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ENSURE LEARNING NEVER STOPS IN THE SHOP 30

APRIL 2017
VOL. 136, NO. 4 // MOTORAGE.COM

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IN EVERY ISSUE

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281-419-5725. Ext. 121

Motor Age (Print ISSN: 1520-9385, Digital ISSN: 1558-2892) is published monthly, by UBM 131 W. 1st Street, Duluth, MN 55802-2065. Periodicals postage paid at Duluth, MN 55806 and additional mailing offices. POSTMASTER: Send address changes to Motor Age, P.O. Box 6019, Duluth, MN 55806-6019. Please address subscription mail to Motor Age, 131 W. 1st Street, Duluth, MN 55802-2065. Canadian G.T.S. number: R-124213133RT001. Publications Mail Agreement Number 40612608. Return Undeliverable Canadian Addresses to: IMEX Global Solutions PO Box 25542 London, ON N6C 6B2 CANADA One-year rates for non-qualified subscriptions: U.S. $70.00; Canada/Mexico $106.00; International surface $106.00. For information please call (866) 529-2922 (Domestic inquiries); (218) 740-6395 (Canadian/Foreign). Printed in the U.S.A.


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INNOVATION STARTS WITH THE ORIGINAL

PHOTO: SEARS

NEW SERVICE CENTER

SEARS LAUNCHES FIRST DIEHARD SERVICE CENTER IN TEXAS

BRIAN ALBRIGHT //
Contributing Editor

Sears is launching a new standalone auto service center in San Antonio, Texas. The company, which operates Sears-branded service centers in connection with its retail stores, opened the first DieHard Auto Center Driven by Sears in February.

The service center will offer a full range of both quick service and general repair services. In addition, there will be branded offerings that include the DieHard 360 Vehicle Assessment (a 120-point inspection); DieHard Edge Maintenance Plans that provide 36 months or 45,000 miles of coverage; free WiFi for customers; and the Digital Tire Journey web app to help find the right tire.

This year marks the DieHard brand's 50th anniversary. Last year, Sears launched a DieHard tire line. "We did that after conducting a customer survey and asked respondents to name the top three brands of tires," says Brian Kaner, president of Sears Automotive.

>> **SEARS** CONTINUES ON PAGE **8**

BREAKING NEWS

INDUSTRY TRAINING

TRAINING FOCUS ON TRENDS, TECHNOLOGY, PROCESS AT NACE AUTOMECHANIKA

With four days full of training, powerful show floor exhibits, multiple co-located events and new business opportunities, the slate of offerings at NACE Automechanika Chicago 2017 brings current, innovative and necessary information to automotive professionals from all segments of the industry.

NACE Automechanika, the largest U.S. trade show dedicated to high-end technical and management-related training for automotive service and collision repair shops, takes place July 26-29 at McCormick Place West in Chicago. Registration for the show is open now.

Education at the 2017 NACE Automechanika Chicago will focus on current topics and technologies that automotive professionals must understand

>>**NAMC** CONTINUES ON PAGE **6**

TRENDING

WALKER PROMOTION REWARDS SERVICE PROFESSIONALS

This spring, Tenneco is offering $15 mail-in rebate gift cards for each installation of qualifying Walker brand emission control products, now through April 30.

MOTORAGE.COM/SPRING

WELLS VEHICLE ELECTRONICS EXPANDS WEBCAST SEGMENTS

Wells Vehicle Electronics recently expanded its series of diagnostic case study videos with the addition of the CounterPoint and TechConnect web series.

MOTORAGE.COM/WVE

ADVANCE AUTO PARTS, FUTURETECH SUCCESS CAMPAIGN PARTNER

Advance Auto Parts announced its support of the FutureTech Success campaign, which aims to recruit and educate the next generation of automotive technicians.

MOTORAGE.COM/SUPPORT

AUTO CARE CAREERS OFFERS EMPLOYER DISCOUNT FOR POSTS

The Auto Care Careers resource center is offering a discount code — HIRE2017 — for employers to save on individual and multiple job postings through July 31.

MOTORAGE.COM/DISCOUNT

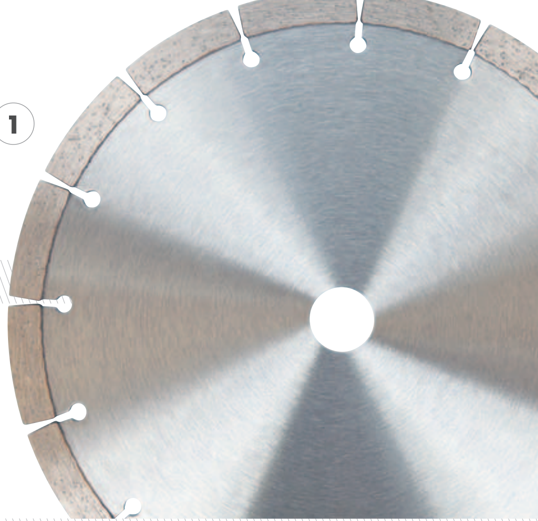
SNAP-ON DIAGNOSTIC TRAINING VIDEOS OFFER QUICK TIPS

Snap-on added three new Diagnostic Quick Tips training videos to its website and YouTube channel to help techs speed their diagnostic capabilities.

MOTORAGE.COM/VIDEOS

Resilient to the Core

1

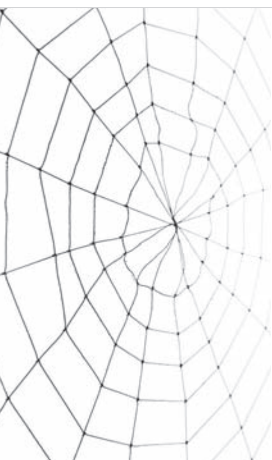


Strength is measured in a number of ways. It isn't just about how much weight it can withstand, but also how heat-resistant it is, how durable it is and even how scratch-resistant it is.

These are some of nature's strongest materials, and with each one comes unique uses and benefits.

1. DIAMONDS

The precious stone of forever also happens to be the hardest material found in nature. That's why diamonds are used in thousands of industrial applications. Diamond saws, which most commonly use a steel core sintered with segments of diamonds along the blade, are used extensively in the construction industry to cut through brick, stone, glass and concrete.

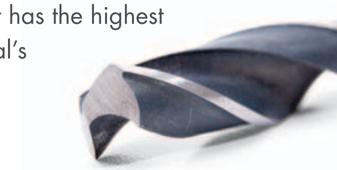


2. SPIDER WEBS

Oft depicted as something to be afraid of, a spider's web is stronger and has far greater elasticity than a piece of steel of similar weight. That's why walking through a web doesn't snap it like a thin string. Before you run in fear, you can now admire spiders for their construction prowess.

3. TUNGSTEN

A metal that's described as brittle doesn't exactly conjure up thoughts of strength and resilience. However, of all the metals on the periodic table, it has the highest tensile strength, which is a material's resistance to being pulled apart, and the highest melting point at 6,192 Fahrenheit!



4. BAMBOO

The plant that is used in a diverse amount of applications can be found on your plate, in your plate, in the utensils that you eat your bamboo with and inside the floor you tread on. It's strong, nutritious and rivals steel in strength. It's a material for almost anything, really.

5. TITANIUM

Titanium was discovered first in 1791 in Great Britain. The metal is aptly named after the Titans in ancient Greek mythology for its incredible strength-to-density ratio, which is unequaled by any other metallic element. Chances are you've run into this metal before, considering it's used in everything from dental implants to aircraft.

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INNOVATION STARTS WITH THE ORIGINAL

RESEARCH

STUDY: INDEPENDENT REPAIR SHOPS INCREASE USE OF FACEBOOK, TWITTER FOR MARKETING

More independent repair shops are using Facebook and Twitter to promote their services and to offer coupons and specials, according to the 2017 Independent Repair Shop Study, conducted by *Motor Age* sister publication *Aftermarket Business World.*

Some 78 percent of independent repair shops that use social media said they use Facebook in the 2017 study, compared to 74 percent of shops that said they used Facebook in the *Aftermarket Business World* 2016 study. In the 2015 study, 73 percent of independent repair shops used Facebook for that purpose.

Independent repair shops using Twitter to promote their services and to offer coupons also has increased steadily from 11 percent in the 2015 study, to 13 percent in the 2016 study, to 14 percent in the 2017 study.

However not all social media sites showed an increase in usage this year. Independent repair shops using LinkedIn to promote their business increased from 10 percent in the 2015 study, to 15 percent in the 2016 study, but fell back to 11 percent in the 2017 study.

Some 44 percent of independent repair shops said their sales of certain products have increased in the last 12 months compared to the prior 12 months, while 51 percent said sales stayed the same.

Independent repair shops enter 2017 with confidence as 49 percent said they expect to sell more products in the next 12 months compared to the prior 12 months. Some 47 percent said they expect to sell the same amount in the next 12 months.

Independent repair shops also are confident about future gross margins as 46 percent said they expect their margins to increase on certain product sales in the next 12 months, while 53 percent expect their margins to stay the same.

Thirty-nine percent of independent repair shops said that part quality is the number one need of customers, while 22 percent said price was most important, and 19 percent said OEM form, fit and function.

When it comes to preferred suppliers, 36 percent of independent repair shops said they prefer to buy from warehouse distributors while 35 percent prefer to buy from auto parts retailers and 21 percent prefer to buy from jobbers.

Methodology: The 2017 Independent Repair Shop Study was fielded to readers of *Motor Age* magazine via email. Survey results are intended to show general market trends, not statistical certainties, as results were garnered from a small sample audience. MA

>>**NAMC** CONTINUES FROM PAGE **4**

and become proficient with to be successful, whether they are technicians, painters, welders, service managers or distributors. Dedicated educator courses will enhance automotive instructors' skillsets, while current automotive students will be able to enhance their classroom learning by attending the show.

A number of diagnostic courses will be taught, focusing on drivability concerns and electrical issues. These courses aim to improve technicians' abilities to use the proper tools to find and resolve issues with vehicles, not solely the symptoms a problem presents. Additionally, detailed looks at specific underhood systems, undercar best practices and strategies for brake, transmission and emissions service as well as managerial courses on leadership, shop management and revenue streams will be presented. Hybrid and alternative fuel vehicles will be discussed in a variety of courses, while collision repair professionals can learn about vehicle scanning, estimating, bonding practices and more.

