BMW TechDrive Magazine

For independent BMW service professionals

The Ultimate Driving Machine®

TechDrive

Volume 5 Number 1 February 2008

Original BMW Parts

Welding 04 Sound Systems 08 Evap Diagnosis 14 Brakes 25 Dealer Listing 27

To our readers,

What could be more useful to independent service technicians who work on BMWs than a publication dedicated specifically to them?

That's the idea behind the magazine you're holding, *TechDrive.* BMW of North America both sponsors the publication and provides much of the information that's included. A big part of the rationale behind *TechDrive.* is the belief that if you are able to diagnose, repair and maintain BMW vehicles properly and efficiently, your reputation and ours will be enhanced.

TechDrive. 's combination of feature service articles (written from both BMW tech information and interviews with successful independent BMW specialists), new technical developments, systems evolution, as well as the correct BMW replacement part, and service bulletins are intended to help you fix that BMW right the first time, on time. Our list of BMW dealers will assist you in finding Original BMW Parts.

There's more to this effort, including highly-informative and user-friendly web sites, which we'll explain in future issues.

We want to make *TechDrive.* the most useful and interesting technical magazine you receive, and you can help us do that. Please email us at editor@techdrivemag.com and let us know what topics you'd like to see covered, and provide any other comments you might have. With your involvement, this publication can evolve into one of your most important tools.

Thanks for your continued interest.

For more information please email us at: editor@techdrivemag.com

Cover Photo:
Welding in the stabilizer bearing

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BMWs use a "saddle" gas tank. What happens with the gasoline that evaporates inside?

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A Publication For The Independent BMW Service Professional

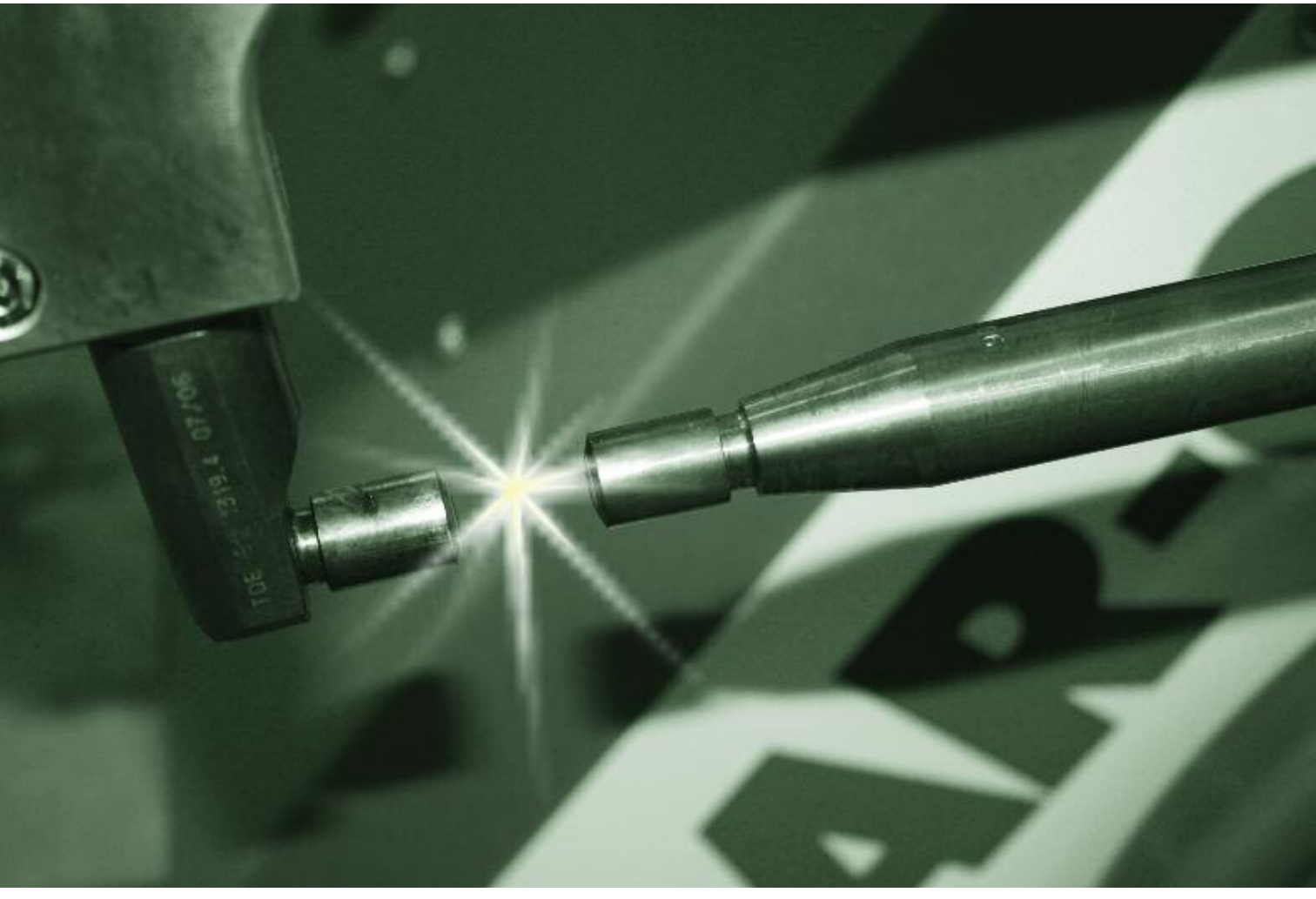
25 Brake Hydraulics: Fluid Flushing and BMW Requirements

Why do brake fluid changes? For several good reasons. Corrosion and contamination of that intricate and expensive ABS and DSC hardware is to be strenuously avoided.

27 Original BMW Parts... Nearby

Wherever you are in the United States, there's a nearby source of Original BMW Parts for your customers' BMW vehicles.

