

fast times

the newsletter of **Bavarian Autosport**

Winter 2012

New gear for 2012!



Far left: 2-bar kit for 3 series 92 thru 98.
Above: rear bar for MINI.

Bavarian Autosport sway bars for 3 series 92 thru 05 and MINI 02 thru 06.

Each kit was developed for its specific chassis. Made from solid steel for strength, the BMW kits (27mm front, 23mm rear) have been pre-tuned to deliver optimum performance during spirited street driving yet provide enough strength and rigidity for occasional track use - no adjustment is necessary. For MINIs we offer a rear sway bar (19mm) that features 5 possible adjustment settings.

All of our sway bars work with the original BMW and MINI end links, so installation is straightforward and very cost-effective. Just install, drive and experience what is undoubtedly the best value in a suspension upgrade on the planet. (You won't believe how much better your car handles for so little money!) The bars have been given a durable powder coating (in Bavarian Autosport red) for durability and lasting good looks. Plus each kits includes urethane bushings and lubricant.

But perhaps the best feature of our sway bars is their price: BMW kits (front and rear bars) are just \$299.95, and the MINI bar (rear only) is just \$149.95. And they're all backed by our unbeatable 2-year warranty. For more details, ask your phone rep or check them out online at BavAuto.com. *More applications are coming soon!*

Seat Heaters Kit. These plug-in heaters are designed to be installed under our custom-fit seat covers. The kit includes four heating elements, fabric "envelopes" for the elements (not shown) wiring harness and a cigarette lighter plug (left) with separate on/off switches. For more details call 800.535.2002 or visit www.BavAuto.com. \$199.95 pair.



NEW! **Bavarian Autosport t-shirts.** Two new, exclusive, Bavarian Autosport designs! One is an update of our popular "Apex It!" shirt, now with an E92 M3. The other, for MINI enthusiasts, says, "Seek the twisties!" \$17.95 each.



D.I.Y.: Installing pencil-type high-performance coils



There's a trick to installing these newer style ignition coils. If you don't get them in just right, your BMW may not start! In his latest D.I.Y. video, Otto shows you how to install them correctly. See page 7...

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PRODUCTS FOR BMW ENTHUSIASTS
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Product Focus: **UUC** Motorwerks twin-disk clutch kit

Your BMW is making *how much* power? That's insane! The folks at UUC know what it's like to live with a crazy-powerful car. The constant smiles, the maniacal laughter, the embarrassed supercars, the rear tire replacements... and oh yeah, the toasted clutches. Just when you're ready to launch "the beast," there's that stinky smell and lots of revs with no forward motion. You're staying in for the night, crying. (Might as well put on a Snuggie and watch a Hugh Grant movie.)

What's that you say? You have found a carbon/ceramic/metallic, multi-puck, Stage 3, super-clutch? Is that the one that's like a giant on/off switch and spills your coffee at every start? You know, the one that you can't modulate in traffic? That requires a bionic left leg to operate for more than 20 minutes?... What's that?... Sorry, I can't hear you over the CLANK-CLUNK-CLANK noise whenever you change gears.

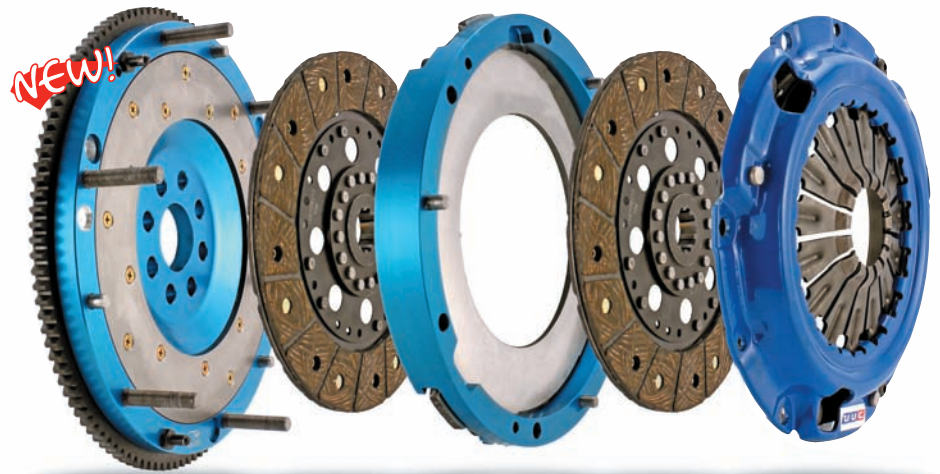
Now, what if there were a clutch kit that could reliably handle your BMW's über-power, that didn't sound like frying pans slapping together, and that could be engaged so smoothly even Grandma would love going for rides?