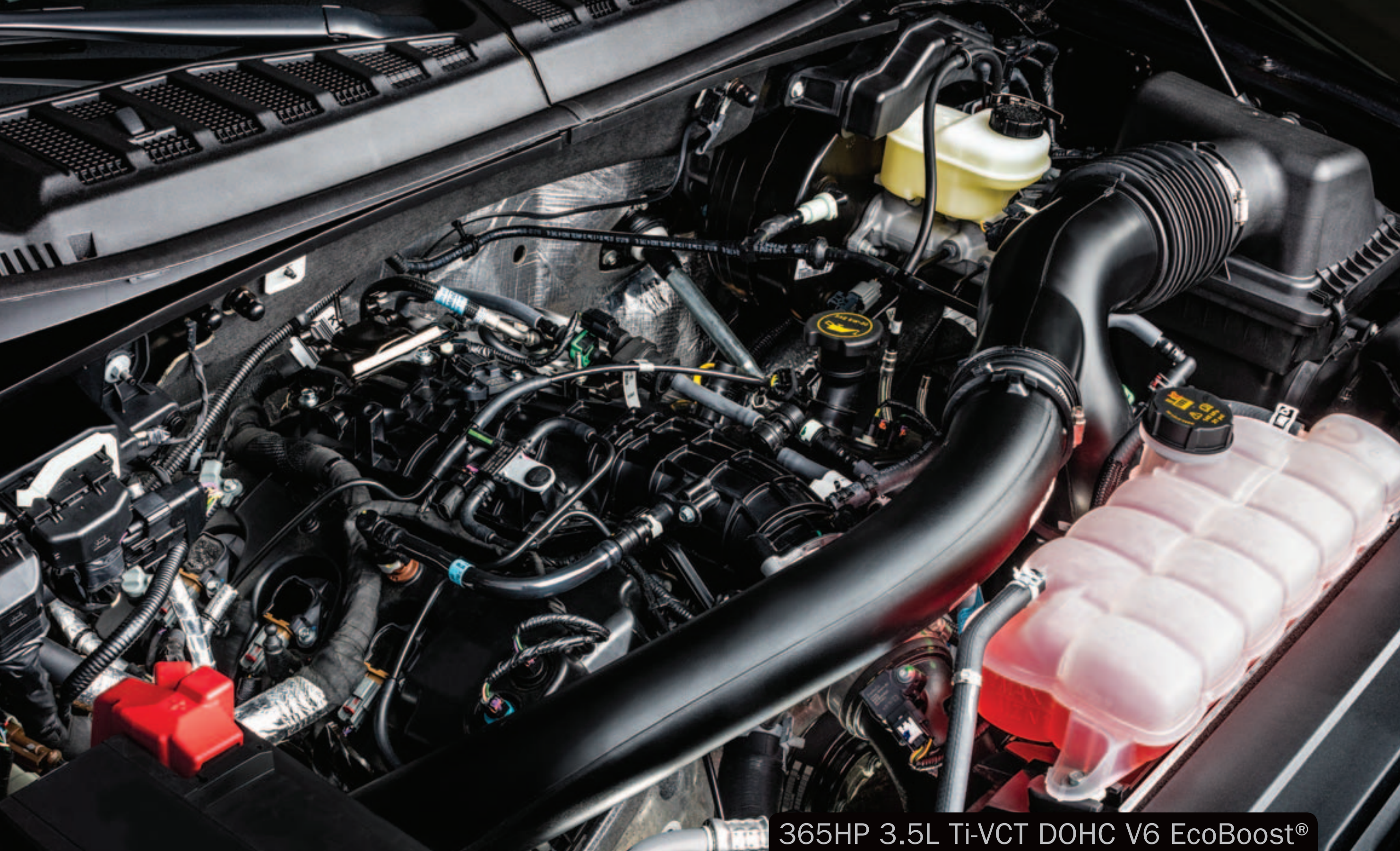
All mechanical-related training, both technical and management-based, is offered for no cost to attendees when they register with a code from one of NACE Automechanika Chicago's many sponsors, including Automotive Training Institute, ATSG, CARQUEST Technical Institute, Federal-Mogul Motorparts, Mitchell 1 and the National Alternative Fuels Training Consortium.

Additionally, the Business Outlook Conference offers information, insight and awareness of the economy, legislation, technology and their impact on the automotive industry and market.

Other co-located events round out the slate of educational, interactive and enlightening offerings at NACE Automechanika Chicago. The annual MSO Symposium will take place July 26th at the Hyatt Regency McCormick Place, while the Advanced Technology & Diagnostic Repair Forum will again be offered.

I-CAR training classes will also be part of the agenda for collision repair professionals to attend.

You can view a full list of training sessions, register for courses and receive a free expo pass at: www.NACEAutomechanika.com. MA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>> SEARS CONTINUES FROM PAGE 4

"Die Hard came in as No. 4, even though there wasn't a DieHard tire line at the time. That gave us the idea for launching that tire product."

Sears had closed a San Antonio store as part of an ongoing restructuring of its retail footprint, and Kaner says that presented an opportunity to experiment with a stand-alone service center. "The DieHard name seemed like a natural fit, given the traction we had on the tire line," Kaner says. "We thought this would be a good pilot store for this project."

Kaner says the store will have a full complement of oil change, brakes, shocks, struts, tire services and other services. "Right now we are still trying to figure out how to fit an alignment machine in one of the bays, but that's also coming," Kaner adds.

The DieHard store will source mechanical parts through the same third party that supplies Sears Automotive Centers. "From a model perspective, not much will be different," Kaner says. "There will be a new in-store experience, which will play on a more contemporary and comfortable setting."

The Digital Tire Journey, which uses a touchscreen kiosk in the store, will be part of that experience. "It really turns the way tires are sold on its ear," Kaner says. "Typically, selling tires goes right into a price conversation without much recognition of what the customer is actually looking for."

The solution leverages IBM's Watson technology and guides the customer through a series of questions to determine the best fit for their vehicle and priorities.

"Our intention is to make the waiting area much more inviting and productive for customers who are waiting on their vehicles," Kaner says. "We'll have the normal amenities like WiFi and a TV, but there will also be seating for people to do work, and there will be refreshments."

Sears Holdings has struggled financially for some time, and earlier in February it announced that it could sell more real estate and brands in order to cut $1 billion in costs from its operations over the next year. The plan the company announced included closing some 108 Kmart and 42 Sears locations, as well as possibly selling the Kenmore and DieHard business. The company sold its Craftsman tool line to Stanley Black and Decker for $900 million at the beginning of the year.

Sears Auto Centers are either attached to a Sears retail location, or immediately adjacent to one. If the DieHard store is successful, it opens up the possibility that the company could launch more stand-alone service centers that are separate from the retail operation.

Sears representatives emphasized in a briefing that there are currently no plans for additional DieHard service centers at this point. The company will be evaluating the store's performance before making any decisions. If there are more service centers in the future, Kaner said that Sears' existing real estate could play a role in where any additional freestanding stores are located.

"We are trying to get a sense of what the market acceptance will be for the new store," Kaner says. We'll be looking at more traditional ROI calculations, but also at traffic and seeing how people experience the brand. Does this change the type of customer we see come through the door? So we'll be looking at demographics as well.

"Our hope is to get as many new consumers into the store as possible and give them a great customer service experience," Kaner adds. "Hopefully that can give us the foundation to make this more than just a pilot store." MA

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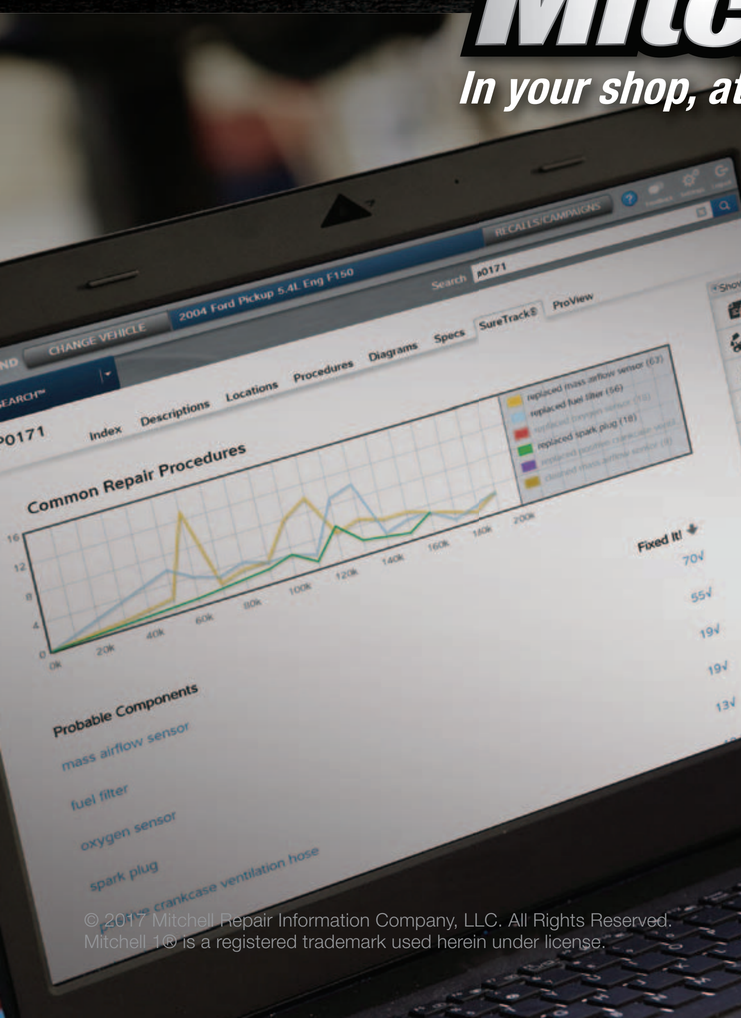

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PRIORITIZING TRAINING

PHOTO: SHUTTERSTOCK.COM / MONKEY BUSINESS IMAGES

Empower your team to make the right decisions

DAVID ROGERS // Contributing Editor

Steve Jobs wore the same outfit every single day — a black turtleneck, jeans and sneakers. He was in good company; many successful people, including Mark Zuckerberg and Albert Einstein, choose to wear the same clothes every day as well. Why? They have more important things to worry about than clothes. You're no different.