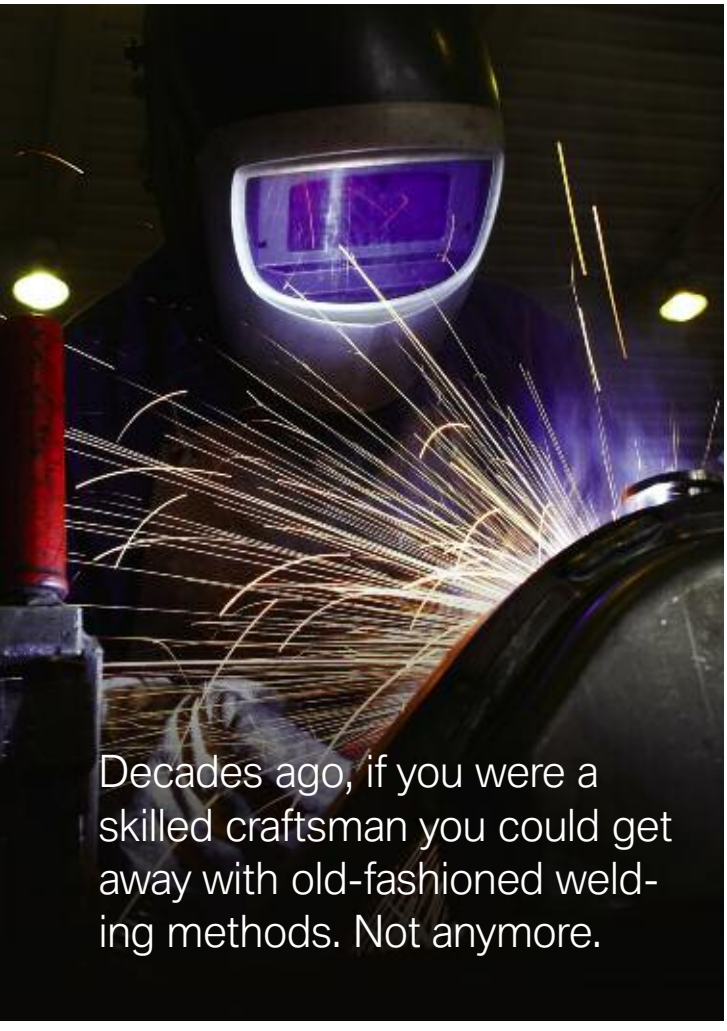
Welding Strictness and



"Faulty welds spur inspection of 7 more ships" was the headline for the Navy News on December 18, 2007. The article covered the need for the U.S. Navy to inspect at least seven more new ships, including the $4.5 billion aircraft carrier George H. W. Bush that was commissioned in October, 2006. Mike Petters, sector president for Newport News where the ship was built mentioned that the "welding discrepancies" would delay the sea trials. "The matter is a technical issue that has called into question the discipline of our processes. We are also putting into place a rigorous set of corrective actions that include mandatory training for each and every welder and every welding foreman. What really matters the most to me is that we conduct our business with the highest level of integrity…in support of America's freedom!"

Now that we have answered your question as to why BMW certifies and de-certifies welders, and stresses the importance of training and certification, let us take a look at the entire welding process and what BMW recommends.

Its Importance



Decades ago, if you were a skilled craftsman you could get away with old-fashioned welding methods. Not anymore.

A summary of welding these past 40 years or so

It is 1965 and the vehicle you are repairing requires a new quarter panel. You quickly summon the counter person to pull your parts while you head over to the corner to "unbury" the welding torches, stumbling at the same time on the spot welding unit. Not having much luck in the past and fearful of the shock you may receive from the spot welding unit, you roll the set of torches over to your stall. You then take your grinder out with #36 grit sandpaper and begin grinding the sheet metal where you will be welding. Clamp the panel together, light up the torch and begin stick welding the panel into place, all the time trying to reduce heat to not warp the sheet metal.

Move ahead to the late 1970s and a new type of welder becomes the talk of the industry: the "MIG welder", or Gas Metal Arc Welding (GMAW). MIG welding is a process that joins metals by heating them with an arc. The arc is between a continuously-fed filler metal (consumable) electrode and the workpiece.

Today, squeeze-type resistant spot welders/resistance pressure spot welders must be used on BMW vehicles to assure a factory-like weld and avoid heat distortion.

Externally-supplied gas or gas mixtures provide shielding. Metal is deposited only when the wire actually touches the work. No metal is transferred across the arc. MIG welders continued to become easier to use, to require less maintenance, and to be more cost effective and more adaptable to various types of welds.

Late in the nineties, squeeze-type resistant spot welders/resistance pressure spot welders make their debut in North America, producing cleaner, better, factory-like spot welds with limited heat displacement. Within the next couple of years, power conversion and duty cycles are improved making the tool more attractive to collision repairers, and demand increases for the new welders.

Resistance Pressure Spot Welding (RPSW) – the reasons

The metals being used in today's vehicles continue to change at a rapid rate. As auto manufacturers continue looking for lightweight, fuel efficient and safe vehicle designs, the advances in various steel and other metal types will continue. RPSW delivers the appropriate weld needed while limiting the heat levels to the area of the weld and maintaining the molecular makeup of the advanced steels. For example, mild steel has a tensile strength of around 180-200 N/mm2. Compared that to today's best steels at around 1,500 N/mm2.

Today's RPSW continually monitors the unit while the welding process is being performed, reducing user error and insuring proper weld characteristics. On-board microprocessors and electrical current technologies provide the user with a more accurate, consistent and repeatable spot weld, resulting in assured quality of workmanship. Pre-programmed spot welding is becoming more popular with these units to ensure that vehicle repairs match OEM specifications, thus returning the vehicles to "pre-loss condition." As metals continue to advance, demand expectations for RPSW will continue accordingly.

BMW's Currently-Recommended Welders

Car-O-Liner CR600

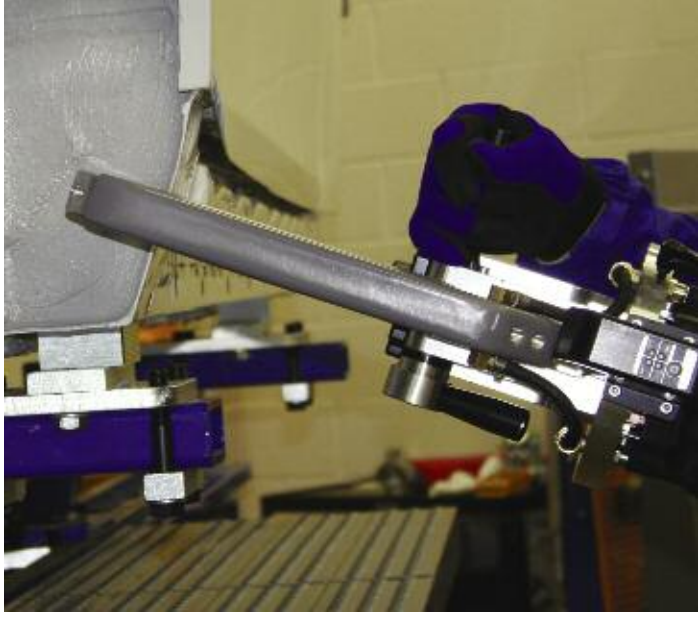
Car-O-Liner understands that collision repair facilities are different, which is why its CR600 welder will "sense" if your voltage is low and adjust itself so that the power time is extended, thus ensuring that your welds are of proper quality. It also features programs that can be set to vehicle manufacturer specifications so you can be sure that your weld is not any stronger or weaker than it was originally, but rather the way it was designed to be. Car-O-Liner understands that any deviation would jeopardize the vehicle's crashworthiness should it be involved in another collision, all of which makes it worthy of a BMW recommendation. The Car-O-Liner CR600 also allows the veteran welder to adjust the electrical current and time length for those unforeseen uses.

