

So You Just Bought an E60 (Version 4.6 4/2018).....

Changes from 4.5: Comments on experience buying a used BMW. Comment on eccentric shaft position sensor. Please check for the most recent version before reading. As always, typos get corrected when I see them and are not generally noted –banglenot

Note that this doc started in 2013 and has been edited 30+ times since then. If you haven't read it in a few years, it may be worth your while.

Introduction for Absolute Newbies:

A comment for the newbies we're scaring away: Welcome to BMW E60. The various items in this document do not mean that your E60 will immediately implode from all the listed issues the day after you buy it. Many apply to specific models and engines. Some apply to all. Most are rare, with some more likely (like the electric water pump and the battery). If you buy a well-maintained E60, and continue to maintain it, it can give you 200K miles or more. Maintenance – before and after you buy it -- is the key to a long-lived E60.

Another Warning: Get a warranty if you can't DIY the usual issues. Route 66 is very well regarded. Get an indy if you can't afford Dealer repairs, or just don't want to hand them money for common work that is brutally overpriced. Your indy will have seen a lot of issues in older E60's. Yes, there are some talented senior techs at Dealers. Pay them for the hard stuff, not something simple like a water pump or brake job. Put another way: it doesn't accomplish much to complain about Dealer repair prices on the Forum. You've seen plenty of warnings, and you should know by now what you're getting into when you go to a Dealer. Seriously, we'll sympathize, but stop tossing money on the showroom floor and find a better cost repair solution. Or buy a Lexus, like your grandpa did.

This doc has grown (organically) since 2013, mostly from repairs and calls for help on Bimmerfest , as well as the writer's interest in E60 DIY. I'm a shade-tree DIY mechanic for 30 years, and I'm learning all the time. So, it's 99% correct, but not perfect. Errors get corrected when noticed, so call them out. It's changed a lot over that time, so if you read one from 3 years ago, skim it again. Pros: I'm always interested in your ideas and corrections.

First, For Some Of You, Don't Buy An E60:

Below is a post that was written in December 2014 after reading from folks who really, really wanted an E60...so they spent their last nickel to get it out of the dealer's lot. For some, it's their first car. We know you love BMW's. So do we. But....

We've been getting more and more posts on Bimmerfest that go like this:

"I just drove home from the (used car dealer/private party) with my new E60. It has 150,000 Mi on it, and it's really beautiful! HELP! The light on the dash went on, and its shaking, and Transmission Fault lit up and the clock doesn't say the right time! The guy

said he didn't have the service records, but he maintained it religiously! What's happened?????"

What happened is a list of things. So take some advice from Ye Olde BMW Owner(s).

1. These cars can be very pretty longer than they can be reliable (without maintenance). This is the most important point. They're not Hondas (thank god). They're complicated, with a pretty specific list of things that go wrong as they age. If you buy one with, say, 150K, certain things have worn out, and others are about to. We assume these items have not been maintained. We all know the list. You probably don't.

2. Bought from a Dealer? Very high mileage BMW's are very rarely (meaning "never") sold by BMW dealers. They know, and if they get one, it's off to the Auction for it. That BMW at the Toyota dealer, if you're really lucky, was a trade in from a little old lady for a new Camry. Far more likely? It's an auction car. No records, no reliable owner history. Could be a bargain. Could be a money pit.

3. NEVER buy a 150+Kmi BMW unless you know how to fix it (or can learn). You can't afford to have the major things fixed. Paid \$10K for the 530 and the transmission crapped out? It's \$5K or more for a reman. You saved up your bucks to spend 50% of the purchase value on a major fix.

4. NEVER buy a himile E60 without the service records. Look until you find one that has them. You can get the ones BMW has (maybe) until the car left the Dealer system -- but that was probably when it dropped out of warranty, years ago. A reliable owner keeps their records. Buy from someone who did. Just look until you find it.

5. NEVER buy a himile BMW without an independent inspection by a shop that knows them. This may come as a shock, but sellers lie. If the owner won't let you do a Pre Purchase Inspection, well, don't buy it. Keep looking. Part of managing risk is knowing when to not take it on.

Anything else you have to watch for in a used car? You have to watch for it with a BMW. The major difference is that it costs more when you find it 🤔. Buy it with your eyes wide open, or don't buy it at all.

Thanks, and good luck in your search. 🙏 Now that your eyes are hopefully open, continue your learning about this fine car.

Used BMW's: So, the author went on a search for a used BMW for the summer place. Criteria: E39 or E46, because they're cheap and bulletproof; the author knows how to diagnose and fix them, parts are cheap, and they're depreciated enough to sit in storage for 7 months of the year without making the author's finance gene mutate into a rage gene. And I like those models.

So, what happened is a lesson for anyone buying a used BMW.

- Yes, they all lie: There is an ungodly amount of lying and deception out there. I have never been lied to as much as in this search. Sure, used car sellers lie; but in 20 cars investigated, I met no one, seller or dealer, who told me the full truth about their BMW's.
- Place: Always review a car during the day, in a public place. You will meet whack jobs. Always evaluate from the outside in: if the visual review is bad, walk. If the car has kid-crap on it, such as pretty wheels, speed junk in the engine compartment, uselessly pretty lighting systems, walk. Don't waste time with a code/software review on a car that is obviously beaten, or a 525 that some fool thought could be blinged up and treated like an M5.
- Setbacks: If they don't have repair documents or code readings or Carfaxes supporting the mileage, steer clear. There are an amazing number of these cars out there with miles suspiciously low for their age.
- Codes: Always run code scans on them. Carly is OK, but you need INPA or ISTA/D to see the miles on the codes. No surprise that most have their codes deleted. Use INPA to scan the background history codes. Sometimes the sellers miss them. Also, sellers will say they didn't reset the codes. INPA (on the E39 – I can't find it on the E60) displays an engine hours meter that tells you when the last code reset occurred. I saw two that has their codes reset in the previous engine hour. If no codes, take the car out for a half-hour and check them again when you return.
- Software: Run INPA and look at the software releases on the engine and transmission (and anything else). I was puzzled by an E46 engine management system on an otherwise appropriate E39 wagon. Realized that the engine had been swapped in from an E46. Maybe a good thing and done right; maybe not. And the engine hours meter offers a SWAG on the engine mileage (2500 hours times 30 miles per hour – 75,000 miles). Yeah, it's a seriously SWAG, but add it in to your evaluation).
- Deceptive Indicators: INPA and ISTA/D will sometimes re-illuminate lights electronically shut off to mask a problem. Saw a couple of E39 DSC's lights that were hidden and re-illuminated by ISTA. Has to deal with a whackjob who claimed I broke his car. Tried to scam \$75 out of me to have the deceptive indicator reset off. Also, always check to see if indicators all come on in key position 2. I saw another DSC light that had been physically disconnected.
- Oil Starvation: Saw several M54's that suffered from oil starvation – weak/bad oil pumps combined with suspiciously noisy top ends. Open the oil cap and put the tip of your finger in a little bit. Or the tip of a paper towel. If it comes out dry, oil isn't splashing around in there like it should. If you can hear rattling in the top end, run, no matter how nice the rest of the car is. Also amazingly saw an E90 N52 with the top end stuffed full of axle grease to quiet the noise.
- VIN's: Always run the VIN through <https://www.nicb.org/how-we-help/vincheck> to find salvage or flooded cars. Always run the VIN through BMWVIN.com to see if the features claimed are really there.
- Carfax: If not provided by the seller, don't waste money on a Carfax until you inspect the car. Even before you go there, call the seller and ask the questions: How many owners? Will Carfax support the mileage? Do you have the

maintenance records? Where was the car last titled? Bad answers, save yourself a trip.

- **Battery:** hesitate to even mention this, but check the date on the battery. 4 years old means it's aged.

By the Way: Yes, we'll all help you when you limp into the Forum with an empty wallet. We may feel a bit sorry for you, but, well....we'll always help where we can.

OK, So Much for the Warnings. Now, the E60:

Welcome. This is for new owners of a used BMW E60, or those considering buying one.

Because used E60 prices have dropped to the point that they're affordable luxury in the sub \$10K range (*now lower than \$7K for the early year models*), there are lots of new BMW buyers on this forum.

Many new owners are buying cars with mileage above 80K; many are well above 100K. All of them are off BMW's warranty at this point. Many of you are new to BMW, and many are concerned about whether the dealer is the right place to go or not. Some of the new owners are experienced mechanics; many are not.

As a result, there are many questions about this model.

- What can go wrong if I buy it?
- What maintenance do I need at [xx]K miles?
- My water pump/transmission/steering/shocks are having a problem or are failing – what do I do?
- Can I fix it myself, or do I need the Dealer?
- Where can I get parts? The right parts? At a reasonable price?
- ...And so on.

This document is meant to summarize some of the issues on a used 5-series E60. [Read the footnotes, because that's where most of the useful references and URL's are.](#)

There are usually detailed threads on each of these items, so we'll assume you'll search for them. Don't forget to search E39 and E46 forums as well – the M54, N52 and N54, as well as many components and a lot of the tech are included in all three models in the overlapping years. Also, many of the E39 and E46 matters will occur on the E60 as it ages towards 10+ years.

Further, this doc doesn't spend any time at all on the regular issues that accompany a used car, including accidents, strange noises, or that odd line of dried salt water across the middle of the seats. It assumes you're comfortable with internet and forum searches. We'll spend no time at all on cosmetic mods.

