

# **VERUS**

## **ENGINEERING**

# **BRZ / GR86 Air Oil Separator (AOS)**

## **Install Manual**



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**Approvals:** E. Hazen

### **Document Revisions**

<b>Rev</b>	<b>Date</b>	<b>Author</b>	<b>Description</b>
01	2022/04/14	T.Lang	Initial release of install manual
02	2022/07/25	E. Hazen	Added information regarding AC condenser

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## BRZ / GR86 AOS – Install Manual

## 1. Introduction

**1.1. Overview:** Detailed instructions on installing the AOS for the BRZ / GR86 chassis.

**1.2. Difficulty:** Moderate

**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. 13/16" deep socket
- 1.4.9. 22mm deep socket
- 1.4.10. 1/4" allen wrench
- 1.4.11. Adjustable wrench

**1.5. AOS Kit**

- 1.5.1. Full assembled and pressure checked AOS
- 1.5.2. 85 inches of 1/2" hose
- 1.5.3. 25 inches of 5/8" hose

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**1.5.4. Bracket****1.5.5. Hardware Bag**

- 1.5.5.1.** (4) M6x1.0 x 16mm Stainless BHCS
- 1.5.5.2.** (1) M6 18mm OD Stainless Fender Washer
- 1.5.5.3.** (3) M6 12mm Stainless Washer
- 1.5.5.4.** (2) 3/8" NPT to 1/2" adapter
- 1.5.5.5.** (8) zip ties

**1.6. Optional Drain Kit**

- 1.6.1.1.** (1) AOS Drain Fitting
- 1.6.1.2.** (1) 1/2" Y Fitting
- 1.6.1.3.** 15 Inches of 1/2" Hose
- 1.6.1.4.** (1) 1/2" Hose Barb
- 1.6.1.5.** (1) #014 Buna O-Ring

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**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
- 1.7.1.6. (1) Coolant Block Off Plate
- 1.7.1.7. (1) O-ring for block off plate
- 1.7.1.8. (4) M6x1.0 x 16mm Long Stainless BHCS
- 1.7.1.9. (4) M6 Stainless Washer



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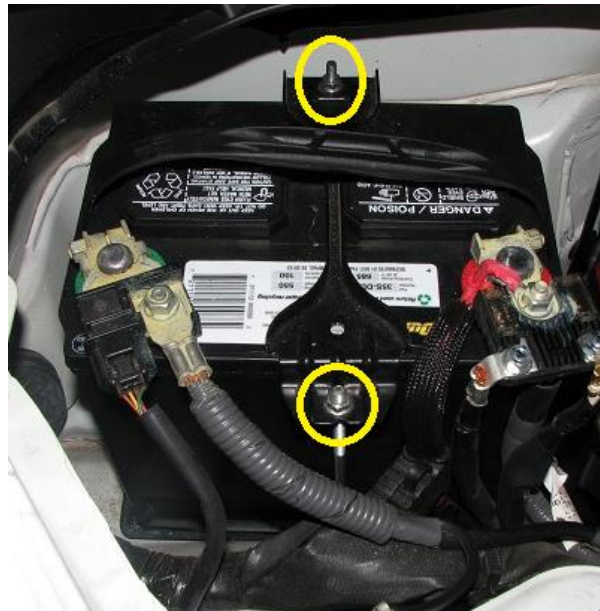
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**2. Air Oil Separator Install**

- 2.1. Verus Engineering is 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.



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



- 2.5. With the battery tray removed, you will 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.



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- 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. The GR86, and 2022 BRZ are now equipped with a 5/8" hose in this location. To remove the cover that typically goes on top of the manifold, pull upwards.



- 2.7. Remove the PCV valve using the 22mm deep socket, extension, wobble socket, and ratchet.



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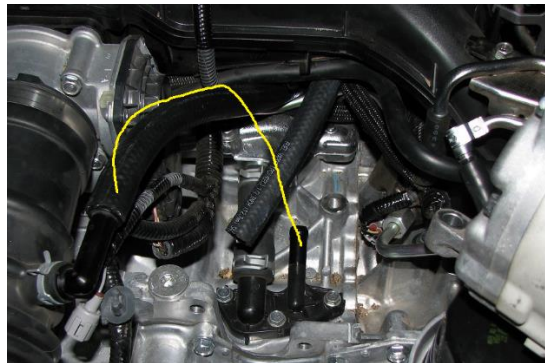


- 2.8.** Install the supplied 3/8 NPT to 1/2" adapter fitting. You will need a 13/16" deep socket to install this. It is recommended to use some Teflon tape or sealant to ensure a leak free seal as shown below. Install this adapter to 12-18 ft-lbs.