Celette Midispot QSVM9000

The Celette Midispot also senses if your line voltage is low and adjusts itself accordingly. Its programs can also be set to vehicle manufacturer specifications, making sure that your weld is of the strength the designer intended, which maintains crashworthiness. In addition, the Celette Midispot also allows manual adjustment.

Elektron – Multispot MI-100 Control

One of the characteristics that this welder offers is the ability to measure, record and analyze every weld, and provide a printout for your records. Approved manufacturer repair facilities can access information from a manufacturer like BMW to prevent improper settings that result in inferior welds. The Elektron Multispot MI-100 Control welder also produces consistently accurate spot welds by using a microprocessor to control current and the welding time. It also allows the veteran welder to manually adjust controls, and will record this data.



In all three recommended welders you will quickly see common themes: water cooling, programmability, and controllability so that vehicles are repaired in a way that assures passengers safety.

Below is the matrix (updated March, 2007) for RPSW equipment that is currently approved by BMW and is either “Recommended” or “No longer recommended”

Repair Procedure

Sample spot welds should be performed on separate scrap pieces with destructive test procedures being performed (peel, chisel and twist testing). All surfaces being welded together should have paint removed, be free of contamination and panels should be clamped. Inspect all welds after completion making sure that there are no welds contacting the panel edges, no pin holes, and that the weld surface is smooth.

Here at BMW our vehicles may not cost $4.5 billion dollars each like an aircraft carrier, but our customers’ safety is priceless. Make sure your welds have integrity!

Vehicle	Group 1	Group 2
E93 - 3 Series	OK to use EXCEPT on A-Pillar & Rocker Areas	OK to use on ALL areas
E70 - X5	OK to use EXCEPT on B-Pillar	OK to use on All areas
E64-6 Series Convertible	OK to use EXCEPT on A-Pillar, B-Pillar & Rocker areas	OK to use on ALL areas

Managing the Airwaves:

BMW Radios

Change is a part of life. Radios have become computer controlled entertainment systems capable of interfacing with other control units and bi-directional control.

When scrolling through the display and you see this, you can change between multiple regions such as Europe and U.S. Use the number keys to select your region, then press the plus or minus key to move on to the next feature.

There is more to a radio these days than just punching in the anti-theft code. Since '93, BMW has been adding features to automotive entertainment systems -- push-button control panel interfaces, road-speed dependent volume control, self-diagnostics, BUS communication, etc. Sometimes service may include resetting or adjusting these various features. For a decade and a half, BMW has advanced technology in vehicle entertainment.

Worldwide Radios in the U.S.

Starting with the '93/'94 3-Series, BMW's Bavaria C Business RDS radio features could be changed through the radio head push buttons. In order to do this, you needed to get the radio into "Service" mode. It has to be in FM mode, and you may have to put it in FM mode, shut off the ignition key, and turn it back on again. Immediately push the star button followed by the 1 and 4 buttons together (for more information see Technical Bulletin SI B650704, which you can find in TIS on www.bmwcenternet.com). The word "Service" should pop up on the display. You can scroll up and down using the Seek Up and Seek Down buttons. If you get the word "Region" displayed, you can change from European to USA and back again by using the preset number buttons (USA is #2). To exit the service mode, just shut off the radio. The radio's anti-theft code is not available in the radio service mode.

In '95, the 3-Series convertible, 325iS and the '96 BMW Z3 received the upgraded Bavaria C radios with new features such as road-speed dependent volume control (GAL) and traffic broadcast volume increase (TP). In the event of improper radio operation, a self-diagnostic feature, with trouble codes, was added through the push-button interface. In these applications, the Bavaria C radio had a few variations in its capabilities. The Business RDS remained chock full of features. To view these features, turn the ignition key on and immediately press the star key, then press the number 8 and 0 together. You are now in service mode. Using the radio station preset buttons, you can select from one of seven modes as follows: Button #1 responds with "SYN," which allows you to set synthesizer

levels, button #2 gets you "ADW," which is the status of the A/D converters, button #3 gives you volume, tone and fader setting in decibels, button #4 is the LCD test where all of the segments on the LCD should illuminate. If you scroll using the arrow keys such as “<” and “>,” you can get various patterns off the LEDs, button #5 pulls up "GAL" mode in the Professional RDS radio, otherwise known as “Road Speed Dependant Loudness Control.” The factory setting is the number two but you can adjust the increase to any one of three rates. Rate #1 is a minimal increase, #2 is medium, and #3 is the loudest increase. This only applies through the 2000 model year. For New Generation radios, the GAL function has six levels, and is set differently.

In the Professional radio (w/o RDS), button #5 causes the "TAB" feature to be displayed, which are frequency readings. Button #6 is the serial number and programming level for the RDS. For the non-RDS, this is the GAL feature explained earlier. Button #7 for the RDS represents "NAT" regional settings for radio station frequencies.

On the non-RDS model, button #7 displays the serial numbers and programming level. Where possible once you pick a service mode, you can scroll through options using the arrow keys again. Then, pick your selection. To save your new setting simply press the same button as the mode you just entered. To exit service mode, just push the “0” button.

If you have a cassette integrated into the radio, you are working on the lower-end model. Only three features are included. By pressing buttons #2 and #5 together for four seconds, you enter

Model	Button #1	Button #2	Button #3	Button #4
RDS	SYN	ADW	NF	LCD
Non-RDS	SYN	ADW	NF	LCD

Model	Button #5	Button #6	Button #7	Button #0
RDS	GAL	SN	Region-NAT	End
Non-RDS	TAB	GAL	SN	End

GAL mode allows you to adjust the increase in volume as road speed goes up. Road speed is received from the instrument cluster. On early models, you had choices one through three. Newer models have choices one through four.

service mode with an “S” in the display. Pressing the “VF” button yields “Traffic Broadcast Volume Increase” (TB). Select radio station preset number one through five, one being the smallest volume increase and five being the loudest. After entering service mode, you can hold down the button #3 for a few seconds and you will be rewarded with GAL mode. In service mode, try hitting the “M” button and you can now access the “Station Signal Strength” mode (local and long distance reception).

Everybody Get on the Bus

Also in ’96, the high-end cars such as the 7-Series had two high-fidelity options known as “Hi-Fi” and “Hi-Fi w/DSP.” The DSP (Digital Sound Processing) version had a separate LCD for equalizer display, or this was displayed through the “On-Board Monitor” display. Either with or without the on-board display, a new capability was added to the system, known as the “I-Bus.” The introduction of the I-Bus data lines allows all the components to communicate with one another along with other control units such as the IKE (instrument cluster), navigation system, and the vehicle telephone system.

Steering wheel controls were added, and these could be monitored via the self-diagnostic system. This mean the GT1 was added to the arsenal when it came to entertainment system problems. Unfortunately, this also added complexity to reinitiating systems when the battery went dead. Updating software was now added to the possible list of repairs. At this time, it was accomplished by first replacing the radio. With software versions becoming so important, BMW made sure the information was available through the radio. Try holding down the “WB” (Weather Band) button with the ignition key on and the service mode will give you radio serial number, production date, DSP communication, GAL mode (now with options 1 through 4) and Station Signal Strength modes.

