UPDATED

CBU CLEAN LESSONS LEARNED

2011 335d M Sport, 115,000 miles

2011 335d Sport, 64,000 miles

Just finished CBU cleaning of the second of my two 335d. I've owned the black M Sport since 32,000 miles—it now has 117,000 miles. I've owned the white Sport since 24,000 miles and it now has 64,000 miles. When I first learned of the carbon build up issue, I installed a Frantz oil filter in the M Sport thinking it may help the CBU—I think now that it may have kept the oil very clean of soot particles larger than 3-4 microns, it has no apparent effect on reducing CBU.

I have been religious about changing filters/oil and other preventive maintenance. It's a California car and has to pass smog every other year so both cars still have DPF, EGR cooling and swirl flaps. I have Reingold for diagnostic analysis and maintenance support. Although I have an Innova 3120 OBD II scanner for checking/clearing codes and monitoring I/M status for smog, I have found the free version of InCarDoc (along with an ELM 327) superior in ease of use and it enables me to check other things like water temp, boost pressure, etc.

I did the M Sport first because it had the most miles and I had to pull the intake manifold to check a glow plug code anyway. Once I saw the astounding amount of build-up in the manifold there was no turning back. I subsequently did the Sport because I wanted to have a basis for comparison. OBTW, there is no mechanical difference between the Sport and the M Sport versions of the 335d—only cosmetics.

- - - - - - - - - - - - - - 2011 M Sport, 115,000 miles - - - - - - - - - - - - - -

Recently, codes for glow plugs #3 and #5 went from intermittent to steady. I had changed the controller at 50,000 miles so I assumed that the glow plugs had followed suit and set about pulling the intake manifold to change them (stupid me—the glow plugs tested fine. It was the control module which can be changed without pulling the manifold!).

I recommend cleaning your engine before you begin. Warm the engine, remove the top cover, spray the engine liberally with Gunk Engine Brite and let it sit for ½ hour or so. Spray it liberally with a 50:50 mixture of Simple Green (or Awesome or Orange Cleaner) and let it sit a bit more then hose it down with a pressure washer. Pay particular attention to the areas around the intake manifold, injectors and glow plugs.

When I pulled the intake manifold, this is what I saw. I couldn't button it up in that state so I set about the cleaning.

Left – caking inside intake runners in rocker cover. Right – yes, there is a valve in this photo!

Preliminary work is covered by BMW B 11 03 14 Preliminary Work Note that special tool 13 0 170 on page 10 is not required. Simply lift the lock (2 on the diagram) and the connection (1 on the diagram) will lift right up and the return line will pop off the injector.

There is a lot of questionable information and opinions out there on the internet that should be disregarded so beware. If the poster hasn't actually done the job, take the observation with a grain of salt.

Read “N54 Intake Valve Blasting” by e90man. It is well written and provides much useful information as do videos by A A Rodriguez and others.

The BMW Group Carbon Blaster pamphlet shows you what “clean” valves look like on page 19. Note from the valve on the left that there will remain a “shadow” of buildup at the front (just barely visible) and back of the valve where these areas are partly shielded from the walnut shells.

Clean valve with residual carbon “shadow”

SI B 11 03 14 Diesel Intake Carbon Cleaning provides additional detail on cleaning procedure. A fancy blaster is not required—the 50 lb portable blaster (Item 37025) and 24 grit fine walnut shells (Item 92155) from Harbor Freight work great. I bought the fancier blaster but didn’t use it because it didn’t have a quickly adaptable gun.

I used a small portable vacuum which I had cleaned well before starting and fitted with a set of mini vacuum adapters from Harbor Freight. Clean your vacuum before you begin and between each valve blasting to permit you to gauge the effectiveness of the blast by viewing the amount of walnut shells captured in the vacuum. The mini adapters enable you to get down into the valve plenums and other tight places. Beware that carb cleaner will melt the mini adapter plastic.

