

# DIY BMW N54 Hybrid Intake System

## 1. Disclaimer:

This document contains technical information that could potentially lead to damage of personal property. The author provides no warranties, guarantees of success, nor shall be held liable for any damages (personal, property, mental, financial, etc) incurred to anyone who uses this document.

This document is designed to be as an instructional guideline purely for educational purposes and it should be treated as such! You are welcome to experiment and attempt to improve the techniques discussed in this document, but there are no guarantees of success. **Be warned: Your Mileage May Vary**

## 2. Preliminary Thoughts:

I've been doing research on the N54 aftermarket intake systems for over 2 years now. Every one of them has its advantages and disadvantages and this custom hybrid system is no different. Here are my thoughts for each type of intake system currently available on the market:

\* **Dual Cone Intake (DCI):** This is perhaps the most popular type of intake system. There are several reputable manufacturers and vendors who make these systems. There are several different versions of DCI out there, some with bigger filters, some with smaller, some with heat shields, some without and some are cheap while others are expensive. Ultimately however, all DCI systems suffer from one main fault: they all suck hot air from inside the engine bay. It is no secret that the tightly packed N54 engine bay gets really hot regardless of the outside temperature. Ingesting hot air is not optimal for any engine.

\* **Cold Air Intake Systems (CAI):** This type of intake system addresses the issue with the hot air completely. The stock airbox is removed and a custom intake pipe is installed which places a single cone filter in the lower fender area on the driver side of the engine bay. Cold fresh air enters the intake from the lower front bumper grill. Some people even modify the brake duct vent to channel more air into the filter. I see two issues with this type of system: it has only one filter which limits your total air flow and the location of the filter often makes it difficult to perform maintenance on it.

\* **Dinan CAI:** The Dinan intake uses the stock air box and adds a special lid which has an extension pipe which places a second filter in the lower fender area of the engine bay, similar to the cold air system discussed above. The big benefit is that there are two filters providing fresh cold air to the engine and also it looks very good. Unfortunately, the Dinan system also suffers from somewhat difficult maintenance. Perhaps the biggest issue with Dinan is the astronomical cost!

\* **Mr. 5 type Intake System:** Mr. 5 created a really nice intake system similar to the Dinan one. The stock air box remains and a secondary air filter is installed in the lower fender area for more air flow. Unfortunately, this system still exhibits the maintenance difficulties described above. Furthermore, the Mr. 5 system uses a flexible plastic hose which creates a lot of turbulence. In my opinion, this is not optimal. This type of intake system is one of the cheapest and the low cost seems to offset some of its disadvantages.

\* **Helix Intake System:** Maintains stock airbox and utilizes a 90 degree silicone boot, a short aluminium pipe and a cone filter. The cone filter is installed right above the charge pipe and next to the stock intake ducting. The system has excellent accessibility which makes it easy to perform maintenance on it. It also has very little turbulence because there are no flexible hoses and it has only one bend. Unfortunately, it utilizes only a 2 inch pipe which is rather small and it requires modifications to the plumbing

of the diverter valves which is also not optimal.

After much deliberation, I decided that I liked the Helix Intake the best. However, I wanted to improve on it and mitigate some of its deficiencies. Therefore, I create this Hybrid intake system. Here are the key features that I found very important:

- a) Cheap: It can be built for under \$200 including all parts, tools and the two filters
- b) Excellent airflow with minimum turbulence: It utilizes a 90-degree silicone bend, a 3-inch diameter pipe and two filters. There are no flex hoses to create turbulence.
- c) No extensive modifications needed for stock diverter valve plumbing.
- d) Easy maintenance.
- e) Minimal amount of protruding bolts and nuts. Clean installation is a must. This is why I chose rivets instead of bolts. See below.

**Note:** I purposefully designed this intake system to utilize filters made from the same company with the same technology. I wanted to make sure that both of the filters have the same filtration parameters! I highly recommend that you follow the same principle even if you choose a different brand and type of filters for your system. See below for more information.

Clearly, my intake system is also a compromise and it is in no way perfect. It is not 100% true cold air system since one of its filters draws hot air from inside the engine bay. Hence the name: Hybrid Intake. Also, unlike the Helix system, it has a bigger pipe, bigger secondary filter and does not require extensive modifications to the plumbing of the diverter valves.