The steering wheel switches control volume, radio station selection and voice activation. The benefits include hands-on the wheel operation so the driver is not distracted looking for a knob. However, this does add some features that one day may have to be diagnosed.

Brave New World

For the 2001 model year, a New Generation of multi-information radios (MIR) debuted in the Z8. These represented more features, more communication possibilities and more diagnostic complexity. As well as scan-tool data, the push-button interface would still get you into service mode. With four different radio configurations, you had four different methods to get into service mode. The "Base" radio (display screen in radio) needed you to turn the ignition key on, quickly turn the radio on and hold down the “M” button for a few seconds. When you released the button, a service number, “SN#”, would be displayed on the screen. You can then use the “+” and “-“ buttons to scroll through the service functions as follows: SN#, software version, GAL setting, radio signal strength, DSP equipped, TP (NA in U.S.A.), AF (NA in USA), region and revision index, in that order.

This service number shows that you are in service mode. It is often the first screen that comes up after entering this mode. From here, you can scroll through the categories using the plus and minus buttons, or the arrow buttons to the right.

MIR radios have a separate display screen used for Navigation, telephone and, of course, audio functions. Here you have to turn the MIR on and quickly apply the “Set” button. You get the same service mode as on the other radios, but you have to use the arrow keys to change the category. If the vehicle has an “On-Board Monitor,” you have to press and hold the “RDS” button after turning the unit on. The on-board monitor is identified by its black and white screen. With the wide-screen board monitor (color display), start with the “Info” button, select “RDS” on the screen and hold the control knob down for 10 seconds.

One function of note on these new radios is the personality feature. This uses the vehicle's remote to identify who is getting into the vehicle. Radio station settings are saved for that remote. If a different remote is used, then its different radio station settings are displayed. Keep this in mind when diagnosing radio station reset problems. You could waste a lot of time trying to check for battery power loss when the problem was actually due to different key remotes being used.

MOST

Starting with the new E65, or 7-Series, the MOST bus handled all sound generation for the entire vehicle. Radio, navigation requests and warning chimes are all in the MOST system. At the center of MOST is the “Acoustic System Controller,” or ASK. The ASK module controls everything from turning units on and off to retaining self-diagnostic trouble codes. When you plug in your GT1 scan tool, this is the module you communicate with for codes and data. It also coordinates the importance of audio output. In other words, it will override a radio station song with navigation instructions and override that with warning indicators such as “Parking Distance Control.” The MOST system still has a service mode and a good set of instructions is found in Service Information Bulletin SI # B 650704. □

You promised the car by 5, so he could start his trip

www.zflife2.com



...but that knock off part won't fit and it's 4:30.

Will fit parts that usually don't and knock off parts that cause expensive comebacks, the story's not new. ZF first started supplying driveline and chassis components to BMW in 1937. Today we continue to do our part to ensure the driving machines from BMW remain "the Ultimate". Since 1979 ZF Sales and Service North America LLC has worked with BMW North America to provide technical support, parts, and remanufactured components to keep owners enjoying their cars. We'll keep working with BMW to raise the driveline and chassis technology benchmark. You just take care of that customer who needs his car by 5 with original BMW Parts available at your local BMW Center.

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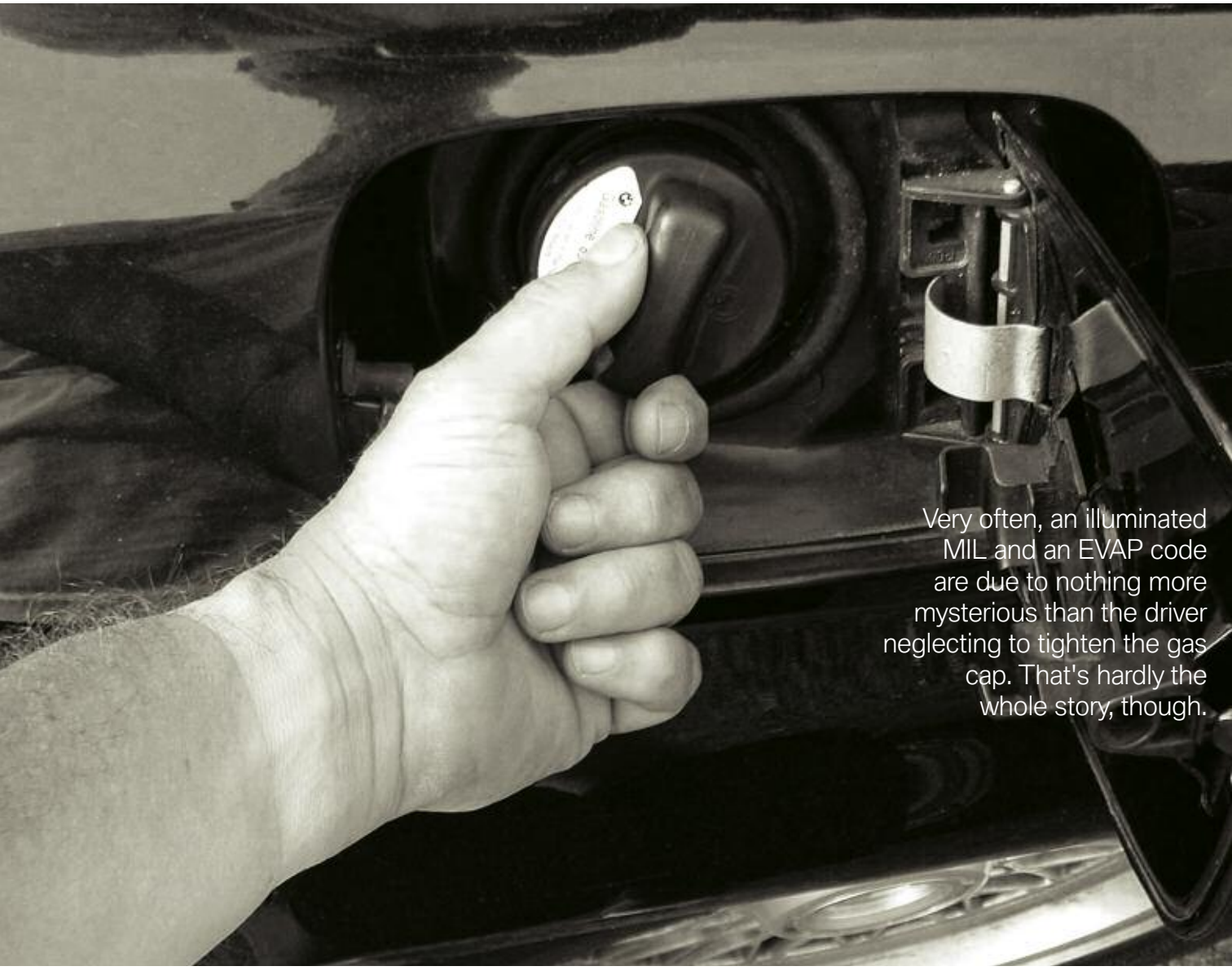
Car Driveline Technology
777 Hickory Hill Drive
Vernon Hills, IL 60061-4102
Phone: 800.451.2595