Documents like this discuss problems, so it sometimes looks like everything about the E60 is a problem. Lots of people take the E60 to well over 150-200K miles – just like they did the E39 before it. It helps to read success stories, and what it takes to get to a high mileage BMW: <http://forums.5series.net/e60-discussion-2/any-members-here-high-mileage-e60-101091/>

This document originated at <http://www.bimmerfest.com/forums/showthread.php?t=731460>. It's evolved since 2013. Comments and corrections are appreciated.

Lawyer Language: You take any and all responsibility for reading this document and using it or any other information to work on any BMW or other vehicle.

Identifying your E60

Read the E60 Wiki¹ at the top of the Bimmerfest E60 forum. It'll give you a good overview of models and (this is important!) engine types. Also, look for the M54, N52, N54 and N62 engine descriptions on Wikipedia. Three things are fundamental to identifying the E60 over its production run, and getting the right parts, bulletins and forum advice for them:

First, of course, is the model, which in the US is the 525, 528, 530, 535, 545 and 550, and the X5 and M5. The M5 is beyond the scope of this document.

Second, the manufacturing date (mm/YYYY), is on the driver's doorframe or decoded through the VIN. This overlaps and may be different than the model year – for example, a 2007 might have a manufacturing date of November 2006. The manufacturing date is what defines changes related to parts, service bulletins and design alterations. It's often worthwhile to talk to the parts supplier with your VIN in hand to make sure you get the right part, due to changes that happen throughout the year of your car's manufacture.

Third, understand the engine types, since each type has peculiarities and problems that appear again and again in its maintenance.

Want help? Learn how to describe your E60 on the forum. The wrong way: "My new Bimmer broke. Help!" As kind as most folks are to render aid, this is just annoying, so don't do it if you want an answer. The right way: "My 2007 530xi with the N52 engine and automatic transmission, with 67,000 miles, has a (description) when I'm (description) with it. The BMW codes are XXXXX and YYYYY. What should I do?" And remember that same/similar engines are used on multiple BMW's of the same era. For

¹ Can be found here: http://www.bimmerfest.com/wiki/index.php/BMW_E60 The Wiki for the N52 Engine (525, 530): http://en.wikipedia.org/wiki/BMW_N52 For the N54 (535): http://en.wikipedia.org/wiki/BMW_N54 For the N62 (545, 550): http://en.wikipedia.org/wiki/BMW_N62

example, the N54 is used on various 3 series models as well as the E60 535. So, reading relevant 3 series forums can help in identifying problems.

Always get the codes if you can. Remember: typical code readers supply the basic generic OBD codes. So P0700 says "transmission fault". Says exactly that for a Ford or Chrysler as well.

The E60 has 30-60+ controllers (networked computer modules) with more than two hundred BMW specific codes across them. To read them you must have a BMW compatible code reader. See the section below on BMW codes. You'll need to get the codes, if any, to get accurate help.

Want to know the theory and ops of the E60? Look at the link below² for a long list of detailed training docs. You'll be amazed at how sophisticated this car is. NOTE: due to various copyright restrictions, the docs below focus on previous generations than the E60, like the E39 and E46. Use them to understand systems methods. There are more recent training docs that may be provided from member's personal archives. Ask for them.

AND, puzzled by the endless list of German acronyms? A colleague on the E39 Forum collected a long list of BMW terms and issues. Pretty much most terms that apply to the E39, the previous 5 series, are relevant in the E60. A lot of great info. Here, and thanks to bluebee for the info:

<http://www.bimmerfest.com/forums/showthread.php?t=454814&highlight=e39+acronyms>

Finally, this doc assumes you can do good enough searches to find the referenced docs. It also uses USA measures.

A New Concern...Rollback: As we go into 2018, sometimes we wonder if some of the 40-60K mile purchases we read about have had their mileage memory edited. We have no reason to say they are; it's just that, well, this seems awfully low. And there seems to be a boatload of extremely sophisticated tools out there designed for just this purpose. So, is there a way to check? Here's a few:

- **Inspection:** The traditional way is to ask your mechanic on the PPI if it looks like a 100K car rolled back, and that's always necessary. That's part of the PPI. Wear points are visible to a mechanic that you won't see.
- **INPA and ISTA:** The code history in BMW's has the Km record when it occurred. Quick way to check rollback. BUT any thief with any brains will clear all the codes, so the reliability of this idea is in question. But pull them anyway.
- **Carly for BMW:** has a routine that (supposedly) checks multiple points in the ECU's where mileage values are stored. Try it – this writer did, and it pulled valid data from several points (like the light modules). But no one has answered if a change to the odometer coding changes the values anywhere else. Note that we tested this on several E39's without pulling verifiable data for modules. So, it works on the E60, but not clear if any others.
- **Carfax, etc:** If I'm interested in a car, I order a Carfax (from Carfax) and see if the mileage is rational. But some believe Carfax can be gamed, and certainly a good thief can edit the Carfax image he cheerfully gives you at the sale negotiation.

² http://www.bmwmotorsports.org/BMW_docs/

So, as always, if it's too good to be true....

On we go.....

You've Just Bought a Used Higher Performance Luxury Car. Get Used to It.

No, it's not a Rolls, but it is a pretty nice piece of German auto engineering. So, it's gonna cost ya to own it. Could be no more than any other 5 -10 year old car, or it could be a helluva lot. How much depends on two key items: Maintenance to this point, and your ability to DIY (Do It Yourself) going forward.

Dealers are extraordinarily expensive, since that pretty building doesn't come for free. Independent BMW specialists ("Indys") are usually a far better cost choice. A good indy will discuss problems with you in great detail, and will sometimes use aftermarket parts you source (but some resist this, so ask nicely) and charge you for labor alone.

Indys resist using your parts for two good reasons (1) they get a healthy discount on the parts they source, for which they charge you list price; and (2) importantly, users will bring in crap Ebay parts and demand they get put on – then blame the Indy when they give out or don't work. They'll be a lot friendlier about installing performance parts (those Bilstein coilovers) than cheap replacements (those Chinese Ebay no-name thrust arm bushings).

DIY is by far the cheapest, and a good DIY'er can own an E60 for not much more than any other sedan.

NOTE: Figure dealer costs are about 1.5 - 2X for most parts listed in this DIY document, and labor is about the same as your parts cost. So, as an example, a 530 waterpump/thermostat replacement costs you \$450 or so for aftermarket parts from a reliable supplier. The dealer will charge \$900-1200+ for the same job. Obviously, this varies widely depending on the labor.

Fluids: Before we begin, we're assuming that certain fluids³ get used, such as BMW 5-30 or LL-01 compliant full synthetic oil; Pentosin CHS-11 hydraulic fluid; BMW or Pentosin "blue" Coolant (G48 spec); ZF Transmission Fluid. There are aftermarket alternatives as well. Feel free to seek them out as long as you confirm compatibility with the E60. For simplicity, we'll use the list above.

Codes: Also, you need two new tools to work on these cars. **First, you must get a code reader that accurately reads BMW codes.** A BMW-compatible code reader is an absolute necessity. Many

³ There's much discussion on the "right" fluids. We recommend BMW approved fluids or better – meaning it meets BMW's specs at the minimum. If you want to use a non-BMW fluid (such as oils and coolants), don't just grab something off the shelf at Autozone. Research it and start with something 100% equal to the BMW product. If you can do better and maintain compatibility, go ahead. A great place to get educated on oil is www.bobistheoilguy.com . For the ZF, however, we strongly recommend you use exclusively the ZF longlife fluids from BMW or from ZF suppliers, such as <http://thectsc.com>. There are debates (aren't there always?) on alternatives to ZF, so do your research if you want to use them.

people here use an app for the Iphone/Ipad/Android, called Carly For BMW⁴ (formerly BMWhat, but you know the BMW trademark lawyers were on them like wolves for infringement once they got noticed). Deeper dives and finer diagnostic control can be taken with in-the-wild versions of INPA⁵, DIS and ISTA/D (Rheingold)⁶. Bavarian Technic is also a fine aftermarket product.

There's a long list of unique codes from the 30-60+ computers in the E60. Your Autozone reader will get very few of the BMW codes. Also, when you go to a dealer or indy, ask for a complete BMW code printout during whatever diagnosis they do. Here's a code list some of us use: <http://engine-codes.com/make/bmw>. But note that DIS and ISTA/D have much better code descriptions included in the software, including the miles at which they occurred.

There are two levels of memory in these 30-60 ECU's (most of them). Transient events occur and get recorded. But it takes a number of repeated events before a generated code lights your SES light. Also, events that occur enough to light your SES but go away (such as forgetting to tighten your gas cap) will self-extinguish. So, you'll get current codes, and with some software (like INPA) you get a complete historical list of codes for every ECU. Buying a used E60? Read the codes, but it's likely they've all been cleared by whatever car dealer is selling it.

Also, if you want to do your own work, buy a Bentley manual. They're about \$100 for the two volumes online (used). Used is fine, of course. It's designed for folks who haven't done much with the car and want to learn the mechanics. Also, torque tables, etc. Torque matters a lot with BMW's. There are resources online that do the same job, but they're much harder to use⁷.

⁴ Seriously, this isn't a plug. Over the past few years, Carly for BMW has proved itself a low-cost effective tool for basic recoding of vehicle options; code reading; sensor data; and basic stuff like battery registration that's harder to do with other tools, and recently a really cool routine that reads mileage data from multiple ECU's – great for used BMW buying. Just get it. If you want to go deeper, then install INPA, etc.

⁵ INPA, DIS and ISTA/D are BMW software products, owned by BMW and not sold by them to the public. Not that we recommend anyone buy pirated copies, of course. There are many locations to discuss BMW coding software, but this is a good start: <http://www.bimmerfest.com/forums/showthread.php?t=561237> Remember, INPA can screw up your car if you use some of the active/modifying functions. Until you understand it, just use it to read codes and engine data. Don't try to (for instance) adjust your VANOS on your first day using it.... Note that most versions of INPA floating around out there don't have the N62 module, so if you have an N62, confirm before you download.