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- 2.9.** Remove the other side of the PCV system, which goes from the block (via a black plastic fitting under the A/C compressor) to the intake tube. It is the hose drawn in yellow and circled in yellow below. **It may be easier to remove the AC compressor, remove the belt and unbolt the compressor. We used 45 degree needle nose pliers.**



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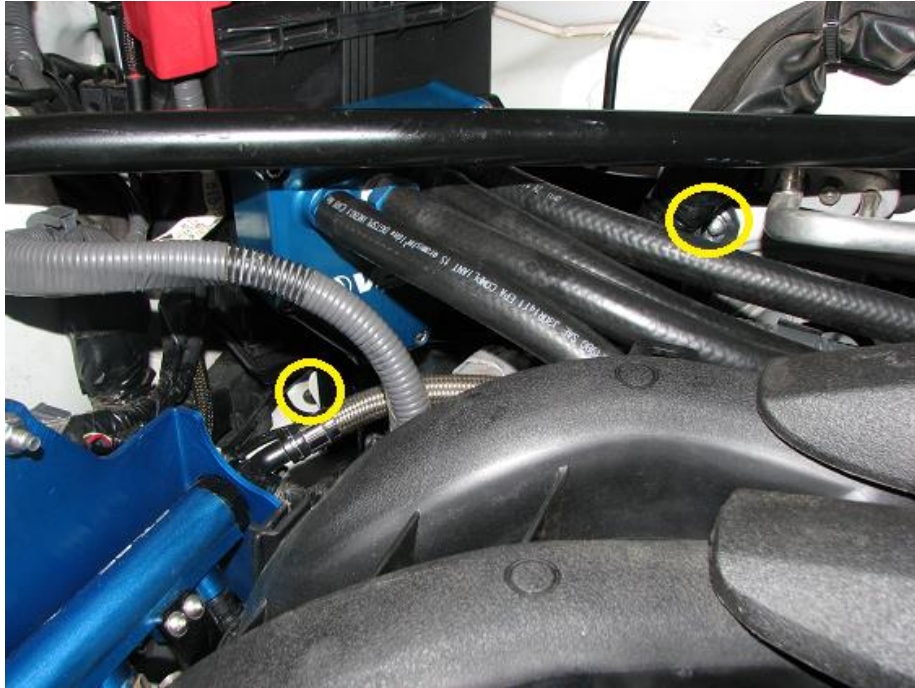


- 2.10.** Now we are going to install the bracket onto the car. Loosen the 10mm nut on the wiring loom as shown below circled in blue. The bracket will slip behind this. This is on the firewall, near the starter.



- 2.11.** Using the supplied M6x1.0 BHCS and 18mm washer on the bottom point, slide the top/side bracket behind the point mentioned above. You will have to install the stock bracket removed in step 2.5. Securely tighten these two points when the bracket is nicely installed.

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- 2.12.** Install AOS with (3) 16mm long BHCS with washers to the bracket as shown. Tighten these bolts to 6-8 ft-lbs max.

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**2.13.** On the AOS itself, you will 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.