Driveline and Chassis Technology

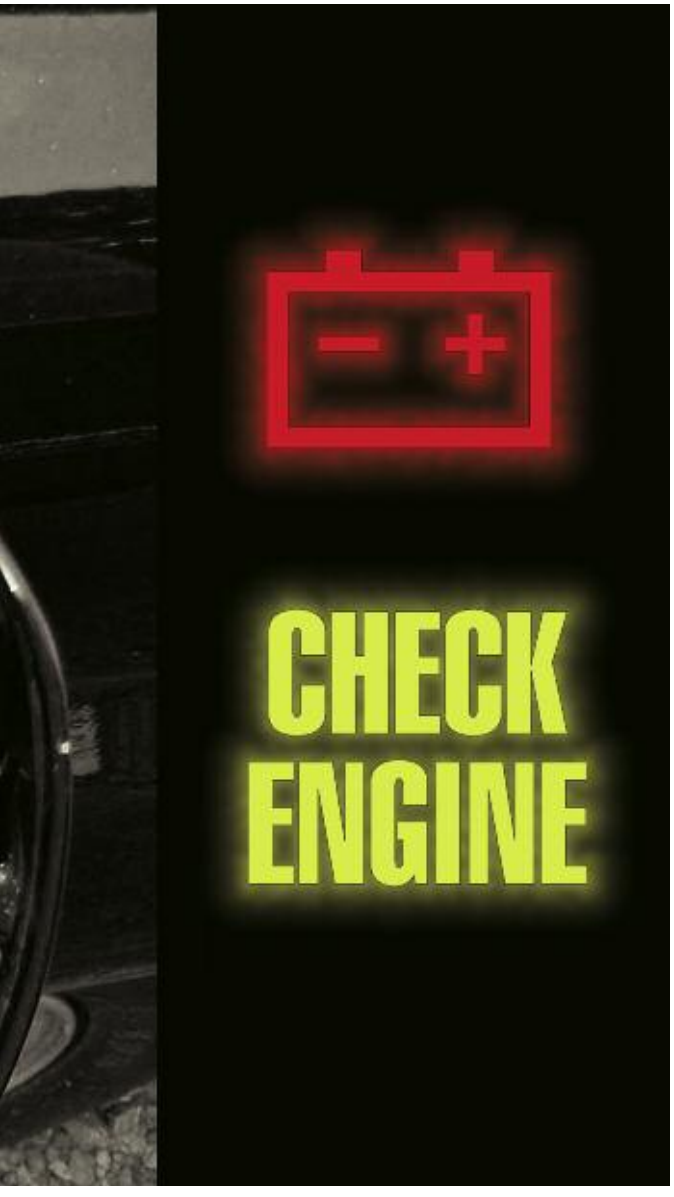
What If It's Not



Very often, an illuminated MIL and an EVAP code are due to nothing more mysterious than the driver neglecting to tighten the gas cap. That's hardly the whole story, though.

EVAP codes are some of the most common causes
If you don't have such a program in your area now, ju
EVAP system is sometimes difficult to find. Here's ho

The Gas Cap?



☐ Since 1996, OBD II has required that fuel storage systems be checked for leaks so that no errant hydrocarbons will escape to pollute our atmosphere. Well, between fuel's Reed Vapor Pressure and temperature fluctuations between cool fuel in the tank and heated return line fuel, this is no walk in the park. Add the difficulty of running the monitor to test for fuel tank leakage and you know by now how difficult it is to diagnose one of these codes. The call two weeks later informing you that the light is back on doesn't help either. Here is a look at the different systems BMW uses to monitor tank leakage and some testing methods that may boost your confidence in your diagnosis.

In The Beginning

BMW was ready to check for leaks in its Evaporative Emissions System (EVAP) in 1996 with program HC II. Federal EVAP emissions regulations were not that strict early on, so non-enhanced systems were allowed. You could consider BMW's first system non-enhanced. These vehicles were known as Transitional Low Emissions Vehicles or TLEV. You can determine what EVAP system you have by knowing the engine management system. TLEV vehicles use MS41.1 systems.

– Continued on page 18

of state emissions inspection failures.
st wait. One is on the way. And a leak in the
w to diagnose BMW's versions.

Original BMW Remanufac

Why Buy Original?

Replace — We replace more parts than aftermarket brands.

Engineered — Designed to meet original OEM drawings.

Manufactured — Made with same OE components as factory parts.

Assembled — Completely assembled from components and not just repaired.

New — Fully performs as new unit.

Quality, Reliability and Value

The quality, reliability and value of the Original BMW Remanufactured A/C Compressor wasn't meant to be taken lightly. It is not only an exact replacement for the original unit, it's also remanufactured and tested to meet the same strict specifications as the original, so it performs just as well. And like all remanufactured parts, it's covered by a two-year warranty. In fact, the only detectable difference you'll find between a Original BMW Remanufactured A/C Compressor and a new one is the price. Which we're sure you'll find quite refreshing.

It's All In the Process

Remanufacturing Process (Original BMW)

1. Dismantle core and clean all components.
2. Replace key components 100% with new OE part.
3. Test all other critical components.
4. Replace components that do not meet specs.
5. Assemble, test and box.

Rebuilt Process (Typical Aftermarket)

1. Identify damaged part or parts.
2. Replace damaged part with non-OE part and clean.
3. Re-assemble, test and box.

TURED A/C COMPRESSORS

Remanufactured for BMW by

DENSO

Available only through your local BMW Dealer

You can smoke any year system to check for leaks. Here the gas cap seal is missing, allowing smoke to leak past. Notice that the tether is cut. A BMW Technical Service Bulletin warns about these tethers getting caught between the filler neck and the cap.

– Continued from page 15

A rundown of the components starts with the fuel tank itself. Second would be the Activated Charcoal Canister, which has a shut-off valve mounted on it. This valve is sometimes referred to as the Carbon Canister Valve in diagrams. The next component is the Liquid Vapor Separator that has a Fuel Tank Pressure (FTP) sensor mounted in it. The job of this separator is to capture fuel vapors during refueling. Finally, there's the actual Canister Purge solenoid. With the system purging normally, the shut-off valve is open allowing air into the canister. The purge solenoid is commanded open and gasoline vapors are drawn out of the canister as well as the liquid/vapor separator. Before the test, the DME control unit monitors the fuel tank pressure sensor signal voltage.