⁶ This is probably the best of the lot, as it's the same as was used by BMW techs. Has diagnostic routines in it. Learning curve in installing and using. Source: <http://www.bimmerfest.com/forums/forumdisplay.php?f=175>. Note that this forum doesn't welcome stupid questions, so read before you ask. ALSO: ISTA/D does not allow E60 programming, only F and later. It is for diagnostics only.

⁷ http://bmw.workshop-manuals.com/5_Series_E60/530i_N52_SAL/index.php for an electronic manual; and <http://www.bmw-planet.net/diagrams/> for a wiring diagram. Also, the latest TIS' are at <https://www.newtis.info/tisv2/a/en/>

Torque Wrench: If you don't have it already, the second new tool is a good quality accurate (preferably digital) torque wrench. This is not your granpa's cast-iron Crown Vic. The N52 engine is partially magnesium with single-use aluminum bolts in many locations (note that the M54, used in the 2003-6 525/530, and the N62, used in the 545/550, do not use magnesium in their engines); the N54 turbo uses the M54 alusil/cast iron liner base engine structure, but has certain N52-derived items (such as the electric water pump). The N52/magnesium was not deemed suitable for turbo apps. There're very few things that can crap up your mechanical day more than twisting the head off an aluminum bolt, or stripping the threads out of a magnesium engine, because you imagine your arm is magically calibrated in foot-lbs. Go read the Wikis on each of these engines, or at least the one you have.

But back to torque wrenches. Disk rotors can warp if the wheel lugs aren't properly torqued. 10 Newton-Meters torque is a whole lot less than you think it is, and 85 ft lbs on the disk rotors is a lot more. Suspension bolts are often north of 100 ft lbs, and that's a serious amount of torque. Torque and torque sequences are very important on BMW's. Your arm, accompanied by a muttered "that's about right", is not a torque wrench. For high-torque bolts, failure to tighten to proper torque values is a safety issue. So, buy a damn torque wrench and use it.

Parts: There are various kinds of parts as well as sources. Prices can vary as much as 100% across suppliers. You can do very well with name-brand (Sachs, Pierburg etc.) parts from name-brand suppliers (Autohaus, Bimmerparts etc) if you learn how to look.

- **BMW vs. OEM vs. non-OEM vs. Aftermarket:** Yep, there're four major categories, and no one explains them to newbies. **BMW** is the thing from the dealer. Costs twice as much as non-BMW. Most of the time, the only major advantage over the OEM part is the logo. Ex: BMW alternator made by Valeo: \$800. **OEM** is the BMW part made by the part manufacturer who did it for BMW. Same part, no BMW logo. As good as BMW for half the price or less. This is by far the preferred source for DIY support on the E60. Ex: Valeo alternator for BMW's: \$<400. **Non-OEM:** This is the part manufactured by someone other than the OEM manufacturer. Quality varies widely, from just-as-good to iffy – so it's crucial to order your parts from a known source. Ex: Alternator from chain store: \$100-200. **Aftermarket:** Usually performance or upgrade parts, hopefully from a name source. Ex: Koni shocks designed for your E60, or a performance exhaust, or monoball bushings.
- **Finding Parts: Best:** go to RealOEM.com, learn how to use it and get the BMW part number. Google it. Search name parts houses, buy the lowest OEM price. **As good:** Download PNPC and search by part number. **OK, but iffy:** Search by vehicle type on whatever house you like. Parts often change over time as the E60 evolved, so you may get the wrong part. Always include the last 5 digits of your VIN when you order. **Learn** which parts are BMW OEM parts, like Lemfoerder for suspension or Sachs for struts/shocks, Pierburg for electric water pumps and so forth.
- **Source:** Good BMW supply houses will clearly identify OEM or not. This writer won't buy anything important on Ebay or Amazon. Sure, air filters, lightbulbs, perhaps, but nothing that matters to operations or safety. Your choice is yours, of course.
- **Another option:** If you're sophisticated enough in the process, you can find parts sourced for the OEM version of the unit. For example, a Valeo alternator can be found in established

alternator specialist supply houses. So can the regulator on it. So, BMW alternator: \$600+. Valeo Alternator: \$350-400. Regulator on the Valeo alternator (the part that usually fails) from an established supply house: \$30.

Videos: There are some great videos out there, since parts suppliers have learned that they attract visitors to their site. As of the date of this document, AutoDoc, Bavarian Auto and Pelican Parts all do fine series⁸ on E60 common repairs, including suspension and brake replacement.

Be Neither Cheap Nor Stupid: Cheap means don't reuse single use parts (aluminum bolts, locknuts, hoseclips and so forth) to save a few pennies. Never re-use fluids, like ZF transmission fluids, and make sure your dealer/indy uses fresh fluid every time (mostly a problem with the "lifetime fill" nonsense on ZF transmissions).

"Neither cheap nor stupid" also means knowing where your replacement parts come from. Use name brands (Brembo, Lemforder, Pagid etc) from reliable suppliers (Pelican, BavAuto, Autohauz, OEMbimmerparts, FCP etc) who have established a name for themselves among the BMW community. Don't buy parts from unknown sources. There are fakes out there, or badly done rebuilds. Go to a parts site with a long history with BMW's, who can stand behind their good reputation. Good parts are cheap compared to the labor to re-install and the damage if cheap parts fail.

SilberVoegel created an app that searches many different sites by part number and posts their current prices. Very useful and can save you a bundle. Still being tweaked, but check it out. If he sets up a tip jar, leave a few bucks for the time and money you save. Search BMW PNPC for it, or the link below.

Check out the PNPC resource at Bimmerfest, located at <http://www.bimmerfest.com/forums/showpost.php?p=8935328&postcount=10>.

Finally, "Don't Be Stupid" means know how to work safely; using only a floor jack to hold a 3500 lb car six inches above your face is probably the textbook definition of stupid. Rather than becoming a Darwin Awards entry, take it to a dealer/indy if you can't work safely.

DIY and Maintenance:

First, how was it maintained? Get the records and read them very carefully.

If it was maintained to BMW dealer spec, fine – but many folks here feel that BMW dealer specs are barely adequate, and in cases like ZF transmission maintenance, woefully inadequate. If it was not even maintained to BMW specs, consider another car. The BMW maintenance schedule is available everywhere. A better one is Mike Miller's *Roundel* schedule. Email Mike for a copy.

⁸ Links to Videos and training: <http://blog.bavauto.com/category/bmw-5-series/5-series-e60/> and http://www.pelicanparts.com/BMW/techarticles/tech_main.htm. Autodoc seems to just have posts on YouTube, but they are good professional tutorials.

Below is what the consensus here is about what should be done on your average E60 (not the M5). It generally follows Roundel's Mike Miller in his "BMW Old-School Maintenance Guide"⁹. Mike requests that it not be shared, so email him at Roundel and ask for a copy if you want it. Someone who followed Miller's guidance is passing on a well-maintained car.

Tutorials: Here's a good source for tutorials on typical fixes:

http://www.pelicanparts.com/BMW/techarticles/tech_main_e60.htm They discuss M54 and N62 engines by name, but they refer to N52 and N54 engines, and variants, as "NG6", where the tutorial applied to both. Bavarian Auto also does pretty nice videos on common fixes:

<https://blog.bavauto.com/category/bmw-5-series/bmw-5-series-e60/> Go there to learn.

Levels of DIY: In each comment below, **DIY** is added as **Easy**, **Moderate**, **Hard**, or **Leave it to the Dealer/Indy**, and the rough cost just for parts from good aftermarket stores.

- **Easy:** you can reach it from above or the side and don't have to take much apart.
- **Moderate:** harder to reach, disassembly required, should know how to wrench with decent tools.
- **Hard:** requires skill and experience, and may require special tools. Yes, you can do it, but this needs preparation and research to make sure you get the job done right.
- **Leave It To the Dealer/Indy:** Only a small percentage of amateur mechanics want to take this on.
- **Cost** assumes you looked around for good quality stock¹⁰ parts sources like Autohauz, Bavarian Autoparts and thectsc.com (for ZF parts), rather than simply buying from the dealer. Nothing wrong with dealer parts except the cost. We don't discuss upmarket parts, since there's an endless number of alternatives and debates.

So, get out yer torque wrench and start:

- **Air filters:** 25K. DIY: Easy, \$60 for all three. Good place for the newbie to start, since it'll get the hood open and a wrench or two in your hand.
- **Oil/filter:** every 8K miles, with whatever 100% synthetic oil that meets BMW's LL-01 spec. There are many quasi-religious debates of the best oil, and you're welcome to search them out. If the previous owner changed them every 15K Miles, fine. But you probably want to do better while you own it. Remember, with oil it's as much about the hours driven rather than the mileage; many short trips are much rougher than fewer long ones. Cheapest solution: Mann

⁹ Email techtalk@roundel.org for a copy. While you're at it, join the BMW Car Club of America. You get a \$500-1000 cash rebate on new car purchases if you're a member for a year.

¹⁰ An excellent online parts catalog is <http://www.realoem.com/bmw/select.do>. If you have the part number, searches for competing parts prices are easier. That said, buy from reputable suppliers to avoid fakes or badly done rebuilds. If you buy from Ebay, please let us know so we don't drive or ride in your car.

filter online and Castrol Edge 5-40 LL-01 at nearest big box store.¹¹ More expensive: BMW 5-30 LL-01, basically Castrol in a BMW bottle, about \$55. As a minimum, always use LL-01 spec (BMW LongLife), and always use 100% synthetic. DIY: Moderate, \$50-60.

