# N54 Intake Valve Blasting

05 Aug 2012

Subject:  BMW E90

The BMW N54 Inline 6-cylinder twin-turbocharged engine featured in many of BMW's production automobiles suffers from carbon build up on the intake valves as a result of direct injection. Positive crankcase pressure combined with a common crankcase ventilation system when used in conjunction with direct injection technology leaves intake valves defenseless from oil accumulation on the back of the valves and valve stems.

It has proven that this condition can not be treated passively, i.e., with "Seafoam", oil additives, or even methanol injection. The most effective measure to rid this problem is partial disassembly of the induction system and manually cleaning the valves either by wire brushes and carb cleaner (very messy) or with walnut shell media abrasive blasting.

This tutorial offers step by step instructions for the abrasive blasting procedure.

Tools Required:

Air Compressor (5+ HP, 20+ gal)
Shop Vacuum (5+ HP, 8+ gal)
Harbor Freight Tools Portable Abrasive Media Blaster Item #37025
Harbor Freight Tools 25 lbs. Fine Walnut Shell Blasting Media Item #92155
Blow Gun Kit – with extension wand

BMW N54 Vacuum attachment for Abrasive Blasting – Part# 81 29 2 208 037
BMW N54 Abrasive Blasting Wand – Part# 81 29 2 208 033
Optional: Abrasive Blasting Wand for Mini (90° Bend)* - Part# 81 29 2 208 032
*recommended for N54 cylinder 5 and 6 but not necessary

BMW is the OEM for the Vacuum attachment (to my knowledge).

Wezag Tools is the OEM for the Blasting Wands. If you can not procure the wands through BMW or Mini*, contact Wezag Tools.

WEZAG TOOLS, INC
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Naperville, IL 60540
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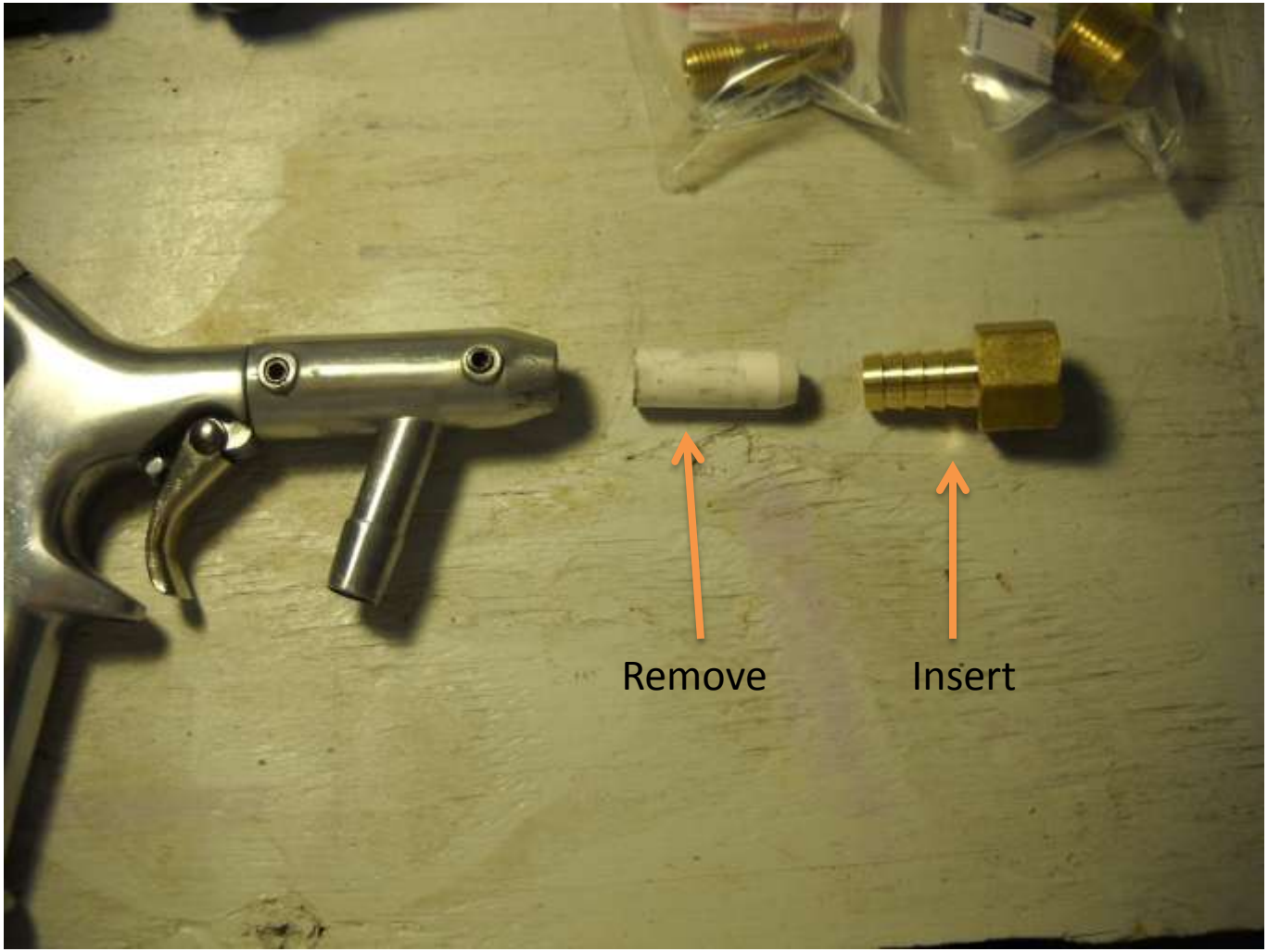
Adaptation of the BMW blasting wand to the Harbor Freight Tools (HFT) blasting gun:

The brass fittings were bought from Lowes in the plumbing department.