~~While some posters recommend sifting and re-using walnut shells, I do not recommend this practice. Used shells will work but the little bits of gunk that remain after sifting will significantly degrade or even stop the flow of shells through the blaster hose. Often times you will have blasted with no media flow or significantly reduced flow and the job will take a LOT longer with less satisfactory results.~~ With a proper sifter, you can re-use walnut shells without issue. A Cooking Concepts mesh strainer from Dollar Tree did the trick and quickly sifted problematic carbon bits from the media. After having done two cars, the box is still very nearly full. One box of shells is more than ample for the job ~~and you would be much better off to use clean shells as the blast will be more effective and a lot faster.~~

CBU consists of a firm layer of soot adhered to the walls of the air passages/parts/valves generally covered with a gooey tar-like top coating. My buildup was so intense that I opted to first scrape to remove as much build up as I could from accessible areas then vacuum up the debris. The carving tools from Harbor Freight (item 34152) were my "go to" scraping tools but would not reach all the way down to the valve crowns. I fashioned some additional scrapers from ¼ inch brake line in order to reach further in.

Scraping the runners on the intake manifold sent considerable crud into the main plenum. The CBU is awful stuff and makes a quite a mess. I opted to remove and clean the throttle body, EGR valve and swirl flaps myself but took the manifold to a local machine shop for a professional cleaning. The manifold came back looking like new and was $45 well spent! Had local shop do both manifolds. While the first one came back like new, the second one had quite a bit of carbon remaining in the swirl port runners and main plenum so I took it back. The shop re-did it in short order without hassle or additional charge and it came back like new.

The throttle valve was relatively clean and without much soot. A little scraping, wire brushing (brass wire) and paint thinner followed by a carburetor cleaner rinse took care of that.

The EGR valve was heavily caked. Scraping, carb cleaner, and elbow grease got it looking very clean.

The swirl flaps are metal flaps in a plastic housing that has a silicone rubber-like sealing surface for the flaps. It took quite a bit of scraping, light brushing and care not to damage the silicone seal but came clean as well. I no longer have a blasting cabinet or I would ~~have~~ might have soda blasted them.

With the intake manifold out of the way I pulled the glow plugs. I didn't have the luxury of a warm engine so pre-treated them 3-in-One penetrating oil (yes, they now make it in a squirt bottle and it's a great alternative to a spray can). After 30 mins or so I used a 1/4 inch torque wrench to very slightly tighten each glow plug (click plus ever so little) then reversed the torque wrench to loosen them (click plus ever so little). With constant pressure (click plus or click plus a little more) they very subtly gave way then came right out. I will tell you that giving way feels exactly like it would if they were to shear so be cautious but brave. It was interesting to note that they were all clean and tested the same as new with my ohm meter. Bet it was the control module all along and I didn't need to pull the manifold. Damn. On the M Sport I went ahead and replaced the glow plugs with new as I had already bought them and they weren't that expensive. On the Sport, the glow plugs would not pull out of their holes due to carbon build up at the tips. I took an old Harbor Freight dent puller with a crow foot attachment and modified it to fit the top of the glow plug. A little more 3M penetrating oil and a few very gentle taps with the dent puller and they came right out. The glow plugs from the Sport tested the same as the ones from the M Sport so I reinstalled them. I now have an extra set of known good glow plugs…

Injector removal is straight forward. I bit the bullet for an ABN diesel injector tool from Amazon. The ABN tool has the proper adapter for the M14-1.5 threads at the top of the injector and, once the retainers are unbolted, the injectors come out with a little upward tapping from the fuel fitting. Take time to vacuum around the injectors before you pull them and be aware that a bit of junk collects in the

injector bore above the center o-ring. ~~A little 3-in-1~~ Vacuum out the bore as soon as the injector is out and inspect the bottom of the bore for carbon accumulation there. This will interfere with the copper washer when you reinstall the injectors. Although they have a special reamer for the chore, I carefully cleaned the bottom of the bore with one of my Harbor Freight scrapers and got it bright. Check to ensure the copper crush washer comes out as well--#5 remained in the bore but I easily picked it out with the mini-adapter-equipped vacuum. A 2 inch piece of blue painter's tape over the injector bore will keep foreign material out. Be careful of the tips of the injectors and cover the M14-1.5 fuel studs on the injectors and the common rail to keep the crud out.