- **Brake Fluid:** change/flush every 2-3 years. DIY: Moderate, \$30. Any big name brand DOT4 is fine. Racing fluids are nice and won't hurt anything, but almost never necessary on a non-tracked car. (If you have a 5-mile sharp downslope from your mountaintop house in 100+ degree Arizona weather for your morning commute... well....) Note that ABS braking systems should have ABS valve cycling to get all the old fluid and any air out of the system, but you can do a satisfactory flush without this.
- **Cooling Maintenance:**
 - **Radiator Coolant:** Change every 2-3 years, with a G48 class coolant such as BMW or Pentosin NF (blue). The Pentosin is added because you can usually pick it up at your nearest auto parts chain. Use the right spec coolant to prevent corrosion. If you find that your recent BMW purchase has green fluid, drain it out and use the right stuff. You have to bleed the system. Units with electric pumps (N52 and N54 engines) have an electronic bleeding process. The others use various bleed screws. DIY: Easy, \$40-50.
 - **Leaves Clogging Radiators:** E60's have two closely spaced "radiators": coolant and AC. If your E60 is over 5 years old, check the space between the two for packed leaves by removing the hood latch (10 screws) and the radiator top cover (four screws on the M54 and N52 engines; may be different on the others). The space between has been seen to get up to 1/3 clogged with road debris. Clean it by lifting the coolant rad up an inch, crushing the debris and washing out or using compressed air. The AC will improve and last a lot longer.
- **Power Steering Fluid:** Mike says change around 30K, but most on here go to 50K. DIY: Easy, \$20, with the turkey baster method. No matter what BMW says, it's not "Lifetime Fill". Don't confuse ATF with Pentosin Hydraulic Fluid.
- **Transfer case and Differential Fluid:** Mike believes in 30K, but 50-60K is more common. DIY: Moderate, since on newer cases there is no drain plug and you have to suck out the old fluid. \$40. Also not "Lifetime Fill".
- **Plugs:** BMW says 100K. Mike says most non-turbo engines: 50-70K. Turbo (N54 engine on 535 series): 45-50K. DIY: Easy-Moderate, depending on experience; cost \$10-20 per plug. This is easy on the 525-535 series, harder on the 545 and 550 N62 engines.
- **Brakes:** If the car you're buying has 60K using BMW stock components, the pads/rotors likely have been replaced at least once, more likely pads twice, rotors once. A typical example of a complete set of parts for all four wheels is \$500-600. Pads Only: \$100+. Probably the most common aftermarket combo is Zimmerman rotors and Akebono pads. DIY: Moderate-Hard, depending on your experience, cost: \$500-600. Good video at Bavarian Auto¹². Use cross-drilled and slotted if it makes you smile when you look at them. Also, do the brake fluid every 2 years or when maintenance is done on the brakes. It's cheap, so do it.

¹¹ Note: as of spring '16, the Mobil 1 0-40 oil is no longer LL-01 spec in the US. Not clear if this is a technical or marketing driven change. We've changed the recommendation solely because of the LL-01 shift.

¹² Bav Auto Video: <http://blog.bavauto.com/10012/>

- **Transmission Fluid:** At 60K, the ZF fluid and filterpan should have been replaced at least once. Do not accept BMW's "lifetime fill" statement about the ZF transmissions. ZF itself does not recommend lifetime fill. Pan replacement has been done very often by forum members, but the risk of breaking off a pan bolt is enough to recommend a dealer/indy assume the risk unless you're an experienced wrench. Trust us, you'll be a whole lot happier if you do this on a lift. DIY: Hard-Leave It To the Dealer/Indy; Cost: \$400 parts, \$200 labor at the Indy. But get it done. Important: See the section on ZF at the end of this doc.
- **Battery:** In the E60 this is a maintenance item. Batteries last about 4-5 years. If your E60 is at 60-80K, you'll need one soon. DIY: Easy-Moderate. Cost: \$150-300. You'll need to get it registered at an Indy, for about \$50 or use Carly for BMW's recent upgrade to do it. Note that you can register the battery on DIS and INPA as well. E60's have between 20-60 networked computers, depending on options. A weak (or greater than 4 years old) battery causes numerous transient and peculiar errors and faults¹³. As you get more sophisticated, you be able to check battery SoC (State of Charge) with various tools.
- **Gasoline:** Yes, gas. Cheap gas has an effect on these cars. The fuel filter can get clogged (located under the driver side rear seat, and a >\$150 part). Injectors can get clogged with bad gas. Also, these cars don't like regular and Plus is iffy, particularly in hot weather where the ECU retards the ignition timing to prevent knocking. Get 91-93 octane Premium, from a reputable outfit. It's only \$3.00 to 5.00 more per tank, and you really can notice the difference. A lot of users find Chevron with Techron (93 octane) to be a good reasonably priced top-tier gas. Use a bottle of Techron every 5-10K miles. Doesn't hurt, and does help.

Going Forward:

Like any car, E60 models have certain known failure points. If you buy one, check these items for past repairs. Each of them has a higher probability of failure on the cars noted, based on forum complaints. That doesn't mean yours will fail; but these are the items people complain about most often. The two items at the top can destroy your engine. **Do not drive your car if they occur.** No, seriously. You could ship your car from Texas to Maine (three times) for the cost of a failed BMW engine.

If your oil pressure indicator light ever comes on, accompanied or not by a "low oil pressure" warning on Idrive, stop! And shut off your engine. (Note that this is not the green oil level and condition indicator in Idrive – they are two different systems). Immediately flatbed the car to a shop.

Oil circulation failure on a BMW can destroy your engine in minutes or seconds, depending on the extent of the flow problem and the RPM's of the engine. Note that permanent damage can occur before the engine locks up, due to bearing and mating surface damage throughout the engine. Imagine that your engine is aging 100x faster than normal usage and you'll get the idea.

¹³ Bav Auto Description: <http://blog.bavauto.com/13260/bmw-e60-e61-5-series-battery-removal-how-to-remove-525i-530i-545i-550i-etc/>

- Water Pump Failure:** 525, 530, 535 (six cylinder engine)¹⁴. The electric water pumps on certain engines (N52, N54) are known to suffer electronic failure, usually at more than 50K miles. You may get warning codes indicating implausible coolant flow and pump speed. This is good news, since it's the only warning you get, so part of maintenance is checking the codes regularly. This is one of the few items people replace preventatively, since pump failure results in a tow every time. **Do not drive any car with a failed coolant pump (whether electrical like the N52 and N54; or mechanical like the others). You will warp the head.** DIY: Hard, since it's difficult to reach, but many people replace their own. Harder on the XI – expect to practice your patience on these. Usually replace the thermostat at the same time. The author improved the driveway replacement experience by removing the passenger wheel and fender liner to access from the side. Cost: about \$450, assuming pump and thermostat, but not hoses. Mike Miller recommends E60 coolant hoses at 150K. New: Bimmerfest member phaduman found a possible preventative fix for pump failure, caused by a loosening capacitor lead on the dry side. Check it if you have the chops to try it out:
<http://www.bimmerfest.com/forums/showthread.php?p=8306027&posted=1#post8306027>
- Serpentine Belt Failure Causing Engine Failure:** This is a rare, but serious event that sometimes happens if the serpentine belt fails. **You should stop immediately if your serpentine gets wrapped around the main pulley. Flatbed your car to a shop. Do not drive it.** This is caused in some cars when there's oil leakage onto the serpentine belt. ~~Sometime the belt will weaken and shred.~~ In other cars,¹⁵ It appears that the belt is coming off the path due to oil splash and aged tensioners (this is why we recommend replacing the tensioners and related pulleys). When it does, it can wrap around the main pulley shaft and drive metal past the shaft gasket into the oil pan. If the pieces are confined to the pan (usually by stopping immediately upon seeing the oil pressure light come on), the pan *may* be able to be dropped and cleaned. If, however, the pieces clog the oil pump, damage will be serious. This is doubly dangerous since you can still drive the N52 and N54 engines with a failed belt (electric coolant pump and chain-driven oil pump). Bottom line on this one is to (1) fix any oil leak that affect the serpentine belt, (2) replace the belt and tensioner and guide pulley every 75K miles.¹⁶
- Coils:** with one for each cylinder, these are the cause of annoying problems. Often a code will clearly call out the failing cylinder. Sometimes, you need to swap a coil to another position to pinpoint the problem, particularly with marginal ones (and it seems that coils most often seem to fail a little bit at a time, to everyone's irritation). DIY: Easier than changing the plugs on the N52 engine. On the N62, it's harder due to difficulty reaching the near-firewall units. Cost: \$40-60 each. Some swap them all when one fails as PM – currently a \$200 price tag for a 6 if you look around for a good price.

¹⁴ Bav Auto Video: <http://blog.bavauto.com/14581/>

¹⁵ The longer we do this doc, the less it seems that the belts are actually shredding from oil or could conceivably rot from the substance. It's far more likely it's slipping off a tensioner from weak tensioner combined with oil on the belt. When the pulley rips it apart, owners see a shredded belt.