To test the purge system, both the canister purge solenoid and the shut-off valve are closed. The FTP reads the resulting increase in pressure in the system. If the pressure increase is below a specific threshold, the testing continues. If the pressure increase is too high, then the fuel temperature is probably too high also and the monitor is abandoned. If the pressure is right, the purge solenoid is opened and the resulting pressure drop is read, the purge function is deemed okay. Once the

purge valve is switched off, the DME expects to see an increase in the pressure. If not, the DME determines that there is a leak. Finally, the shut-off valve is turned off allowing venting to resume (valve closes when energized). By alternating between purging and not purging, and monitoring the FTP change over time, OBD II checks for proper purge operation along with leak detection. Solenoid operation and sensor signal voltage are critical to proper monitor operation.

Evolution, or Revolution

In 1998, BMW started to phase in the next generation of leak detection systems. With the next evolution of the DME, version MS42, it had to be able to differentiate between a leak of .5mm for being "Low Emissions Vehicle" or LEV compliant. These systems are different from their predecessors. This system uses pressure to determine if a leak is present. Once again, a brief rundown of the components is necessary. Of course, we still have a gas tank and charcoal canister. We also have the liquid vapor separator, but the fuel tank pressure sensor has been deleted. It has been replaced by another component called the Leak Detection Pump (LDP). This unit applies a slight amount of pressure to the evaporative emissions system, and the DME monitors a pressure switch inside LDP. The pressure switch indicates the pressure built up in the EVAP system. If a substantial leak is present, the pressure switch will quickly indicate that to the DME, which will flag a large leak code. If it takes longer for the pressure to drop, the DME will set a small leak code. To pass the leak check, the pressure switch needs to indicate that the pressure is maintained for at least 1.5 minutes. With the Federal Test Program (FTP) regulations getting tighter on EVAP, the systems had to continue evolving to allow even lower emission vehicles.

Here, we've removed a cover to expose the charcoal canister. In this model, the DMTL is mounted on the canister. Most of the EVAP system is easily accessed for smoke testing.

History Repeating

Getting ready for the 2001 model year, BMW introduced the next phase of EVAP leak detection. The new system is referred to as Diagnostic Module -- Tank Leakage (DMTL). This debuted on the 3.0L engine using DME version MS43 and meets the new requirements for Ultra Low Emissions Vehicles (ULEV). It uses an electric air pump assembly. In the normal state, the valves are open to the atmosphere and fresh air is allowed into the EVAP system. After the vehicle is shut off, the pump is energized and forces air through a .5mm orifice. The DMTL monitors and records the amp draw of the motor. Then, a valve switches over and the pump is activated again, but now pumps air into the EVAP system. If the current draw is the same, the DMTL determines there must be a .5mm leak in the system, which indicates a small leak. If the current draw is lower, then there must be very little pressure built up in the system, which indicates a large leak. If the amperage draw is higher, there must be greater pressure in the system, which means no leaks are present. This is a sophisticated system, and, as a result, it is very difficult to test.

When There Is a Fire, What Do You See?

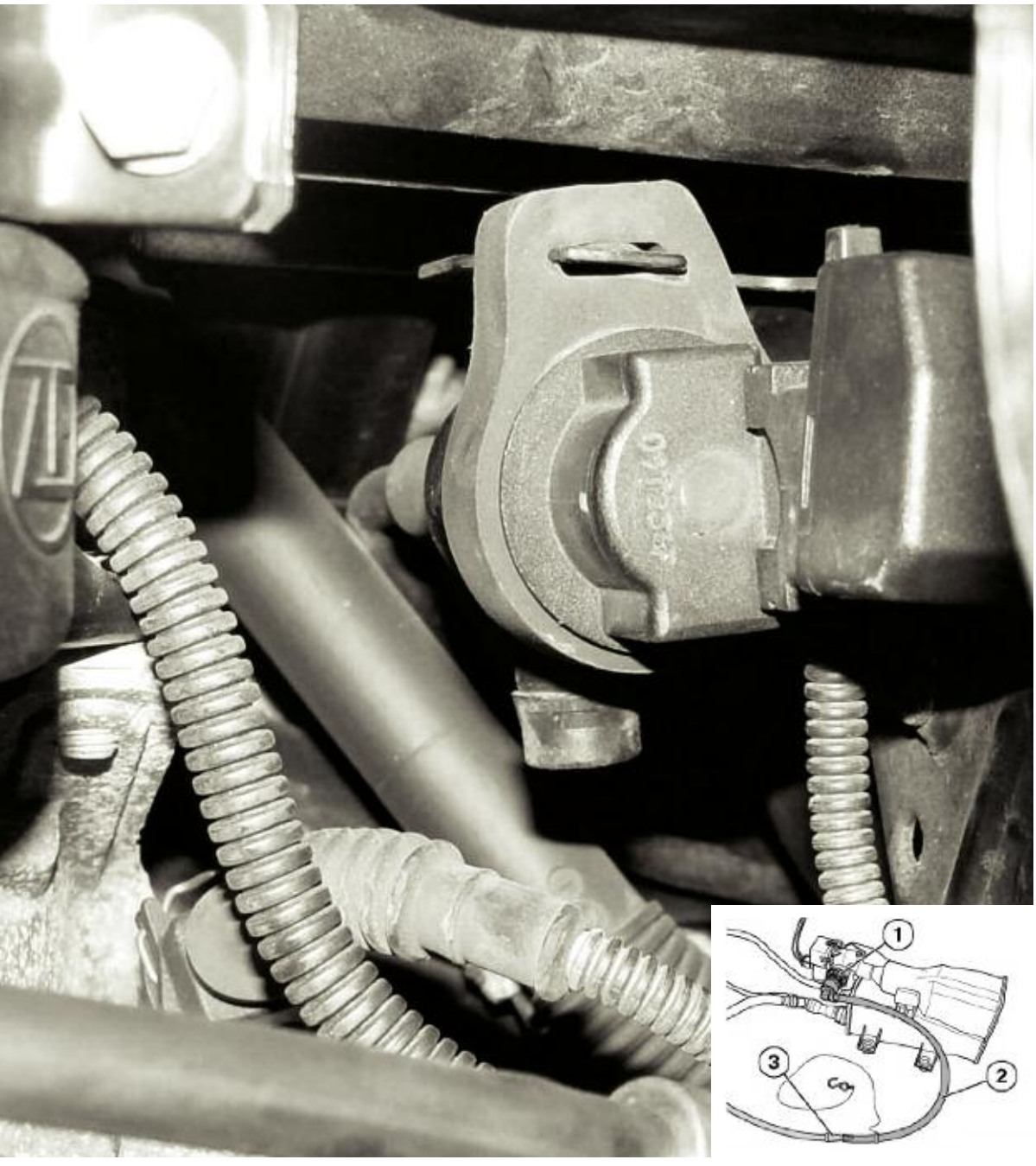
So, how are we going to test these various systems for leaks? Generally, EVAP is tested with very small amounts of vacuum or pressure. Special test equipment is required for measuring and monitoring the subtle changes. After over ten years of implementation, the subject of testing EVAP is still up for debate. You may not find your test method here, but if it works for you keep doing it. We realize not every shop has the high-dollar test equipment to monitor the pressures in the system. Even if you do, this will not tell you where the leak is, just that you have one.