UUC to the rescue! By taking their class-leading flywheel and clutch technology to even greater heights, UUC has developed a twin-disk clutch and flywheel system that operates just like a regular clutch but has the power-handling capability that meets or exceeds any of the old-style race clutches. By incorporating larger disks than the average multi-disk clutch, UUC's unique design operates as smoothly as original equipment yet can easily handle power levels approaching 1,000 hp.

The key to marrying the characteristics of high torque capacity with street-friendly operation is the use of a smoother-functioning material with a larger surface area. This all-new design combines the stiffness of an aluminum cage with the reliability and compactness of a steel cover. Plus it maintains normal pedal effort. And the rotating mass of the



UUC's new twin-disk clutch system assembled.



An exploded view of UUC's new twin-disk clutch system.

complete flywheel and twin clutch package is just 25.5 lb – the same total mass as a typical, lightweight 11.5 lb flywheel coupled with the M3 clutch or UUC's Stage 2 clutch upgrade.

The basic twin-disk clutch system contains everything required: lightweight aluminum flywheel, twin organic clutch disks, aluminum cage, steel cover, release bearing and all hardware. The price of this system is \$1,599.95 (\$1,799.95 for E46 M3). That is significantly less than any other twin-disk kit on the market! An upgrade to twin feramic disks is available for just \$200.

If you have any questions about this new twin-disk clutch system, please call and speak with one of our friendly phone reps – he will be glad to help.

Materials guide/power output:

- **Twin Organic:**
850 hp, 600 ftlb applications
- **Twin Feramic:**
1000 hp, 800 ftlb applications

Available fitments (more coming):

E46 M3 2000-2006
E46 323/325/328/330 99-05 (5-sp.)
E36 M3 99-99 (5- and 6-sp.)
E36 92-99 328/325/323
Z3 1.9/2.3/2.5/2.8, Z3M

UUC clutch upgrades for the rest of us...

While UUC's twin-disk clutch is a marvel of modern engineering and manufacturing, if your BMW doesn't have 500+ hp, you don't really need it. But that doesn't mean you can't upgrade to a UUC clutch. We offer UUC clutch upgrades for daily drivers, street racers and track cars, too. Why would you want to upgrade your clutch? Here are two good reasons:

- 1) Your current clutch has failed or is showing it's age. Rather than just replacing the clutch, you can upgrade to a better-built, longer-lasting UUC Stage 1 clutch kit that features a performance organic clutch plate and stronger pressure plate assembly. (The labor is going to be the same – why not install a better product that makes driving more fun?)
- 2) Your current clutch isn't properly matched to the power of your BMW (are you listening M5 owners?) or the way you drive (e.g. track/autocross events). For folks like you, we recommend the UUC Stage 2 kit. It offers a range of sizes and friction materials to suit your needs. It also includes the UUC lightweight flywheel that lets you accelerate and decelerate faster and match revs sooner for quicker shifts.

Lighten your load. You can also enjoy faster acceleration, deceleration and quicker shifts simply by replacing your stock flywheel with a UUC lightweight flywheel. (Did you know that a 17 lb. reduction in flywheel mass gives the same performance boost as a 400 lb. reduction in car weight?) UUC's lightweight flywheels are direct replacements – no mods are necessary – and include OEM dowel pins.

Clutch kits start at \$544.95: clutch kits with lightweight flywheels start at \$974.95. For more details on these or any UUC Motorwerks products, or to get some help determining which upgrade would be the best choice for your BMW and the way you drive, give us a call – one of our friendly phone reps will be happy to help you figure it out.



Right: UUC Stage 2 clutch & flywheel upgrade kit.

Over 279 years of BMW/MINI experience is yours for the asking - free!



If you add up all the years the enthusiasts at Bavarian Autosport have been working on BMWs and MINIs – and helping people like you work on theirs – it totals well over 279 years. That's a lot of knowledge under one roof. And it's all yours, free! Have a question? Ask that savvy, BMW and MINI enthusiast, "Bavarian Otto." Just call 800.535.2002, e-mail Otto@BavAuto.com or check out his searchable knowledge base on our tech blog – blog.BavAuto.com.