¹⁶ Here's a thread discussing Serpentine Belt Failure on Bimmerfest:
<http://www.bimmerfest.com/forums/showthread.php?p=8224999&posted=1#post8224999>

- **Headlight Wire Rot:** All models. The wiring insulation in the some of the Hella light modules flakes off and exposes the bare wires. This one is increasing in frequency as certain models age (and is pissing off a lot of owners). It seems to be accelerated by hot climates and vibration. Since light pods cost \$350-900 each, it's an expensive problem. Some DIYer's have disassembled and rewired their lights; others use shrinkfit insulation or brush-on liquid insulation. Doesn't happen to everyone. Tip: make sure you inspect the pods when buying – they have caps (to access some bulbs) on the back that can be opened to see the condition of the wiring. If found, negotiate for it, or walk. In the meantime, be *very* gentle when replacing bulbs to avoid further damage. Best practice is to pop out the pod and work on the bench. This almost always takes less time than scarring up your hands and stressing the wires by trying to do the job in place.
- **Coolant Transfer Tube:** 545, 550 (N62 eight cylinder engine). The seal eventually leaks on this part, requiring replacement. DIY: Hard. Cost: parts are relatively cheap, but getting to them is a real challenge. Dealer/Indy labor is the expensive part of this one.
- **Coolant faults:**
 - The expansion tank has been known to crack and many owners preventatively replace it around about 80Kmi or so. Not common, moderate DIY, <\$100.
 - The small fan heat sensor in the lower radiator hose has a gasket that fails with age and causes very slow coolant loss (a "low coolant" light about every 2-4 weeks). Common on many BMW's. Moderate DIY, part is \$25 or so.
 - Very rare is failure of the transmission cooler that mixes coolant and transmission oil. Only one instance on Bimmerfest. If it's found, requires rebuild of transmission. Indy fix, expensive.
- **DISA Valves:** 525, 530, 535. Problems above 75K miles have occurred on both the M54 and N52 engines. The DISA valves control airflow in the intake manifold. They fail because of poor design. Symptoms are rough idle, low torque at lower speeds, reduced gas mileage¹⁷. For the M54, there is a repair kit¹⁸. The N52 is a replacement only. May throw no codes and confuse you and your mechanic for awhile, as it's mistaken for bad coils, other vacuum leaks, etc. Some have identified a 2AAC code.
- **Valve Guide Seals:** 545, 550. This is a rare, but expensive problem on the N62 engine, usually above 100K miles. Symptom is oil consumption and a "puff of white smoke" out the tailpipe on acceleration. Detailed Vid description: <https://www.youtube.com/watch?t=97&v=YacOx2ydMbl> DIY: No. Dealer or indy. Cost: \$4-5K, mostly 25-30 hours of labor. Some enterprising entrepreneur mechanics have invested in tools that let them do the job for \$2.5K. Some indy's specialize and can do this for the same. There's a respected mechanic on the Bimmerfest E60 forum with a good reputation for this. But this is a fiddly, labor-intensive job, so it will cost you.

¹⁷ There is a very good explanation of the DISA at <http://www.bimmerfest.com/forums/showthread.php?t=751038>

¹⁸ Here: http://germanautosolutions.com/bmw_solutions/disa_products/m54_m52tu/m54_disa_repair_kit/product_m54_disa_repair_kit.php

- **High Pressure Fuel Pump:** 535. The HPFP was a recall on early 535's. It can apparently be a repeat failure. DIY: No. Dealer/Indy.
- **Turbo:** 535. BMW's twin turbo made a big difference in 535 performance. But, no surprise, new technology resulted in new problems. The best advice on an early production 535 is to make sure all recalls and TIS's have been done, including turbo assemblies, and do research on the model /production timeframe you're considering to see how it has fared. Later E60 535 production is more reliable as bugs were worked out. The basic engine is a good one, however. DIY: No.
- **Upper Control Arm Bushing:** All models¹⁹. Wears out, and if not replaced already, a 60K car will need them soon. At 100K, it's almost certain they're worn out. The bushing may appear OK, but these things fail. DIY: Bushing only, for most people, is not a DIY, as it requires a hydraulic press to remove/install bushings in the control arms. Some shops have an on-car press. Check your local autoparts store to see if you can rent/borrow one. If not the arm will have to come off to press the bushing. Parts are around \$120 for the front axle. Alternative DIY is upper control arms with preinstalled bushings: Moderate-Hard, but can be done in your garage. Advantage of new arm is a new ball joint at the same time as the bushing (for the RWD – the AWD is different). NOTE: the Four Wheel (Xi) drive control arm does not have a ball joint on it. Cost: \$340 for both. Makes a big difference in returning your BMW to the tight steering/handling you bought it for.
- **Tie Rods:** All models. These wear out, like on any other car. At 60K, have them preinspected prior to purchase, or looked at the next time your car is at the mechanic. Unlike the E46 models, they last a long time, but failure is a catastrophic event involving high speeds into trees, etc. So, standard practice to look them over every time they go in or you work on the front end. DIY: Moderate. Cost: \$300 for both.
- **Shocks/Struts:** Though wear time varies with the roads, etc. At 80K they're aging, and at 100K they're likely worn out. People go to 150K on the same struts, but that's likely highway mileage. At 100K, budget for struts. DIY: typical suspension: moderate-hard, needing spring compressors. Cost: Sachs (OEM) strut cartridges: \$350 per pair; rear shocks: \$110 per pair. DIY: spring compressors can be dangerous. Pay a shop to swap springs onto the new units if you can find one who'll do it, and DIY the dismount/remount yourself. **Don't forget to reinstall the damn spacers, or you'll be kicking yourself around the shop.**
- **Water In the Trunk:** All models. Accidentally leaning on the keyfob trunk/boot opener sometimes results in opening the trunk while it's raining. Also, some have complained about leaking gaskets next to the rear window. Result is to get certain electronics wet and cause intermittent problems. When purchasing, inspect under the spare for water or rust. Cost to repair varies widely. The MPM that was deployed in the spare tire well was supposedly integrated into another unit after 9/2005, but next time you have the trunk open, take a look.
- **Sunroof Drains:** All models. The sunroof drains water out through tubes that exit out the rear wheel wells, under the splash covers. They occasionally clog over time. This causes water to exit the sunroof into the car as the sunroof area fills with water. Easy DIY by exposing the drain exit points and widening their covers. Note that there are also front drains that can clog, located under the cabin filters and draining near the front wheel wells. Regular PM is to vacuum out the filter area once a year. You'll be surprised how much stuff collects there. Here's a

¹⁹ Bav Auto Video: <http://blog.bavauto.com/14581/>

discussion of how and where to clean them:

<http://www.bimmerfest.com/forums/showthread.php?t=691644&page=3>

- **Rough Engine Idle:** All models. There are a number of causes for this, but in the absence of consistent codes a place to begin is a couple of tanks of premium with a bottle of Techron in each tank. After that, if the problem persists, there's a list of possible causes, including CCV, coil packs, bad/clogged injectors and vacuum leaks.
- **Walnut Blast:** Recently there have been more instances of N54 (turbo) engines that need walnut blast. This is caused by the N54's use of direct injection (DI). In Port Injection (PI) engines, the intake ports are "washed" by fuel (all of them except for the N54, N20 series and similar turbo engines). In DI, they're not, and oil fumes condense on the intakes ports into black crust. Walnut blast is a normal part of maintenance for the DI engines. If it's never been done, you'll need it around every 40-50K mi. So do it, and don't waste effort bitching about it. Couple of items: (a) a catch can assembly will condense oil fumes and reduce the formation on the DI engines; and (b) don't let the SA sell you a walnut blast for anything but the N54.
- **Vacuum Leaks:** As these engines age, certain plastic parts begin to age, dry and crack. There is a list on the E39, referenced at <http://www.bimmerfest.com/forums/showthread.php?t=595709>, which discusses their experiences with the problem, as well as a 3-series (E46) discussion <http://forum.e46fanatics.com/showthread.php?t=773551>. These are the previous generation of 6 cylinder, 5 and 3 series (the M54), so many (but not all) the problems are similar. Yes, this problem will increasingly happen on the E60. If you start to get a problem caused by aging plastic or rubber, it will occur at high mileage for the most part. If anyone has a similar detailed discussion with photos for the E60, please let me know.
- **CCV:** This is the oil separator, condensing oil vapor and returning it to the oilpan. It has a higher failure rate (per complaints on forums), due to heat-related cracking over time, causing vacuum leaks (see above). Over 100K miles, give it a look if you're getting a rough engine idle (probably caused by a vacuum leak). Also, some early models lacked the tubing insulation and tube heaters, resulting in water condensate mixing with the oil condensate in cold climates. Replace the entire assembly and hoses if you're working on it. DIY: Moderate. Parts: Complete kit from ECS Tuning \$200-300.
- **Alternator:** Threads on alternator problems are increasing as E60 mileages increase, since the units have several mechanical wear points. On 545 and 550 units, there are complaints that the coolant tube slow leaks will drip on the alternator, damaging it. There are some comments that new units are a better reliability choice than rebuilds. Overall, on 525 and 530 engines, there appear to be few complaints, though.
- **Regulator/Alternator:** Recently, complaints of random voltage spikes/sags have been coming in. These seem to be a sudden "Christmas tree" effect on the displays, where the indicators flicker and bounce, and strange readings appear on some of the indicators. Shutting off and restarting seems to clear the effect until the next time. This is likely the regulator feeding unregulated power to the car systems for a moment. Replace the regulator, or if you're up in the 100K+ mi range, inspect the alternator for replacement. For more info, google "BSD Bus" or read the article referenced in the footnote²⁰ for background. Only four items can fail on an alternator: the bearings (rare), the diodes (rare), the regulator electronics and BSD bus interface

²⁰ <https://www.picoauto.com/library/case-studies/2003-bmw-5-series-4-4-v8-communication-error>

(sometimes) and the brushes (high failure rate at 100K to 130K miles). The regulator replaces the brushes and electronics, for about \$100. Also reports of many odd codes related to items on the BSD bus, that suddenly disappear when the regulator or alternator are replaced.

