GT86/BRZ/FRS High Performance Radiator

Install Manual

Author: Eric Hazen
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Approvals: E. Hazen, P. Lucas

Document Revisions

Rev	Date	Author	Description
01	2017/03/10	E. Hazen	Initial release of install manual
02	2017/08/09	P. Lucas	Company name change from Velox to Verus

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GT86/FRS/BRZ High Performance Radiator – Install Manual

1. Introduction
   - **1.1. Overview:** Detailed instructions on installing the high performance radiator for the ZN6/ZC6 GT86, FRS, and BRZ chassis.

   - **1.2. Difficulty:** Moderate

   - **1.3. Time Required:** 3 hours

   - **1.4. Disclaimer:** An understanding of basic electronics is a great benefit for this install. This install was on a Full-Race Motorsports Turbo Kit equipped car, please bare that in mind.

   - **1.5. Tools Needed:**
     - 1.5.1. 12mm socket
     - 1.5.2. 10mm socket
     - 1.5.3. Ratchet
     - 1.5.4. Extension
     - 1.5.5. 12mm Wrench
     - 1.5.6. Flat head screwdriver
     - 1.5.7. Pliers
     - 1.5.8. Philips head screwdriver
     - 1.5.9.De-pin tool or paper clip
     - 1.5.10. Digital Volt Ohm Meter (DVOM)
     - 1.5.11. Soldering Gun
     - 1.5.12. Heat Gun
     - 1.5.13. Crimpers/Strippers

   - **1.6. Radiator Components**
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       - 1.6.1.1. High performance Radiator
       - 1.6.1.2. (2) Radiator fan mounts
       - 1.6.1.3. (2) High performance SPAL fans
     - 1.6.2. (2) 30 Amp SPAL fan relays
     - 1.6.3. (4) Toyota Flying Leads
     - 1.6.4. (1) Toyota connector

2. Radiator Install

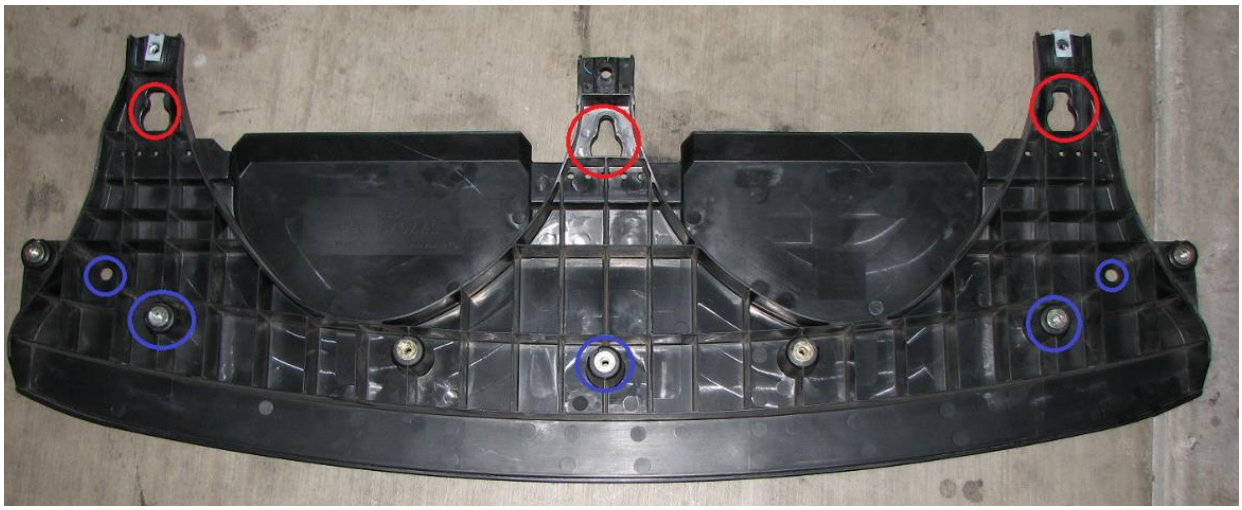
2.1. Velox is not responsible for damage to you or your vehicle by following this manual and/or installing Verus Engineering products.

2.2. We begin by popping the hood and jacking the car up on jack stands. We do not need a lot of room to work under the car, just a bit to get some splash shields and the bumper off the car.

2.3. It is recommended to disconnect the battery for this install as we will be performing electrical work to connect the high performance SPAL fans. Remove the negative terminal and place it somewhere where it cannot contact the battery terminal.

2.4. With the front of the car off the ground, we'll want to start by removing the underbody plastic piece. This piece is quite large and has multiple plastic push rivets and a few bolts holding it on. There will be six push pins (shown in red), and three 10mm bolts to remove (shown in yellow).