Not cool! ⚡

Dear Bavarian Otto,

My 1997 BMW 528i has a weird cooling problem. My commute involves about 20 minutes of stop-and-go driving, which gets the temperature indicator up to the normal range (middle), then I hop on the freeway and the needle starts to drop. The needle goes down to about 1/3 of where it's supposed to be. Then I go back to stop and go driving and it goes back to the normal range, and so on. What's wrong with my Bimmer, Otto?

Otto replies:

The symptoms that you've described are a textbook description of a thermostat that is fully or partially stuck open. These symptoms would go along with a lack of heater output as well. (If you turn on the heater, you will notice it is blowing cool or tepid air.) We would recommend replacing the thermostat. Note that we also offer an upgraded aluminum thermostat housing for your 528i (and some other models) because the original plastic housing does have a tendency to crack. Finally, you'll need some BMW anti-freeze/coolant. A gallon is plenty, once you mix it 50/50 with water.

Otto's Ultimate Maintenance Schedule now available by chassis!

Three years ago, in the Winter 2008 issue of *Fast Times*, we published "Bavarian Otto's Ultimate Maintenance Schedule." It was a large chart that listed recommended service intervals for many common maintenance tasks – for just about every BMW built since 1967. We recently took that chart and separated it into maintenance schedules for individual chassis. For example, the E46 3 series 99 thru 05 has its own chart, the 7 series 95 thru 01 has its own chart, and so on. Not only are the recommended intervals listed, we included spaces for you to fill in dates, mileage, etc., when the jobs are performed. We then made PDFs of these charts and posted them on our web site and blog so you can download them, print them and keep them in your glove boxes for easy reference. Following this schedule will keep your car in tip-top running condition and if you ever decide to sell or trade your beloved Bimmer or MINI, it's a nice way to let people know how well you have cared for it. (P.S. the schedules are free. Happy motoring!)



Download the individual maintenance schedule(s) you need at blog.bavauto.com/go/maintenance or scan the QR code at left.

Coolant expansion tank removal. ⚡

Dear Bavarian Otto,

I am having a hard time replacing the coolant expansion tank on my 2002 330ci. I am able to remove all upper hoses from their attachments after removing the air filter box, but the tank is somehow still secured from the bottom. There are two more hoses that I cannot remove. Any suggestions?

Otto replies:

At the bottom of the expansion tank, there is one coolant hose (at the rear side of the tank). On the underside of the tank, there is a connection to the automatic transmission cooler connector valve, as well as the coolant level sensor. Once the upper hose, the lower rearward hose and the upper radiator bracket connectors are disconnected, either twist and remove the level sensor or unplug the wiring harness from the sensor, then pull the tank up to disconnect it from the transmission cooler connector. The Bentley repair manual covers this procedure with photos and drawings.

A dim view. ⚡

Dear Bavarian Otto,

What can I do to improve the illumination from my 98 328i headlights? Last night I nearly took out a cyclist because I didn't see him until the last minute.

Otto replies:

The best upgrade is to replace your stock headlight assemblies with European assemblies that use brighter bulbs. (Plus they have angel eyes!) These assemblies cost \$400–600 a pair. If that's not within your budget, try these two upgrades: 1) replace your stock halogen headlight bulbs with brighter Hella high-performance blue or yellow bulbs; and 2) use one of our headlight restoration kits to remove the cloudiness and/or pitting on your plastic headlight lenses. Do these two things and you'll be amazed how much better you'll be able to see at night. [Ed. note: The Hella bulbs and headlight restoration kits are on sale thru Feb. 29. See page 8...]



Winner! BMW in motion. Sam Raymakers of Minnesota and his 1991 318i. Upgrades & modifications include Bilstein Sport shocks, performance springs, performance chip, cold-air intake kit, Schrick cams, stress bars, front lip spoiler and more.

for this photo, Sam received a \$100 Bavarian Autosport savings certificate. Complete details on our photo contest can be found on page 96 of our catalog or at www.BavAuto.com/photocontest.

Replacing the crankcase ventilation (PCV) system on a V8.



PCV check valve cover and gasket.



All engines have crankcase ventilation systems. On late-model BMWs (all V8 and 6-cylinder cars from 96 on), the systems involve hoses, check valves and oil separators. We have found that failures of these systems are all too common. Symptoms of failure include any or all of the following: oil burning, rough idling, engine management fault codes suggesting misfires and/or lean running conditions (vacuum leaks) and evidence of moisture in the oil (gray or tan sludge at the oil fill cap area).