Please Note: I am not claiming that this is the only way to adapt the gun to the wand, but this is certainly one way that was the easiest and cheapest for me.




Use allen key included in blasting kit to remove the ceramic nozzle already equipped in the blasting gun

Don’t be afraid to use some force to insert the barbed adapter.  Fortunately it’s just the right length to be fully seated without causing problems.

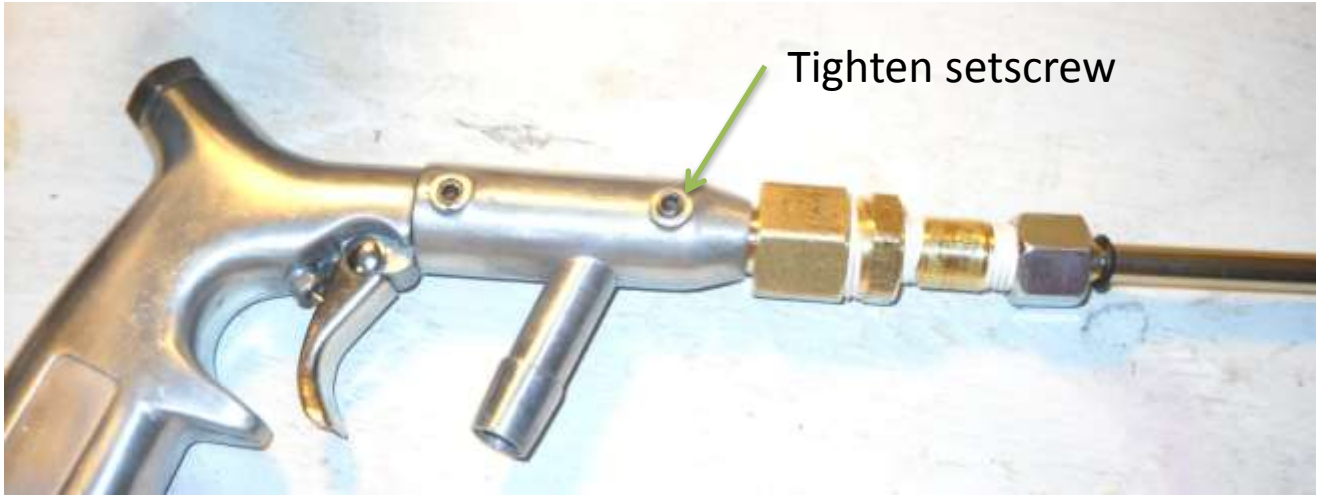
Unfortunately the nipple has to be modified in order to adapt it to the BMW blasting wand. The threads just don't engage well otherwise. I chose to use my drill press and a 3/8 drill to enlarge one side of the nipple, then a 7/16 drill to flare the same end.


In retrospect, it may have been easier to just drill with 7/16 only, but it may have destroyed the threads on the nipple.  A simple chamfer/flare was all I really needed to get more threads to engage from the nut on the BMW blasting wand (nut not shown).

Before 7/16” Flare

After 7/16” Flare

After the nipple mod, everything should go together smoothly. Teflon tape is recommended but is actually not required because this is not an air-tight application. I did it anyway though.

Remove Cabin Air Filter Duct and cable cover

Remove ECU cover and brake fluid reservoir cover

Remove Cowl Shield (no clue what real name is)

Remove Engine Cover (4 screws) – removal of compression strut rods not necessary.

<- Evil hidden screw near firewall on passenger side

DID YOU KNOW:
BMW was *almost* prepared for work on this engine with the integration of the elusive wire bundle stowage feature:

Now if we can just figure out what to do with this cable trough:

Remove factory airbox or aftermarket intake

Remove Diverter Valves (Blow-off Valves) – See next page

I wish I had gotten a better picture of these amazing connectors. The gray portion rotates approximately 30°. When the arrows on the gray portion line up with the arrows on the black portion they are locked, or are ready for click-lock if empty. To remove the existing diverter valves, rotate the gray pieces (either by hand of with channel locks) so that the arrows no longer line up. After that the DV's simply slip right out with very little force.