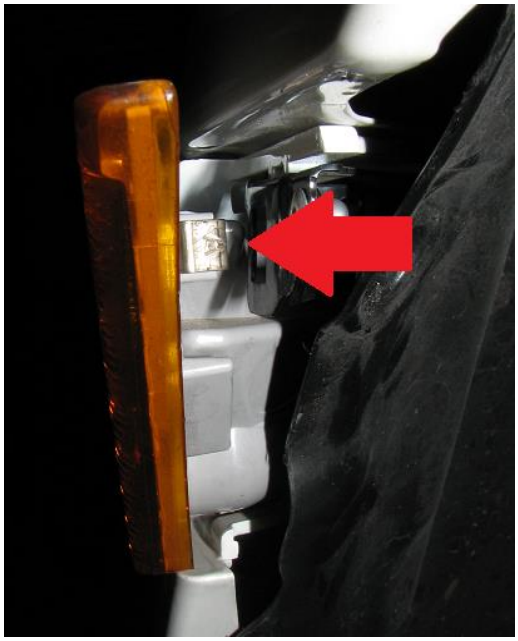
2.5. Next up is to remove the plastic tray between the front bumper and the radiator support. This will allow you to reach the OEM petcock to drain the radiator while we remove the bumper. Remove the plastic push pins with a screwdriver (located in purple/blue). Also remove the (3) 10mm bolts with a ratchet and socket (located in red).



2.6. Next step is removing the front bumper. To remove the front bumper, remove the strip of 10mm bolts and plastic push pins across the top of the front bumper under the hood.

2.7. Then on each side of the car in the wheel wells, remove 4 plastic screw pins. Three are located down low (see below photo), the last one is up by the turn signal on the inside of the fender. Ignore that the splitter is installed in this photo, it was taken after the installation.

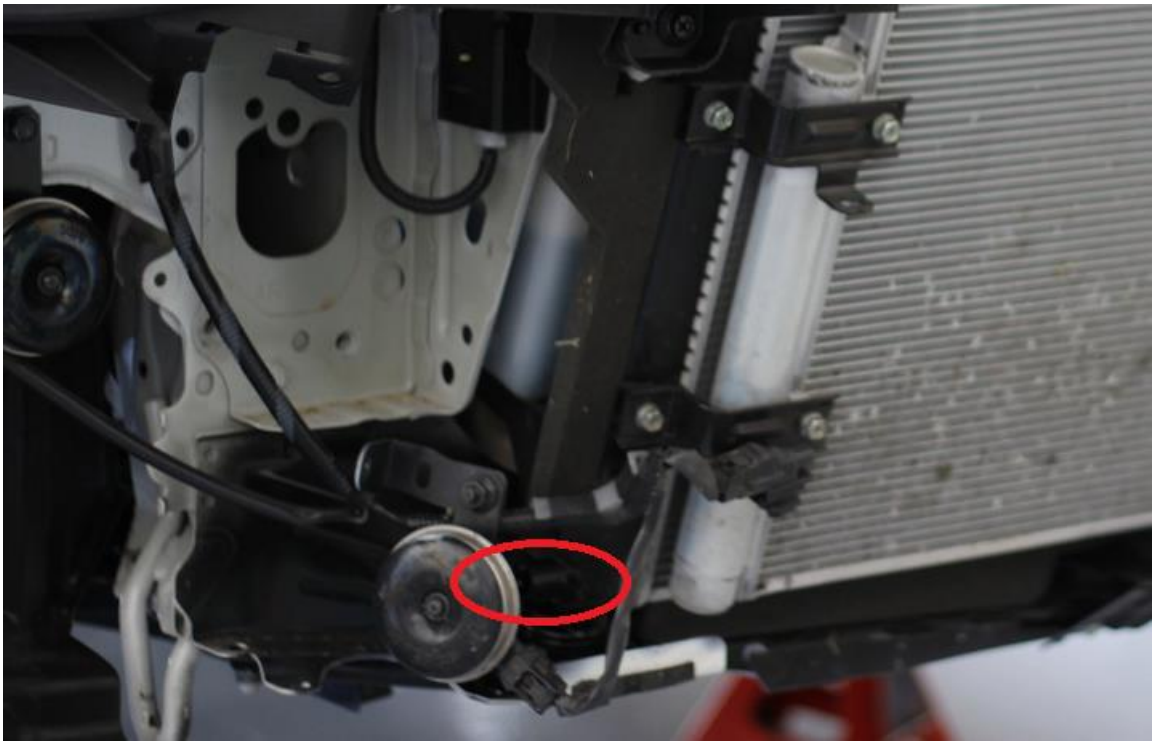
2.8. The turn signal has to be removed to expose the final plastic push pin and then the front bumper will come off. There is a metal tab that needs to be push towards the ***front*** of the car. The arrow in the picture shows this well. I used a flat head screwdriver to push this forward and then gently pried the signal away from the car.