V8s – We find that a ruptured vacuum check-valve diaphragm is the most common failure. This creates a vacuum leak and can cause low/rough idle, oil burning and engine fault codes for miss-fires and fuel mixture troubles.

6-cylinders – These systems have problems with clogging or the hoses deteriorating and creating vacuum leaks, as well as ruptured check valve diaphragms. The vacuum leaks are not a huge problem and can be dealt with in a timely manner. A clogged or ruptured check valve, on the other hand, can lead to a catastrophic failure with major engine damage (including cracked valve covers or cylinder heads and even bent connecting rods), due to ingestion of engine oil into the cylinders.

We recommend pre-emptive replacement of the systems instead of waiting for the symptoms to appear... which could be too late. We offer complete kits for each engine type that include all of the parts needed to make the repair. We showed you how to do this repair on the M52TU and M54 6-cylinder engines in the Winter 2010 *Fast Times*. You can download a PDF of this issue at BavAuto.com/newsletter, or go to blog.BavAuto.com where you can read this step-by-step guide with photos or watch our multi-part D.I.Y. video.



Video: blog.BavAuto.com/go/PCV

Article: blog.BavAuto.com/go/PCV2

In this article, we will focus on the M60 and M62 V8 engines. These engines are used in all BMW V8 models from the early 1990s through the mid 2000s (5 series through 03 except M5, 7 series through 01, 8 series, X5 through 06).

The most common symptoms for a faulty PCV check valve on the V8 engines are intermittent oil burning, rough idle and misfire or fuel trim fault codes. The PCV check valve is incorporated into the rear cover for the intake manifold. BMW has historically recommended that the intake manifold be removed from the engine in order to access and replace the check valve cover assembly. While this does make the check valve replacement an easy task, the manifold removal is rather tedious and adds a minimum of a couple hours to the task. We have found that the PCV check valve cover assembly can indeed be replaced without removing the complete intake manifold. The replacement procedure does require some creative tool use and a bit of patience, but it is much easier than removing the intake manifold and can be completed in 2 to 3 hours (as opposed to 4 to 5 hours).

Follow along as we replace the PCV check valve assembly on a 1999 740il. Note that other models may require removal of cabin air intake ducts and/or wiring harnesses at the firewall in order to gain full access to the rear of the intake manifold. (See the applicable Bentley repair manual.)

Tools used:

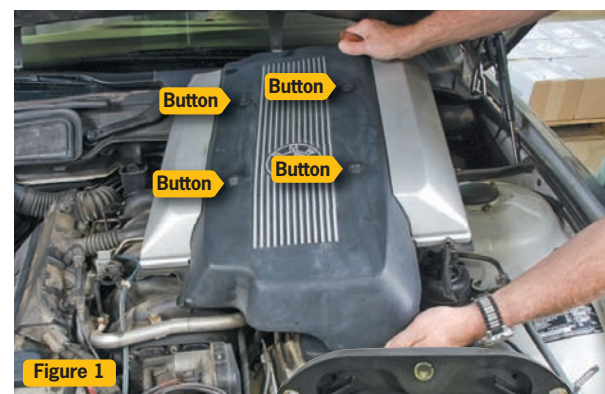
- Bentley repair manual (B701, or as applicable)
- T30 Torx Bit – 1/4" hex drive
- 1/4" ratcheting box-end wrench
- Flexible hose clamp driver (53190)
- Diagonal cutters
- Various flat-blade screwdrivers

Parts used:

- V8 PCV Repair Kit (M62 CVRK 96)
- Vacuum Hose between cover and vacuum check valve, if needed (11 61 1 440 126)
- Hose Clamps for vacuum hose (CL 16-25)

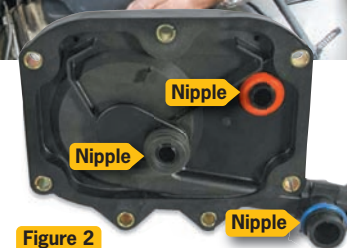


1. Release and/or remove any obstructions at the rear firewall, that may prevent access to the rear of the intake manifold, if required (see applicable Bentley manual). This E38 7 series does not require any removals for clearance.