Yes, oil was everywhere in the intake

# Unplug pressure transducer and IAT sensor

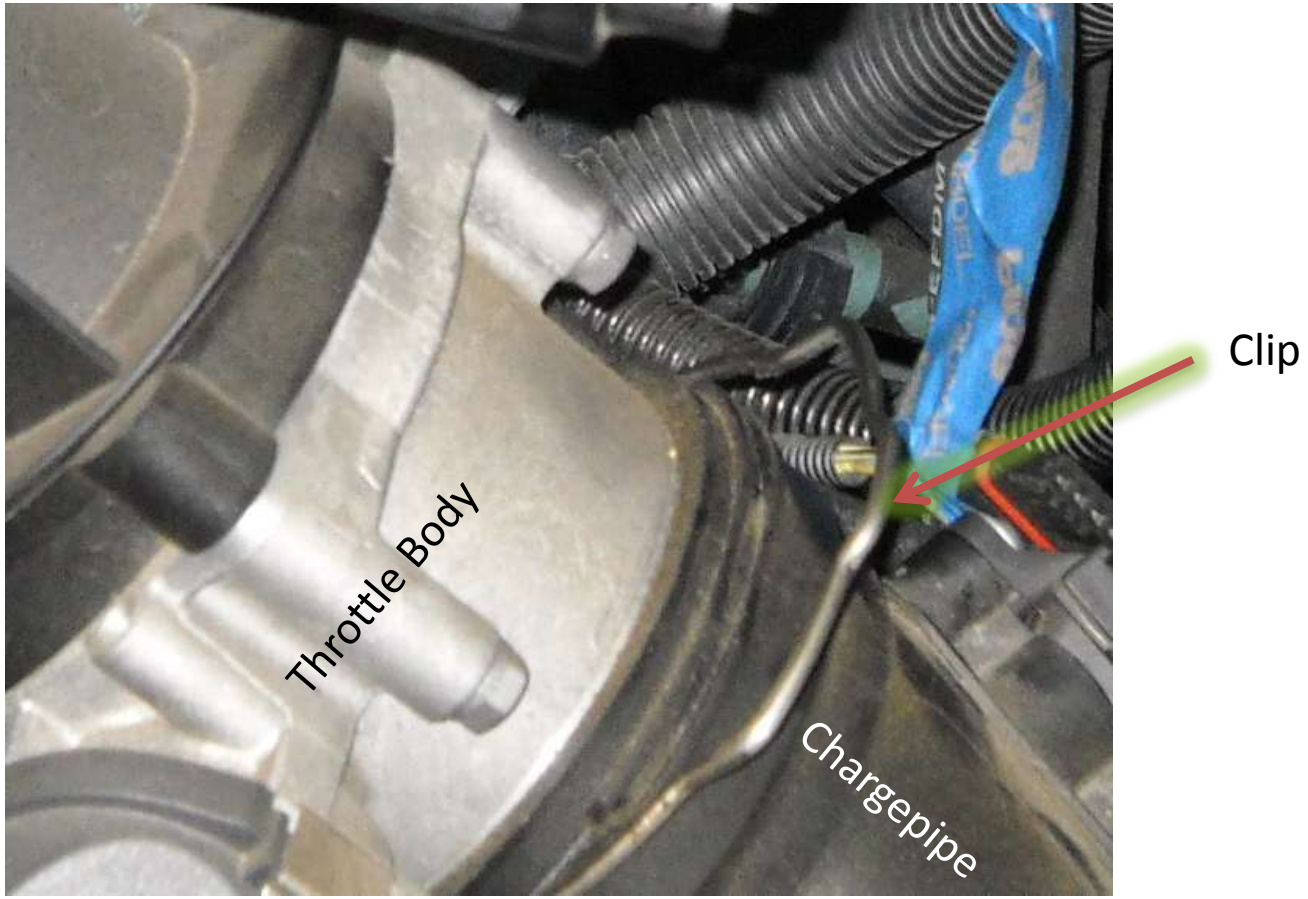
NOTE: “Flagging” your connectors with some sort of easily visible tape or string will make them MUCH easier to find later on. You don’t want to learn this the hard way.

# Remove your charge pipe:

Simply pull or pry up on the clip holding the pipe to the throttle body until it clicks.

The other side is just a worm clamp you can loosen with a screwdriver.  Easy pull out after that.

(You may find it easier to remove the pipe, however, by removing the clip completely.  Requires prying one edge of the clip out of its saddle, easy with small screwdriver.)