2.9. The final push pin is circled here! Remove this and gently pry around the front bumper to remove it completely.

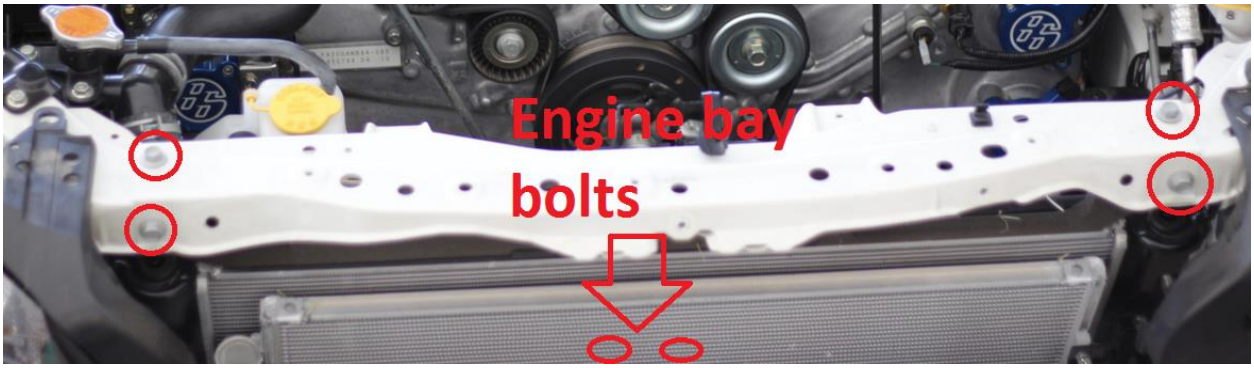
2.10. Remove the intake and intake filter so that we have room to remove the radiator later. Below is a photo with the front bumper removed as well as all intake related components.

2.11. On the passenger side of the radiator, there is a petcock. Unscrew this with your finger to drain the coolant from the radiator. This is circled below in red. Collect the coolant in a container to dispose of later. The below photo has the crash beam removed but that is not necessary for this install.

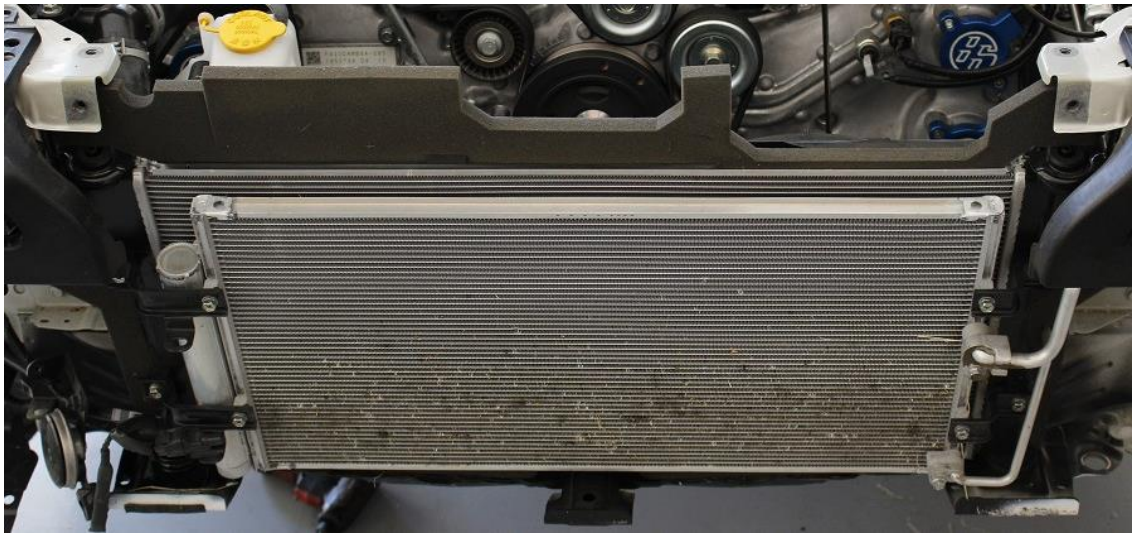


2.12. Open the radiator cap to help drain the radiator quicker.

2.13. While the radiator drains, we can remove the radiator core support. This can be uninstalled by removing the (6) 12mm bolts circled in red. The middle two bolts are at the bottom on the engine bay side.



2.14. With the core support removed, below is what you will be left with. Keep in mind, the crash beam is removed in the below photo, which is not necessary for this install.



2.15. Remove the (4) 10mm bolts from the condenser to the radiator, circled in blue below.

2.16. When the radiator is done draining, we can remove the radiator hoses from the radiator. To do this, use pliers to remove the clamp from the hose.