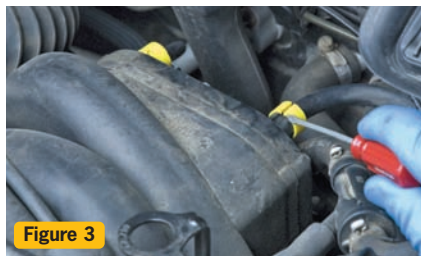


2. Remove the engine trim cover (fig. 1). Push the four locking buttons to release them and lift the cover off.

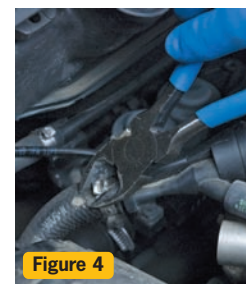
3. Look at the new check valve cover to determine the locations of the 7 mounting bolts, two vacuum hoses, the main vacuum hose for the power brake booster and the crankcase vent tube on the lower-driver side. Also note the two internal tube connections (fig. 2).



4. Remove the two upper vacuum hoses. Push the yellow locking rings rearward and then pull the hoses off the nipples (fig. 3). Note the orientation of the two locking rings. The driver and passenger side rings are the same, but they are installed differently.



5. Remove the power brake booster vacuum hose. This is the short hose that runs from the check valve cover to the "sucking jet pump," or vacuum control valve. Disconnect the hose at the vacuum control valve (you can remove the hose from the cover after the cover is removed from the manifold). Use diagonal cutters to twist and cut the factory crimped hose clamp (fig. 4).

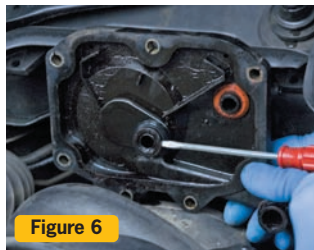


6. Disconnect the coolant hose that is connected to the coolant crossover pipe. This hose is toward the passenger side and prevents full access to the lower mounting bolt that is in the second position from the passenger side. Very little coolant will be released when this hose is disconnected. Just disconnect the hose at the crossover manifold nipple and push it aside.

7. Remove the mounting bolts. These bolts are female Torx (T-30 size). The best tool is a short T-30 male bit that fits into a ¼" hex driver. We use this bit with a ¼" ratcheting box-end wrench (fig. 5B). Depending on the bit, it may need to be cut shorter for access to a couple of the lower securing bolts. Accessing the upper bolts is no problem (fig. 5). Accessing the lower bolts is tedious and requires both hands to be used – one to find the bolt head and guide the bit and one to work the wrench. We like to secure the bit into the wrench with one tiny drop of super-glue. (Drop the bit and you'll know why.) If the wrench does not have a reversing lever, it will have to be flipped around for the bolt tightening. This will require the bit to be removed and inserted into the opposite side of the wrench. Therefore, do not use more than a small drop of the super-glue. You can use a vise to push the bit out and then reinstall it.



8. Remove the cover. **STOP!** Just before prying the cover off, take note of the following issues. The internal vacuum pipe connection (where the seal is in the center of the cover – fig. 6) and the lower-driver side crankcase vent pipe **MUST NOT** be allowed to pull rearward when the cover is removed. We want the two pipes to stay connected at the forward ends. The best way to accomplish this is to gently twist the cover once the bolts are removed and slowly pull it rearward. As the cover is pulled rearward a bit, use a light to look between the manifold and the cover. You can then use a long small screwdriver to assure that the internal pipe stays forward as the cover is pulled back (fig. 7). Watch the lower-driver side pipe in the same manner. Most times the pipes do indeed stay in place. However, taking steps to assure that they do will prevent further steps to reinstall them into the forward mounting points.



9. Remove the short vacuum hose from the old cover and install it to the new cover. Leave the hose clamp just a bit loose so that the hose can be positioned properly after the cover is installed.

10. Remove the old seal from the intake manifold. Use a small screwdriver or a seal pick to pull the seal from the groove (fig. 8)

11. Install the new seal into the manifold groove.

12. Mount the new cover assembly. Position the cover and assure that the internal vacuum pipe and the external pipe are properly positioned into the cover nipples. Push the cover into place and install the upper corner bolts, by hand. Install all of the mounting bolts and secure them with the bit and wrench.

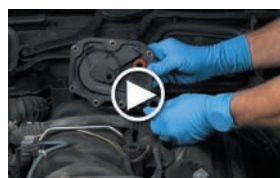
13. Connect the coolant hose to the crossover manifold.