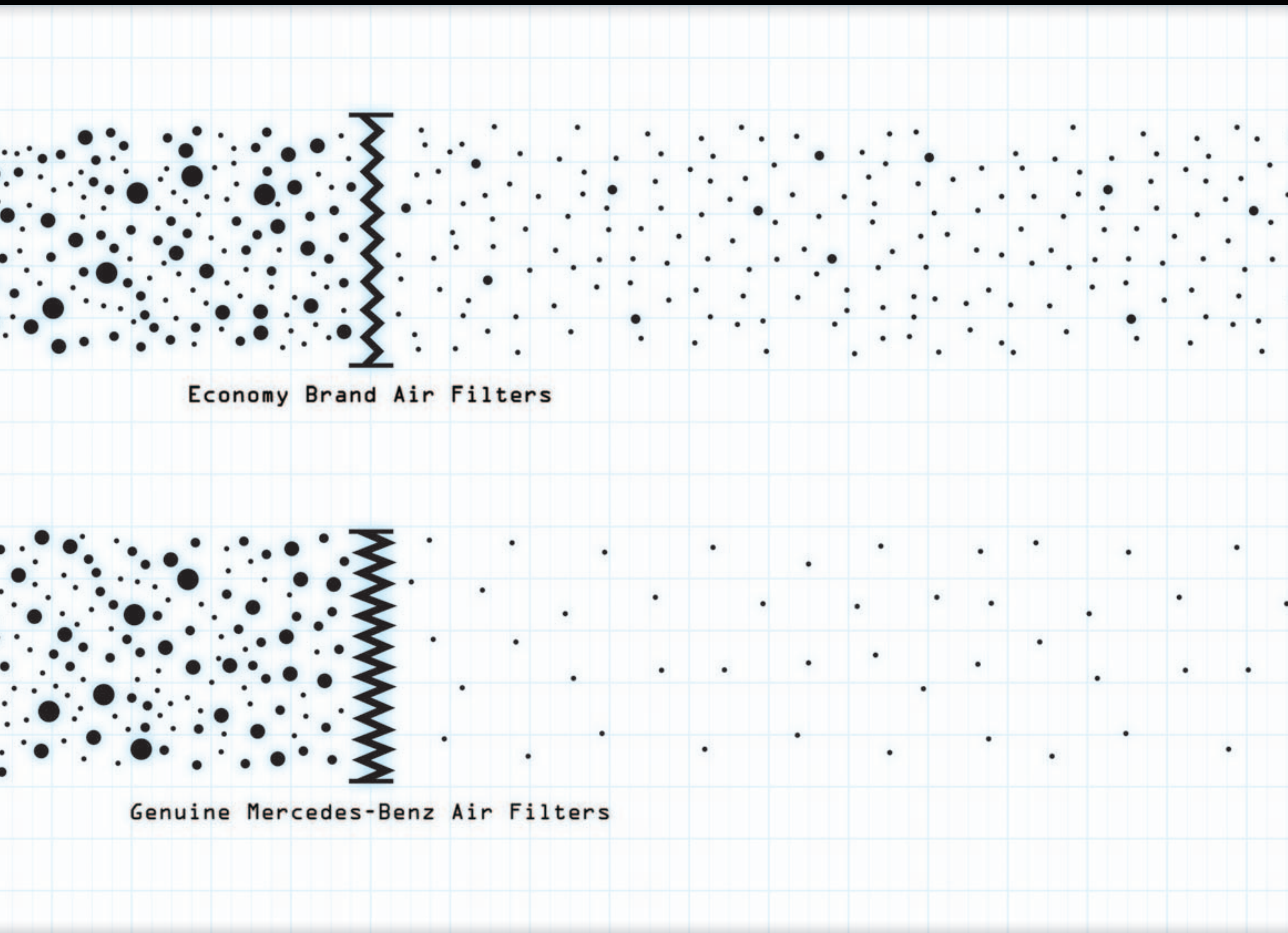
I'm not talking about clothing, of course. For most people, what they wear each day isn't a taxing decision. But, just like those innovators, when you can get rid of micromanaging, chaos and stress, you can spend more time concentrating on more important things like growing your shop, which means you need a team that is empowered to make the right decisions.

Every one of your employees must know exactly what they're responsible for, have the tools and training to hit their target and know where they stand in hitting those goals every day.

In other words, you need a shop culture that prioritizes training — not one class or one day or training only for new hires. I mean ongoing training for the entire team.

Why should you prioritize training?

Because until you do, you're trapped. You're stuck working in the business instead of growing it. Consider marketing. What's the key to get the most out of your marketing dollars? Delivering on what your advertising promises!



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If your advertising promises superior customer service, then your customers will come to your shop expecting a great experience. But if your service advisors aren't delivering on that promise, then you risk burning and losing every new customer your advertising brings through the door.

How can you make sure that everyone on the team is delivering on every promise with every customer, every time? You can do that by breathing down their neck every day. You can look over their shoulders to make sure they perform thorough inspections, advise the customer properly and don't make any mistakes. You can micromanage or do everything yourself.

Or you can free yourself from that burden by making sure your team is empowered through training to deliver on those promises.

In other words, you need a team that understands your expectations, knows what to do and has the authority to do it.

Through training, you can ensure that your employees have the knowledge and tools they need to make the right decisions — not only for one issue, but for every aspect of their job, their responsibilities and the shop.

Training your employees may require more time up front, but it frees you from the time, demand and stress of controlling every aspect of your shop yourself.

How do you make time for training?

Training isn't optional in our shop; it is required.

Every time I hire a new employee, they spend two full weeks in training before they even get to touch the cars or the phones.

It's not that I don't trust them. If I didn't, I wouldn't have hired them in the first place. But their role is about more than ability to perform the job. They have to learn the processes in our shop. They have to learn how we answer the phones. They have to understand how we treat our customers.

One of our clients once told me, "I cannot find an employee worth a darn." When I asked about his training process, he said, "Any qualified employee should know how to do their job without me having to show him."

When an owner doesn't take the time to train employees, teach them the shop's policies and procedures and explain their benchmarks and how to hit them, they cannot expect the employee to meet their expectations.

Many owners will tell you it's hard to find good techs, but it's downright impossible to find a psychic one.

Training should be the FIRST requirement for EVERY employee. In order to exceed expectations, the employee first needs to understand what those expectations are.

Success — for both the employees and for the entire shop — is about more than the ability to fix a car. Sustainable success for both employees and the shop comes when the whole shop is committed to a culture of training. You need a team that can work together with clear expectations and responsibilities and that has the empowerment to deliver on them. Everyone on the team should be able and incentivized to make decisions that benefit the entire shop.

Build a culture of training

Training is not a one-time solution. It requires ongoing commitment and follow through in order to be effective. For our shop and our clients' shops, we use a three-step process.

First, measurement. You don't know what you don't know. By paying attention to the key metrics in your shop and tracking them every day, you can identify trends and spot problems — and then correct them that day.

Second, training. Once the measurement shows an area of weakness, you can implement the right training to fix that specific issue. You can identify where a specific employee is struggling and provide the training and tools they need to improve. In the best-case scenario, they can see everything for themselves, know exactly where they stand and be proactive about training. They can seek out the resources they need when they need them.

Third, accountability. Instead of implementing a training program and hoping for the best, it's important to follow through. After you empower an employee and give them the tools and training to hit a benchmark, you need to hold them accountable.

Training is what allows you to set clear expectations for your employees, communicate a clear set of processes for your shop, and hold employees accountable to those policies.

Training is about more than techs staying up to date on new technologies. It's about the owner and service writers committing to constant training, too. Building a culture of success doesn't happen overnight, but it is the only way to create sustainable success. It's the only way to get freedom for the owner from constant micromanagement and stress and chaos.

Incorporating continuous training should be your top priority to set yourself, your shop and your employees up for success.

Once you understand this critical factor, it's no longer a matter of "making time" for training because it is the most important thing you can do with your time.

DAVID ROGERS is COO of Keller Bros. Inc., and president of Auto Profit Masters.
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Integrate your marketing software with your POS to save time, money

RYAN WILMOT // Contributing Editor

Information is power. So doesn't it make sense to harness the information available through your Point of Sale system to maximize your marketing efforts? Integrating your marketing software with your POS will save you time and money and will allow you to identify what strategies are actually driving leads and resulting in sales. I often get questions from shop owner clients about why integration makes sense. Let's tackle some of the concerns heard most frequently.

Why is it important for shop owners to integrate marketing into their POS system? What are the benefits of integration? What are the disadvantages?

Integrating your POS with a powerful marketing platform can provide a number of important benefits. For example, it will give you much better insight into which of your marketing dollars are helping your shop and which aren't generating a return. For example, most marketing sources can tell you how many leads you received for the amount you spent. Let's say you spent $400 to generate 20 phone leads. However, those leads may not have resulted in any sales. It's a lot more powerful to know if that $400 investment led to five new customers and $4,000 in immediate revenue or $50 and one new customer. Consumers are constantly changing, so it's critical to be able to see this information on a monthly basis so that you can make quick adjustments to your marketing plan.

Integration also gives you access to advanced analytics that offer nearly real-time indicators about the success of your shop operations. If you have a robust marketing platform, you should be able to compare that data against how other shops are performing. For example, one simple metric can alert you that your marketing calls are going unanswered or ending up

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Connected marketing can also make it easier to more effectively retain your existing customers, because you can easily access customer information to produce relevant smart email, postcard and phone reminders. Marketing can be fun and exciting, but retention is crucial to a shop's long-term success. It's also usually a lot cheaper to retain an existing customer than to find new ones.

Why do you think some shop owners are reluctant to integrate?

I actually think embracing integration has become more common among shop owners. Not integrating is a bit like having a computer that's not hooked up to the internet — you lose access to the best features available when you are disconnected.

Are makers of POS software making it easier to integrate marketing features?

Unfortunately, we are seeing a disturbing trend where some POS vendors are actually making their new software intentionally closed-off to third parties. It's akin to Microsoft banning businesses from loading any other software on their computers, except for other Microsoft programs. We've seen some very upset shop owners when they find out that they upgraded to the new version of their POS system, only to be locked out of working with their other software vendors. This seems to be a particular problem with the new crop of cloud-based POS systems.

What types of metrics should shop owners be tracking through integration?