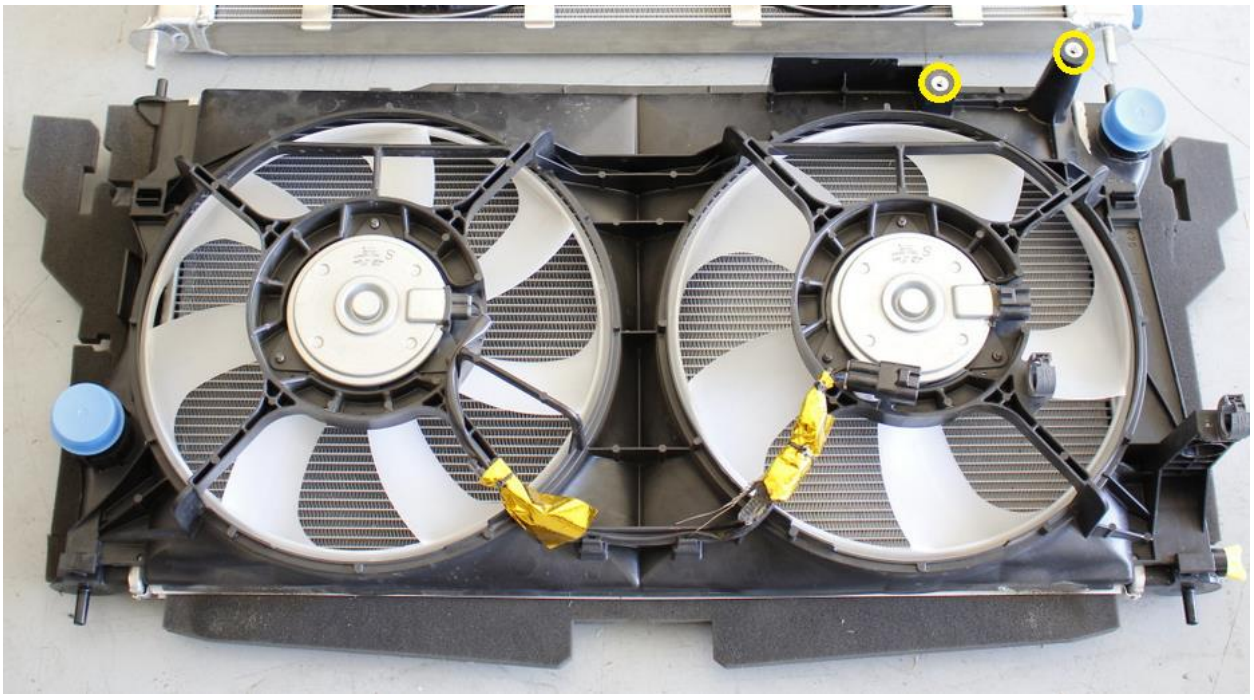
2.17. Removing the hoses can be difficult. There are a few ways to do this. You can try to twist the hose with your hand to break the seal. Next step, if that does not work is to try to stick a 90 degree needle nose plier or pick to try to break the seal between the hose and the hose end. Break the seal then twist and pull off. It is quite stubborn.

2.18. Unplug the two radiator fans.

2.19. On the top of the radiator, there are two mounting brackets. We need to remove these and the radiator will be ready to pull out. Each bracket can be uninstalled by removing the (2) 12mm bolts holding the bracket on (circled in red below).

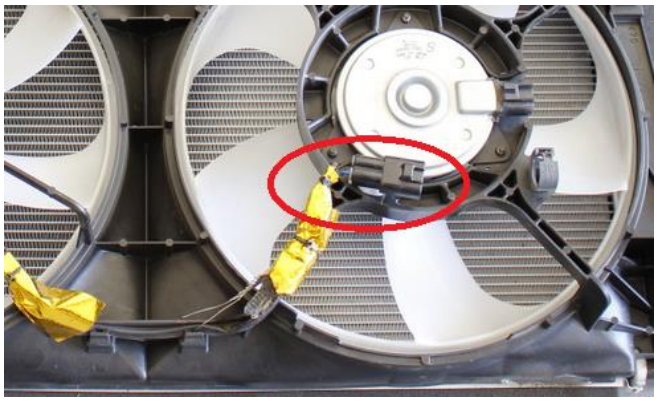
2.20. Below is a photo with the radiator removed and the condenser still attached and in the car.

2.21. With the radiator out of the car, we can get the new Verus Engineering radiator ready for install! We start by uninstalling the overflow from the OEM radiator by removing the (2) 10mm bolts circled below in yellow. The overflow has already been removed in the below photo.