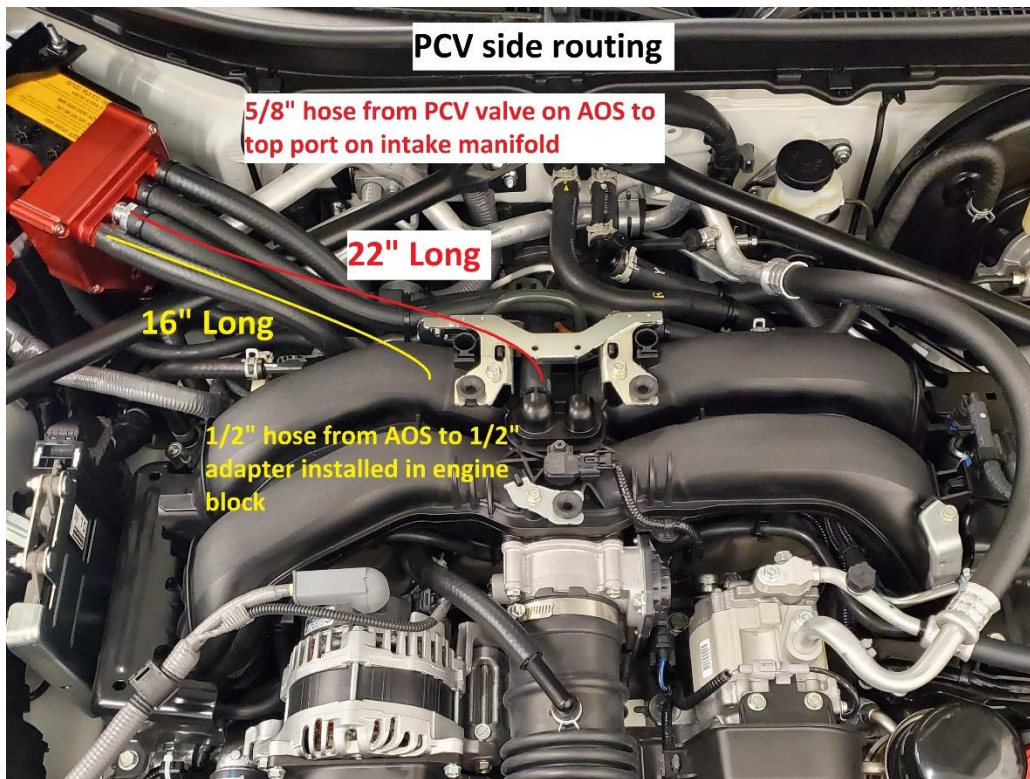
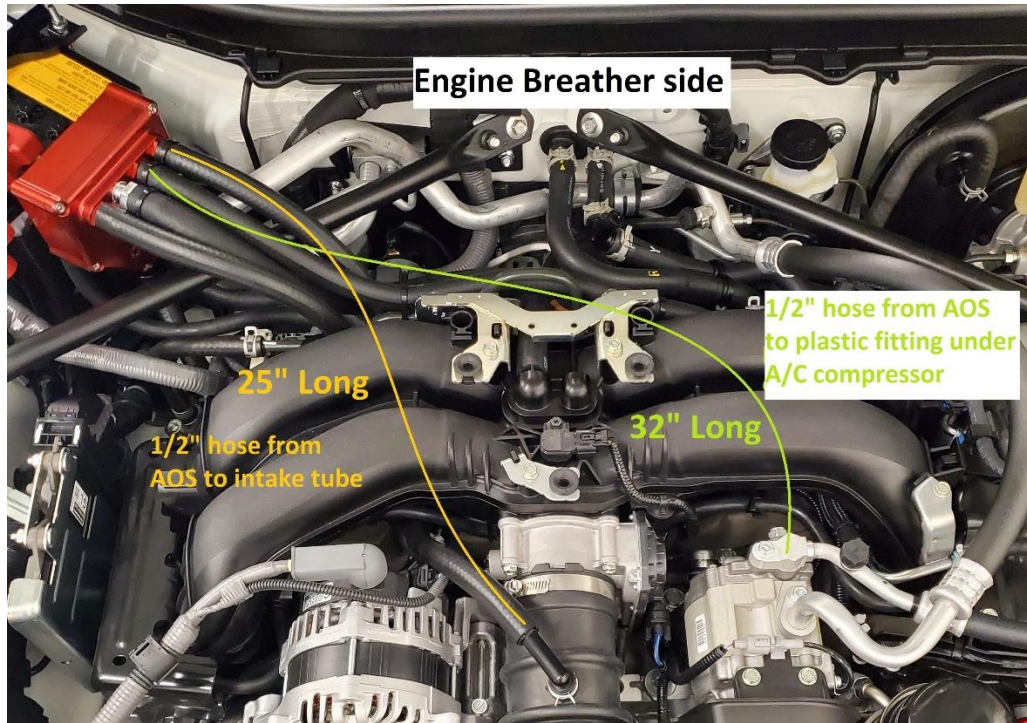
**2.13.1.** For routing, below are the two possible ways to route the hoses to the AOS. The hoses from the engine are inlets into the AOS, and the outlets go to the intake manifold and intake.