14. Connect the vacuum "sucking jet pump" valve to the vacuum hose from the cover assembly.

15. Connect the two upper vacuum hoses and install the clamping rings.

16. Install the upper trim cover.

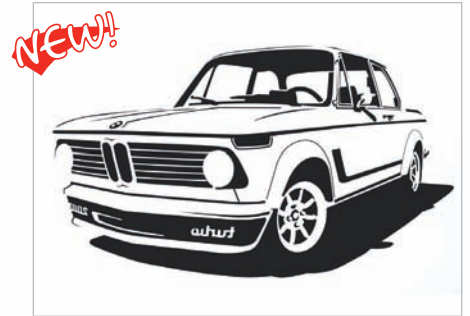
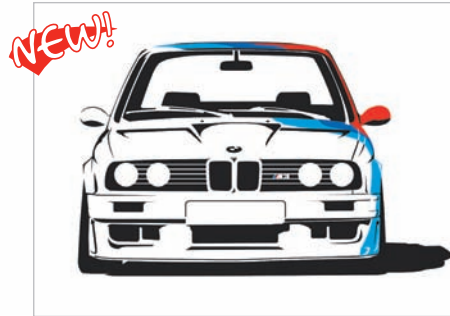
17. Install any items that may have been removed to access the check valve cover assembly.



We have also produced a D.I.Y. video of this repair. You can view it at blog.bavauto.com/go/PCV-V8 or scan the QR code at left.

New Products for 2012 continued...

Exclusive limited edition prints. We asked stencil artist Chris Holewski at Manual Designs to create two limited edition prints for us – a 2002 turbo and an E30 M3. Each one is numbered and signed by Chris. He's making just 50 of each, so if you want one (or both!) you'll need to order soon, before they're gone. 20" x 16". \$59.95 each.



You can see more new products for your BMW or MINI at BavAuto.com/newproducts.

Product Focus: The clear advantages of Protect-A-Mats.

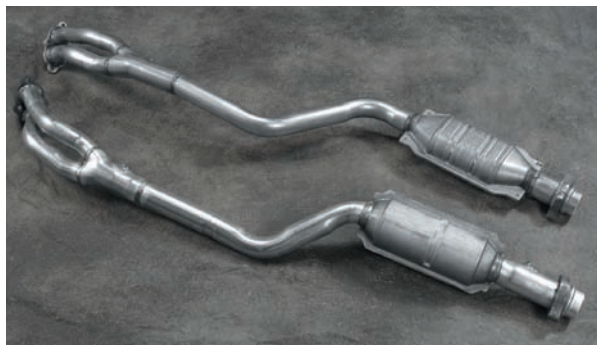
Sand, dirt, water, salt – these are the enemies of floor mats and carpeting. If you want some protection but don't like the look of rubber mats, our clear vinyl Protect-A-Mats are just the thing. Yes, similar products have been around for years, but these are much different:

- They're made of heavier vinyl than cheap versions, so you get a Lifetime Warranty.
- They have longer nibs that reach deeper into carpet to grab hold and stay put.
- They're cut to fit your BMW or MINI precisely, using the exact same patterns as our carpeted floor mats. This allows them to provide complete coverage for maximum protection.*

Protect-A-Mats are normally \$59.95 for a set of 4; \$49.95 if purchased, in combination with Plush mats, Ultimate mats, Berber mats or Coco mats. Now thru April 29, we'll take another \$10 off, so \$49.95 alone or \$39.95 in combination.

* They work on BMW or MINI factory floor mats but are not an exact pattern match.

“Why did my catalytic converter fail... again!?”



We offer factory BMW/MINI catalytic converters, as well as D.E.C. cats which are an excellent value. They're available in your choice of 49-state legal with a 2-year warranty or 50-state legal with a 5-year warranty. For model-specific pricing, ask your phone rep or visit BavAuto.com.

All gasoline engine automobiles sold for use in the U.S. since the late '70s/early '80s have catalytic converters installed in the exhaust systems. The catalytic converter is a section of tubing in the exhaust that contains specific catalyst elements that react to the heat and particulates in the exhaust, creating specific chemical reactions. These chemical reactions alter environmentally harmful compounds in the exhaust and change them into different, less harmful (or harmless) compounds that can safely be released into the atmosphere. In this article, we will focus on vehicles produced since 1996. This is when the infamous OBD-II (On Board Diagnostics 2) system became mandated by the EPA (Environmental Protection Agency) for most highway vehicles sold in the U.S. The OBD-II system monitors various operating parameters of the engine and exhaust. If these parameters go “out of spec” (beyond a set variance value), a fault code is generat-

ed and stored in the engine management computer, often leading to the ubiquitous “CHECK ENGINE” or “SERVICE ENGINE SOON” warning light in the instrument cluster.