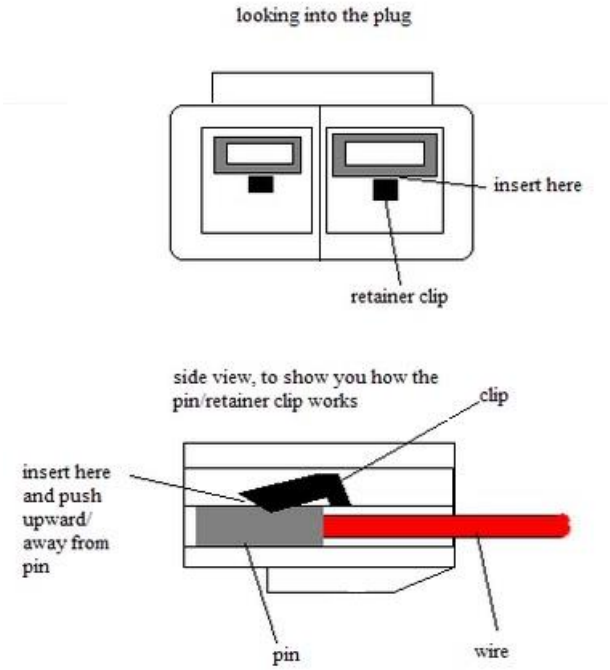


2.22. Reinstall the overflow onto the Verus Engineering radiator. The fit of the bottom nipple is quite tight in the bracket, but a little wiggling will get it to slide in. Using the (2) OEM 10mm bolts, install them on the top two bungs, and tighten to 8 ft-lbs.

2.23. Next, we work on the wiring. We need to de-pin the connector circled in red below.



2.24. To de-pin the connector. Depinning the connector can be a bit frustrating and is a two-step process. You must first release the pin guard. Pull this guard piece out of the connector to expose the pins, then using a de-pin tool or paper clip, remove the wires from the connector as shown below.



2.25. Alternatively, you can cut the connector off the OEM fan shroud with about 12” of pigtail as shown below. This is personally the route we went with our shop car.

2.26. Now that the OEM radiator has everything removed that we need and the Verus Engineering radiator is outfitted with the fans, overflow, and the drain bung is tight, we can reinstall it in reverse order.

2.27. We only need the radiator in the car and bolted/secured on, leave the bumper and all associated parts off for now for an easier time on wiring. We’ll be working in the passenger side fender well area circled in red below.

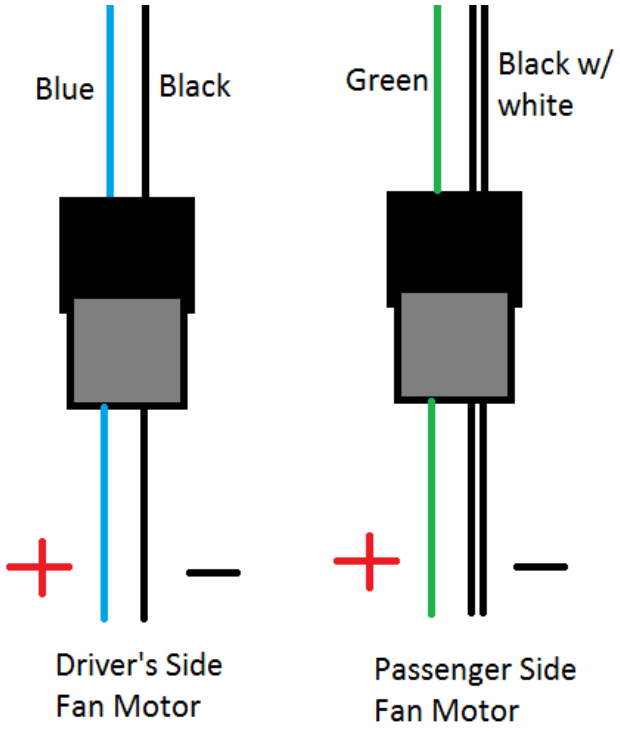
3. Wiring Install

3.1. Let’s start the wiring install with familiarizing ourselves with how the fan system operates and how we will be implementing our fan controlling relays and how relays work.

3.2. Relays are simple devices. They are a switch in essence which powers a high amperage circuit (SPAL fans in this case) dictated by a low amperage circuit (OEM fan wiring). If we were to power the SPAL fans with the OEM wires, we could overheat and burn the OEM wiring since it was not designed for this amperage load.

3.3. The OEM system can vary the speed of the fans, while the SPAL fans do not possess the ability to do this. The SPAL fans also pull more amperage than we feel safe for the OEM wires, so we included a relay to wire into the OEM system to control the fans safely.

3.4. Below is a picture showing how the OEM fans are wired.



3.5. What we will be doing is shown below. We are adding relays to ensure proper amperage and operation for a lifelong of use!