# Remove throttle body (4 10mm screws)

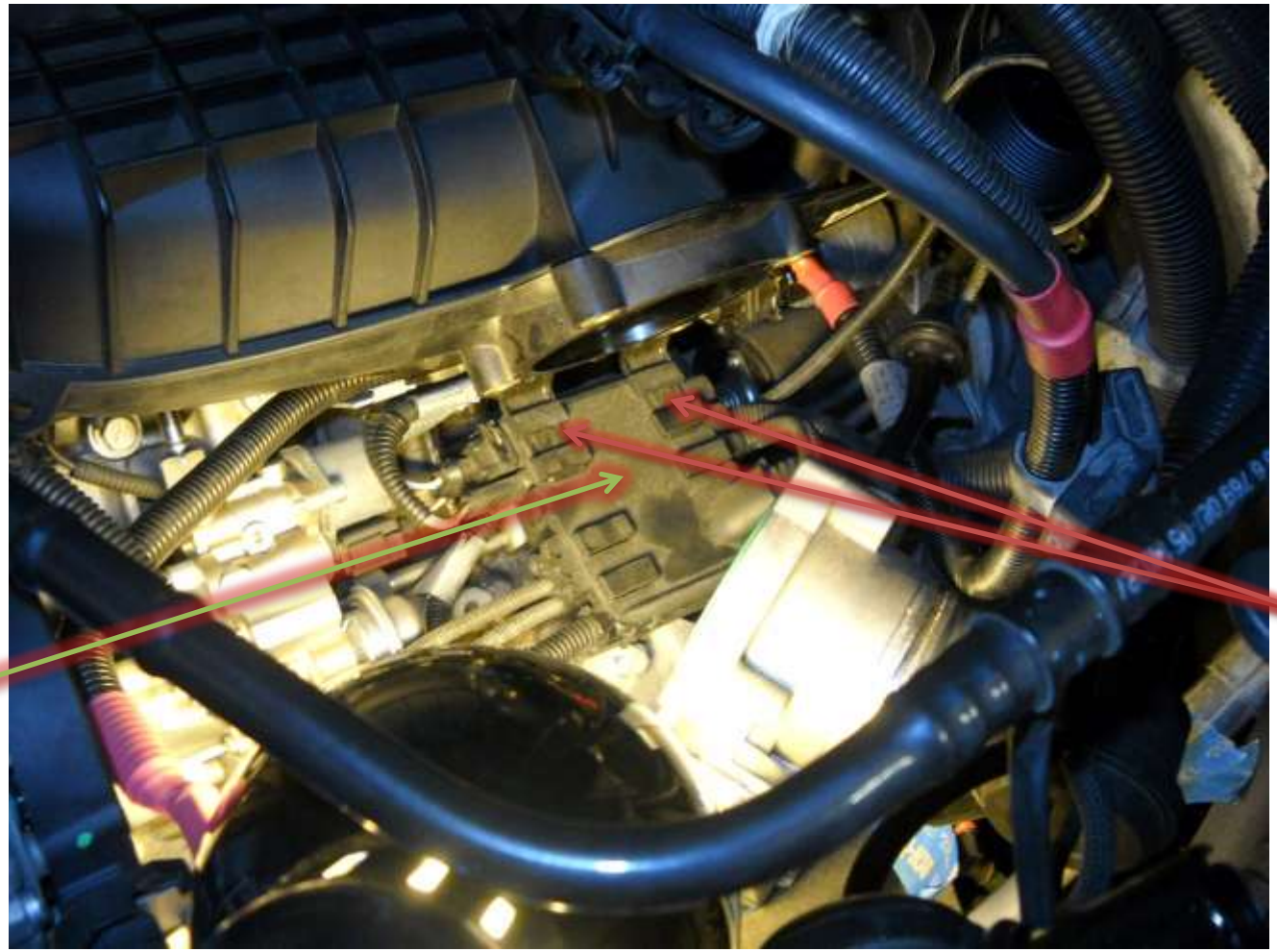
Note – no need to disconnect throttle body harness or tube.  Just let it drop (carefully) and clean it when you're done.

This is where things get interesting, and the pictures get worse. Before loosening the intake manifold, 4 items need to addressed:

-disconnect oil pressure/temp sensor
-slide evil box off it's 2 rails
-disconnect diverter valves vacuum line
-slide rubber clamp off its rail on the back underside of the intake manifold

I will do the best I can with the upcoming pictures to better describe what's going on.

I was able to put one hand on each side of this box and slide it down off it's rails. No need to disconnect anything, the intake simply won't come out with it attached to those rails. I've heard some are more difficult to work with than others. A dab of spray lube may be helpful if yours won't budge. I got lucky.