**Note: If at any point you get confused about how the hoses should be routed into the AOS unit, just remember that the AOS acts as an inline filter. This means that the pathway for air should always flow from the engine > into the AOS > back into the engine. For example, on the PCV side, crankcase air will flow out of the engine block, into and through the AOS, out of the PCV valve (installed in the AOS), and back into the intake manifold.**

**2.13.1.1.** For hose routing and length, follow the diagrams below. Be sure to measure twice, and confirm the lengths before cutting the hose. Ultimately hose routing is up to you, but this is the way that worked best for us.

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- 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](mailto:sales@verus-engineering.com).

### 3. Optional Drain Back Kit Install

- 3.1. Start by unscrewing the plug at the bottom of the AOS.
- 3.2. Swap the o-ring over from the knurled plug fitting to the new threaded adapter with the through hole shown below.

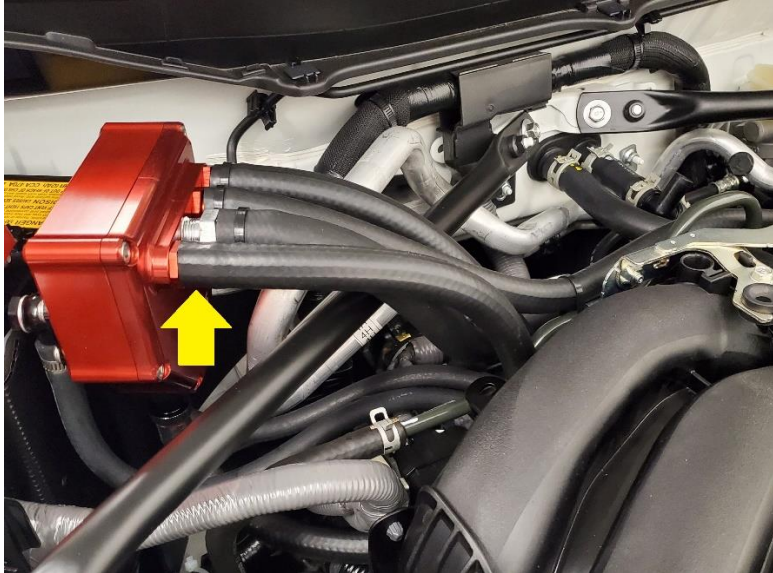


- 3.3. Then, install the black 6AN to 1/2" barb into this and torque to 8 ft-lbs. A photo of this is shown below. **When installing the black 6AN to 1/2" nipple, do so with the knurled fitting already installed on the AOS.**



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- 3.4. Cut the existing 1/2" hose going from the AOS to the 3/8" NPT to 1/2" adapter on the engine block at approximately 13.5". This should leave you with another section that is 2.5" long.



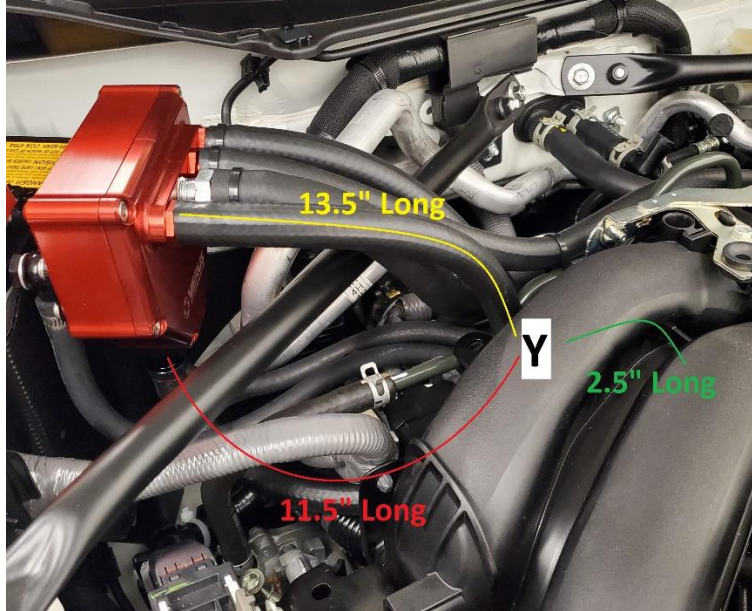
- 3.5. Install the hose pieces to two sides of the Y fitting.
- 3.6. Cut an approximately 11.5" long piece of 1/2" hose and install it onto the last side of the Y fitting, and the nipple installed in 3.1.