- **Cracked N54 Valve Cover:** Rare. Seems to be a couple of instances on the plastic (! Are you kidding?) valve covers for the 535 N54 engines. Stupidly, this plastic cover also has multiple integrated parts that cost \$<20 on earlier versions, but require a \$400 complete replacement on the plastic one. Look for oil seeping around the middle of the cover.
- **Valve Cover Gasket:** Most models. Some valve cover gaskets eventually seep, a problem on most 5 series BMW engine types. DIY: Moderate, 1-2 hours. Everything is reachable and the parts are cheap, but it's a thoughtful torque wrench job. Many people have replaced their own. On the N62, leakage is more likely and the job is twice as long.
- **Various Oil Leaks:** very minor on the N52 and N54, more common on the N62 as it ages past 70K miles. N62: Valve cover gaskets, front timing cover, alternator bracket gasket (thanks, HF@ bimmerfest). Fixes are usually DIY, and fixing what is an annoyance rather than a serious problem, but sometimes complex and sometimes knuckle busting. The N62 alternator bracket can be a PITA. Many DIY threads on the subject. Be particularly careful of oil getting on the serpentine belt. Some say it rots the belt (unlikely), but it's much more likely that oil causes the belt to slip off older or worn tensioners. As said above, if the belt wraps around the crankshaft pulley, tow it to a shop for inspection and repair.
- **Computers, Controls and Electrical Systems:** There are 20-60 controllers on the E60. In general, they remain stable and reliable for a very long time. However, they are highly interconnected, and a failure of one unit might be clearly defined with code, or may affect others with multiple codes posted. Two common problems have floated to the top: First, a weak battery will cause multiple random faults, though the good news is that a new battery will immediately rectify the random glitches. Second, water in the trunk or battery compartment can flood certain trunk resident components and cause them to fail. This can be much harder to pinpoint and fix. With a BMW code reader, and using the wiring diagrams at <http://www.bmw-planet.net/diagrams/release/en/e60e61/index.htm>, you can often isolate the electrical problems. However, computer and network related problems can be very tough, and often the dealer/indy is the only solution. Some money can be saved via BMW parts recyclers for the less complex devices. Some of the more complex ones, such as the CAS, require the VIN # to be programmed into the unit to install it. Good news: computer/network problems are rare. Bad news: get ready to open your wallet when they do.²¹
- **Current Draw:** Usually encountered as a dead battery in the morning, caused by an electronic/electrical component that has not shut down properly. Though rare, these can be maddening to fix. This is a dealer/indy matter, unfortunately. They have specific procedures using amp meters to check for draw, or failure of a particular controller to "sleep" properly. This may be the single most maddening failure on the E60, since few "didn't go to sleep" codes seem to be generated. Sorry if this happens, but don't expect a simple or easy fix, either DIY or with an expert. Really – get an expert for this one – this can be a bitch to find and fix. For better

²¹ There are a couple of sources for electronic systems repair. Audio: <http://www.hitechserv.com/electronics-repair/oem-navigation-dvd-cd-changer-repair/67> ECU: <http://www.ecudoctors.com/bmw.html?gclid=CJP1pbjz-dQCFUOVGwodaSI1Q> We have positive reviews on Hitech, no reviews on ECU doctors. We can only stress that you MUST research electronic repair services before you consider them.²¹

understanding, google “E60 BSD Bus”. There are routines in ISTA/D that switch modules on and off in sequence. We have not tested this, but it might be valuable in diagnosing sleep/wake problems.

- **Alignment:** Front and rear need to be done when new tires, or suspension work is done. Car must be weighted properly. For non-BMW owners, it’s a surprise that rear tires can wear a lot if not aligned. So, do it right. *Sears, or your average tire shop is not the right place to do BMW’s.* Alignment is not some magic process on these cars. But it’s not the quality of the equipment. It’s the understanding of weight, and four wheel alignment, and doing it right that matters, not processing a lot of cars per day. Alignment is cheap compared to the cost of good tires.
- **Steering Angle Sensor:** Your steering wheel is monitored for its position, and used by various systems, including Active Steering. On some models, an Active Steering Code can be fixed by cleaning the optical sensors in the steering wheel. Look for the Active Steering DIY’s, or Steering Angle Sensor. A repair posting is in the endnotes.²²
- **CCC Failure:** As these cars age, we’re getting more reports of iDrive unit failure. Not a surprise, as electronics fail with age. Best DIY approach is to check fuses, and then connectors throughout the unit. After that, more sophisticated diags are needed. BMW dealers will only replace, not repair – as would most indys. One solution is a recycled unit from a wreck – probably 50% of retail. Another is to find a repair service, as noted in the recent footnote.

E61 Additional Common Issues (suggested by several E61 owners):

- **Panorama Roof Drains:** Like the sedan, rear drains easily get clogged due to valves at the end; can result in leaks and potentially cause extremely expensive to repair water damage to low-mounted electronics in rear. When buying, make sure to check for signs of water/water damage to modules in trunk/spare tire well. Supposedly easy to resolve by removing the drain outlet rubbers.
- **Rear Self-Leveling Suspension Compressor Failure:** Particularly an issue on pre-LCI cars; among other issues, compressor intake hose is liable to crack, which can eventually destroy the compressor as it sucks in debris and dirt. Check for error codes and assess whether compressor properly lifts car when weight is applied in the rear. Good idea to fix prophylactically if the old-style hose is present.
- **Tailgate Wiring Issues:** Tailgate wiring harness can become worn over time leading to frayed wires. There are threads with suggested fixes available to search. Jal1234 offered two articles on E61 tailgate wiring repair, as being a huge help to him. One concentrates on the cables going to the glass and diversity module, and the other primarily deals with the light wiring on the main tailgate. They are both at <http://www.bimmerfest.com/forums/showpost.php?p=9286823&postcount=218>
- **Tailgate Window Switch:** reported failures, not much detail provided.
- **Diversity Module:** Also called Diversity Amp/Amplifier or Antenna; very common failure point. Symptoms of diversity module issues include, among other things, bad FM reception, short or nonexistent key remote range, iDrive failure to save radio presets and other settings. Basically, the module is located in a supposedly waterproof black 'box' inside the rear spoiler (in the E61;

²² Here’s the Steering Angle Sensor fix, from the M5 board: <http://www.m5board.com/vbulletin/e60-m5-e61-m5-touring-discussion/204192-steering-angle-sensor-diy-fix-worked.html>

it's located elsewhere in the E60). In fact, the box does not seem up to the task and even later TSBs and revisions don't seem to conclusively resolve this issue. The module itself is a ~\$300 part and is easy to replace if it's completely dead; sometimes it can be fixed by cleaning corrosion with 90%+ isopropyl. Might not be a bad idea for a new owner to check it out prophylactically.

[Other Problems to be provided as documented]

Special Mention: The ZF Transmission

The ZF Automatic Transmission deserves special mention. It's a fine unit, used on BMW, Bentley, Jaguar, Rolls and many other high end Eurocars, as well as some Fords and Hondas.

However, BMW has always had an odd view of the ZF hydraulic fluid, labeling it "Lifetime Fill" for many years. Many BMW experts, like Mike Miller, heatedly disputed this, and strongly believe the ZF needs new fluid and filter every 60K miles (at most). People familiar with the ZF in other cars see recommended maintenance at shorter intervals, as well. Even BMW recently stated that a fluid/filter replacement should occur at no greater than 100K miles.

The problem with this is that the ZF is the most expensive single assembly on the car. A rebuilt unit for the E60 is \$3-5K, and a new one is \$7+K. Many owners complain of ZF problems as the car reaches towards 100K – though to be fair, some owners claim it's rock solid to 200K Miles.

The final nail in the "lifetime fill" coffin comes from ZF's website: *'Regular maintenance intervals will substantially increase the automatic transmission's service life and, precisely for that reason ZF recommends regular oil changes every 80 000 to 120 000 km or after 8 years - depending on the usage.'* That's 48K-72K miles, for us metric challenged folk in the USA. Not 100K miles, and certainly not "lifetime fill". Finally, here's a vid of the change procedure, from ZF. Note the recommended change interval. It's a whole lot less than BMW's recent 100K miles – which they decreased from "lifetime" in the last few years. <https://www.youtube.com/watch?v=ZRrgmfM8VIQ>

There is a debate about this issue (what a surprise...). If the fluid is never changed, some claim, changing it above 100Kmi may result in wear deposits being pushed around by new fluid and clogging up the very tiny hydraulic valves and ports on the mechatronics. Old-school transmission guys will thus claim it's a bad idea to change fluid *for the first time* at high mileage. We invite you to do your own research on this matter. In any case, we strongly advise against using any solvents of any kind to "flush" the transmission, including transmission flush machines. TSM35 has a note on flushing the ZF with Pentosyn ATF-1 by disconnecting the transmission cooler return line and using about 3 gallons of fluid to get the dead oil out of the rest of the system:

<http://www.bimmerfest.com/forums/showpost.php?p=10116097&postcount=15>

Also, there's been a comment out there that removing or loosening the mounting screws on the mecha allows for more oil to flow out. We have not tested this.

Here's the ZF change procedure:

http://www.zf.com/media/media/document/brands_3/service_information/sitematrix~1/transmission/cars_4/englisch_3/modelluebergreifend_1/ZP_SI_Oelwechselkit_EN.pdf

And, with kudos to KyleB on 5series.net, here's his excellent detailed rebuild procedure:

<http://forums.5series.net/diy-do-yourself-14/kylebs-6hp19-service-thread-137584/>

Remanufactured Transmissions: it is BMW policy to replace any warranty failure with a remanufactured ZF transmission, not a new one. ZF has a rebuild facility in the US as well as Germany for this purpose. This makes sense, as ZF can rebuild a transmission far more reliably than a BMW dealer can. However, out of warranty, BMW dealers apparently suggest a new ZF transmission when it fails. Not surprising, perhaps.