For marketing metrics, you need to understand where you are losing your potential customers. This is referred to as your conversion funnel. In particular, you want to track what percentage of people are viewing your website and then calling you. This is known as your website's conversion rate. If this conversion rate is 20 percent and you can improve that to 30 percent, your revenue will grow by roughly 50 percent — just by making a 10 percent improvement in that metric. The next key metric to watch is how well your shop is converting your incoming leads into customers. Again, if you optimize that, you can easily double the effectiveness of all your advertising campaigns or more. So, just by knowing your key metrics and making some smart optimizations, you can turn a good performing shop into an amazing shop.

How do shop owners make the most of the data they are gathering?

It's important to review all of your key metrics at least quarterly, and more ideally, once per month. This will allow you to make quick improvements as necessary to keep your marketing running smoothly and customers flowing in. MA

MORE MARKETING TRAINING OPTIONS AVAILABLE AT NACE AUTOMECHANIKA

NACE Automechanika Chicago 2017 will be held July 26-29 at McCormick Place West and will feature a host of training options for attendees, including courses focused on shop marketing. Some course options include:

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RYAN WILMOT is chief architect of Kukui. He oversees the development and technology behind the company's All-in-One Success Platform. He has two decades of experience in the information technology and Internet marketing industries.

Emergency marketing strategies for car count lulls

Getting extra cars during tough times is about tenacity, ingenuity and the basics

If your shop's car count could be better, you might want to listen to Pennsylvania shop owner and ATI coach Mike Bennett explain how he keeps shops as close to capacity as possible. Most smart shop owners have a comprehensive marketing calendar that includes a balance of new customer acquisition efforts in concert with tried and true customer retention efforts. Marketing, by definition, is the total of activities involved in the transfer of goods (or services) from seller to consumer. More clearly defined for our industry, marketing is ANYTHING we do to get cars to our shop. I would bet for the most part, your marketing calendar and strategy does a fair job of keeping your bays full and your techs busy. It is inevitable, though — despite your best efforts, planning and management, that your shop will hit those brief periods where the schedule looks light and the fear of techs wandering around the shop with no cars in the bays looms ever larger.

As a shop owner, I know this very real fear. Honestly, it is more like a panic. It's that thing that keeps us up late at night or causes us to take that test drive by the competition to see how your fellow shops are doing. The phones aren't ringing, and everyone is looking at you for the magic bullet. As a coach, I have gotten the panicked call more times than I care to remember: "We are slow, and I need cars fast!!" Despite the best marketing plan, your shop will inevitably hit those brief periods where the normal reminder postcards or emails just don't seem to be working like they normally do.

Let's face it — we can't control the weather, the economy, holidays, tax season, government, plagues, wars or elections. I'm sorry to say, but in these moments there is no single magic pill. Getting those couple of extra cars to your bays in these tough times is all about tenacity, ingenuity and yes, the basics. Over the years, we have developed what I like to call Emergency Car Count Strategies. As a procedure, we have a process in place that recognizes low car count situations and triggers a series of actions we take each time to combat the slow phones and get those couple of extra cars in the bays. Below are a few of the most successful immediate and near-term emergency car count actions, as well as some often overlooked longer term actions that I know can work for you.

DESPITE THE BEST MARKETING PLAN, YOUR SHOP WILL INEVITABLY HIT THOSE BRIEF PERIODS WHERE THE NORMAL REMINDER POSTCARDS OR EMAILS JUST DON'T SEEM TO BE WORKING.

Phone mining

Print out the last three months of recommended services or previously declined work. I am sure that most of you have a routine CRM program that touches your customers with either a postcard or email. Reach out directly to these customers and offer a 5 percent discount if they schedule in the next week. This is not discounting at the counter presentation to get the sale. I am vehemently opposed to that sales tactic, and we have other more successful strategies to deal with a customer's pricing considerations. This is providing a special discount as a follow-up to drive cars to your bays in a period of time you choose when you are looking to fill your bays. It's a "special circumstance" incentive for them and for you. Ninety-five percent of something is better than 100 percent of nothing, right? The script for this phone call sounds something like this: *"Hi, Mr. Smith. I was looking over our notes on the Honda today. I see that when we had it in on (insert visit date) we discussed and recommended (brief review of recommendation and value). I know at the time you weren't quite ready to have that done. The reason for the call today is that I have a few openings in my schedule I would like to fill. As this is an important (service or repair) for the Honda, I thought I might be able to make a mutually beneficial offer. If you would be interested in getting the work done in the next five days, I would like to offer you an additional (discount offer) off the job as a special incentive for scheduling with me today."*

The key to being most effective with the offer is to get your customer on the phone and engaged in a conversation. If you are unable to speak directly to your customer and you have to leave a message, the script is a little different. I have found it most successful and likely to get a return call if the voicemail is something like: *"Hi, Mr. Smith. This is (your name) with (your shop). I needed to speak with you regarding the Honda you had in with us*

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on (date and mileage). Could you please give me a call at your earliest convenience at (phone number)?"

Make four-month maintenance reminder phone calls. Look back in your management system history for vehicles that were in for an oil change/maintenance service four to six months ago that have not been back since. Call them up and present the following short-term offer: *"In reviewing your service history, it looks like the '08 Honda should be just about due for its next service at XX miles. The reason for the call today is we have our XX service special (seasonal special), which includes: XX, XX and XX, and it will be expiring in about a week. I wanted to make sure you had the opportunity to take advantage of the special, if you are due, before it expires. We would hate for you to come in in a couple of weeks having not known about the offer and lose out on the savings."*

If you have fleet customers, now is a good time to call them and see if they need anything done. If you haven't visited or touched base with your fleets, local businesses, hotels, etc., in the last four weeks, then trust me — some have forgotten about you. Just a few weeks ago, my shop had an instant positive experience in revisiting local hotels' front desks and the community college information desks. We have traditionally had great relationships with them and have historically gotten a lot of referrals. First, we were surprised that in more than a couple of cases there were new personnel that had no idea who we were. Second, we were amazed how quickly we got referrals after visiting them and reintroducing ourselves. Clearly, even those who knew us had "forgotten" who we were. We learned that you should have a list and calendar of fleet and business clients to visit on a four- to six-week rotational schedule.

Blast emails

Almost all of the Customer Retention Management (CRM) companies have now added email blast capabilities for their shops, so contact them if you're a customer to see how you can use this great tool. If you don't have a CRM provider, there are many available that can provide email blast capabilities at a very affordable price. I routinely see shops that use this type of tool generate an additional five or more cars a week. If you use radio, run an ad with a "limited time only" special.

Understanding that the average vehicle is driven between 12K and 15K miles annually and the average oil service is performed at 3K to 5K miles, it would stand to reason you should see your average customer three to four times per year if you are doing all of their service work, right? When was the last time you looked at how many of your existing customers were in for service six to 18 months ago, but may not have been back in the last six? Almost all management systems allow you to run a report that will list customers by date range of their last visit. I bet you would be shocked by the number of your customers that would fall into this group. In most cases, if a customer has not been back to you in six months they have either missed a needed service, used another provider or they have moved. This can be a very fruitful segment to attack; they know you and will recognize your name.

Exit scheduling

Make sure you're setting the next appointment! Some of our clients use a mystery envelope, which is a great aid to make the exit scheduling process more like a game or contest. When the departing customer makes their next appointment, they receive an envelope with a surprise gift inside. And the gift is valid only if the envelope is opened by the service advisor at that next appointment!

With a review of our Car Count Stabilization Checklist, what basic/staple opportunities are you missing? "Where Have You Been" calls, exit scheduling, taxi certificates? It is called the MUST DO, SHOULD DO list for a reason. If you're not doing something then you're missing out on a huge opportunity.

We know these strategies work! If you would like your own copy of our Car Count Stabilization Checklist, simply go to *www.ationlinetraining.com/2017-04* for a limited time.

CHRIS "CHUBBY" FREDERICK is the CEO and founder of the Automotive Training Institute. ATI's 115 associates train and coach more than 1,400 shop owners every week across North America to drive profits and dreams home to their families. This month's article was written with the help of Coach Mike Bennett.
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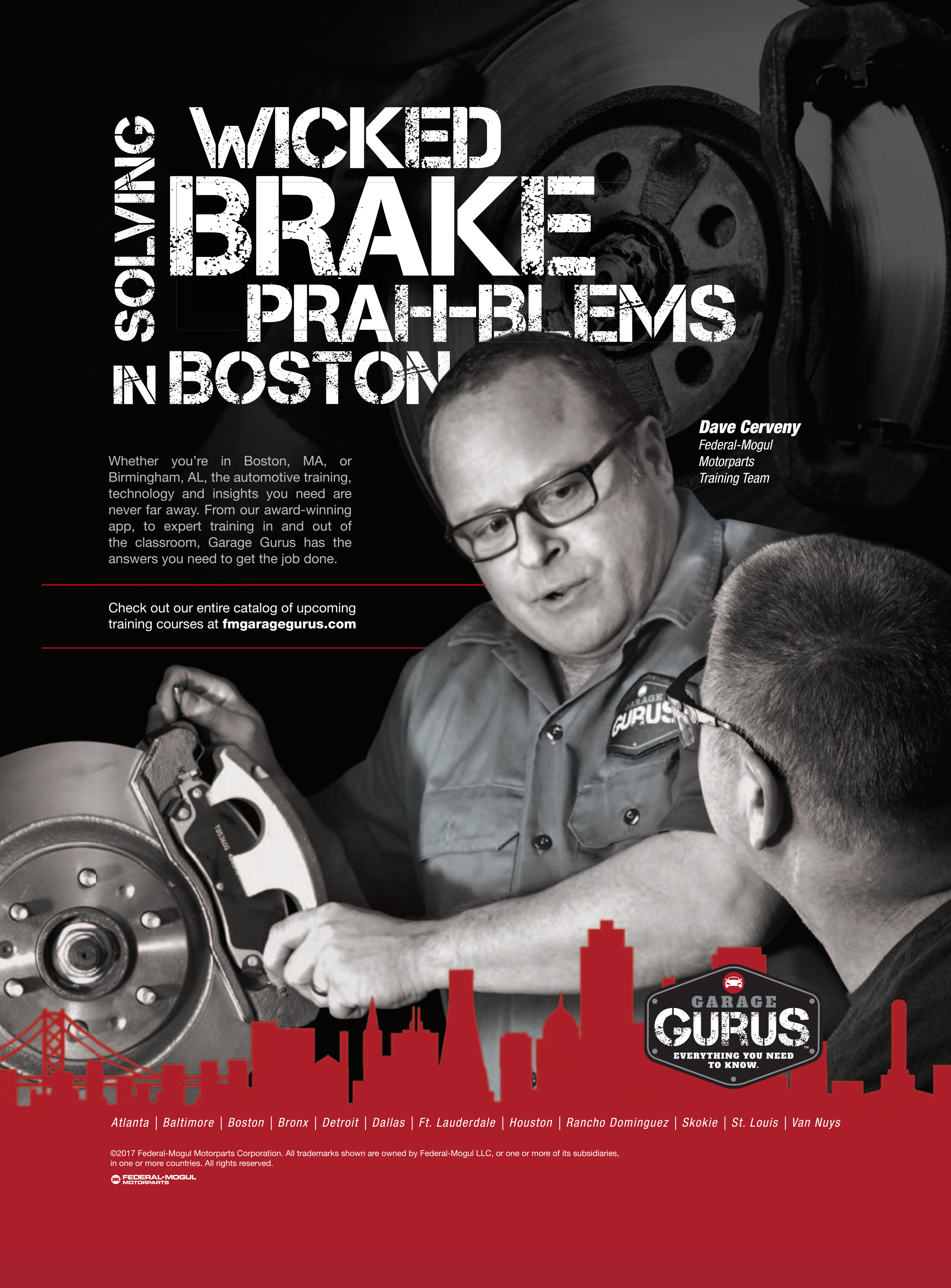
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FEDERAL-MOGUL MOTORPARTS