Since we already have the diagnostic monitor of the vehicle to tell us there is a leak and the GT1 is capable of running the monitor, we are going to focus on finding the leak and testing individual components starting with the early systems that use the Fuel Tank Pressure sensor mounted in the liquid/vapor separator. The FTP should read over 4.50V DC at sea level, normal atmospheric pressure. When a vacuum is drawn, the voltage may go as low as .5V. Remember, vacuum is not measured in inches of mercury here, but in millimeters of water, which reflects a much weaker vacuum.

After checking simple things like the gas cap, you can quickly determine if you have a leak. Manually close the shut-off solenoid, activate the purge solenoid and monitor the FTP signal voltage. Deactivate the purge solenoid and the EVAP system should be completely closed. Continue to watch the FTP signal voltage and see if it drops. If it does, you have a leak.

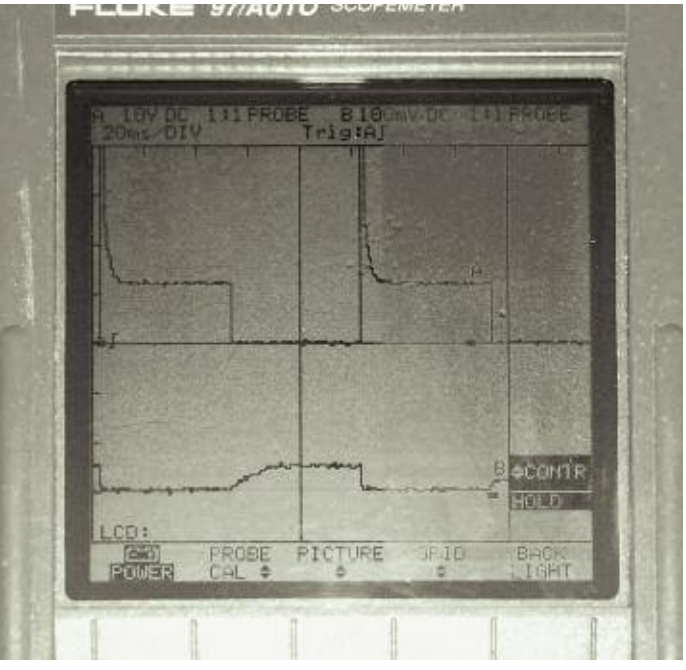
One of the best ways to look for a leak is with a smoke machine. Not just any smoke machine, either -- it must be EVAP safe. Since these devices burn oil to produce smoke, care must be taken to assure that fuel vapors don't enter the machine. Also, it is not recommended that you pressurize the EVAP system to over 0.1 BAR (1.5 psi) as you might damage it. A flowmeter incorporated into the tool is also very useful to determine if there is a leak. Bright lighting will help you see the small wisps of smoke seeping out of the leak.

Remember, smoke will only reveal an external leak. For example, if the shut-off solenoid is not closing properly, you will see smoke leaking out of it. However, if the purge solenoid is not closing properly you will not see any external smoke. Also remember to disconnect the intake side of the canister purge solenoid so you can see the smoke. Another option is to energize the shut-off solenoid and see if the FTP signal voltage drops before opening the canister purge solenoid. If the signal voltage drops, then the purge solenoid must be stuck open. The resistance of the purge solenoid is about 28 ohms. In order to flag a code for this solenoid, the DME expects to see a rich/lean switch when the solenoid is open. If it is not satisfied with the mixture change, then it will pulse the solenoid on and off and watch for an rpm change at idle.



Here, the smoke tool is connected to the DMTL at the fresh air filter connection as recommended.

1. Quick Connect Adaptor
2. Clear Hose
3. Smoke application hose/adaptor



You can monitor the amperage draw of the canister purge solenoid to see if it is stuck or sticking. The top trace in this photo indicates the voltage command by the DME during activation test mode. The lower trace indicates the current pattern. With 100mv equaling 1 amp, you're looking at about .5 amp.

Leak Detection Pump

This system does not have an FTP, so we cannot monitor its signal voltage. We can monitor the switch mounted in the LDP, but the signal will either be battery voltage or ground, neither of which is precise enough to indicate a leak. It is more important that we watch the switch input over a specific time period to indicate if there is a leak or not. In the normal state, the lower chamber of the LDP is open allowing fresh air into the canister. Very often after a cold start, the DME energizes the LDP solenoid with an on/off command. When the LDP is commanded on, the internal diaphragm forming the upper chamber is pulled up drawing air into the lower chamber and closing the vent. When the solenoid is de-energized, an internal spring forces down the lower chamber and the vacuum in the upper chamber is bled through the balance tube to the vent. Also, the air drawn into the lower chamber is forced out into the evaporative system creating a positive pressure.

This on/off pulsing of the LDP solenoid generates a pressure in the EVAP system. The normally open (12V) LDP switch closes under the pressure (0V) and stays there until the pressure starts to drop. The switch will toggle back and forth as the pressure decreases in the system. If the switching ends early, it is determined that there is a large leak. If the switching carries on long enough, then no significant leak is detected. You can check the function of the LDP switch easily by running the engine and monitoring the signal voltage on the switch and energizing the LDP solenoid. The switch voltage should change from 12V to ground. If you are using smoke to fill the system, you will need to close the vent. Activating the LDP solenoid while the engine is off will not close the vent, so you have to supply your own vacuum source to the LDP.

Here is a Bosch-manufactured LDP. Monitor the switch input while the engine is running and the LDP solenoid is activated. You should see the voltage change from 12 to 0 volts. The best way to run this monitor is with cold starts and warm-up times of over three minutes.