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**4. Optional Coolant Hook-up Kit**

**4.1.** We begin the install by installing the o-ring in the coolant plate.



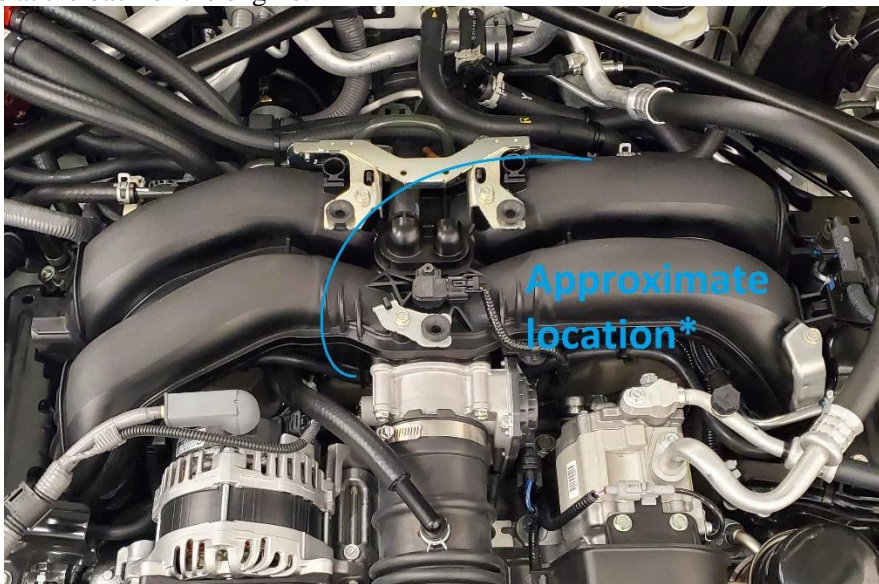
**4.2.** With the o-ring installed, we can install the plate onto the AOS with the (4) M6x1.0 x 16mm BHCS and M6 washers. You will also have to install the bracket at this time as shown in figure 4.3.

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

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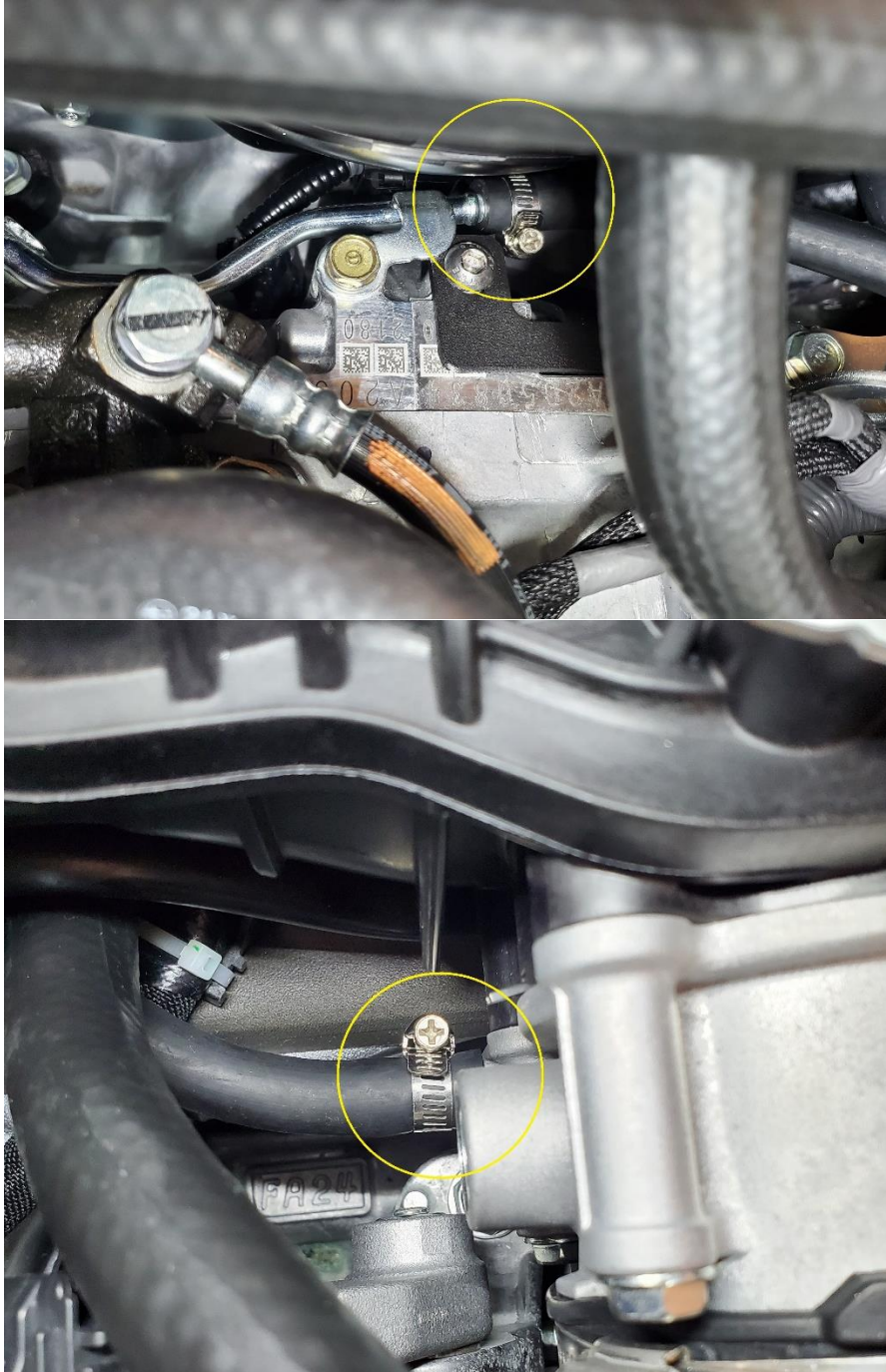
- 4.4. We will be installing this by tapping into the throttle body coolant circuit.
- 4.5. Remove the hose that runs from the throttle body underneath the intake manifold to a hard line at the back of the engine.