### 3. Parts and Tools Needed:

- \* Stock Intake Air Box. You can use your existing one or purchase a used one in case you want to revert back to stock.
- \* Spectre Performance Air Intake Mount. (Part number: 8148)
- \* Spectre Performance 90-degree 3-inch Intake Boot (Part number: 8791)
- \* Spectre Performance 3-inch diameter Aluminium Pipe (Part number: 9419)
- \* Afe Pro Dry S Drop In Filter (Part number: 31-10156)
- \* Afe Pro Dry S Universal Clamp On Filter (Part number: 21-30003)
- \* 90 degree 4-ply Silicone Coupler 1-inch diameter (ebay is your friend)
- \* 3-inch hole saw with a guide pin. I used the Milwaukee brand.
- \* Rivet gun and rivets
- \* Power drill and some drill bits
- \* High temperature all weather silicone sealant
- \* Hair drier (Optional)

Pictures of the parts follow on the next pages.















Model RHT300™  
**ARROW**  
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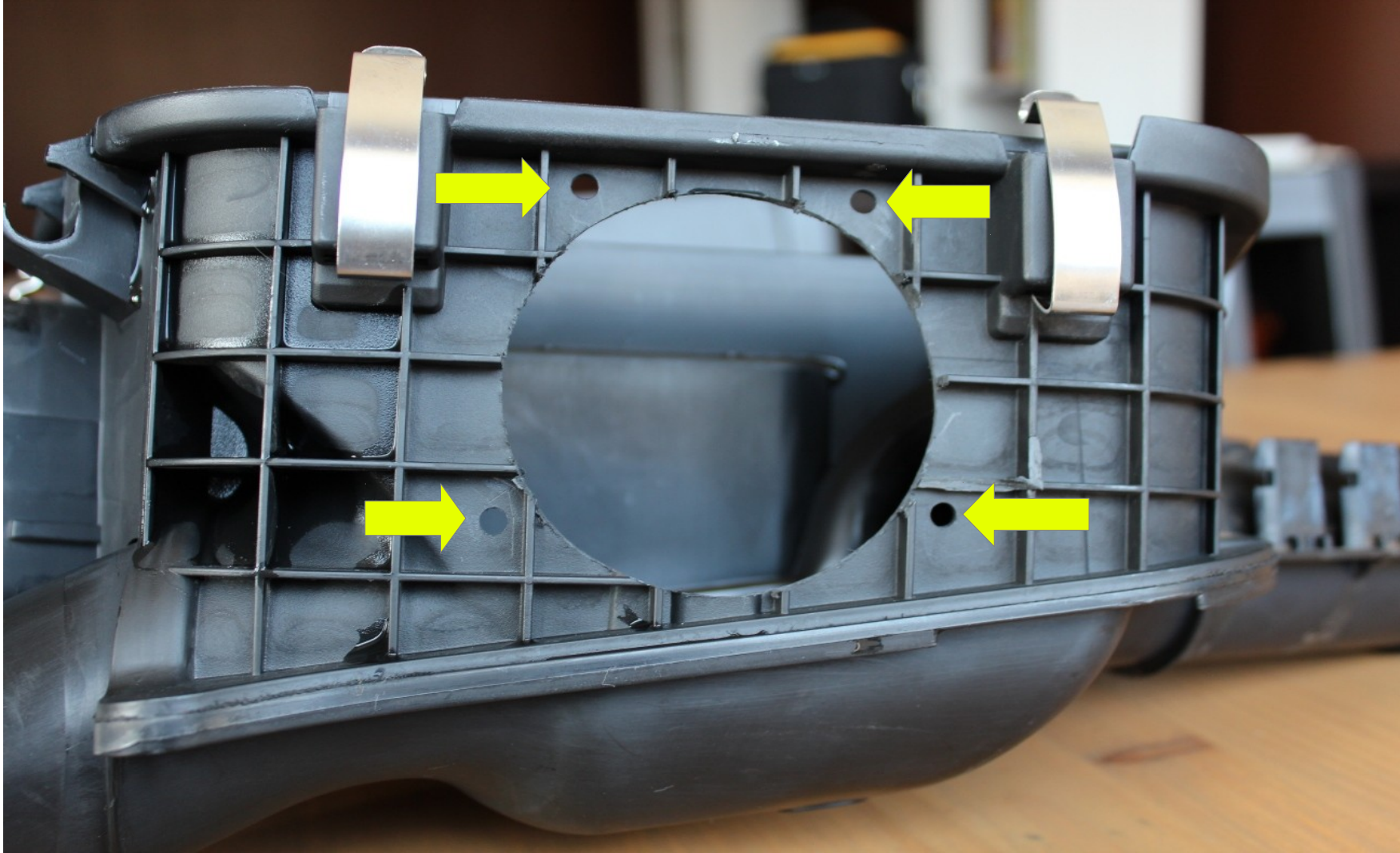