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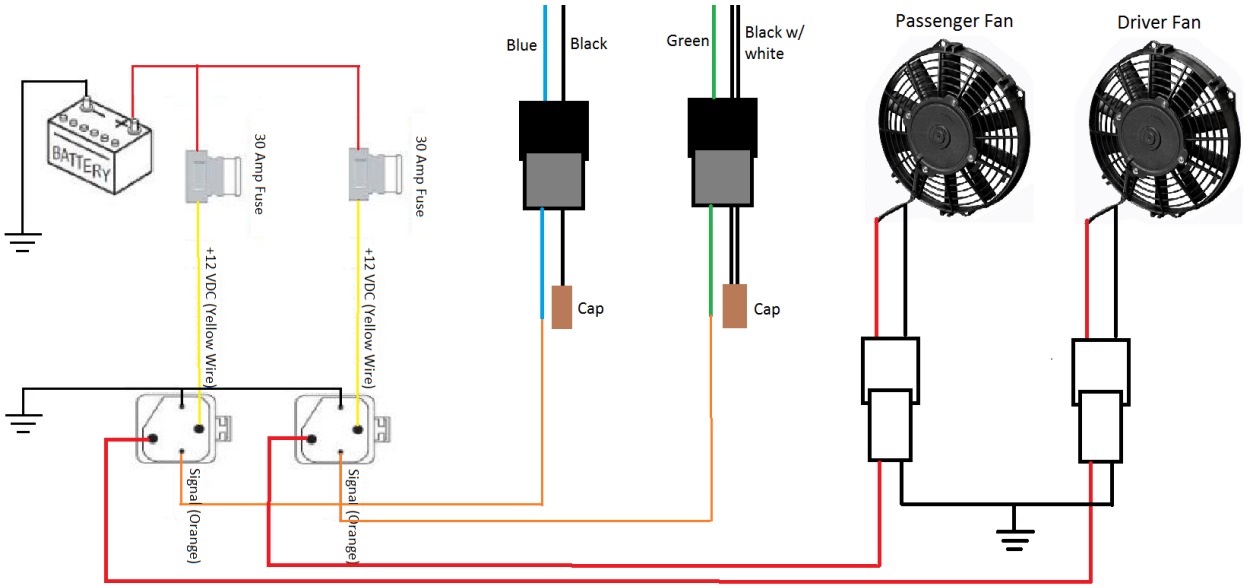
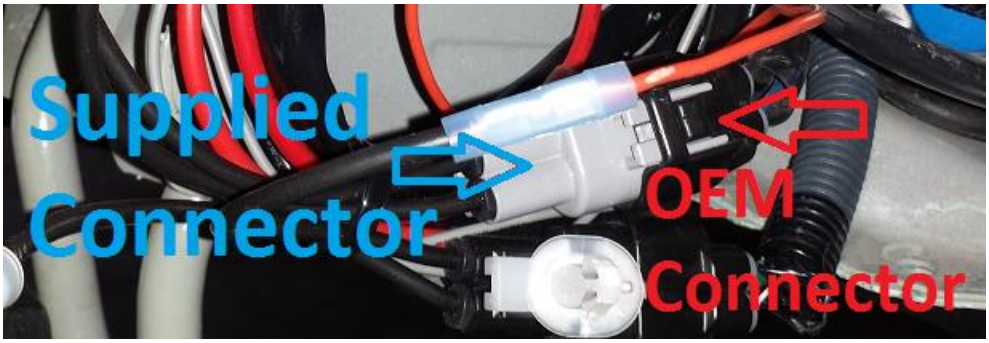
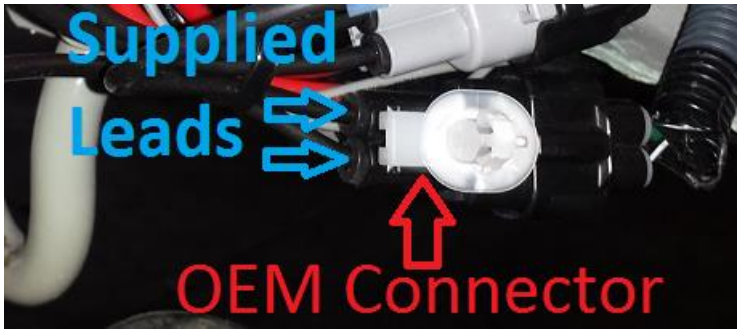


3.6. Do NOT cut any wiring on the factory engine harness, this is not necessary and we supply an OEM connector for the passenger side fan and flying leads for the driver side fan.

3.7. Install (2) leads into the supplied connector. This connector should plug into the passenger side fan harness, which will be the shorter of the two fan harnesses.



3.8. With the OEM connector from the fan shroud we de-pinned in step 2.24, plug in the two remaining flying leads we supply in the kit. The other option, if you did not want to de-pin the connector, is to cut the wires with about 12” of lead remaining. Below is a de-pinned OEM connector with OEM flying leads in it.