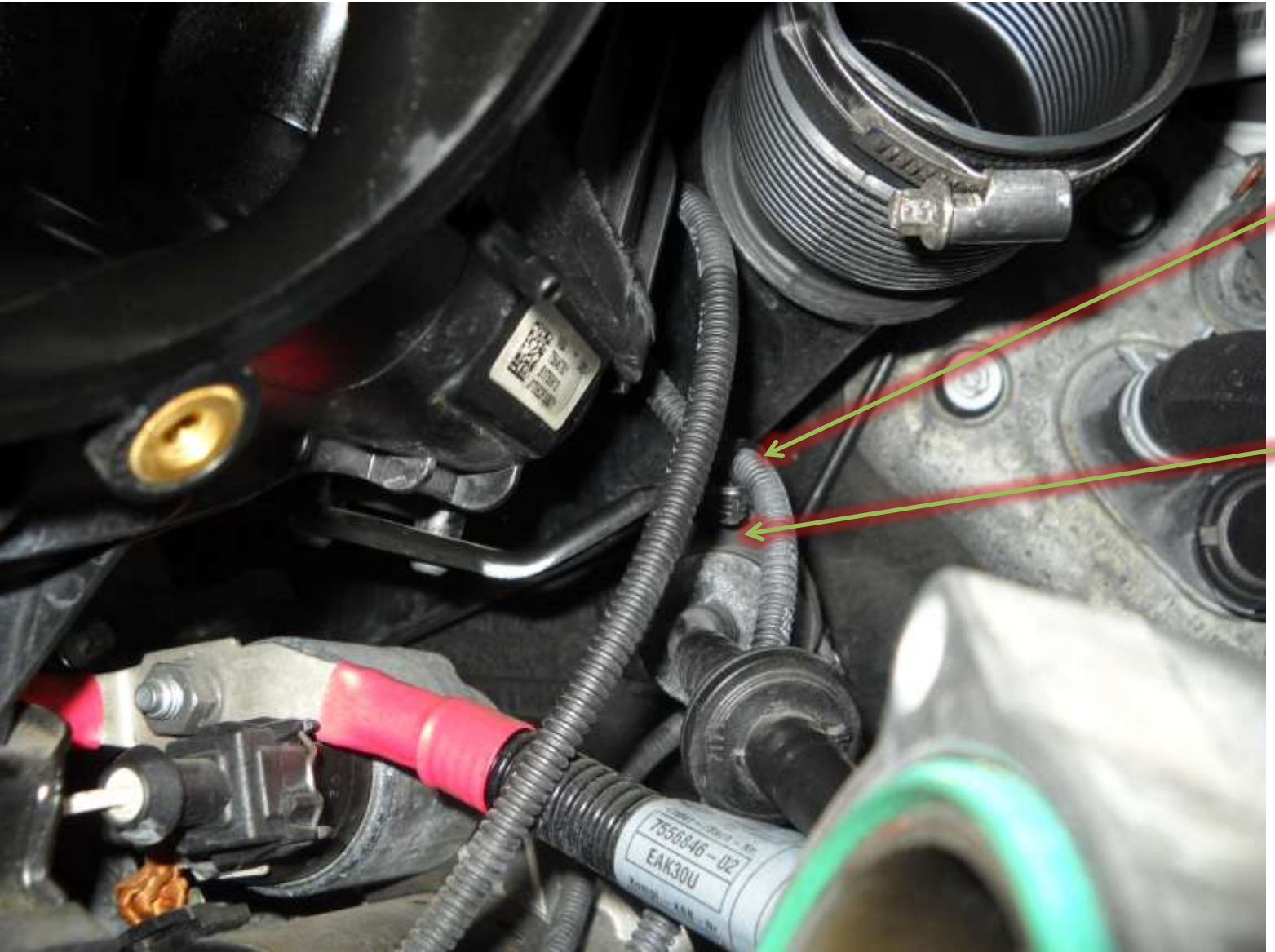


Vacuum tube for diverter valves connects here.  It was a bit difficult to remove.  Rather than take a risk of a vacuum or boost leak I cut off the last 1” of the tube after I removed it so I had an unmolested tube to connect later on.

The final challenge:

Slide this rubber clamp aft towards the firewall and finally off if the rail it is attached to (throttle body will move aft slightly when you do this, so be aware), and disconnect the small wire harness from this rail.

Note: Photo shot UNDER the manifold facing the firewall.



Next you will remove the 6 11mm nuts and 1 11m bolt for the plastic intake manifold. You should be able to remove the manifold (be careful) after that with no problems.

Get a flashlight and start looking at your dirty valves.  It's time to determine which are closed or open, and cover the open intake runners with masking tape.