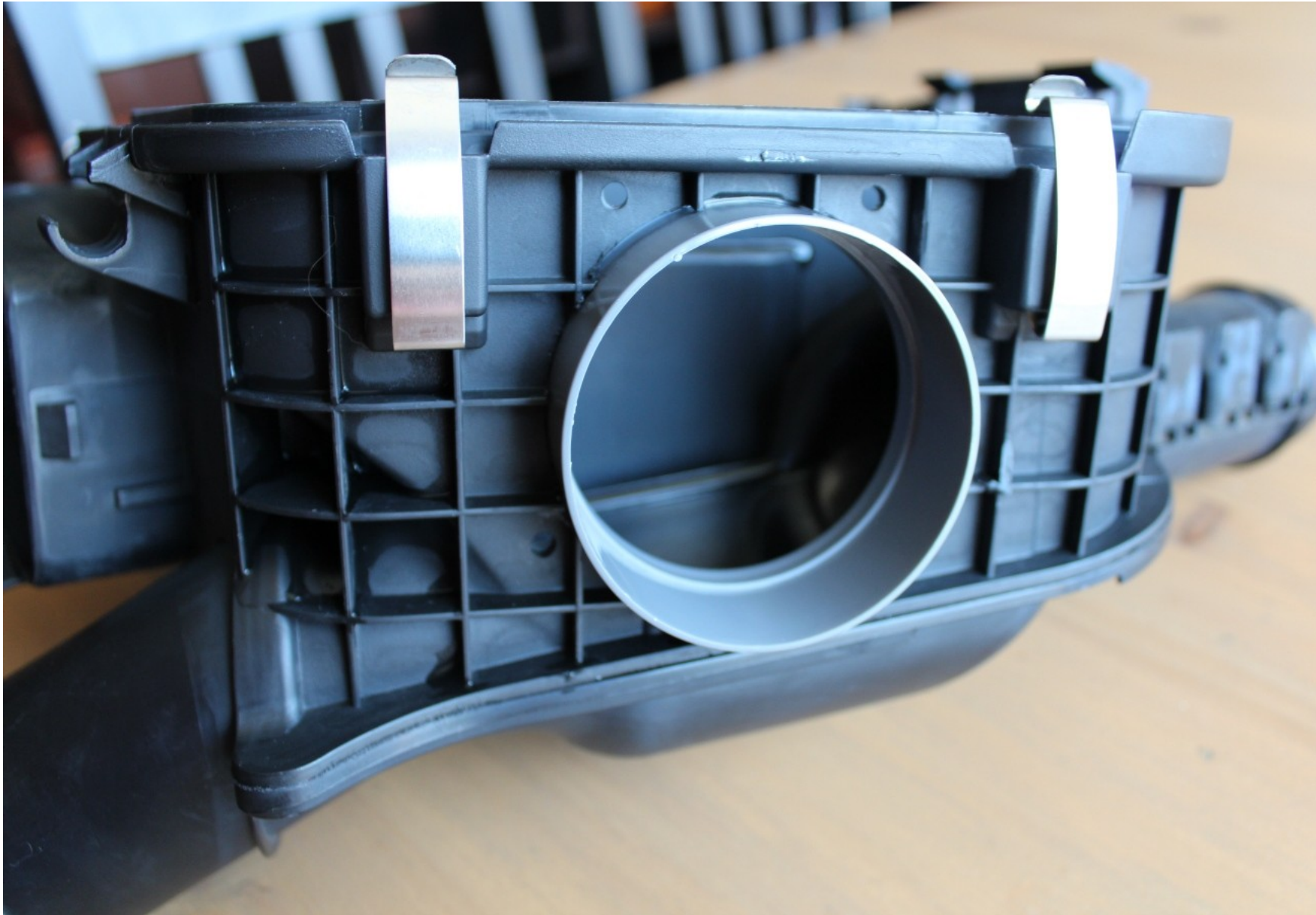
#### 4. Building the Intake System:

Carefully examine the stock air box. You will be drilling a 3 inch hole on the side of it and the placement of this hole is very important because of tight fitment issues. If you drill too high, you will have issues closing the airbox lid once you install the 90-degree boot. If you drill too low, you will not have enough clearance between the 90-degree boot and your diverter valves. If you drill too much to the left or too much to the right, you will have hard time riveting the intake components. Set your drill on low-rpm high-torque setting and drill slowly. The plastic is thick and your hole saw will bind if you press too hard. Just take it slow and let the hole saw do its work slowly. Here is how things should look like once you drill the 3-inch hole using the hole saw:



The holes for the rivets are already made in the image above and highlighted with arrows. As you can see the rivets are located in areas which make it very easy for installation.