I don't see how you could do a proper CBU clean without pulling the valve cover which wasn't that big a chore in the overall scheme of the repair. Removing it permits easy cleaning of the intake channels in it, ready access to the intake ports in the head, and a better go at the valves which are buried deep inside and require considerable effort and blasting to clean.

With a little warmth and coercion, the 1/2 inch gray vinyl thread protectors at Lowes (Part 137985, 3 for $1.48) work well to protect the fuel fittings on the injectors and the fuel rail. 3/8 inch caps are too loose a fit in my opinion.

I bagged the fuel return line in a plastic shopping bag and laid it aside.

In removing the valve cover, there are two E7 bolts at the rear, left side (viewed from the front of the car). While the one securing the injector cable loom faces vertically upward and is accessible with a ¼ inch drive ratchet, the other faces the firewall and is not accessible. Using the easily accessible bolt head as a template and triangular and round jeweler's files, I fashioned an E7 flat wrench from the hole in the end of one of those throw-away sheet metal wrenches you get with certain Harbor Freight tools. It only took about 15 mins to make and worked like a champ. It's now in my "special tools" drawer. I further modified the wrench by giving it about a 15 degree bend about 1/3 of the way from the Torx end to the spanner end. This permitted me better access to undoing the hidden bolt. OBTW, when you drop the wrench it will land in an area neither visible nor accessible from the top so have the lower aerodynamic panel removed so you can crawl under there and fumble around for it.

The BMW media blaster cylinder head adapters (81292356967 and 81292356966) are a necessity. The swirl port adapter fit snugly while the tangential port adapter was loose but effective once the vacuum was switched on. Each required six or nine wraps of electrical tape around the horn to get a snug fit in the vacuum cleaner hose.

Accessing the tangential ports presented no concerns but I covered the engine with ~~painter's plastic~~ shop towels followed by a heavy duty yard waste bag (split along one long seam and the bottom of the bag so you can lay it out flat—doesn't trap walnut shells like the painter's plastic did and doesn't move around much) to keep walnut shells out of the valve train when doing the swirl ports. I recommend reinforcing the ~~painter's plastic~~ trash bag with 2 inch painter's tape in the vicinity of the swirl port, cutting a hole in the tape/plastic slightly larger than the swirl port flange, cleaning the swirl port flange with carb cleaner and a rag, then placing 2 inch painter's tape atop the plastic and swirl port flange. The tape will stick to the flange and hold the plastic in place. Take an Exacto knife to cut along the swirl port outline or simply insert the swirl port adapter into the hole and it will neatly "punch" the painter's tape. This will keep the stray walnut shells out of the rocker arms and camshafts. ~~Make sure the plastic covers the back of the head and is taped in place—light breezes will move it otherwise with accumulated shells going into places you wish they hadn't.~~ (Not an issue with the HD trash bag). I was able to easily remove the few shells that made their way past the plastic with the mini-adapter equipped vacuum.

Note: Heavy Duty trash bag works better than painter's plastic shown here

From the CBU SIB, I scaled and fashioned the BMW blasting wands from 5/16 inch brake line (silver color, NAPA part 813-1245). Upon first use, I quickly determined they were too long, unwieldy, and not very effective. With a little experimentation, help from a tubing bender (AutoZone part 52403 25440) and my trusty brake line flaring tool, I fashioned both straight and curved wands that can get back into the nether reaches of the valve chambers. I also fashioned some scraping tools out of 1/4 inch brake line (green color) that permit reaching the valves a little better, but it's a blind alley that you have to work in. The brake line is very stiff and makes an effective raw material for scrapers. Don't make them too sharp as you can scratch the aluminum head/runners. A 1 inch home-made 90 degree blasting tip attached to a straight wand with a bit of fuel line will permit you to extend the tip inside the valve chamber and change the angle of media blast with a twist of the tip.

Ensuring that the valves are closed is easy-cheesy with the valve cover off. The cam lobes are circle-arc which makes it simple to tell when the valves are shut. I taped the firing order onto the radiator shroud for reference then used a remote starter button to bump the engine until the high points of the lobes for the cylinder I wanted to work on were vertical. I then double checked valve closure by applying a little LP compressed air to the glow plug port and listening/checking for air coming out of the injector port only (The blue painter's tape will bow out/leak if the valves are shut). Note that the tangential and swirl ports are separate and not in communication with one another (as one poster incorrectly opined).