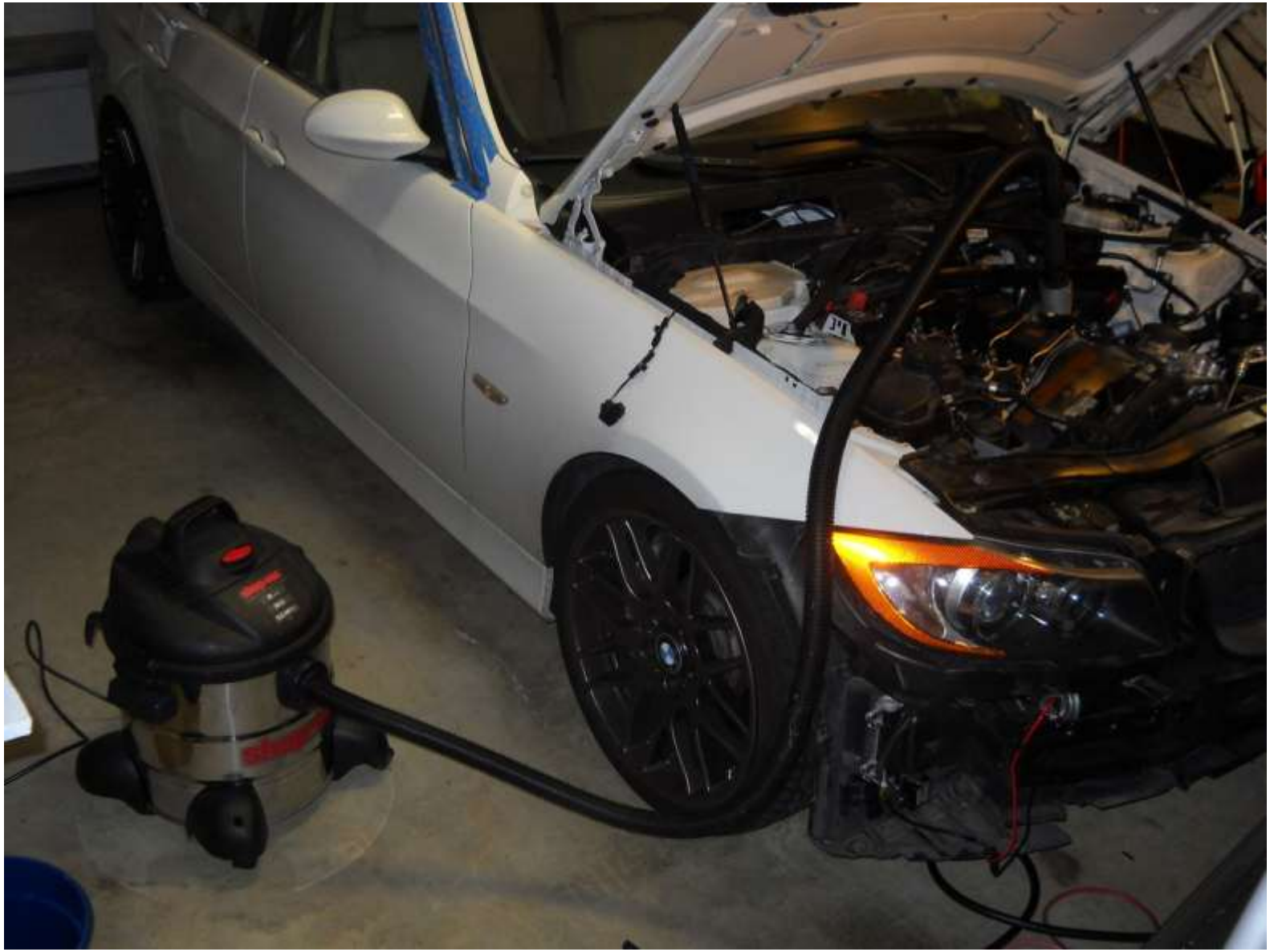



On this particular car you can see that cylinders 1 and 5 were the only ones open. If you are unsure whether or not your valves are fully seated, go ahead and tape them off and work on the ones you know are closed. You don't want to experience a new symptom known as "walnut lock".

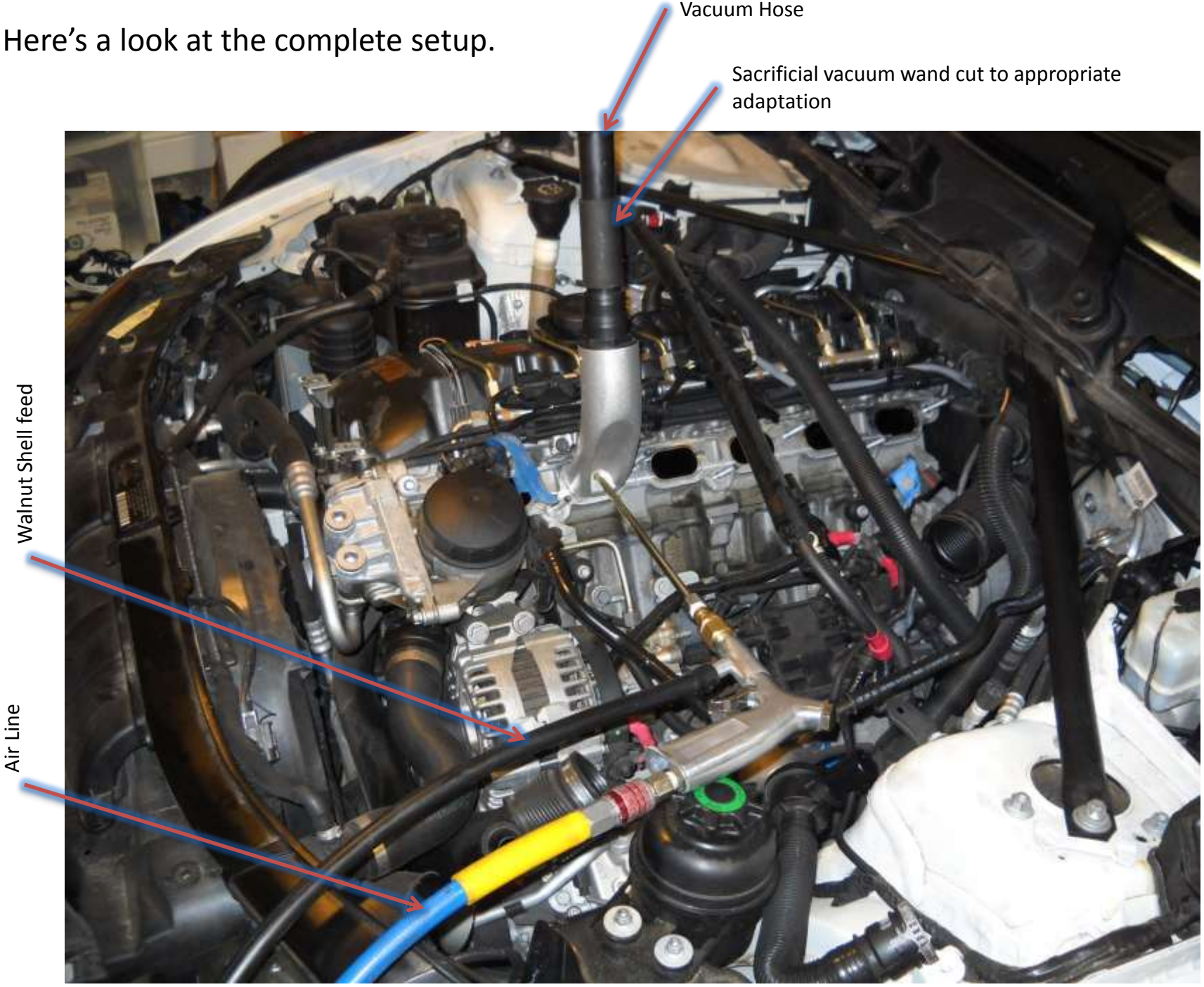
Here you can see how the vacuum adapter fits into the intake port perfectly.  Attach your vacuum (you may have to create a fancy adapter using duct tape, electrical tape, or sacrifice one of your shop vac extension wands by cutting one at the tapered end, until it fits the BMW attachment.

Here’s a quick look at my vacuum setup.  Nothing fancy.  No surprises here.

Note:  Front bumper not required to be removed for this project.



Here's a look at the complete setup.