- 4.6. This will expose two barbs (one on the throttle body, and one on the coolant pipe) that we can use for the coolant circuit.

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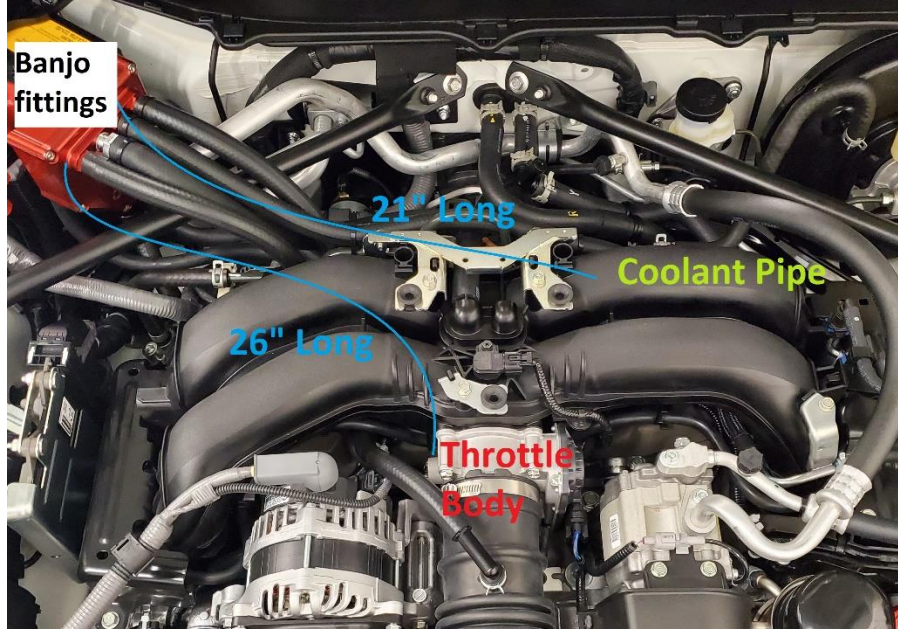
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- 4.7.** Cut two lengths of hose approximately 21” long, and 26” long. Refer to the diagram below for hose routing. Be sure to slide the clamps onto the hose before installing them.

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- 4.8. Once the hoses are routed correctly, tighten the hose clamps and the banjo fittings.
- 4.9. To purge the system of air, you will 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](mailto:sales@verus-engineering.com).

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