When blasting, it is often useful to insert the wand through the port adapter then into the port to ensure best access to the valve. Lower the port adapter to seal with the flange, switch on the vacuum and have at it with the walnut shells. A magic marker works well for applying reference lines to the wand if you are concerned with pulling it out too far but I found this not to be an issue. More important is to pull the wand from the adapter then the adapter from the port before you switch off the vacuum. Both the wand and the adapter will leak walnut shells onto the painter's plastic if you don't. A little LP compressed air will move the shells away from the port but many get trapped in the folds of the plastic, so be aware and ensure the camshaft valley is covered (not an issue with the HD trash bag).

My 46 year old Sanborn 2 HP compressor did the job with the 5/16 inch sized wands. Good for about ~~20~~ 30 seconds of blasting before she kicks on, I blasted for up to a minute at a time without issue. A floor or window fan aimed at the compressor cylinders kept it cool. The compressor easily kept up with my "blast, look, try a different adapter, blast again" rhythm.

A good borescope is critical to this job—you can't do it without one. My 5.5 mm borescope for Android from ebay with its 6 ft limp cable was my preferred scope but the free borescope applications from

Google Play kept crashing and became a significant detriment. With no other reasonable options available, I spent nearly $40 at Home Depot for a Klein borescope for Android (item 092644692987). While unwieldy due to the armored cable, the Klein scope can go micro USB or Type C, is Apple compatible, and was effective with my Android 10.0 cell phone.

Cleaning the valves and plenums is a slow and repetitive process. When you can, scraping is faster than blasting. I don't like carb cleaner except for final cleanup—MAKE SURE THE VALVES ARE CLOSED. I did spray carb cleaner on a particularly hard and durable deposit on the valve and let it rest overnight, but I am not sure if it was the carb cleaner or fresh clean walnut shells that contributed to its eventual removal. Scrape, vacuum, scrape some more, vacuum some more, blow/vacuum, inspect, change wands, scrape some more, blast some more, inspect again, about 10-20 or more times. Did I say slow? Use a short, straight wand first for a couple of 30 sec passes, then use a curved directed up want for a couple of passes, then a curved directed down wand for a couple of passes, then blow/vacuum with compressed air, then check with the bore scope. This will save time.

CAUTION: CARB CLEANER IS VOLATILE! DON'T USE IT IN CONJUNCTION WITH A VACUUM CLEANER! If you use carb cleaner in the plenum, cover the port with a rag afterward and use LP air to gently blow the carb cleaner out. Continue with the LP air until there is no more smell of carb cleaner then you can resume blasting and vacuuming. Make sure you cover the port with a rag while blowing or you will get a face full of it!

My go-to tool for scraping/chipping the intake runners was the stainless steel carving set from Harbor Freight (34152). They have two tools in particular in that set that are perfect for the intake runners and can reach down to the valves but not all of the valve and stem. Inspect the scrapers from Harbor Freight--while my first set was awesome, I misplaced them and had to buy a second set which were very poorly finished (sharp edges, wrong angles, etc) and required re-working with a file before I used them.

Develop a rhythm and a process. Always, always, always check to ensure your valves are closed, and then check again! It's easy to get distracted and forget to turn the engine between cylinders!

Once completed I double checked all valves for cleanliness and walnut shell residue. In doing so, I found one valve I had skipped!

Once a valve has been blasted clean, double check for walnut shell residue *BEFORE YOU ROTATE THE ENGINE!* Residual shells can be removed from a clean valve by using an air blow gun in conjunction with the port adapter/vacuum cleaner. Adding a piece of flexible tubing to the end of the gun enables you to reach into the deeper recesses to blow the particles out and up to the port adapter/vacuum.

Have new vacuum lines available. This process exposes some vacuum lines that are tough to reach otherwise and presents a good opportunity to replace them.