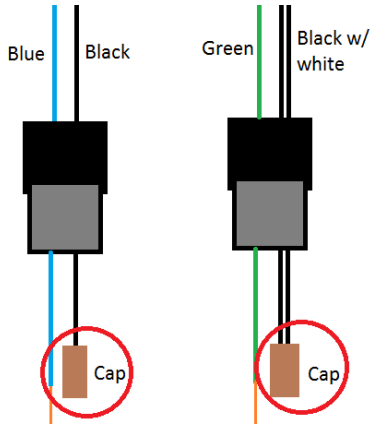


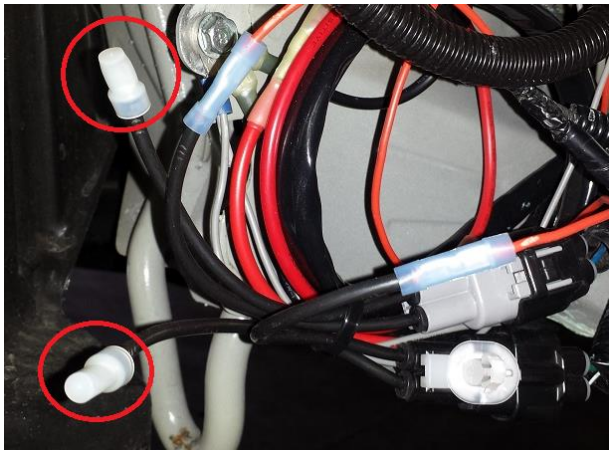
3.9. Before we get into wiring, we'll go through a small brush up on soldering which is how we suggest wiring units on car. Solder is stronger, more permanent, and less likely to corrode over time. If you are going to use crimp connectors, purchase units that have water tight seals.

3.10. Soldering wires is not difficult, after watching a few YouTube videos, you can be proficient and use this skill throughout other modifications as well. Below is a properly soldered wire. https://www.youtube.com/watch?v=Zu3TYBs65FM

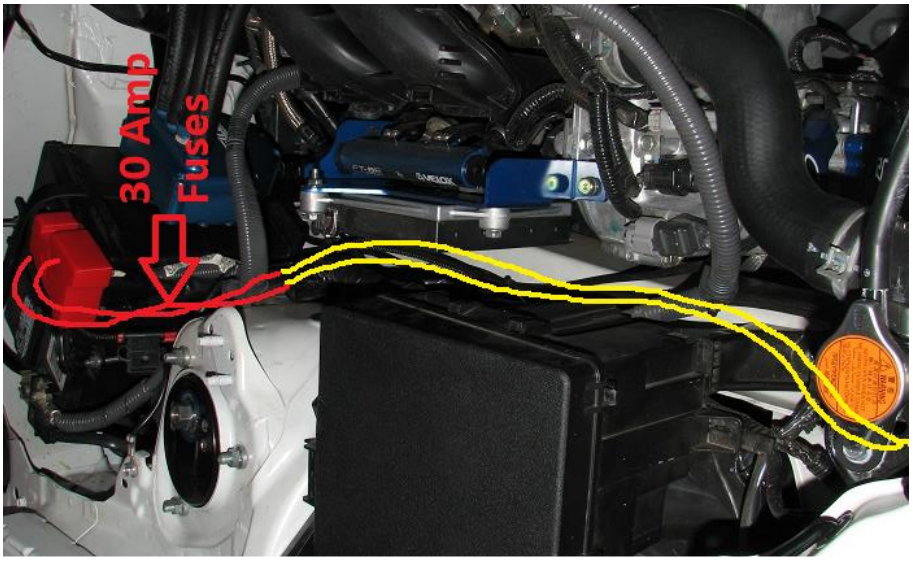
3.11. Finish the wires off with water-proof shrink wrap as shown below. This shrink wrap has an inner layer of adhesive, almost glue like substance. It seals water out from the connection.

3.12. Per the wiring diagram, let's start by capping the negative side of the fan wiring. This can done with electrical tape, or preferably a wire termination terminal as shown below. Note the color of wires you will want to cap.