These days, catalytic converter replacement seems to be a regular (if unpleasant) part of vehicle ownership. It doesn't have to be. With rare exceptions (i.e. poor designs or faulty manufacturing), a catalytic converter should not need to be replaced. If the engine is running properly, the catalytic converter will typically last the life of the vehicle. So why do so many cats get replaced? Because our engines do not



Cut away view of new, undamaged catalytic converter substrate.

always run in tip-top form. When they don't, they emit exhaust gases that contain compounds that damage the catalyst elements in the converter. Once damaged, these elements cannot produce the chemical reactions needed to fully or properly “convert” the harmful compounds. Some common engine problems that can damage a cat include:

- running rich (too much fuel entering the cylinders).
- running lean (too little fuel entering the cylinders).
- internal coolant leaks (e.g. a leaking head gasket).
- improper compounds or additives in the fuel itself.

Some of these faults will trigger a fault code and the accompanying warning light, while some may not. Some faults can be enough out of spec to damage the converter, yet not be egregious enough to generate a fault code. These are the cases (no fault code generat-

ed) that are the most dangerous to the converter. We can be going along thinking all is fine, while the engine management system is trying to take care of one or more degraded system issues and at the same time the catalytic converter is being slowly destroyed. Yet we never see any warnings of an engine management fault because the operating parameters are not far enough out of spec to generate a fault code and turn on the engine warning light in the instrument cluster.

Once the converter is damaged enough that the chemical reactions in the exhaust are reduced to an out of spec value, we finally get a fault code (and warning light). We now go to our mechanic, who dutifully reads the fault codes and says that we need a new catalytic converter (the fault code may typically say “catalyst efficiency below threshold”). While this may very well be true, as the converter is indeed damaged, simply replacing the converter will be treating the symptom, not curing the problem.

Initially, however, it will appear to have cured it as the fault code will go away... temporarily. In short order, we will be dealing with another catalytic converter fault and failure, doubling the expense. And since replacing a catalytic converter can be very costly, failure to identify and correct the underlying problem can soon triple the expense, or cause you to sell or trade a perfectly fine BMW or MINI that you now think is junk.



Replacing your cat? You should replace your oxygen sensor(s) at the same time. Our oxygen sensor tool is on sale thru Feb. 29. See page 8...

Fuel trim is the key.

If we do have a converter failure, we must determine why the converter has failed by diagnosing what's wrong, as opposed to simply replacing the cat. If there are any additional fault codes, we would obviously take a look at those to determine what may be causing



them. Additionally, we need to take a look at the operating fuel trim values, which will tell us if the engine management system is adding or subtracting too much fuel from the air/fuel mix entering the cylinders.

Your trusted automotive technician can read the trim values, or you can use our CReader VI (pronounced “see-reader-six”). This tool (above) can display the fuel trim



Above left: a catalytic converter that is covered in carbon caused by too rich a fuel mixture. Above middle: a catalytic converter that has overheated/ melted due to too lean a fuel mixture. Above right: typical appearance of a properly maintained catalytic converter.

as well as other sensor values at the exact moment that a given fault code was generated, as well as display live running values. And while a full examination of the ins and outs of engine management programming and operation is beyond this article, we can certainly take a look at the general use of fuel trim values in diagnosing catalytic converter failure.

- If the engine is running rich (too much fuel), the con-

verter's chemical compounds (as well as the exhaust pipe feeding the cat) will become coated with carbon. This effectively insulates the catalyst material from the exhaust gasses and prevents the necessary chemical reactions from taking place. In this case, the converter must be replaced.

- If the engine is running lean (not enough fuel), this can either melt the catalyst or there will be too little carbon in the exhaust to generate the proper chemical reactions. If the catalyst material has not been overheated to the point of damage, fixing the lean condition may be sufficient to eliminate the converter efficiency fault codes.

Using the CReader VI and fuel trim values in diagnosing catalytic converter fault codes:

Rich-conditions:

Converter material is coated with carbon, preventing the catalyst chemical reaction. What is causing the

continued top of next page...

continued from previous page...

carbon build-up? There may be additional fault codes that appear to indicate that the engine is running lean, as opposed to rich. How could this be causing excessive carbon build-up?