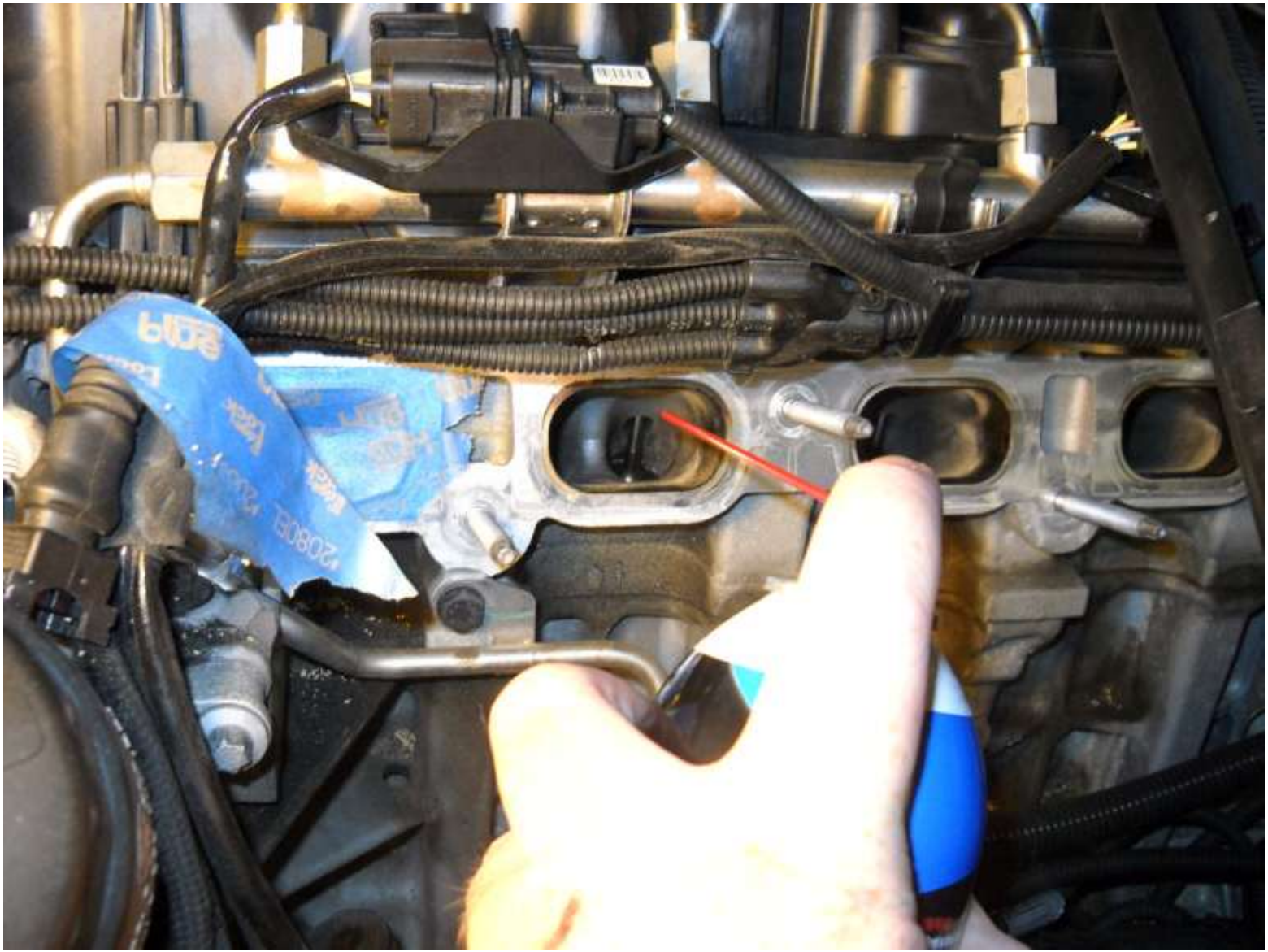


Set your air pressure regulator to 90 PSI, turn on your vacuum, and start blasting away, blindly. After about 60-75 seconds of blasting, moving the wand side to side, up and down, in and out, you should achieve results similar to this. Next, use a long flathead screwdriver to loosen up the crud still on the valve stems and in the runners. It scrapes off easily.

Note: DO NOT LET VACUUM CONTINUE TO RUN WHILE BLASTING WAND IS INSERTED INTO VACUUM ATTACHMENT AT THE PORT AND NOT BEING USED (IDLE). THE VACUUM WILL CONTINUE TO SUCK WALNUT SHELLS FROM THE FEED LINE REGARDLESS OF BLASTING TRIGGER POSITION.

This is what you are shooting for.

After blasting I used some carb cleaner and shop rags to get better results.  Using the long screwdriver mentioned earlier, I lightly forced the shop rag down into the puddle of carb cleaner and finessed it into the port as deep as possible, almost making the shop rag wrap around the back of the valve.  This final step really gave me the results I was looking for.