Are you protecting your most important assets?

Examine your relationships with the people who deliver the results

Safeguarding a shop's assets is an important routine. Setting up internal controls, insuring property, counting inventory and maintaining the equipment and vehicles are all standard things an owner looks after.

But are you protecting your most valuable assets — your people? What are you doing to retain this talent?

The cost of hiring key shop talent is high. It takes time, and even the best searches contain significant risks with potential failure.

TALENTED PEOPLE OFTEN VIEW COMPENSATION AS AN INDICATOR OF THEIR WORTH. IF COMPENSATION DOES NOT CORRESPOND TO DELIVERED RESULTS, YOU RISK LOSING TALENTED INDIVIDUALS.

It is very easy to overlook the people who are performing well. The "reactive" shop owner devotes the bulk of his or her time and energy to those who never quite get it together. You can't fix broken. The compelling need to fix problems can lead the owner to miss the people who get results. It is not uncommon to see time, effort, procedures and processes neutralize weaknesses rather than capitalize on strength.

How do you ensure that the best talent in the shop is retained?

First, identify where the talent exists. Appraise the bottom line produced by each employee. Avoid the sizzle and look for the steak. Without such identification, it is impossible to build in the commitment and retain the talent.

The following questions might be asked to ensure that the necessary steps are taken to retain the shop's top talent.

Why have talented people left in the past? The true reasons often are whitewashed because many people focus more on courtesy than candor in their exit interview. Discuss such factors as compensation, opportunities for growth and personal development. It is critical to find the true reasons. Talented people may be controversial because they demand a lot. People often respond to such individuals by harping about their quirks rather than focusing on results. Investigate tolerance of quirks as a factor in the decision of talented people to leave the shop. Is a focus on conformity, not results, driving talent out of your business? Good people leave a shop because bad people stay. Is accountability throughout the shop in check?

Why do talented people stay? What is it about your shop that talented people like? Does your business encourage creativity? Allow freedom? Are they empowered? Is it an exciting place to work? Knowing why will help ensure that other talented people remain with your company.

Are you paying attention to the talented people in your shop? Are you giving enough positive feedback to talented individuals? Talented people need recognition. Do you stay on top of accomplishments so that you can de-

MORE TRAINING AVAILABLE FROM BOB GREENWOOD AT NACE AUTOMECHANIKA

Bob will be presenting "Elevating Service Excellence and How Productivity Mathematics Measures Service Results" on July 27 at McCormick Place West during NACE Automechanika Chicago 2017. The session will delve into how shop management can get sidetracked if they only focus on individual productivity measurement. This is not to say that it is not important, however; individual measurement, known as proficiency measurement, is excellent for counseling an individual technician staff member to improve themselves. But what about the team productivity measurement as a whole and how that affects the business?

Measuring the entire shop as a team can help direct management to the necessary attention to certain processes that are failing. When processes fail, client service levels decrease dramatically and net income disappears. It also tells us much more. This specific measurement is called "Site Efficiency" and what it reveals is amazing. ***Register for the course at: MotorAge.com/mathematics.***

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liver the appropriate encouragement?

Are you consciously putting enough challenges in front of those people who deliver results? Results-oriented people look for more difficult challenges. Determine whether their learning curve is steep enough. But don't move people on without recognizing accomplishments, or else life in your shop will seem like an endless treadmill.

How equitable is the compensation among your key employees? Is there enough differential between those who deliver results and those who don't? Highly talented people often view compensation as an indicator of their worth to your shop. If compensation does not correspond to delivered results, you risk losing the more talented individuals.

Are you providing what they need to get results? A common frustration of talented people is the struggle to obtain the resources necessary to get the job done. It is imperative to break through the impediments, both monetary and procedural, which are so hard on human talent.

Are you giving more talented individuals exposure to the industry? There is always a risk that visible people might be lured away, but allowing them opportunities to experience the breadth and depth of the automotive aftermarket industry speaks volumes about your belief in them.

Are you factoring individual difference variables into your thinking about retaining highly talented people? The powerful factor that binds one person to the organization may mean little to another. Get to know about each individual and build a sense of what each requires to do their job.

To what extent do talented individuals feel they are progressing and developing? People need to feel that they are gaining skills, knowledge and also building a career. Development reviews and performance appraisals should be calibrated to determine whether your top performers are satisfied with their progress.

Examine your relationships with people who deliver results in your company. Talented individuals are like clients — it is harder to obtain new ones than to retain the old. Both will stay if they feel appreciated and experience a genuine commitment.

BOB GREENWOOD, AAM, is president and CEO of Automotive Aftermarket E-Learning Centre Ltd. (AAEC), which provides business management resources for the automotive aftermarket. Bob has more than 36 years of business management experience and is one of 150 worldwide AMi-approved instructors.
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The right stuff

Shop owner builds his business from scratch with the right focuses

ROBERT BRAVENDER // Contributing Editor

"I started the company with $900," John Stewart shrugs. "They said it couldn't be done." They were obviously wrong; now encompassing three stores in metropolitan Grand Rapids, Mich., his Real Pro Auto Service, Inc. has nearly $3 million in annual sales.

Of course it's easy to see why anyone might have thought otherwise. Back in 1992, Stewart was a 23-year-old technician fortified with raw ambition and a tax refund check. But the check was mostly gone — spent on equipment like a floor jack and stands — and a proposed partnership faded after Stewart started negotiating with a lease agent for a facility.

"We definitely started that first day off on the wrong foot," laughs Stewart. With no money, no credit and no client base to speak of, he managed to scrape together enough money and goodwill to rent a little two-bay facility behind a used car lot.

"I didn't have any employees at first," he reports. "I just worked from morning till night to try to get things done one way or another. From day one — and it's no different today — I couldn't afford to fail. I'll do whatever it takes to make sure that we're doing the right thing." It must have worked like a charm, because Real Pro Auto Service practically doubled in size almost every year of its first decade.

"Nine months from the first day I started, I had to move out of that two-bay building because I had outgrown it," Stewart reveals. "I moved into another building for four years before I outgrew that one. After five years in business I (moved into) my third building, and I've been here ever since. We opened the two other locations during the last eight years."

Meanwhile, Stewart had to build his client base from scratch, but didn't do much in the way of marketing outside hanging homemade flyers on doors. "We market and advertise a ton now," he reports, "but back then I didn't know anything about it — how to do it, who to ask, where to go. It was all word of mouth, 100 percent. It's just a matter of taking care of the customers."

For roughly the first 10 years, Stewart ran the business without any external input. "Then I reached a point where I realized, hey, I don't know what else to do here," he notes. "I didn't know how to make it any different, how to make it go forward; I just didn't have the knowledge. It's no different than working on a car — if you don't know how to do it, you've got to go get the information, so it's been an ongoing educational process. We had a really good consultant for quite a few years that I really learned a lot from."

By the mid-90s, Real Pro Auto Service had enough regular clients to get a computer system. "We started taking that customer information and mailing flyers in-house," reports Stewart. "Then we went to direct mail, and as the technology evolved we went into online marketing. Now we're doing all kinds of internet advertising, like Google. We still do a ton of direct mail — we even do a lot through texting. I was always told to stay away from the impersonal ads; people don't like it. But we tried a couple of text campaigns and it just blew me away. Now we use a service that allows us to text our customers.

"I wish there was a silver bullet where you could say this is the kind of advertising you need to do," Stewart continues. "There isn't one. I was taught that you try to market in a variety of ways; each one makes a little creek, and when they come together they form a stream of customers coming in the door."

Expanding into the suburbs of Grand Rapids, Stewart encountered new prob-

REAL PRO AUTO SERVICE
Grand Rapids, Michigan // www.RealProAuto.com

John Stewart
Owner

3
No. of shops

25
Years in business

18
No. of employees

21,100
Total square footage of shops

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No. of bays

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No. of customer vehicles per week

$2.85 million
Annual gross revenue

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lems. "When you open a new store, it's a completely different game," he relates. "When I was here at the one store for 10 hours a day, I knew everything that was going on. When I hired the consultant, he helped me with a lot of things: how to delegate, how to find a decent manager, how to hire good employees. That made a huge difference, but when I got the second store, all of a sudden it was like, how do I do this? When you take big steps like that, you've got to find somebody else who knows how to do it, and hopefully they can get an education quick enough to make it fly."

Helping ease this transition was the fact that these new stores were existing properties Stewart had bought out, but he still had to bring them into line with his original shop. "It's all in the process," he comments. "There has to be a method with everything you do; otherwise, everyone just does their own thing. As we go forward, we'll find a new issue and try to figure out a process for it and implement that process to make sure that it stays where it's supposed to be. A lot of this is documented, some isn't. When we get a new person in, we just train and train and train until we get them where they need to be. I want to take care of my employees, I want them to take care of me, and together we can take care of our customers."