When installing the gasket in the head cover, make sure you seat the bolts properly in the gasket. A A Rodrigues shows you how to do this in his excellent video. It is very important that the backup rings be properly set as they are prone to falling out. This is exacerbated by the fact that they must negotiate the studs which knock them out easily when installing the intake manifold. I got my intake reinstalled and snugged up when I dropped my socket (it of course came to rest atop the transmission bell). When

I fished it out, a backup ring came with it. Sure enough, the ring closest to the firewall had been knocked off. I had to pull the intake manifold again. In so doing, two more backup rings were knocked off and I couldn't find one of them. A trip to the "stealer" and $15 later and I had the last backup ring in stock, so order a few before you start the job. OBTW, the steel "washer" portion is very thin and easily bent. Fortunately, you can very carefully straighten it out with your thumbnails and use it anyway.

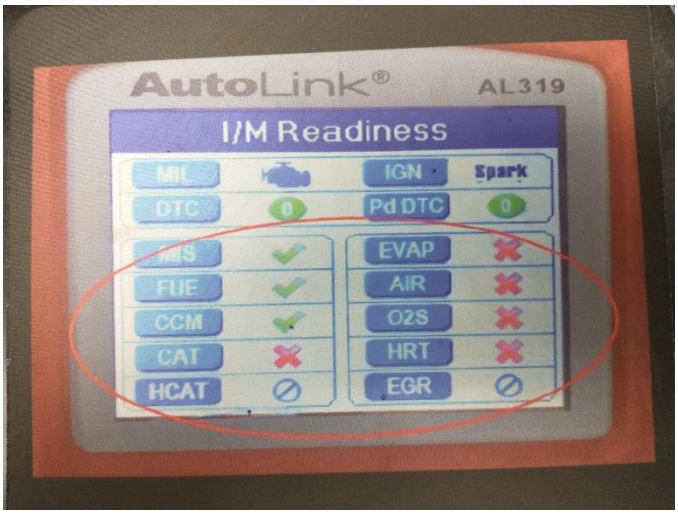
During reassembly after cleaning, I used new gaskets, seals and o-rings where required.

"Aw Shucks!" issues (me, especially)

1. If you're pulling codes for glow plugs, it may be the glow plug control module.
2. Ensure you have the injector hold down clamps the right way around when you re-install the injectors (clamp will be flush beneath the top of the injector). They will go in "upside-down," but will be too high and the fuel line will not reconnect properly.
3. Use silicone grease on seals and o-rings so you don't spin them on assembly.
4. Because you had the injectors out, you will have a "crank no start" situation when done due to air in the fuel system which is a huge PITA. Be patient and use ISTA/ADIABAS (or manual over-ride) to run the lift pump. It took me three 3 min pump runs in ISTA before she finally fired. (OBTW—the "vacuum from the fuel fitting" solutions in the internet didn't work—use ISTA).
5. Double check all fuel lines and fittings "tight" from the common rail to the injectors. A loose (even slightly loose) fitting will also cause a "crank, no start" situation as the rail will not build sufficient pressure to fire the cylinder.
6. Be very cautious when re-fitting the intake manifold to the head. The metal washer on those little red rubber grommets the bolts pass through is easily bent and the grommets are easily dislodged and can disappear in the engine bay. An apron of plastic beneath the intake manifold may well catch them if you knock one off during installation. Have a couple of spares handy in case you lose one (can be very hard to locate in the driver's side jungle).
7. Make sure the charge pipe fitting has securely connected and locked onto the throttle valve. If not, the engine will idle okay but can blow off or leak and cause multiple codes resulting in surge and go into limp mode if you try to drive it. Multiple passes through ISTA to find the leak and resolve the ghost codes should get you going.
8. Don't stress over extraneous error codes (faults) after re-assembly. Be persistent, use your common sense, think of which connector you forgot to reconnect, reconnect it, clear the faults, and try again.