There's a long list of detailed ZF transmission links in the footnotes, for those who want the details (thanks to ajm8127 at bimmerboost.com for many of these)²³

²³ ZF Items: Application Chart:

http://www.zf.com/na/content/media/u...ion_Chart_.pdf

Difference between first and second generation ZF 6HP Transmission:

<http://www.sonnax.com/publications/t...-my-generation>

Spare Parts Catalog:

http://www.zf.com/na/content/media/u...21_Catalog.pdf

Sonnax Valvebody and Mechatronic Service Guide:

<http://www.sonnax.com/system/pdfs/37...AutoChoice.pdf>

ZF Mechatronic Replacement:

<http://www.zftranspart.com/images/custom/mecha.pdf>

Rebuilt Mechatronics Source:

<https://revmaxconverters.com/product/zf-6hp21-6hp28-rebuilt-updated-transmission-valve-body-mechatronic/>

Parts List w/ Exploded diagrams:

<https://www.automaticchoice.com/Catalogue/zf6hp21.pdf>

Note: The differences between the 6HP21 and 6HP19 seem to only be the number of friction plates.

Here is the same diagram for the 6HP19 for reference:

<https://www.automaticchoice.com/Catalogue/zf6hp19.pdf>

and for the 6HP26/6HP28:

<https://www.automaticchoice.com/Catalogue/zf6hp26.pdf>

Repair manual for 6HP26:

<http://www.scribd.com/doc/20322431/Repair-Manual>

So, if you're buying an E60 with 60K miles on it, you should be concerned about the maintenance of the ZF. It's very likely that the fluid and filter has not been changed. In fact, thanks to BMW claiming Lifetime Fill for so many years, many mechanics will say that it never has to be changed, or shouldn't – or even refuse. They're wrong, and many transmissions have their lives shortened because of this belief. If you get one below 100K miles, change the fluid. Above that, do your own research.

Briefly, change the fluid/filter at 60-70K if you want to keep the car. It is very likely that the ZF will fail faster without regular fluid/filter changes. Change it every 40-50K miles thereafter. Most people change the filter pan on the first change, then every other time.

That said, there are a few common problems with the ZF transmission, at least according to the DIY postings on this and other similar Forums.

Performance Issues: This includes surging, inconsistent shifting, delayed upshifts/downshifts. Many of these performance issues were corrected by loading new software releases, since the ZF is extensively computer controlled. Some problems are not fixed with software, and when the question becomes "should I replace my transmission to fix this" the answer can get really expensive. Note that the only solution BMW dealers seem to take to internal ZF transmission problems is to replace the entire thing with a remanufactured or new one. With the exception of the mechatronics sleeve (below), BMW dealers don't seem to do much work inside the ZF. Less costly solutions are mechatronics and actuators, below.

Mechatronics Sleeve: This is the sleeve around the electronic connector to the transmission. They often leak fluid. There is no information available to us about how much leaks out before a transmission fault is posted, so even though many Mechatronics sleeves have been replaced, there is no way to tell if a lot of fluid leaks out, or just a few drops. In any case, if it leaks it needs to be replaced. Kits are available from thectsc.com for \$85. DIY: Hard. Numerous forum members have done this work, but generally, leave this to a dealer or indy to do unless you're an experienced wrench.

Mechatronics Replacement: The mechatronics unit consists of the control electronics and computer controlled hydraulic valves (actuators). It can be replaced as a single unit, and the replacement DIY is

Another training manual:

<http://www.bimmerfest.com/forums/showthread.php?p=9637875#post9637875>

Technicians Guide:

<http://www.scribd.com/doc/149103113/ZF6HP26-automatic-transmission-manual>

Sonnax ZIP Kit:

Parts Summary: <http://www.sonnax.com/system/announc...6-GEN2-ZIP.pdf>

Technical Booklet: <http://www.sonnax.com/system/instruc...IP-Booklet.pdf>

Quick Guide: <http://www.sonnax.com/system/tech/ZF...-ZIP-Guide.pdf>

Another source for ZF parts: <http://www.zftranspart.com/index.php?p=home>

actually easier than doing the actuators alone. It's more expensive, with a rebuilt unit costing around \$1500 from thectsc.com. Sonnax and others are alternative sources. See the Endnotes. Replacement is a two hour job for an experienced DIY'er.

Actuator Replacement: One solution that we're seeing more often is replacing the electromechanical actuators²⁴. This is becoming an option for experienced DIY'ers. This involves a parts kit from thectsc.com, for \$500-600, and the ability to remove, do a partial disassembly and a reassembly of the Mechatronics unit, plus replace the fluid. One member did this job in his driveway. Results have been reported as good. So, this is a DIY, but one that should be taken by experienced wrenchers. Alternatively, an indy experienced in ZF transmissions should be able to do it. There are also transmission places that specialize in ZF transmissions. Use one that is authorized by ZF. Check with ZF to confirm. Seriously; you don't want Bubba's Transmission Repair to be doing this. Expect that parts will be \$1K or so with pan and fluid, and labor at least \$300-500.

The mechatronic fluid interconnections. There are rubber/plastic channels that connect the mechatronics to the turbine section. On the author's car, there is a dual-square shaped connection, and four round ones. These harden and may eventually fail. They are important to maintaining correct operating pressure in the Mecha. Cheap, and an easy maintenance item if you're mechanically confident. Some have proposed these have a lifetime in the 70Kmi range, so good to replace them next time you refresh the fluid.

Black, smelly fluid. This one is an opinion. Clutches and steels wear faster on heavily used ZF transmissions (no surprise). So, old fluid blackens due to crap pulled off the turbine components by hard treatment. Also, the fluid breaks down much faster due to high temps. The result is more crud deposited in the mecha. A maintenance item is to poke a long Qtip or the edge of a paper towel into the fill port to check the condition of the fluid. If the fluid is light brown, the tranny has been fairly used and it's probably OK. If it's black, it's likely beaten. In any case the right thing to do is to refresh²⁵ the fluid on ZF's schedule, not BMW's.

A ZF repair training doc was provided on Bimmerfest at <http://www.bimmerfest.com/forums/showthread.php?t=907311&highlight=zf>

Good summary of certain ZF issues: <https://sayarti.wordpress.com/2015/01/20/everything-about-your-zf-automatic-transmission-issues/>

²⁴ Can be found at <http://thectsc.com> and (perhaps) your BMW dealer – though since BMW seems to take an all or nothing view of the ZF, actuators may not be available.

²⁵ Note that we say “refresh” rather than replace. This is because the ZF only allows about 5 liters to drain out of the 8-9 liters in there. Normally, on ZF's refresh schedule, this is fine. More fluid will drain if the mecha is dropped and the plastic/rubber interfaces are replaced. If the fluid is filthy or damaged, some do a double drain and fill to get 80-90% new fluid in there. No one has identified how to easily dump all the fluid out.

Note: Actuator replacement does not require that the transmission be removed; in fact, it can be done by a good backyard mechanic. But “good” is the key word here. Don’t try this the first time you pick up a wrench, please. If you want to dive into the mechatronics beyond the actuators and the rubbers that interface to the turbine unit, you better be a *very* good wrench. Also, consider that a ZF authorized shop has an expensive test rig to test all valves and electronics; so you take a measure of risk by not having it. Your call.

Symptoms of Problems:

Below are a few of the repeating problems and their initial symptoms. This should help guide new owners when/if these problems occur. Note that none may ever occur, but the list below is in descending order of probability

Electronic Water Pump Failure: All N52 and N54 engines with electrically driven waterpumps. Not relevant to M54 or N62 engines. You may get codes in advance, indicating pump flow is not plausible. You may not, and with no warning, the display will suddenly call out overheat problem in yellow, then almost immediately turn red and warn driver to pull over and not open the hood. **The car will need to be towed for repair; it cannot be driven.** The good news is that the warning is so clear that it’s very unlikely engine damage has occurred.

Belt wrapped around crankshaft pulley: Immediate alternator light. A belt that drops off is not a problem, except to get it fixed. A belt that wraps around the main pulley (crankshaft pulley) can destroy your engine. **The car will need to be towed for repair; it cannot be driven. If this happens, take it very seriously. Don’t ask your mechanic to just pick out the pieces from the pulley and fix it. Consider dropping the oil pan and examining it for metal in the oil, which can clog your oil pickup. Other than a stick of dynamite, stopping oil flow wins as one of the fastest ways to destroy a BMW engine of any kind.**

Battery Failure Due to Age: All models. Early signs are failure of the clock to keep it’s time, and odd transient codes or warnings. Battery life is typically 4-5 years. The Bimmerfest E60 forum has a detailed thread on where to buy battery replacements from alternative sources. Yes, the new battery should to be registered on the E60 ECU network. This can be done at an indy/dealer, or via INPA, DIS or ISTA/D. Carly (formerly BMWwhat) now has a subroutine to register batteries for a few extra Euros.

Transmission: All models. As each shift occurs, the car hesitates for a very short time, or alternatively the car surges forward very slightly as each shift occurs. Acceleration is no longer uninterrupted and smooth. Starts very mildly, and gradually becomes more noticeable. Requires, in order of relative cost, (1) new fluid and filter; (2) reprogramming; (3) new actuators; (4) new mechatronics or (5) new transmission. As always, start with the cheap alternatives.

