

So You Just Bought an E60 (Version 1.8).....

Changes from 1.7: Added steering angle sensor to the maintenance list, and a reference to a long list of German acronyms and other BMW module data.

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

Because the used E60 prices have dropped to the point that they're affordable luxury in the sub \$20K range, there are lots of new BMW buyers on this forum.

Many of the new owners bought cars with mileage above 60K; some are above 100K. Most of them are off 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 great, 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?
- ...And so on.

This document is meant to summarize some of the issues on a used 5-series E60. There are usually detailed threads on each of these items, so we'll assume you'll search for them.

Also, this 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.

And, one more thing. 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 150K 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>.
Comments are appreciated.

Many URL's are referenced in a series of endnotes on the last page.

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 forum. It'll give you a good overview of models and (this is important!) engine types.

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.

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?"

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.

BMW has dozens of controllers with hundreds of BMW specific codes across them. To read them you need a BMW compatible code reader. See the section below on BMW codes. You need to get the codes, if any, to get accurate help.

Want to know the theory and ops of the E60? Look here for a long list of detailed training docs. You'll be amazed at how sophisticated this car is:

<http://www.bimmerfest.com/forums/showthread.php?t=709712>

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.

We hope this helps you enjoy your E60.

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

No, it's not a Veyron, 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 6+ 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. 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.

Fluids: Before we begin, we're assuming that certain fluids² get used, such as BMW 5-30 oil; Pentosin hydraulic fluid; BMW Coolant; 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. However, BMW has a full fluids list available for all models. The current URL for this is in the endnotes³.

Codes: Also, you need two new tools to work on these cars. First, get a code reader that accurately reads BMW codes. Many people here use INPA⁴; others are using Bavarian Technic; and a newer item for the Iphone/Ipad/Android is the BMWWhat app. There's a long list of unique codes from the several dozen controllers and sensors in the E60. Your Autozone reader may get some, but it won't get all of them. Also, when you go to a dealer or indy, ask for a complete BMW code printout during whatever diagnosis they do.

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 engines are often magnesium with single-use aluminum bolts in many locations. There's very few thing 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.

Disk rotors can warp if the bolts aren't properly torqued. 10 Newton-Meters torque is a lot less than you think it is, and 85 ft lbs on the disk rotors is a lot more. 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.

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, Bavarian Auto does a fine series⁵ 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 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 a good reputation. Good parts are cheap compared to the labor to install and the damage if cheap parts fail.

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.

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.
- **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 stock⁶ 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.

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 spec s 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.

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"⁷. 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.

- **Air filters:** 25K. DIY: Easy, \$60 for all three.
- **Oil/filter:** every 8K miles, with whatever 100% synthetic oil that meets BMW's spec⁸. 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 filter online and Mobil 1 0-40 LL-01 Euro Formula for \$30 at nearest big box store. 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. Note that ABS braking systems require ABS valve cycling to get all the old fluid and any air out of the system.
- **Radiator Coolant:** Change every 2-3 years, with BMW coolant. These are magnesium engines. Use the right spec coolant to prevent corrosion. 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.
- **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 Penstosin 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 (N52 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 your car has 60K, the pads/rotors should 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+. DIY: Moderate-Hard, depending on your experience, cost: \$500-600. Good video at Bavarian Auto⁹. Cross drilled and slotted if it makes you smile when you look at them.
- **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. 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. DIY: Hard-Leave It To the Dealer/Indy; Cost: \$300 parts, \$200 labor at the Indy. But get it done.
- **Battery:** Yes, this is a maintenance item. Batteries last about 4-5 years. If your E60 is at 60K, you'll need one soon. DIY: Easy-Moderate. Cost: \$150-300. You'll need to get it registered at an Indy, for about \$50. E60's have dozens of computers. A weak battery causes numerous transient and peculiar errors and faults¹⁰.
- **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 \$140 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 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.

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.