CALIFORNIA RESIDENTS – Disconnecting your battery will clear your I/M Monitor which will cause you to fail smog until they are ~~ALL~~ reset (Diesels can have two I/M monitors not reset and still pass SMOG). You will need a copy of the BMW OBD II Drive Cycle procedures, a decent code scanner, and an appropriate stretch of highway to carry out the reset procedure. I have Rheingold/ISTA but am not familiar enough with that software to know if it will work for resetting I/M sensors. I used my Innova 3120 CAN OBD II scanner but the AutoLink AL-319 scanner is more intuitive and a heck of a lot cheaper at less than $50. To date, I have been through "How to Do BMW OBDII Drive Cycle for Smog Check" by ilovjdmtoy in WorkshopCars and "Federal Test Procedure (FTP) Drive Cycle" for BMW—simply driving the car up onto the freeway and around town didn't work. I have managed to reset all but HTR and EGR. Will try again tomorrow morning… at 4:00 a.m… to avoid SOCAL traffic… NOTE: It took me

multiple runs through the various procedures and normal driving over 450 miles (!!) to get the I/M monitors to reset. Grrrr!



- - - - - - - - - - - - - - - - - - UPDATE CONTINUED - - - - - - - - - - - - - - - - - -

REQUIRED PARTS (refer to RealOEM.com)

1	81292356966	BMW Vacuum Adapter	Swirl Port Adapter
1	81292356967	BMW Vacuum Adapter	Tangential Swirl Port adapter
6	11617790198	Profile Gasket	Intake Manifold Gasket, rectangular
6	11612246945	Profile Gasket	Intake Manifold Gasket, round
1	13547792098	Throttle Body O-ring	Throttle Housing to EGR
1	11612245439	Rubber Seal	EGR to Intake Manifold
1	11127796378	Profile Gasket	Valve Cover Gasket
6	13532247156	Gasket Ring	Fuel Injector - lower copper seal
6	13537787236	O-ring	Fuel Injector - Mid-body O-ring
6	13537794553	O-ring	Fuel Injector - Fuel return hose
1	13627792261	Grommet	Fuel Injection System Pressure Sensor
1	11617791470	Preformed Seal	Charge-air line to intercooler (passenger side)
1	11617791469	Preformed Seal	Intercooler to Charge-air line
1	11617790547	Preformed Seal	Charge-air line to throttle body (driver side)

RECOMMENDED PARTS (refer to RealOEM)

2	11612246949	Backup Ring	(Spares for when you lose one, or two, or…)
1	11747810831	Electric Valve	Vacuum valve below vacuum manifold (access)
1	13718596850	Preformed Seal	Bypass valve to charge-air line
1	11617791470	Preformed Seal	Charge-air line to intercooler
1	11617791469	Preformed Seal	Intercooler to charge-air line

RECOMMENDED TOOLS

Consumables
- Brake line, 5/16 inch x 48 inch (Napa)
- Brake line, ¼ inch x 24 in (Napa)
- Carburetor cleaner (two or three cans)
- Electrician's tape (partial roll)
- Hand cleaner, orange
- Paint thinner
- Painter's tape, blue, 2 inch wide
- Paper towels
- Rubber gloves
- Shop rags
- Silicone grease
- Trash bag, heavy duty, black (or painter's plastic)
- Vacuum hose, 3 mm (1/8 inch) x 10 ft, black (Amazon)
- Vacuum hose, 3 mm (1/8 inch) x 5 ft, red (Amazon)
- Vacuum hose, 3 mm (1/8 inch) x 5 ft, blue (Amazon)
- Vacuum hose, 8 mm x 1 ft, black (Amazon)
- Walnut shell blasting media, fine grit (Harbor Freight)

Remote starter switch, 12 V automotive (Harbor Freight)

Ratchets
- 3/8 in drive ratchet with stubby, 3 inch, and 6 inch extensions
- ¼ inch drive offset micro ratchet with stubby and 3 inch extensions (AutoZone)

Screwdrivers, assorted

Sockets and adapters
- 3/8 inch to ¼ inch drive adapter
- 3/8 inch to ½ inch drive adapter
- ½ inch to 3/8 inch drive adapter
- 6 point metric socket set (1/4 and 3/8 in drive)
- 6 point deep socket set (1/4 in drive)
- E-Torx socket set (E-6, E-14, E-18)
- Socket, Diesel Fuel Injector Line, 17 mm (Amazon)