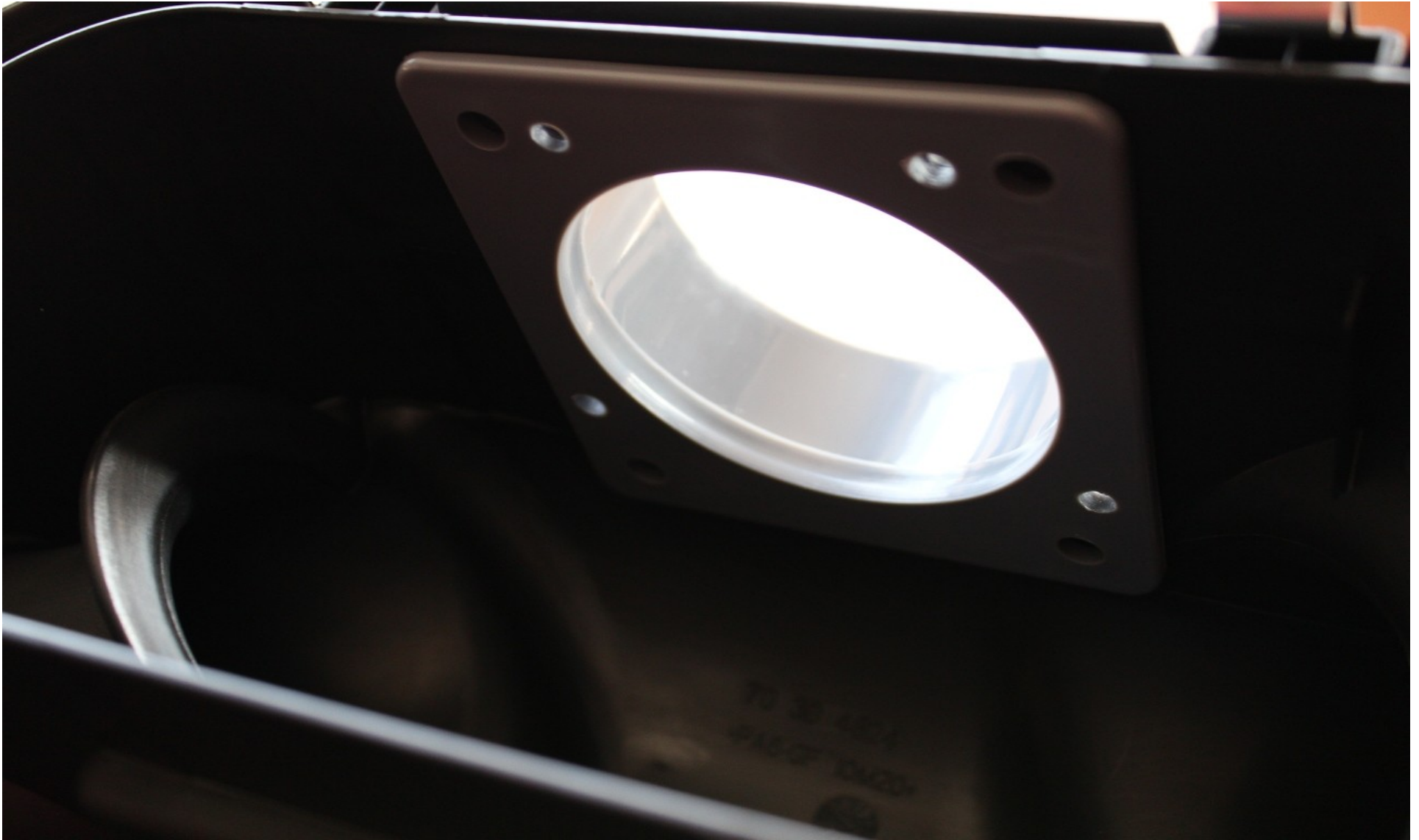
Test fit the intake duct and make sure that all of the rivet holes match:



Note: The base of the Spectre intake duct is not a true square but rather a rectangle. Make sure you install it in such a way that it sits flush with the inside wall of the air box!

