.4. Thread this into the cam block off plate as shown below. Tighten to approximately 16 ft-lbs.

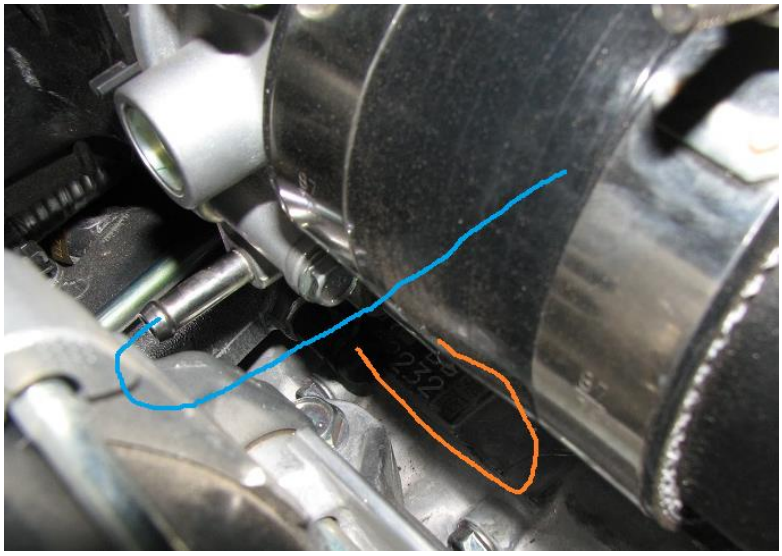
3.5. Using the supplied hose, install the straight hose end on the AOS, and the 90-degree hose end as shown below. Tighten these to 14 ft-lbs. *It is best to have the AOS loose on the bracket to allow some vertical play.*

3.6. The optional automatic drain back system has been installed and is now functional. The AOS will automatically drain the oil back into the engine now, and will operate service free for multiple years.

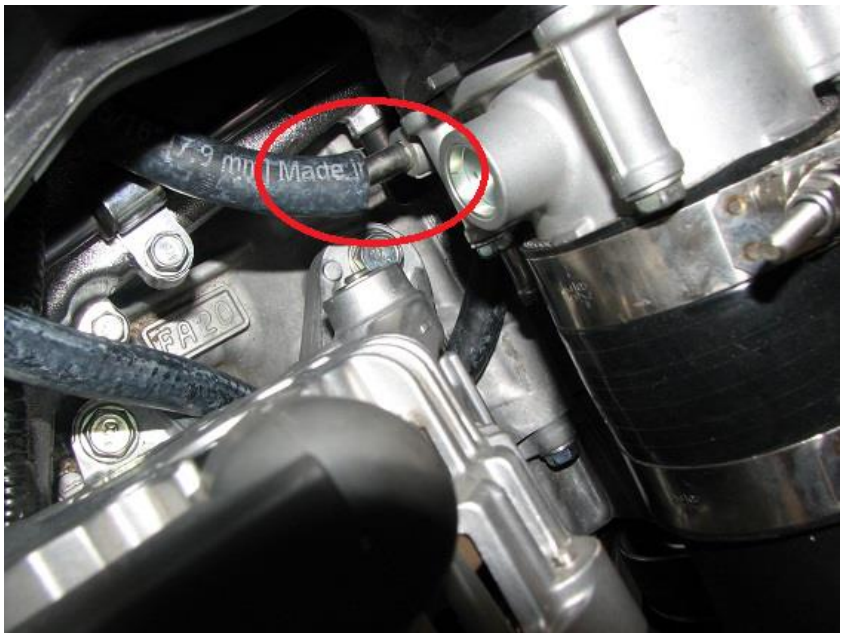
4. Optional Coolant Hook-up Kit

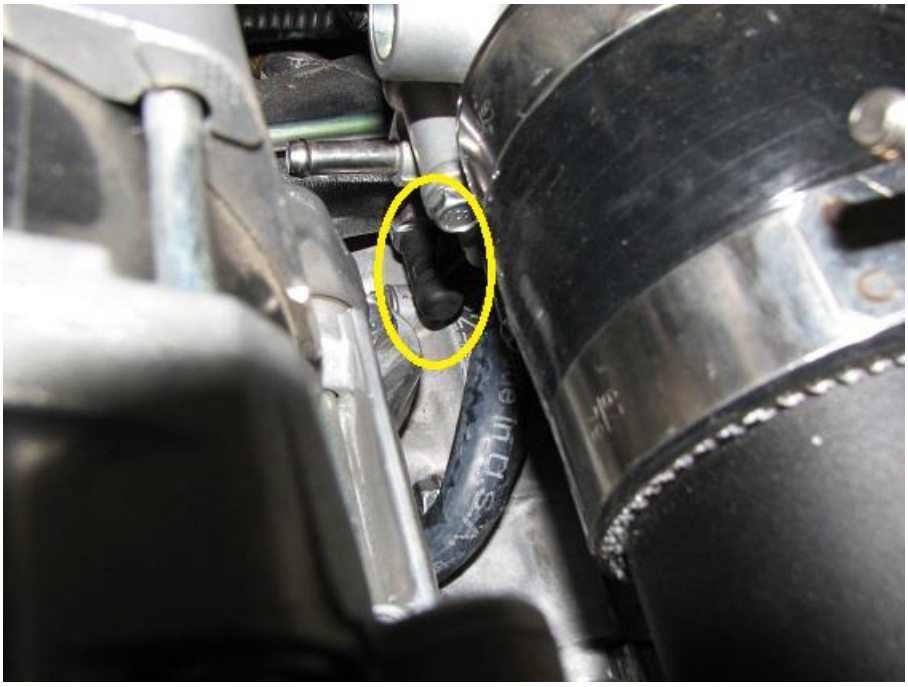
4.1. Thread the banjos into the back of the AOS as shown below. Do not fully tighten them right now.