Torque Wrenches
- Inch pounds torque wrench
- Foot pounds torque wrench (3/8 in drive)
- Foot pounds torque wrench (1/2 in drive)

Mini pick and hook set

Detail brush set

Plastic tub for parts cleaning

Heavy duty trash bag

Razor blade scraper

Wet or dry vacuum cleaner

Pittsburg six piece stainless steel carving set

Multi-bit screwdriver with Torx, hex and security Torx bits (yes, you need a security T-20)

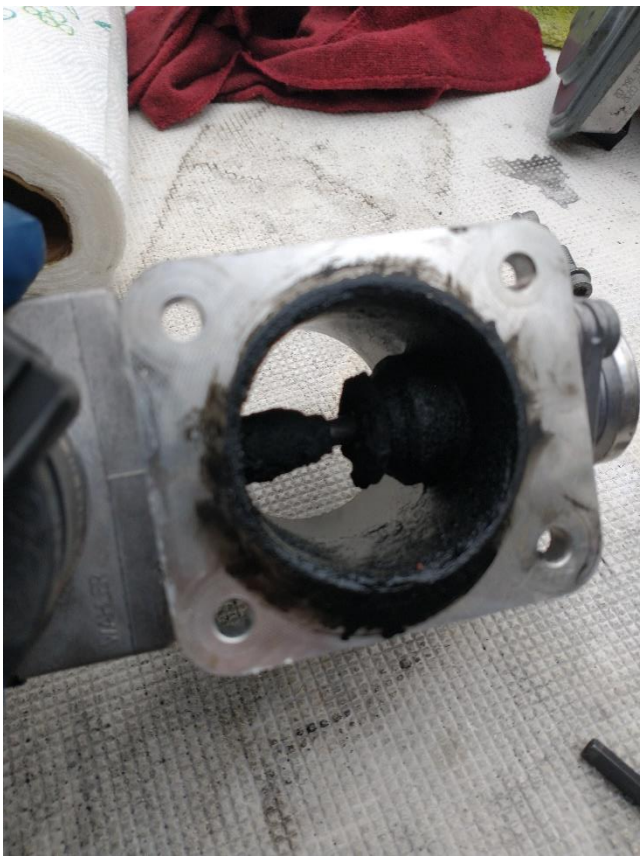
Magnetic and claw style pickup tools (for when you drop things)

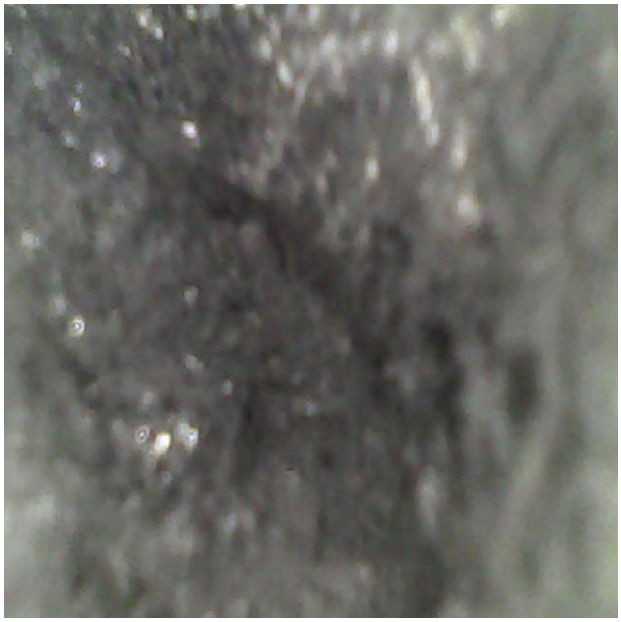
Ramps or a hydraulic lift
Good torch-type flashlight
Decent semi-rigid bore scope with good imaging and photo capabilities
Rheingold or equivalent diagnostics tool
12 volt/50 amp external power supply for extended diagnostics
Drop cord with 3-way outlet adapter
Xacto razor knife (for getting into very tight spaces to slice vacuum line ends)
50 lb portable abrasive blaster kit (Harbor Freight)
Mesh strainer (Dollar Tree, for sifting carbon chunks out of used walnut shell media)
½ in ID x 3/8 in MIP Hose Barb Adapter (Everbilt LFA-385A or equivalent)
80 piece copper washer assortment (Harbor Freight #67526)
Mini adapter extension set for vacuum cleaner (Harbor Freight)