Battery Draining: All models. Car battery is relatively new, but is drained when you try to start the car. After charging, it drains again. Assuming the battery is OK, this is a tough analysis, since there are a number of modules that can cause it by not shutting off (“sleeping”) properly. Doesn’t happen often, thankfully. You’ll need a dealer/indy to diagnose it.

Voltage Spikes: All models. Dashboard does a little light dance, indicators read bad data, car may warn to stop driving. Restarting clears the issue (maybe). The BSD Bus controls how electricity is fed to the car, and how the alternator, battery and various electronics interact. A failing regulator (on the back of the alternator), or a worn out alternator, can cause these spikes. Usually not damaging the first time around, but fix it asap. New alternator, or for the more sophisticated, a new regulator on the existing alternator. Possibly related to the same symptoms, the author's '07 N52 530 also had a G30 relay intermittently fail, resulting in a scrambled electrical start sequence. Diagnosed it with ISTA/D and replaced for \$20. Strong sense of satisfaction of avoiding a \$500 mechanic charge for a 10 minute fix....

Front Suspension Issues: All models. (1) Groan/squeal from front end when going over speed ramps or otherwise when front end is full compressed. Usually occurs when weather is cold. This is the front stabilizer rubbing against the stabilizer rubber mounting. (2) Steering wheel moving slightly, "floating" or slightly sloppy steering feeling, or rumbling sound from front end at higher speeds. Possibly the Thrust Arm bushings in cars over 60-80K miles. (3) Front end seems to get stiffer than normal on rough roads, crashing on bumps and holes; or, alternatively, the front end seems to float up and down. Either of these are probable strut failures. For the "typical" everyday road driver, 100K is probably a good target for replacement.

Water in Headliner Around Sunroof, or Water on the Floor Under the Dash: All models. Clogged sunroof drain lines (common) and clogged drains in airvent intake area at the bottom of the windshield (less common).

Water in Trunk: Failure of Micro Power Module, Park Distance Control and other electronics that were located on the floor of the trunk wheelwell in early models, perhaps due to a Munich engineer being hungover one day while designing this part of the E60. Applies to E60's built before 9/05 for the most part, but check your trunk and relocate the modules if there. Happens due to clogged sunroof drains, or accidentally pressing the trunk open button on the keyfob when it's raining out. After cleaning out the sunroof drain tubes, solution is to relocate the electronics out of the wheelwell and into the fenderwell on the left side of the E60 sedan. Some later models still have the RDC (tire pressure monitor) control unit in the spare tire wheel well. Move it. Quick job, and several threads available to do this. Note that this got bad enough that BMW lost a class-action suit on the subject. So, BMW will replace and/or relocate the electronics in the spare tire well for free, at least here in the US.

Sunroof Metal on Glass Sound: All models. Sound of metal hitting glass, a ringing when you drive over bumps. Usually when the sunroof is open at an angle. Caused by dirt in wind deflector bearings preventing the deflector from moving to its proper position. Most easily fixable with a strip of adhesive black Velcro material along the top center of the wind deflector. Still bounces on the glass, but you can't hear it.

Turbo-related: Model: 535's. Engine Noise, Rattles, Hard Starts, No Starts, Power Losses and so forth. 535 Turbos, in the early days, were problematic. Some still are.

Codes: All Models. Said before, say again: you must get a code reader capable of reading BMW codes. Most auto parts shop OBD code readers do not read the majority of BMW codes. Get a printout of the codes, then clear them and read them again.

Other Considerations:

The E60 is generally a very well-built car. With good maintenance, it'll last over 200K miles and 15+ years. And, after all, an old BMW is still a BMW, isn't it?

It's not cheap to own, but neither is it a money pit, particularly if you do your own work or find a good Indy. But if you expect Lexus-level maintenance, buy a Lexus.

Right now, the non-turbos (525, 530, 545, 550) are stable designs with relatively minimal failures. The turbos, particularly in the first years of introduction, have more failures. Expect '08 E60 535's to cost more to maintain, sometimes considerably more. By the time they reached '10, they were pretty stable.

One key point: the E60 *must* be maintained with replacement fluids at regular intervals. If you use Mike Miller's (Roundel) schedule, the E60 can last for a very long time.

Appendix: A BMW from new to 100K miles:

This is a '07 530 base with an N52 engine, ordered from the factory. Since warranty expired, I do 100% of my own work. I'm lucky enough to have an excellent DIY garage (garageyourself.com) in North Miami, about a half hour from me. Garage time is the lift and tool rental there. Most miles are in-town.

All parts are OEM equivalents (Pierburg, Lemfoerder, Sachs ect.). No BMW branded parts used.

I'm not a fanatic, but I do fix things well before they break, and maintain per Mike Miller's maintenance guide. I've only been stranded once, by the waterpump. Swore I'd never let it happen again. Here's everything done to 100K miles. Note that as I approached 100K, I decided to go to 150K, hence the work done between 90 and 100K. Next two pages.

BMW Records					
DIY unless specified					
Repair/Maint/Enhance	miles	date		Parts Cost	Gar Tim
Brake pads all around	97.5	11.17	Akebono. Zimmermans excellent cond	150	135
alignment & balance	97.3	11.17	BMW alignment	200	
Rear Shocks and Mounts	97.2	11.17	Sachs and meyle mounts: End of Life	200	140
Tires	97.1	11.17	Conti Eco Plus	515	65
Oil and Filter	96.5	10.17	Castrol Edge LL01 0-40 Mann filter	56	34
VANOS solenoids	96.5	10.17	replaced orings and cleaned.	18	0
Replace HVAC Blower and Module	95.5	7.17	End of Life replacement: 4 hrs	160	133
Replace raditor (pinhole)	95.3	7.17	Pinhole Behr OEM: 2hr	179	75
Replace coolant	95.3	7.17	With new radiator Pentosin NF	25	10
Replace Plugs NGK	95.3	7.17	PM	50	25
Replace regulator @ EoL	94.7	7.17	regulator only, buff alt slip rings	39	45
rotate tires	94.5	6.17	front to back	0	0
Replace both front struts	94.5	6.17	Sachs Struts, Lem Mounts, bumpstops	330	280
Oil and Flter Change	91.2	1.17	Castrol Edge LL01 0-40	60	25
H9 German Battery from Advance	89.9	10.16	Weak, time resetting etc.	150	
Lower radiator Hose and new Coolant	87.7	5.16	Hose and Pentosin Blue (G-48)	50	
Oil and Filter; New LED's	87.5	4.16	M1 0-40 and filter	50	50
Replace TPMS wheel transmitters	86.8	3.16	End of Life replacement	138	50
Replace both Xenon DS1	86.5	3.16	Wearing out -- PM Osram Sylvania	113	
Fuel Line at injector rail	85.5	12.15	Found damaged fl when replacing starter	65	
Replace starter (PM)	84.5	12.15	Bosch. PM. Intake manifold gaskets.	155	50
Inspected pads	84.0	12.15	about halfway	0	
Measured disc runout and wear	84.0	11.15	Runout good; wear 30.0-.3	0	
Replace coil set as PM	83.5	10.15	Bosch x 6	172	
Replace coil Cyl 2 (keep new as spare)	83.4	10.15	Autozone Coil emergency replacement	30	
clean leaves front drains & radiator	83.2	10.15	about 1/3 blocked	0	
brake flush	83.2	10.15		10	35
replace leaking fan sensor	83.2	10.15	lower Radiator hose	25	15
rotate tires	83.2	10.15	back to front. Checked spare (not rotated)	0	
Angel eye LED	83.0	10.15		30	
Belt & tensioner (PM)	83.0	10.15	Contitech Package	100	35
Oil & filter	83.0	10.15	M1 0-40 plus filter	50	
Replace expansion tank and cap (PM)	80.0	3.15	cracked	70	35
oil & filter	76.0	12.14	M1 0-40 plus filter	50	
Tail light bulbs	74.5	7.14	All Philips Long Life	24	
thrust arms	70.7	1.14	Lemforders	300	120
oil & filter	70.7	1.14		50	
alignment & balance	70.7	1.14	redone by BMW	220	
brake flush	66.5	7.13		10	
water pump & thermostat	66.5	7.13	Also new coolant	425	
air cleaner	66.5	7.13		15	
differential fluid	63.5	2.13	done by indy Pentosin CHF-11	90	

Warranty Ends				
exhaust vib damper	62.6	12.12	Ft Laud BMW	0
rear left window reg & drive	62.6	12.12	Ft Laud BMW	0
oil filter	62.5	11.12	M1 0-40 plus filter	50
new tires	62.5	11.12	Continental DWS	825
transmission repl under CPO	61.7	10.12	Ft Laud BMW	50
oil & filter	57.7	6.12		50
plugs	57.7	6.12	NGK	75
flush PS	57.7	6.12	Pentosin CHS-11	12
battery cable recall	56.3	5.12	dealer	0
oil & filter	55.2	6.12	M1 0-40 plus filter	50
coil packs	54.9	1.12	Ft Laud BMW	50
	52.1	3.12	Autozone	150
rotors & pads	48.5	8.11	Zimmerman & Akebono	500
oil & filter	48.5	8.11	Also new coolant	75
oil & filter	47.1	7.11		50
oil & filter	43.4	1.11	M1 0-40 plus filter	50
brake flush	43.3	10.10		10
sunroof seal	43.3	10.10		0
New tires	33.2	3.09	Continental	825
oil & filter	30.1	12.09	also coolant	25
brake flush	21.6	10.08		0
oil filter	15.5	4.08	dealer	0
			Cost	7221
				1357