4.2. We will be using two of the three ports that are located near the throttle body for coolant inlet and outlet. Begin figuring out how you want to run the hoses as there are a few ways you can route the lines and how it can flow coolant through the unit. In stock configuration, you'll have a short hose (shown in orange) that needs to be removed. The blue line is another coolant hose that should be disconnected from the throttle body as well.



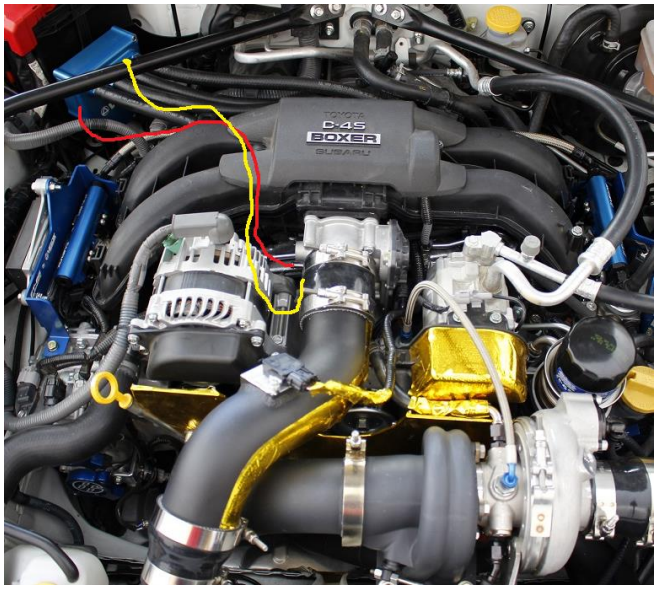
4.3. We recommend using the two below ports for inlet/outlet of the AOS coolant loop. Inlet and outlet do not matter to the AOS, so whatever looks and fits best is good.



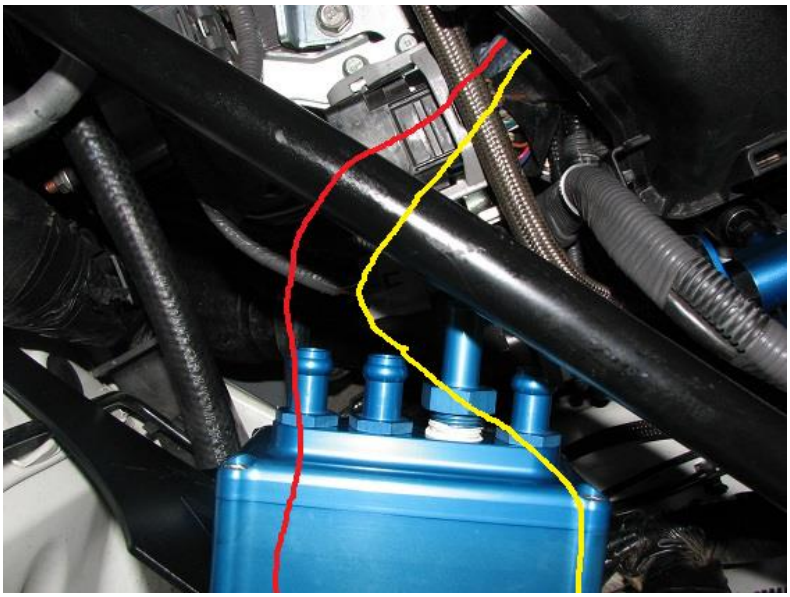


4.4. In the above configuration, the long hose (shown in blue in step 4.2) will now be routed to a different port than when ran in factory routing. This is fine as far as coolant flow is concerned, and the end decision of how you want to run the coolant hoses is up to you.

4.5. Route the hoses to these two points, using the supplied zip ties where necessary. For the hose barb that faces the front of the car, the hose will need to go under the alternator. Below is a drawn depiction of how the lines should run. Use the supplied hose clamps to clamp the hose onto these barbs.



4.6. In the below photo, you can see how the hoses are routed under most of the connectors and harnesses.



4.7. Install the hoses onto the banjos, clocking the banjos however seems best. Use the hose clamps (not shown) on each of the banjos to ensure the hoses do not leak.

4.8. You'll want to hook up the OEM hose that we unhooked in step 4.2 and discussed again in step 4.4 (colored in blue) to the open barb on the throttle body. This completes the coolant hook ups.

4.9. To purge the system of air, you'll have to crack one of the banjos to allow air out and coolant into the cavity. It is recommended to do this multiple times to purge the air out of the system as you fill it with coolant. Ensure no leaks are coming from the hoses you added.

4.10. At this point, you should have a fully functioning coolant kit on the AOS and the AOS is ready for years of service free life.

4.11. Congratulations on installing the AOS. Please contact Verus Engineering with any questions or comments via e-mail, sales@verus-engineering.com. Below are photos showing the final install.

ZN6/ZC6 AOS – Install Manual