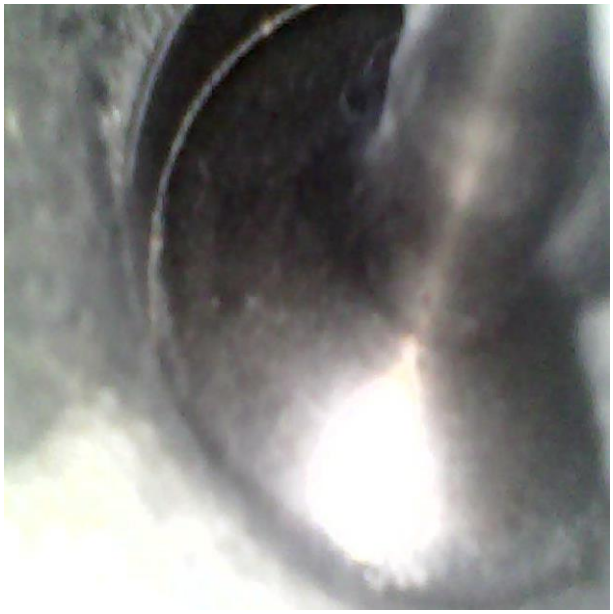
- - - - - - - - - - - - - - - - - - 2011 335d Sport (White) - - - - - - - - - - - - - - - - - -

Pulled intake manifold on second 2011 335d with only 64,000 miles. Did CBU clean, cleaned and checked glow plugs, replaced o-rings and washer on injectors, renewed vacuum lines, and replaced a generally inaccessible vacuum control unit and thermostat as preventive maintenance tasks.

As to be expected, engine with only 64,000 miles had far less accumulation than that with 115,000 miles. Nonetheless, CBU clean was in order and the recommended interval of 50,000 miles for cleaning seems reasonable to me. Once I got the rocker cover off, I was able to do all 12 valves in a 10 hour day.







If when you attempt to start the car you get a “crank, no start” situation with a plethora of obscure codes, don’t be alarmed. If the car was running when torn down, it should be running now unless 1) an electrical connector was left unconnected, or 2) the fuel system is air bound.

I got a mess of scary codes. A studied inventory of electrical connectors revealed one adrift. After reconnecting it, I cleared all the codes, attempted restart, and re-ran the diagnostic.

Purging air from the system was laborious and non-intuitive. Using ISTA, I ran at least six 20 second fuel lift pump actuations but still got “crank, no start.” Reader-recommended attempts to vacuum fuel from the #1 injector fuel supply were futile (which makes sense if you study a common rail schematic). Three 3 minute lift pump actuation cycles in EDIABAS resulted in her firing up but with some rough running and misses. Finally, after idling for 10 mins and driving 20 miles with intermittent “hiccups” (single cylinder miss at a rate of one per minute or so), I’m fairly confident that the fuel system is fully purged. The hiccups have abated and she purrs like a kitten.

OBTW, I went into “limp” mode a couple of times on initial test drives. It turns out that the charge-air line to the throttle valve was not properly set and “blew” out under acceleration. After reconnecting it, running the diagnostic in ISTA, clearing the codes and test driving again, I got that settled.

California owners: Note that resetting the codes will also reset readiness (I/M) codes required for SMOG testing. Of the 9 monitors for a diesel, 7 must be completed before you can pass SMOG (different from gas engines which require all monitor cycles to have been completed). Not also that the DPF regeneration cycle can take up to 7.5 hours driving time to complete (see “FUB—SOW-FB-130013-A06 Readiness Codes” for a full rundown). My M Sport took about 450 miles of combined driving before 7 of the 9 monitors reset and I could pass SMOG. After 20 miles of combined driving, five of the 9 monitors have already reset on the Sport.