- **Water Pump Failure:** 525, 530, 535 (six cylinder engine)¹¹. The electric water pumps on certain engines (N52, N54) are known to suffer electronic failure, usually at more than 50K miles. This is one of the few items people replace preventatively, since pump failure results in a tow every time. DIY: Hard, since it's difficult to reach, but many people replace their own. Usually replace the thermostat at the same time. Cost: about \$450, assuming pump and thermostat, but not hoses. Mike Miller recommends E60 coolant hoses at 150K.
- **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. Cost: \$40-60 each.
- **Coolant 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.
- **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. DIY: No. Dealer or indy. Cost: \$2.5-5K, mostly 25-30 hours of labor.
- **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 tech has been updated, 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 models¹². Wears out, and if not replaced already, a 60K car will need them soon. At 100K, it very likely they're worn out. DIY: Bushing only, for most people, is not a DIY, as it requires a hydraulic press to remove/install bushings in the control arms. 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 5XXi; the Four Wheel 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/Ball Joints:** 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 60K they're aging, and at 100K they're likely worn out. DIY: typical suspension: moderate-hard, needing spring compressors. Cost: Sachs (oem) strut cartridges: \$350 per pair; rear shocks: \$110 per pair.

- **Water In the Trunk:** All models. 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.
- **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.
- **Rough Engine Idle:** 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.
- **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>, that discusses their experiences with the problem. These are the previous generation of 6 cylinder 5 series, so many (but not all) the problems are similar. If you start to get a problem caused by aging plastic or rubber, it will occur at high mileage for the most part. Thanks to poolman at the E39 forum for this info.
- **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.
- **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. Over 100K miles, give it a look if you're getting a rough engine idle. Also, early models lacked the tubing insulation, 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.
- **Cracked Valve Cover:** Rare. Seems to be a couple of instances on the 535. 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.
- **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. Many DIY threads on the subject.
- **Computers, Controls and Electrical Systems:** There are dozens of sensors and 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.com/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.

- **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 to “sleep” properly.
- **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.
- **Other Problems to be provided as documented]**

Special mention: The ZF Transmission

The ZF Automatic Transmission deserves special mention. It is a fine unit, used on BMW, Bentley, Jaguar, Rolls and many other high end Eurocars.

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 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”.

Remanufactured Transmissions: it is BMW policy to replace any warranty failure with a remanufactured ZF transmission, not a new one. 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 endnotes, for those who want the details (thanks to ajm8127 at bimmerboost.com for these)¹³

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.

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.

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, delays in 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 quite 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, 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 actually easier than doing the actuators alone. It's more expensive, with a rebuilt unit costing around \$1500 from thectsc.com. We haven't priced it from other sources. 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 actuators¹⁴. 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. Expect that parts will be \$1K or so with pan and fluid, and labor at least \$200-300. Actuator replacement does not require that

the transmission be removed; in fact, it doesn't really require that the mechanic be a transmission specialist.

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. Display will suddenly warn of 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.

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 needs to be registered on the E60 network. This can be done at an indy/dealer, or via INPA.

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 probability, (1) new fluid and filter; (2) reprogramming; (3) new actuators; (4) new mechatronics or (5) new transmission.

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 properly. Doesn't happen often, thankfully. You'll need a dealer/indy to diagnose it.

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 or rumbling sound from front end at higher speeds. Possibly the Thrust Arm bushings in cars over 60K 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.

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 wheelwell in early E60 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 car. Several threads available to do this.

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.

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 10+ 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 Honda-level maintenance, buy a Honda.

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 E60 535's to cost more to maintain, sometimes considerably more.

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.

Enjoy.

Endnotes and Useful References:

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

² 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>.

³ Complete operating fluids list:

<http://www.bimmerboard.com/members/ripp222/original/Operating%20Fluids%20-%20Complete.pdf>

⁴ INPA is a BMW software product, 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.

⁵ Links to Videos: <http://blog.bavauto.com/category/bmw-5-series/5-series-e60/>

⁶ 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.

⁷ 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.

⁸ Which can be found here:

<http://www.bmwusa.com/Standard/Content/Owner/SyntheticEngineOils.aspx>

⁹ Bav Auto Video: <http://blog.bavauto.com/10012/>

¹⁰ Bav Auto Description: <http://blog.bavauto.com/13260/bmw-e60-e61-5-series-battery-removal-how-to-remove-525i-530i-545i-550i-etc/>

¹¹ Bav Auto Video: <http://blog.bavauto.com/14581/>

¹² Bav Auto Video: <http://blog.bavauto.com/14581/>

¹³ 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.zftransport.com/images/custom/mecha.pdf>

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>

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>

¹⁴ 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.