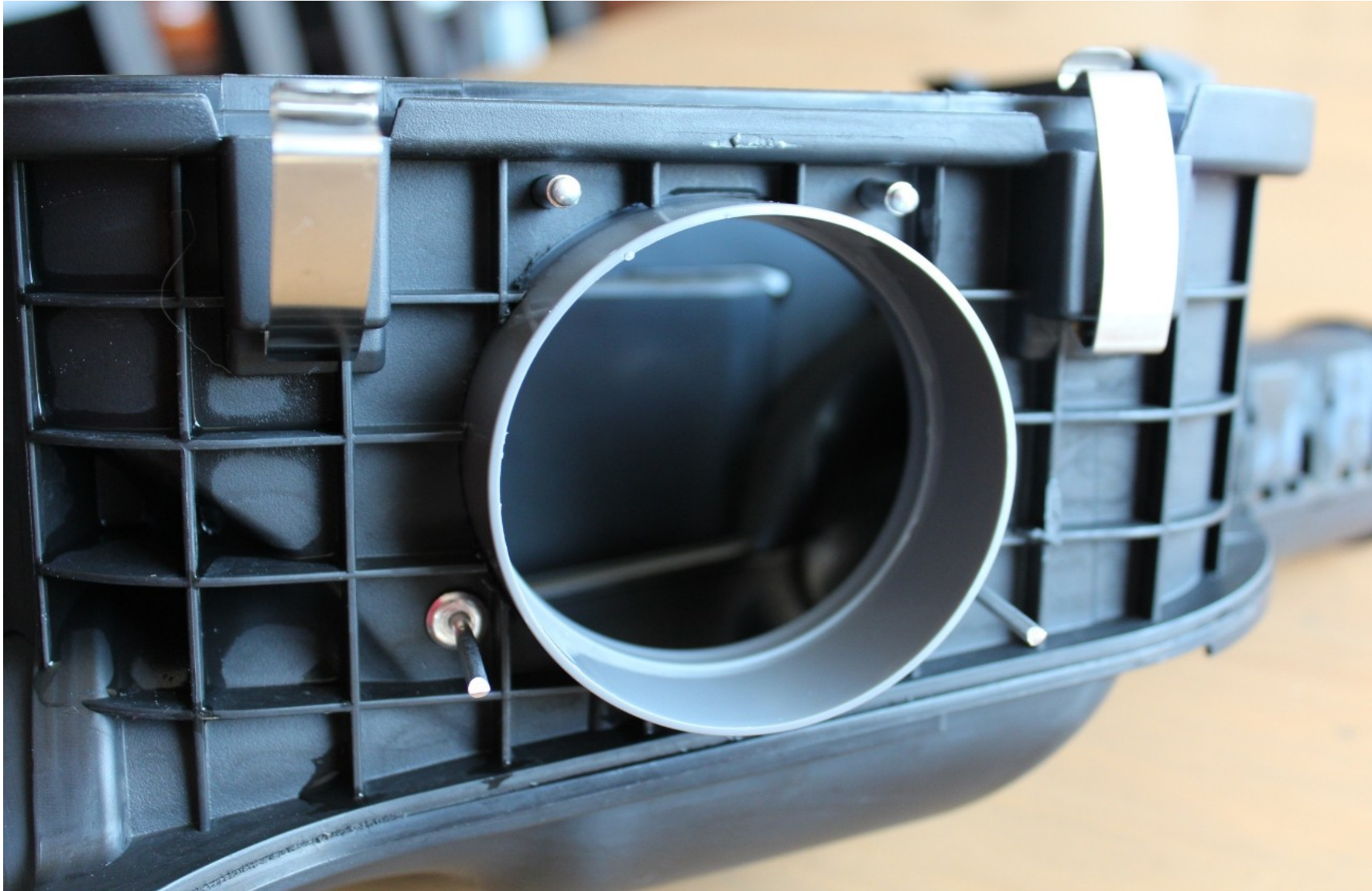


Here is a look from the inside:





Test fit the rivets and make sure everything fits correctly! Note: I installed two of the rivets from the inside of the airbox and two from the outside:

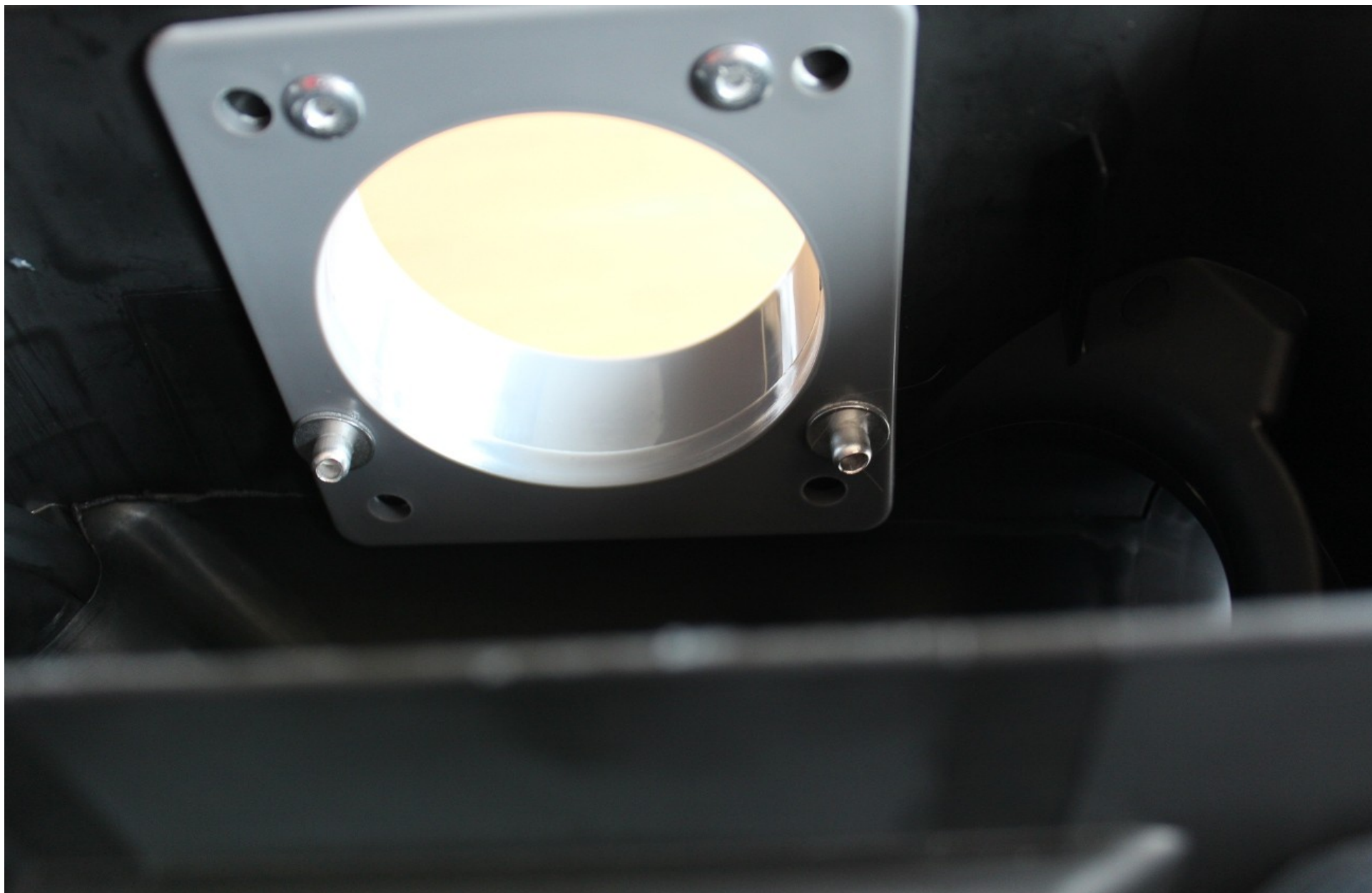


After you are satisfied with the test fitment, apply a layer of silicone sealant on the Spectre intake duct, around the circular part where it will mate with the wall of your intake box. Carefully install the Spectre intake duct from the inside making sure that the rivet holes match the ones you drilled on the intake box. Using the rivet gun, install the 4 rivets. Two of the rivets are installed from the inside and two from the outside. Here is how it should look like after the rivets are installed:





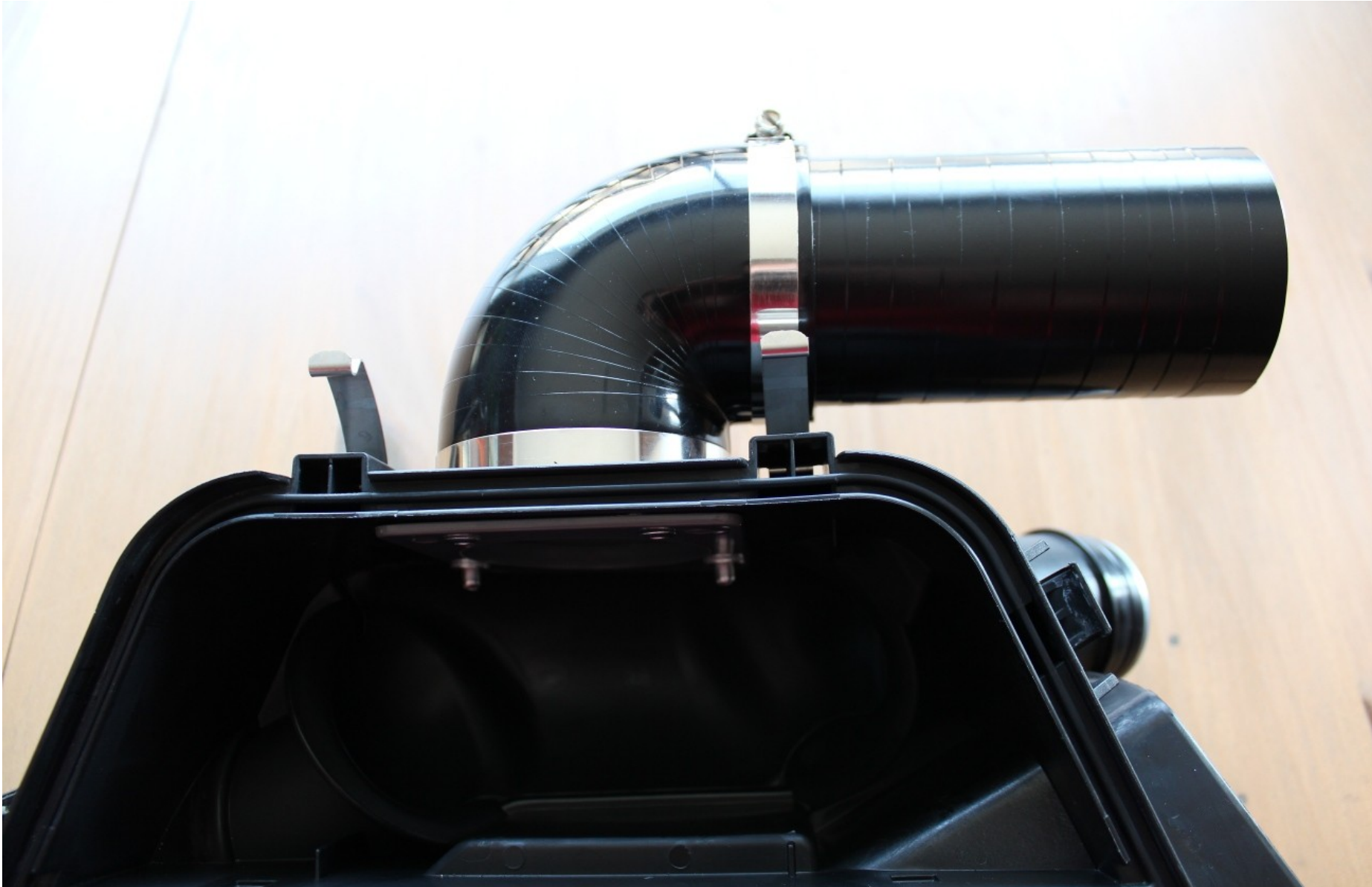
From the inside it looks like this:





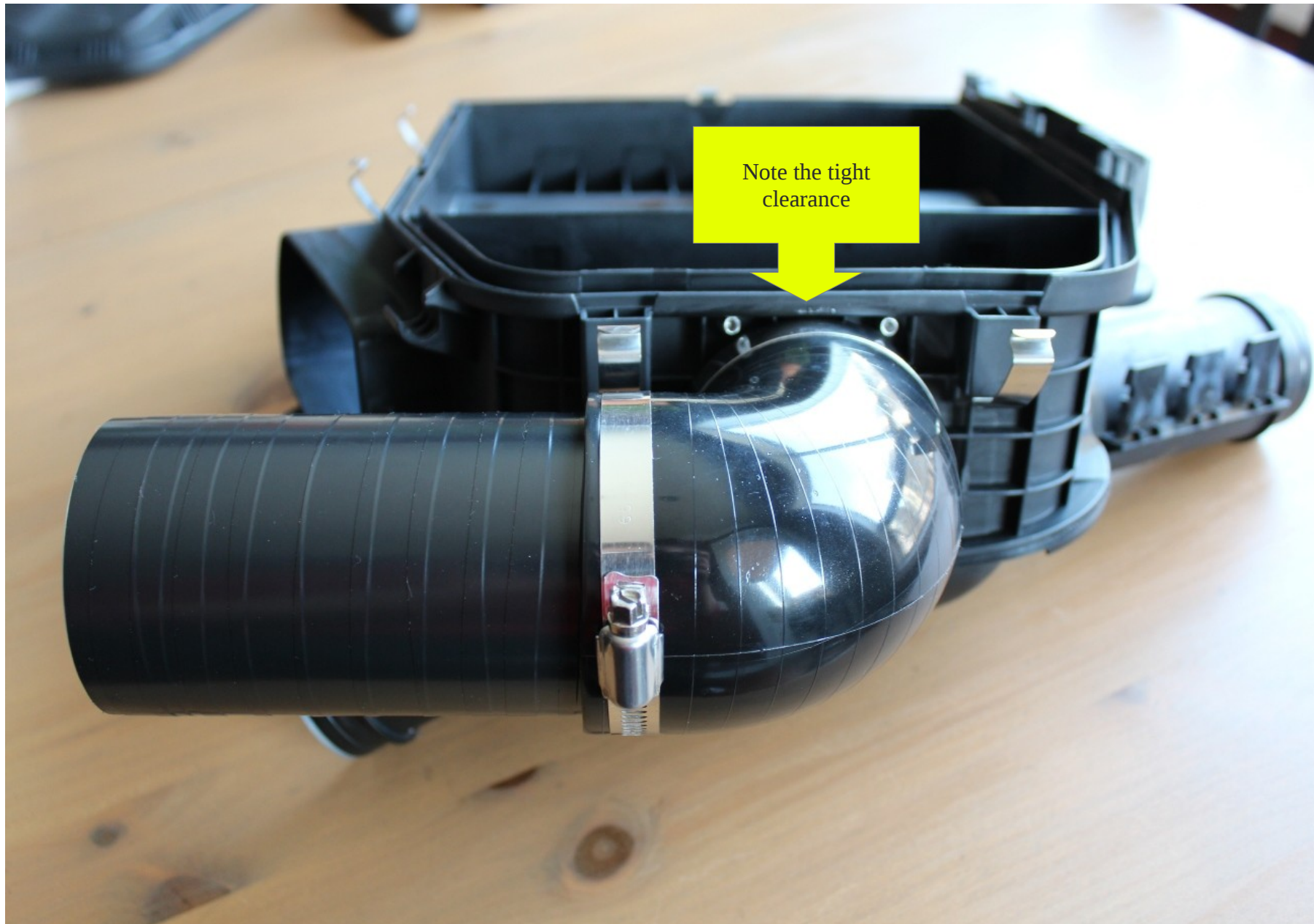
Wait for 24 hours until the silicone fully cures. Clean the airbox thoroughly from any shavings that may have been created from the drilling. I opted out for putting my airbox into the dish washer. It came out perfectly clean! Just make sure the silicone has been cured completely before you put the airbox in the dish washer.

Here is a picture of the test fitment of the other components:



Note: The Spectre 3-inch aluminium pipe is polished. I wrapped it in black electrical tape to achieve more consistent look with the rest of the intake components in the engine bay.

Here is a side view of the product during test fitment:





## 5. Installing the Intake System:

Install the air box back into the engine:





Using a hair drier, heat up the plastic connector on the brake booster hose. Then, very carefully, turn twist the hose in such a way so that the nipple points horizontally and not downwards anymore. This will give you additional clearance for the Spectre 3-inch pipe. **Warning: Be careful not to break off the nipple!** Here is the end result:



Relocate your power steering tank:





Trim the 90-degree silicone 1-inch coupling in such a way that it sits as close to the charge pipe as possible. The more vertical clearance you create the better. Unfortunately, the only picture of this is during my prototyping phase. I know it looks rather unprofessional, but it was just for prototyping:





Assemble the rest of the components. Here is the final product:



Side view:







## 6. Resetting ECU adaptations (Optional):

You may want to reset the ECU throttle and idle adaptations. Your intake system will flow significantly more air compared to stock so it is good to reset those adaptations so that the ECU can relearn. You can use either BavTech Tool or INPA.