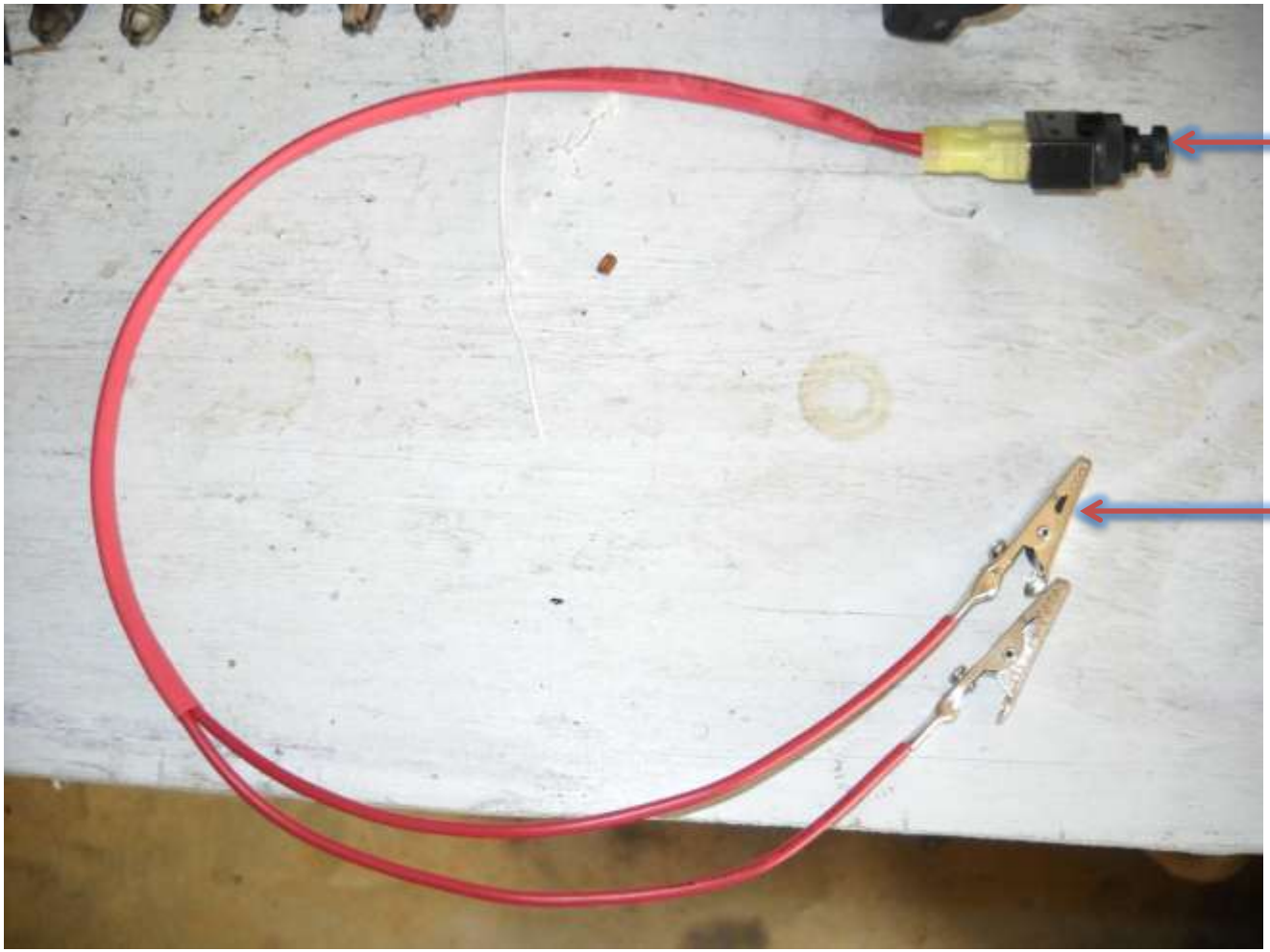
Results are typical.  At this point you can continue to blast more, or the carb cleaner method.  I honestly didn't go further than this.  I also never exceeded 95 PSI air pressure.  You can try higher pressures.  Always read your air tool owners manuals.

# WARNING!

# EXPLOSIVE

DO NOT ATTEMPT TO REMOVE CARB CLEANER USING VACUUM OR ATTEMPT TO USE THE CARB CLEANER EXTENSION SPRAYER IN THE BMW VACUUM ATTACHMENT HOLE WHILE THE VACUUM IS RUNNING. CARBUREATOR CLEANER IS VERY VOLATILE (COMBUSTABLE). FUMES FROM THE CARB CLEANER COULD TURN YOUR CANISTER VACUUM INTO A **BOMB**. A SPARK FROM THE ELECTRIC MOTOR IN THE VACUUM COULD IGNITE THE FUEL/AIR MIXTURE IN THE VACUUM.

Now that the closed valves are clean, what about the other ones? I made a simple push-button device that enables the vehicle starter for split seconds to actuate the valves. You can also buy a remote starter trigger from a parts store to do the same thing.



Gently slide this clip away from the engine block and pull the connector off of the starter, revealing the single blade terminal.

After cleaning the closed valves and using a blow gun to ensure all loose walnut shells have been cleaned out, remove the tape from the open valves. Attach your switch as shown, it doesn't matter which clip is on each terminal. Press the switch or trigger in short increments while watching the open valves. When you see them seat (close), another quick ¼ second starter bump without seeing valve movement will ensure that the camshaft has allowed the valves to completely close and you are free to start the cleaning process.

NOTE: Don't forget to mask off the valves you have already cleaned. Some will be open at this point, and there is no need to risk contaminating the cylinder.

I hope that you have enjoyed this DIY.  If you need further assistance you may reach me at:
N54tech.com  “e90man”
Bimmerforums.com  “e66man”

**Enjoy the road ahead.**

TOOLS