"WHEN WE GET A NEW PERSON IN, WE JUST TRAIN AND TRAIN AND TRAIN UNTIL WE GET THEM WHERE THEY NEED TO BE. I WANT TO TAKE CARE OF MY EMPLOYEES."

That's still the core of Stewart's philosophy. "I don't think it's very complicated," he muses. "When you try to think about it like that, it's so hard to put a finger on it, but I always try to treat the customers the way they want to be treated. It doesn't take much; just look for a way to solve the customers' problems. They might be distraught because their car didn't start or they can't use it. They rely on those vehicles, and you've got to make sure that you've got the solution to their problem." MA

ROBERT BRAVENDER graduated from the University of Memphis with a bachelor's degree in film and video production. He has edited magazines and produced shows for numerous channels, including "Motorhead Garage" with longtime how-to guys Sam Memmolo and Dave Bowman.
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An effective training plan ensures learning never stops

PROVIDE YOUR TECHNICIANS OPPORTUNITIES TO GROW IN THEIR CAREER PATH

CHRIS CHESNEY // Contributing Editor

A common discussion I have with shop owners and technicians is about ongoing education. There seems to be several distinct opinions. There are shop owners who don't want to invest in their people's skills for many of the reasons we've discussed here in previous columns. At the same time, there are shop owners who understand the value of investing in their team, but don't have full control of their business, which allows their team to say no to learning opportunities. There are experienced technicians who want to invest in the understanding of the technologies they are asked to repair, but there are many more techs who believe they know more than enough to get the job done without continuing their education. Put these parties together and you can get a stalemate. Only when both parties are in step and fully appreciate the value of continuing to improve their ability to readiness level will everyone win: shop owner, technician and customer alike.

One of the primary enablers to a shop's success is a well-defined learning plan for everyone in the building. Shop owners, service advisors, young technicians and lead technicians should all have a career path that includes an ongoing education element. For experienced or in-service technicians, a learning plan should challenge them to learn new skills and master the latest technologies that are coming in the door. Continuing education should also create opportunities to perfect core skills. Keep in mind that a skill must be exercised on a regular basis to keep it sharp and ensure it is effectively — and profitably — applied. This is especially true when it comes to solving problems on complex electrical and computer-controlled systems. Depending on how you dispatch jobs to your team, there is the possibility that a skilled, experienced technician may only see a handful of these complex issues throughout a year. With that in mind, let's discuss the appropriate learning plan options for in-service technicians.

The key to any learning plan is to get buy in from everyone on your team, document the plan and set standards of performance to ensure you can hold your team accountable. This should be done up front each year and when you first hire and onboard new team members. First, establish a minimum standard: typically, this is the number of hours of training you expect each position on your team to attend. Say for example, your production team of technicians are segmented into three groups: new or inexperienced, journeymen and master (C-Techs, B-Techs and A-Techs). Our goal is to provide a training standard that ensures each position can be service ready while increasing their knowledge base to allow them to grow in their careers.

The growth element of this process is critical. Most millennials will tell you they want to make a difference and want to see a clear career path. If you don't define that path and communicate it to them early and often, they can become easily disenfranchised and will move on without warning. Best practices in our example would be for C-Techs to receive 40+ hours of training that includes a mix of new-to-our-shop vehicle familiarization and core services training that will prepare them to step up to a B-Tech. Our B-Tech would be challenged to receive 60+ hours of training that updates them on the services they regularly perform,

>> CONTINUES ON PAGE 32

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as well as new techniques that may improve service to your customers. The A-Tech should seek 80+ hours of training that cover technologies that will be arriving soon on those new-to-our-shop vehicles, while also seeking to constantly optimize their problem-solving skills. Set agreed-upon benchmarks with your team and monitor the goal of being service ready year after year.

How best to activate training

Many of you meet or exceed the benchmarks suggested above every year, yet struggle with improving the productivity and quality of work in your shop. The failure of most training programs is the lack of an activation plan. Some of our best CTI customers have seen success in their training efforts by implementing a simple activation that includes everyone attending each class together followed by a meeting at the shop the next day to discuss what they learned. The team then determines how to best implement the new knowledge learned. This is a great way of activating training, but many shops should consider an even more organized approach. Activation needs to be the foundation of the career paths set for each of your team members.

Unless your shop has a group of technicians with the same skills and level of understanding of each system, then you most likely have a mix of A-, B- and C-Techs. I suggest cultivating a mentoring culture in your shop that encourages technicians to share their learnings. For example, your A-Tech's job description should be to mentor the B-Techs on the skills the B-Techs learn in the classroom or online training programs. Partnering an A-Tech with a B-Tech with the goal of improving the B-Tech's skills and proficiency will produce measurable improvement in the B-Tech's work and ability to solve problems. Mentoring also helps your A-Techs grow. Challenging your experienced team members with activating new skills in your less experienced team members can result in a tremendous ROI on training.

Don't stop there. Match the B-Techs with your C-Techs, and allow the experienced B-Techs to find their footing as teachers as they mentor the C-Techs.

Now that we have laid the foundation for activating the training plan for our team, what should each of your techs be focusing on in the classroom? Here's

>> CONTINUES ON PAGE 36


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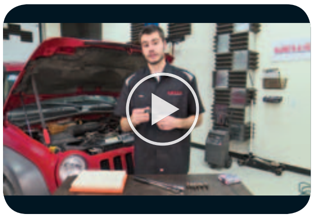
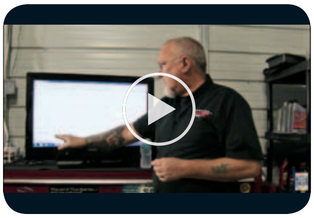
WATCH + LEARN



Repairing a lack of spark plug maintenance

MOTORAGE.COM/SparkRepair



Motor Age How2: Finding that weak cylinder

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Forum: How to manage a negative online review

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Diagnosing misfires with OBDII Mode $06

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SOCIAL INSIGHTS

TENNESSEE REPAIR SHOP HAS THE PRESCRIPTION FOR SERVICE PERFECTION

The good 'doctor' — Frank Chamberlain, founder of Auto Physicians in Maryville, Tenn. — was recently up in Michigan touring a Ford plant. "We use quality parts," he proudly reported from Dearborn, "and we order a lot of Motorcraft." So much so that he won a contest set up by his parts wholesaler. Quality is implicit with Chamberlain, regardless of brand; and they've been the only ASE Blue Seal certified shop in Blount County for the last 5 years.

MotorAge.com/gooddoctor

HOW DO YOU MEASURE UP AS A CUSTOMER FOR YOUR PARTS DISTRIBUTOR?

The amount of mistrust in this industry between the independent service shop and parts distributor has grown over the past 10 years. Many retail shops seem convinced that every parts distributor is determined to "take advantage" of them. This is truly old-style thinking. Today, many good parts suppliers do exist across the country. It is time to address and change the business relationship between the independent service shop and the independent parts distributor.

MotorAge.com/customer

BEATING FLAT RATE — AT WHAT COST?

There isn't a commissioned technician I know who hasn't come up with ways to make a job go faster or easier. I'll never forget an instance back in the early days of the Dodge Neon. When first introduced, they were notorious for leaking oil from the original head gasket design and we repaired dozens of them under factory warranty using the new MLS-style gasket. Some of the techs where I worked loved the jobs and could complete them in just a few hours. How, you ask? By cutting some major corners, that's how.

MotorAge.com/flatrate

USING THE SCOPE'S TRIGGER SETTINGS

In our last outing, Pete Meier showed you how to capture a relative compression pattern on the single channel uScope. In that episode, Pete referenced some new terms: trigger setting, trigger slope and trigger position. Today, Pete explains basic trigger settings to help stabilize your capture for more detailed analysis.

MotorAge.com/trigger

TRAINING EVENTS

APRIL 18-24
Up your voltage!
Auto Career Development Center
Wayside Automotive; Seekonk, Maine

APRIL 24
National Automotive Service Task Force spring meeting
Bourbon Orleans Hotel
New Orleans, Louisiana

APRIL 25-28
ToolTech 2017
Bourbon Orleans Hotel
New Orleans, Louisiana

JUNE 9-11
ASA Arizona Auto Training & Expo
WeKoPa Resort & Conference Center
Scottsdale, Arizona

JUNE 12-16
Advanced Selling Skills for the Service Advisor
RLO Training
Cincinnati, Ohio

JULY 17-20
North American Council of Automotive Teachers (NACAT) Conference
Macomb Community College
Warren, Michigan

JULY 26-29
NACE Automechanika Chicago
McCormick Place West
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>> CONTINUES FROM PAGE 32

one outline that may work for your shop:

C-Techs should be focused on:

- Fluids – how to select the right fluid for the vehicle and system
- Tires – recognize new tire technologies and how to repair or service them
- Batteries – how to identify the correct battery technology and how to service appropriately
- Inspections – understand the correct method of inspecting each system and the importance of this function to the customer
- Growth – knowledge needed to move to the next level such as brakes, steering and suspension, wheel alignment, electrical

B-Techs should be focused on:

- Brakes – including new technologies associated to braking systems and new techniques to improve quality and proficiency
- Steering and suspension – new technologies associated to steering and suspension with a focus on understanding how stability controls affect the way these systems are serviced and adjusted
- Electrical and electronics – continuous immersion in the application of foundation skills on simple and more complex systems
- Problem solving – including application of all learned skills and resources
- Growth – knowledge needed to move to the next level such as onboard diagnostics, fuel, ignition and emissions, and data networks

A-Techs should be focused on:

- OBD – current and new enhancements to onboard diagnostics including changes in the requirements set forth by CARB and EPA
- New technologies – current and new enhancements to fuel, ignition and emissions systems with a focus on application of diagnostic techniques
- Data networks – recognizing new communication protocols and updated PIDS, tests and bi-directional controls
- Problem solving – continuous practice and improvement of critical thinking
- Mentoring – learning and exercising new ways of assisting B-Techs to grow their skills

There are many resources available to you and your team with regard to implementing a successful training program. Start today by scheduling that first meeting with your team. MA

EFI DIAGNOSTIC BASICS

A REVIEW OF COMMON PROBLEMS AND HOW TO FIND THEM

TRACY MARTIN // Contributing Editor

TO CHECK FOR THE PRESENCE OF AN INJECTOR PULSE from a vehicle's ECM, a test light is used in place of a fuel injector. The pointy end of the test light is touched to one of the wires in the injector harness (careful not to damage the connector), and the alligator clip end is connected to a straight pin, which is then inserted into the other injector wire at the harness. As the engine is cranked over, the test light will flash or pulse if an injector signal is present at the connector.