DM-TL

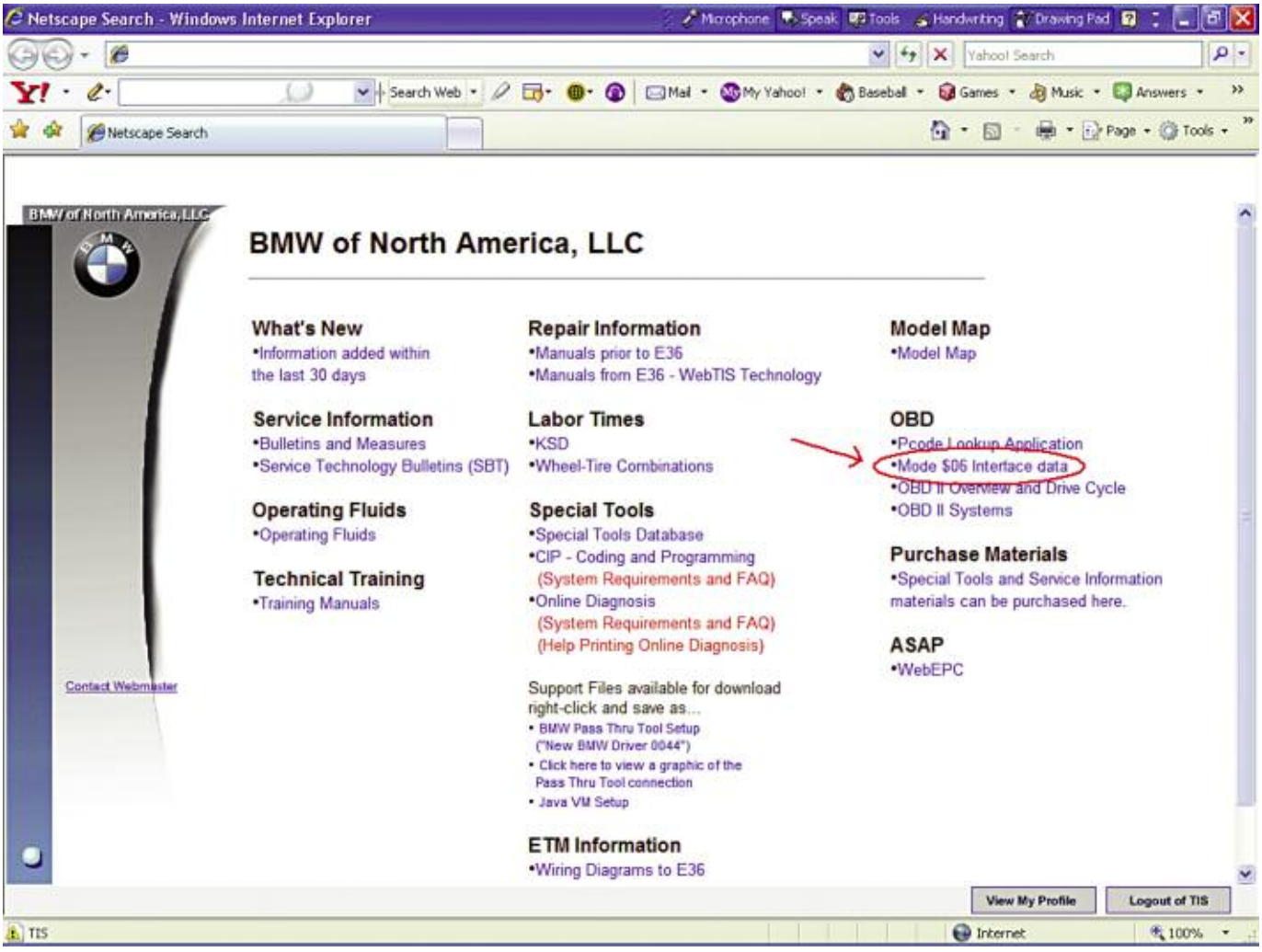
As already mentioned, this system first appeared in 2001 vehicles with DME version MS 43 and the 3.0L engine. Eventually, it was phased into all vehicles. This system is much more difficult to test than its predecessors. The variations in amperage draw are small. However, if the motor amperage is abnormally high, this indicates the motor may be locked up or debris has entered the reference orifice. Like the LDP, the DMTL unit is the vent for the system, so you must close the vent to use smoke detection.

This can be done with the GT1, or by manually grounding the vent switchover solenoid in the DMTL unit. Once again, the canister purge solenoid needs to be checked for proper closing. You can also check this by simply applying vacuum to a closed solenoid and seeing if any vacuum is found on the other side.

To assist in vapor management while refueling, an Onboard Refueling Vapor Recovery (ORVR) valve is included, which allows tank fumes to be drawn into a chamber in the gas station's fuel filler nozzle. The running of the monitor for this involves extended idling of around five minutes, particularly before engine shutdown.

Mode $06

OBD II requirements include Mode $06 (sometimes referred to as Component Parameters) for evaluating monitor performance. Using a generic scan tool, you can access Mode



Going to the BMW technical website (www.bmwtechinfo.com) will give you access to the Mode $06 tables for component and test IDs. Knowing which test failed will help you to determine what the cause is.

$06 data after a code has set. Once you see an EVAP code, do not just clear it. While in Mode $06 scroll to the proper component and test ID. A table of these component and test IDs is available on the BMW technical website. Test ID #5 represents the EVAP monitor scores. They are often given in hexadecimal form, so you may have to use a hexadecimal conversion calculator (found in MS Windows XP), or learn the various scales used and what they mean. You will be given a maximum and minimum value and a measured value. If either the maximum or minimum values are passed, a code may set if enabling criteria (such as coolant temp, ambient air temp, fuel level, etc.) are met.

Finally . . .

EVAP testing and running the EVAP monitor are some of the most difficult diagnostic dilemmas facing any technician. We hope you are now armed with the knowledge and ability to tackle these elusive problems.

Brake Hydraulics: Fluid Flushing and BMW Requirements

These inexpensive strips are a strong sales tool for fluid flushing.

Another item that is very helpful in raising customer awareness is an electronic brake fluid tester.

Why do brake fluid changes? For several good reasons. Corrosion and contamination of that intricate and expensive ABS and DSC hardware is to be strenuously avoided. Another factor is the elevated operating temperatures encountered in the high-performance braking systems BMW uses, which makes maintaining a high boiling point critical to safety.

In the U.S., this is a relatively new service item that the average motorist has never heard of. So you'll need a good approach if you're going to convince him or her to have it done and thus save big bucks in the long run. First, pull the owner's manual out of the glove compartment and show the customer where it appears on the service interval chart. Explain how disastrously expensive internal corrosion can be. Also, you might want to keep those "Wet Check" brake fluid test strips handy, which you can staple to the repair order, or you could invest in an electronic moisture detector.

Many pieces of equipment designed to make this job fast and simple are on the market. Or, you could do it manually. Regardless, just make sure never to let the master cylinder run dry in the process or you'll have to bleed all four corners over again.

Then there's brake fluid itself. Modern DOT 4 glycol is excellent because it has a high boiling point and the ability to hold lots of moisture.

BMW specifically warns against the use of DOT 5 silicone because it has serious -- and dangerous -- drawbacks in terms of seal life and water slugging.

BMW has published the following on what it requires in its vehicles:

"Brake fluid, (glycol-based) as used in BMW brake systems, must conform with the following requirements:

- High boiling point
- Good low temperature resistance
- Low compressibility
- Corrosion inhibition for all metal parts inside of brake system
- Compatibility with all rubber parts used in brake system

These requirements are fulfilled by reputable brand name DOT 4 brake fluids."

But why not keep your customer's vehicles all BMW? While you're buying pads, rotors and other brake parts from your local dealer, add BMW-branded DOT 4 brake fluid and you'll be sure you're giving your patrons the right stuff.

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At BMW of North America, we stand behind the quality of Original BMW Parts with a powerful 24 month warranty with no limitation of mileage within that time frame. Our promise to you is that Original BMW Parts are identical to those used in production, offering the same superior quality and reliability. You only get one chance at a first repair. Choose the parts you can trust. Choose Original BMW Parts.

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