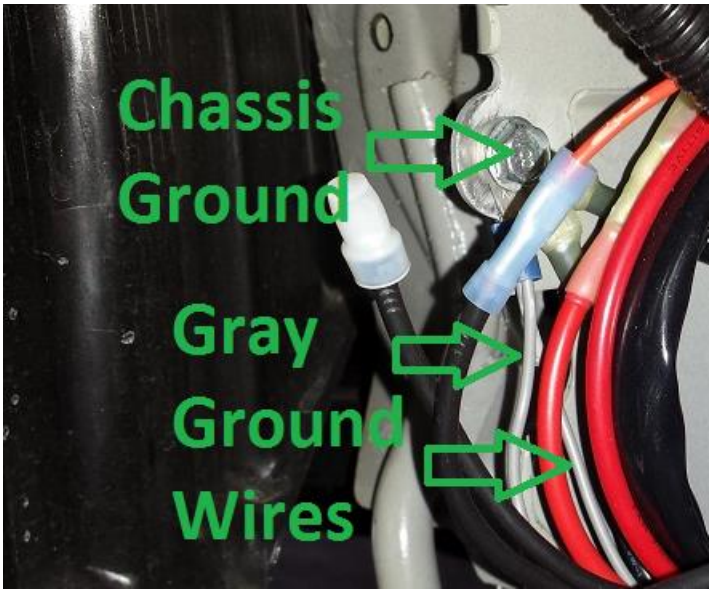




3.13. Next, let's wire the positive side of the relays. Run the two yellow wires to the positive terminal of the battery and wire in the 30 amp fuses included in the relay kit.



3.14. The negative side of the relays (grey wire) can be grounded to the negative battery terminal or the chassis with an eyelet. Ensure the ground you decide to use is a good ground by checking resistance from the negative battery terminal to the eyelet location.



3.15. Next up, we can connect the red wires from the relays to the fan connector wire which is also red. The passenger side signal wire triggered relay, will go to the passenger side SPAL fan. Do this with both relays/fans. Ensure the connection is water tight and shrink wrapped/electrical taped.

3.16. The black wires you see from the fan connectors both can go to the same chassis ground used in step 3.11.

3.17. The fans are wired up now. You can test your wiring a number of ways **once you connect the battery again**. You can test by powering the signal wire of the relay, this should kick each fan on. Remember to not touch the "hot" power to any grounds on the car.

3.18. You can also test by turning the key on, engine off, and turn on the AC. This should kick one of the fans on even while stationary. We've heard sometimes this does not work for certain customers, but for our shop car it did work.

4. Reinstall and Bleeding

4.1. Reinstall all components in reverse order.

4.2. When everything is reinstalled, it is time to bleed the system.

4.3. You may notice while reinstalling the condenser lines need slight tweaking to fit with the radiator. This is perfectly normal. Do not go overboard with slight tweaks, just enough to clear.

4.4. To bleed the system it is recommended to have access to a coolant fill funnel. It is not necessary, but highly recommended as it makes the job significant easier. These can be found at local auto stores or Amazon. Below is a photo of one for your reference. http://www.oreillyauto.com/site/c/detail/LIS0/24680.oap

4.5. Ensure all connections are tight, ensure pet-cock/drain is closed, and then begin filling the coolant.

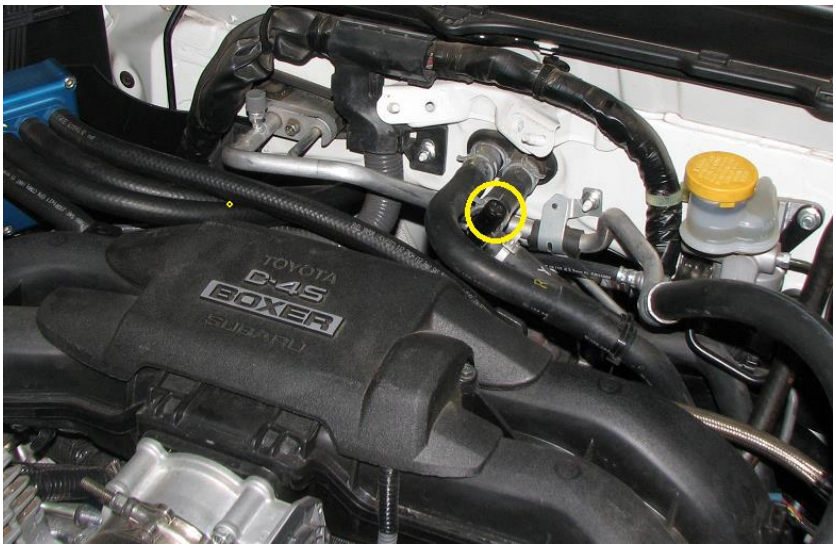
4.6. Squeeze the hoses to aid in getting air out. When the funnel stop letting air out, it's time to turn the car on.

4.7. With the car on, turn the heat to full hot to open access to the heater core.

4.8. Allow the vehicle to fully warm up while squeeze radiator hoses to aid in removal of air.

4.9. Double and triple check for any coolant leaks.

4.10. Unscrew the bleed port to the heater core (shown below). Do this a few times to ensure all air is removed from the system.



4.11. After all air is removed from the system, we can remove the funnel and install the radiator cap back on.

4.12. Fill the radiator overflow to the F (full) mark.

4.13. Congratulations, the radiator install is finished! Please contact Verus Engineering with any questions, comments, and concerns. Our e-mail is sales@verus-engineering.com.