PHOTOS: TRACY MARTIN

Many technicians have traveled down the wrong diagnostic path by reading OBD II diagnostic trouble codes (DTCs) with their scan tool and then replacing parts hoping to fix a problem. While this may work some of the time, it's not the best way to address all engine performance problems. It is important to remember that underneath all that technology, the majority of automobiles and light trucks are still powered by four-stroke, gasoline engines. And while there are challengers to the throne, for now and in the near future, conventional gas-powered engines are still the majority of what comes into a typical shop or dealership, and they are still subject to many of the same mechanical problems that have existed for years.

Depending on the year, make and model, a vehicle's Engine Control Module (ECM) can't always set trouble codes for mechanical engine problems. Although OBD II diagnostic monitors relate in some way (and perform in response) to what's coming out of an engine's exhaust, or in the case of most ignition misfire detection, how evenly the crankshaft is rotating, they still are limited in their capability of diagnosing engine valves that don't seat, a leaking head gasket or leaky intake manifold or exhaust gaskets. Surprisingly, if basic mechanical engine operation is out of whack, a vehicle's ECM still may not be able to respond to the problem and set the appropriate DTC, or any DTC.

One example of this is the P0300 DTC — Random/multiple cylinder misfire. Because the ECM (on most vehicles) senses the intervals between the engine's power strokes, anything that affects rotational crankshaft speed could set the code. The most common causes are low fuel pressure, vacuum leak(s) or mechanical engine problems that cause low cylinder compression. Other possible causes are a faulty ignition coil(s), bad spark plugs or ignition wires, malfunctioning cam or crankshaft sensor, ignition module or the on-board computer. It's ironic that the most common causes for a PO300 are not ECM-related, while the least common causes are all part of the engine management system, including the ECM and its array of sensors.

Engine mechanical problems have caused many an inexperienced — and some experienced — technicians to spend hours using a scan tool trying to figure out the reason why numerous DTCs have been set. Too often this diagnostic path leads to unnecessarily replacing components, only to eventually discover that an easy-to-fix vacuum leak, tired fuel pump or not-so-easy-to-repair bent valve(s) or leaking head gasket was the root cause of drivability problems and subsequent DTCs. Consequently, basic mechanical engine issues need to be isolated from computer-controlled engine management system components and their resulting DTCs before diagnostic hours are spent and/or parts are replaced.

No-start conditions

In instances when an engine cranks over, but won't start, there are some basic things that a technician can check. The first thing is obvious – use a scan tool to check if any DTCs have been set by the ECM. DTCs are a good place to start any investigation into potential causes of a specific problem, since they may provide valuable clues as to what the problem is, or at a minimum, in what system it is most likely occurring. For instance, if any of the range of P0350 to P0362 DTCs are set, there is most likely a problem with the vehicle's ignition system that is causing a no-spark condition. However, P02XX fuel and air metering codes are also a possibility, so these should be checked as well. Moreover, remember — just because a code has been set by an ECM doesn't mean it's time to start replacing parts, at least not until it has been verified by other independent methods that a no-spark, or no-fuel, condition really

THE SAME MECHANICAL PROBLEMS this vintage in-line six cylinder engine on this old Ford was subject to (when it used to run) still occur in contemporary late-model cars and trucks. Modern engines still use pistons, rings, valves, head gaskets and intake and exhaust manifolds that all wear out or leak as miles rack up. The tried-and-true techniques that have worked for years to diagnose common engine mechanical problems still work on today's vehicles.

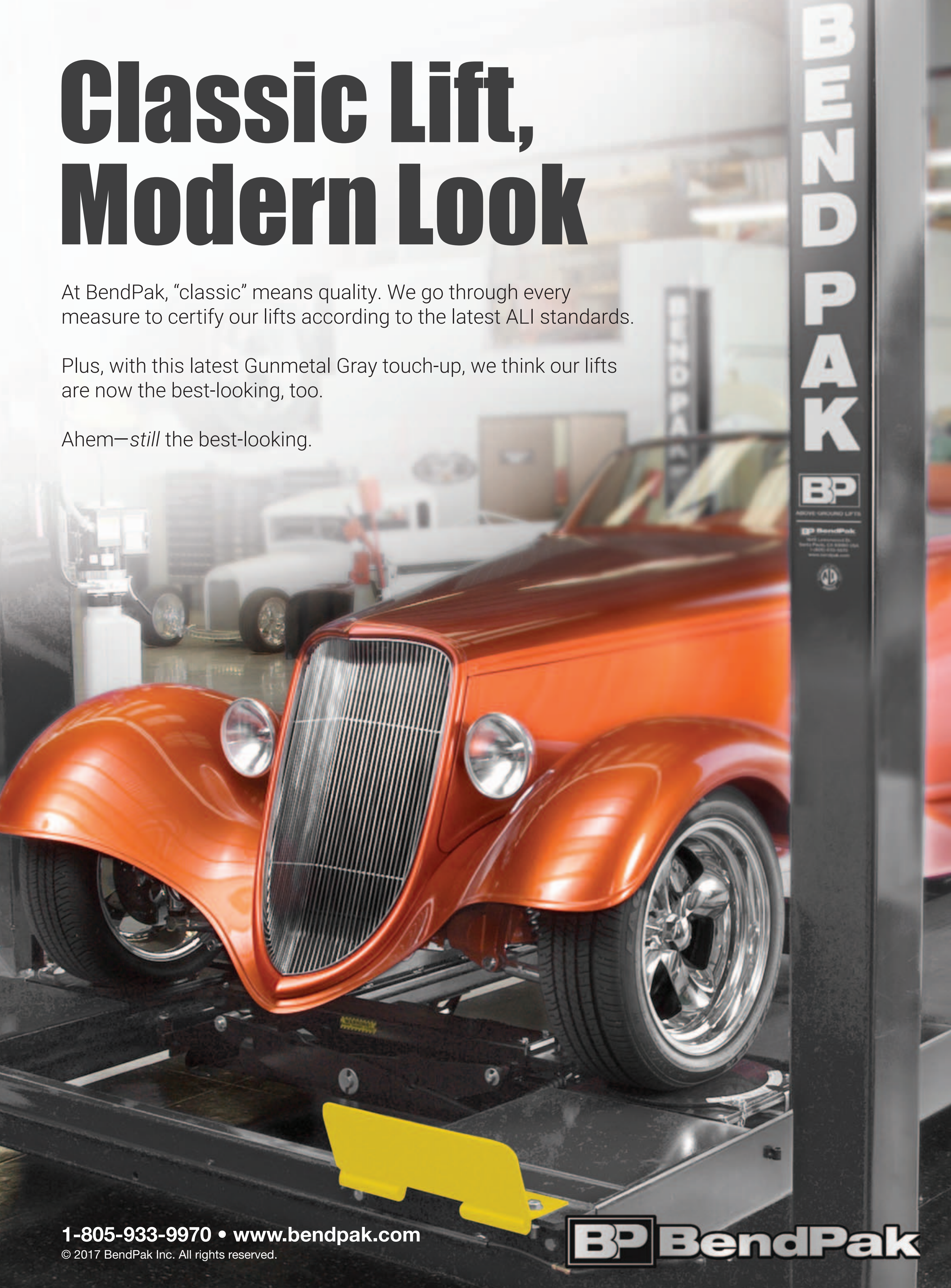
DESPITE THE PRESENCE OF AN OBD-II DIAGNOSTIC SYSTEM, all the high-tech electronics associated with this not-so-glamorous 1996 General Motors 3100 V6 engine are, for the most part, unable to determine if the engine is in good mechanical condition. If the basic engine has serious problems, emissions can reach levels that will cause an ECM to set trouble codes. Vacuum leaks, low compression, coolant leaks and worn-out parts can all lead even experienced technicians down the wrong diagnostic path in pursuit of false trouble codes.

does exist. Keep in mind that DTCs only provide a clue to the source of the problem, but not necessarily the answer.

One often overlooked cause of a non-starting engine is slow engine cranking speed. Engine cranking speed should typically be around 200 rpm, but measuring this is difficult. Fortunately, a person's ear will suffice — with some experience — as a basic test for determining engine-cranking speed. If an engine is cranking over too slowly, there will be insufficient compression generated inside the cylinders to promote combustion, regardless of whether spark and fuel are present. Slow engine cranking can be caused by a bad or discharged battery, cold weather, loose or poor battery cable connections, a bad starter motor, or other mechanical engine problems.

Missing in action — spark or fuel?

If an engine is cranking at normal speeds, but still won't start, the question of "no spark" or "no fuel" must be answered. It is easy to find out which one is missing without having to connect a scan tool to read potential DTCs. Instead of spending the time to remove ignition coils and/or spark plug wires to check for the presence of a spark, a bottle of propane can be used to indirectly determine basic ignition system functionality. A hose connected to a bottle of propane can be placed into the air cleaner or directly into the throttle body. The valve on the propane bottle is cracked open slightly and the engine is cranked over. If the engine starts and runs (even for a few sec-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REGARDLESS OF SHAPE AND APPEARANCE, all electronic fuel injectors work basically the same. A coil of wire inside each injector acts as an electromagnetic valve. Whenever an injector is electrically pulsed by an ECM, the electromagnetic valve opens, allowing fuel to be injected into the engine's intake manifold.

USING PROPANE IS A RELATIVELY SAFE WAY to determine if an engine has spark, but no fuel. This simple test bypasses the entire electronic fuel injection system. To perform the test, simply insert the hose from the propane bottle into the intake duct at the throttle body, then turn on the bottle's valve and crank the engine. If the engine starts and runs (even for only a few seconds), then the presence of an ignition spark is confirmed.

onds) the ignition system has to be producing a spark. This test also verifies that the cam and crankshaft sensors are working because without their input, the ECM cannot produce a spark. The test also confirms that the main ECM power fuse is good.