- Excessive carbon deposits in the engine's combustion chambers can absorb some of the fuel (from the intake air/fuel mixture). This fuel is not burned in the combustion cycle and an accompanying amount of air is not burned. This air exits the cylinder on the exhaust stroke and the pre-cat oxygen sensor detects that there is too much oxygen in the exhaust. The ECU reads this as a lean condition and adds more fuel. This is a positive fuel trim value. The ECU has trimmed its fuel delivery to add more fuel compared to the programmed map. This is expressed as a positive percentage value. The engine is now actually running rich and is depositing carbon within the converter. To top it off, that unburned fuel also enters the converter and produces more carbon deposits as it is partially burned.

- An individual cylinder within a cylinder "bank" (cylinders that are monitored as a group vs. individually, such as; a BMW 6-cylinder = Bank-1, cylinders 1-3 and Bank-2, cylinders 4-6) has a partially clogged injector, which causes this cylinder to run lean. The exhaust from this cylinder passes the oxygen sensor which then reports to the ECU is that this whole bank is running lean (too much oxygen due to the one cylinder running lean). The ECU adds fuel to all of the cylinders in this bank, making an overall rich condition for this bank, resulting in carbon build up in the converter.

Lean conditions:

There is not enough HC (hydrocarbons) and CO (carbon monoxide) in the exhaust to properly support the catalytic chemical reaction within the converter. How could the engine be running lean if there are no lean engine management fault codes?...

Read the rest of this article at blog.BavAuto.com/go/cat or use your smartphone to scan the QR code at right.



Installing pencil-type ignition coils in BMW engines. 🔧

All 6-cylinder and V8 BMW models 92 on (except the early 535i and 735i) use a direct ignition system, (a.k.a. "coil on plug"). In this system, there are no traditional spark plug wires: each plug has its own ignition coil, mounted directly above it.

Historically, ignition coils have not been a standard maintenance item. However, these direct ignition coils are showing a pattern of failure as they age. You may see misfire fault codes and/or drivability problems that can be traced to one or more faulty coils. The bad coils can be replaced individually as needed, or you can replace all of the coils (before the others fail). This is a great opportunity to install our high-performance ignition coils. These coils use redesigned coil-wire windings to create a stronger spark, which in turn produces a more complete burning of the air/fuel mixture in the cylinders. The result is more power and better fuel economy. And they don't cost much more than stock coils.

For 6-cylinder and V8 models from the early '90s through the early 2000s, the coils are bolted in place. Removal and replacement of this design is covered in a previous DIY video (right). For BMW models starting in the early 2000s, the coils do not bolt

Above left: pencil-type coil.
Above right: bolt-on coil.

Product Focus:

Super-adjustable ISC coil-over kits.



ISC coil-over kits not only offer 32 steps of damper adjustment, they let you adjust rebound, height and camber so you can dial in the perfect setting. The maximum lowering adjustment is about 3 inches below standard ride height. And the spring rates have been engineered to suit

each specific chassis for maximum improvement in handling and stability. Other features include:

- High-rigidity steel piston rods meet race/sport standards.
- Large, single-cylinder-and-piston design improves driving stability and handling.
- High-quality SAE9254 steel springs, tested over 500,000 compressions with less than 5% deformation.
- High-quality, anodized, T6061 aluminum alloy brackets and adjustment locks provide lightweight strength.

Each kit also includes heavy-duty, noise-free, rear upper shock mounts and adjustable front sway bar links (if applicable).

Kits are available for 3 series 92 on, 5 series 97 thru 10, M3 95 thru 06, Z3 97 thru 02. The price is normally \$1199.95, but now thru February 29 they're on sale for just \$1099.95 – you save \$100!

to the valve cover – they simply push down onto the spark plugs. Because of their shape, these coils are often referred to as "pencil-type." Accessing pencil-type coils is similar to that for bolt-on coils, but we have found that even professional installers have been having some problems properly installing pencil-type coils in BMWs. The main issue revolves around incomplete seating of the harness connector plug, which can cause a "no start" situation and lead one to believe the coil is bad. (This same "no start" issue can rear its head even if you are just changing your spark plugs.) So we made another "coil installation" video that shows how to properly remove and replace the pencil-type coils. Just follow the appropriate link below. (You can also download a copy of the installation instructions at BavAuto.com/techinfo.)



For the bolt-on coils video, go to blog.BavAuto.com/go/coils



For the pencil-type coils video, go to blog.BavAuto.com/go/coils2