If the engine did not start/run on propane, checking the power fuses to the ECM is a good next step. An alternate method to checking fuses to determining if the ECM has power is to check for the presence of 5 volts at one of its sensors. Disconnect the coolant or air temperature sensor, or the TPS sensor, and probe the connector with a multimeter to see if one of wires in any of the connectors has 5 volts. If 5 volts is detected, the ECM must be receiving power, as it provides a 5-volt signal to each sensor and checking the ECM fuse is unnecessary.

If the propane test verifies that the engine has spark, checking no-fuel-related issues is next. Fuel pump and injector power fuses should be checked to eliminate these often overlooked causes of no-fuel delivery. Although a non-operational fuel pump won't necessarily cause an ECM to set a DTC, it is wise to check the P0230 to P0233 range of DTCs (all are related to fuel pump primary circuit operation) as a good first place to start an investigation into the cause of a no-fuel condition.

Another cause for a non-starting engine could be any related vehicle alarm codes. "Fuel enabled" or "alarm-"related diagnostic trouble codes are not generic OBD-II DTCs, but are instead specific manufacturers' enhanced trouble codes. Any of these anti-theft-related DTCs could prevent the ECM from starting the engine by shutting off fuel, spark or both. One common cause for alarm-related codes are key chains that have lots of keys or other objects added to them increasing their weight. The added weight damages the ignition lock cylinder and/or ignition switch and can cause alarm codes to be set.

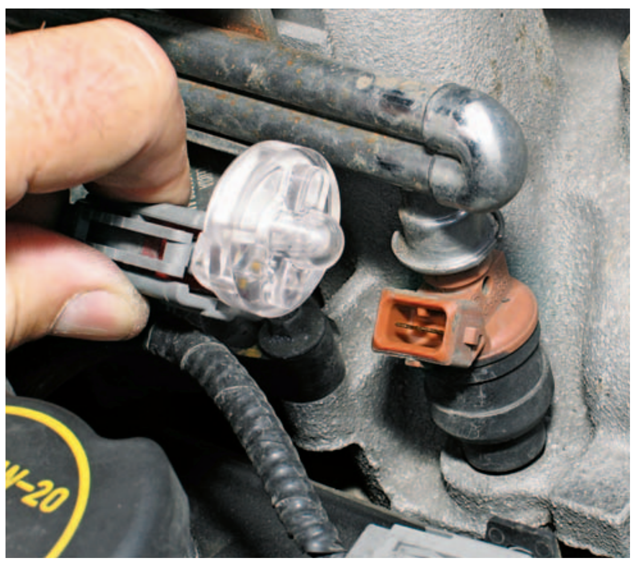
Fuel pressure

After looking up the correct fuel pressure in a service manual, or using a scan tool, check fuel pressure with the engine running. If the engine won't start, power will need to be supplied to the fuel pump to check pressure. There are several methods to power the fuel pump: a scan tool may be able to activate the fuel pump, 12 volts can be supplied directly to the pump or the fuel pump relay can be bypassed. Whether the engine is running or not, if fuel pressure is below specifications, check the voltage at the fuel pump. It should be at least 13 volts (engine running) or 12 volts with the engine off. If it's less, perform voltage drop testing to locate the high resistance in the fuel pump circuit and thus the cause of the low voltage and subsequent low fuel pressure.

On some vehicles, dead head fuel pressure should be checked. Dead head pressure checks the pump's ability to produce enough pressure to run the engine at full throttle and should be around 60 to 100 psi (check the service manual for specific pressures and procedures). Dead head pressure should be checked quickly, as blocking off the fuel pressure return line for too long could rupture a hose or damage the fuel pump. If fuel pressure is low, it could be the result of a tired fuel pump or a poor electrical connection causing low amperage at the pump. Checking fuel volume is next, and it can be determined by connecting a hose to the fuel pump and filling up a container with fuel as the pump runs (some fuel pressure gauges have a bypass hose for this purpose). Look up the acceptable pump discharge volume in the service manual.

Fuel injectors

Fuel injectors are fairly reliable on modern vehicles, but on those infrequent occasions when they do misbehave, OBD II systems have as many as 100 DTCs that can be set to address injector circuit malfunctions. Fuel injectors are expensive; consequently, just because a DTC has been set doesn't mean an injector should be replaced. To verify if an injector, the ECM, or wiring harness is the cause of an injector trouble code, try swapping injectors between cylinders and then check to see if the same diagnostic trouble code follows the injector, or if it stays on the same cylinder where the DTC was originally set. For example, if a P0204 DTC ("Injector Circuit/Open—Cylinder 4") is set, swap the injector from a different cylinder and install it into the #4 cylinder, and then clear all DTCs. Then, after performing an appropriate "drive cycle," check to see if the OBD



BY REMOVING THE ELECTRICAL CONNECTOR from an injector and connecting a noid light to the injector's harness, an injector pulse from the ECM can be viewed when the engine is cranked over. Noid lights come with a variety of adaptors to fit many popular injector wiring harnesses. They are a better choice than a test light to test for the presence of the ECM-generated injector pulse.

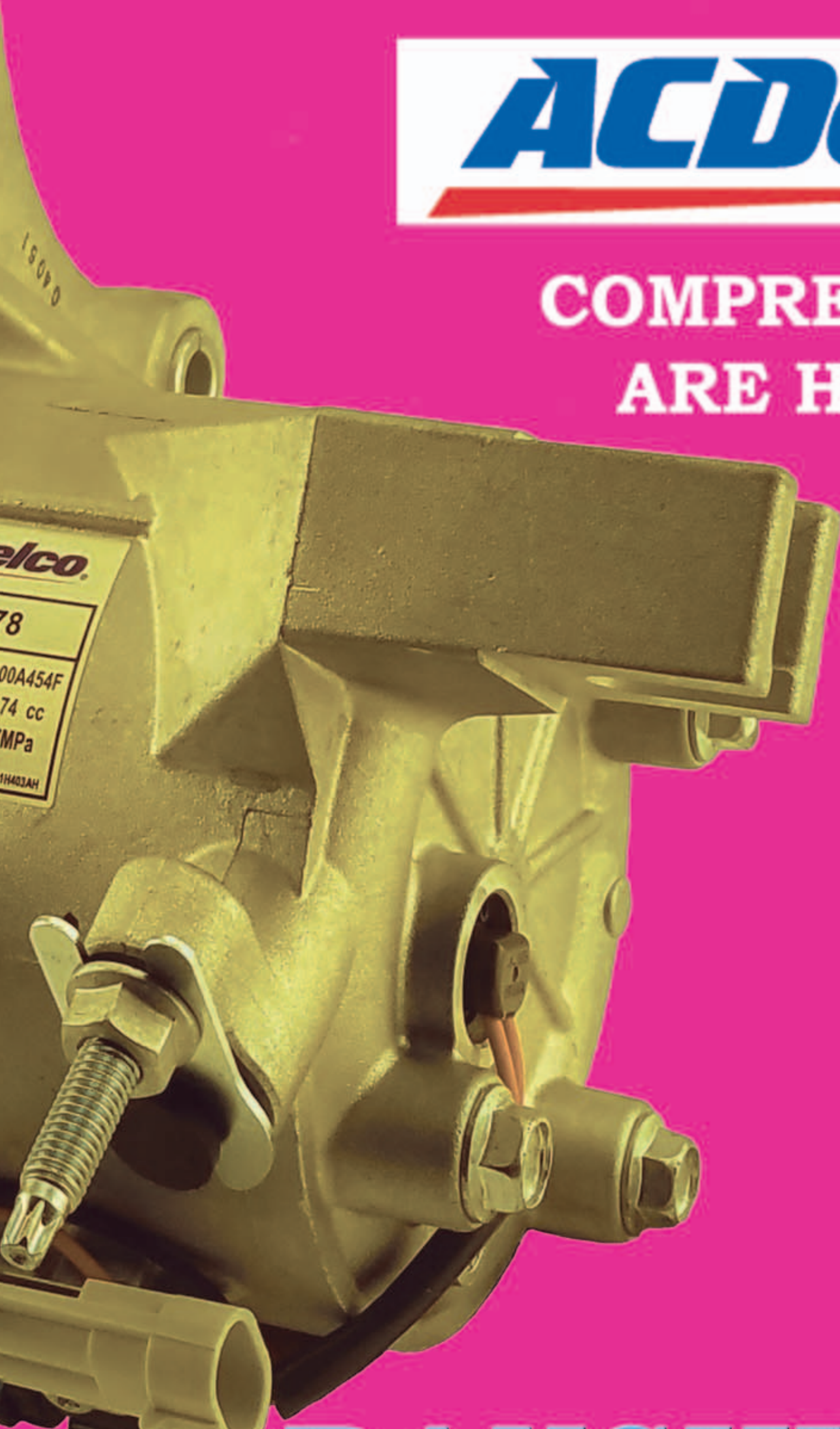
II fuel monitor has completed its scan for any possible DTCs. If the same DTC has again been reset, but this time shows up on the cylinder where the original injector from cylinder #4 was re-installed, the original injector from cylinder #4 is the cause for the DTC, and not the wiring between the injector and ECM, or the ECM itself.

Measuring the resistance of a fuel injector is a standard test, but it provides limited information regarding whether an injector is working. The test can only confirm whether an injector's internal coil is shorted to ground or open. One sure method to determine if a fuel injector is operating correctly is by viewing the injector waveform on a digital lab scope. The pulse from the ECM, as well as the fuel injector's reaction to the pulse, can determine injector operation. Also, a low current probe signal viewed on a lab scope can be used to verify if the fuel injector is working.

If a lab scope is not available, there are a number of simpler tests that will work and yield results most of the time, which can be used to indirectly confirm whether an injector is operating and/or receiving a signal from the ECM. The following are brief descriptions of four simple tests that can be used to confirm fuel injector operation. The first three tests verify that the ECM is, in fact, sending an injector pulse signal to the injector, while the last test checks for mechanical injector operation.

Test 1. Unplug the injector and connect a 12-volt test light between the two wires at the injector connector harness. Crank or start up the engine while watching the test light. If the test light

A MECHANIC'S STETHOSCOPE IS USED TO LISTEN to the operation of a fuel injector. If working properly, the injector should make a steady clicking sound and speed up in direct correlation with engine speed. If the ECM is not sending an injector pulse to the injector, or the pulse is intermittent, the stethoscope will allow a technician to hear the problem.



flashes, the ECM is sending an injector pulse to that injector. While a test light will work most of the time for performing this test, it's important to know this test will not work on all vehicles because some use a dropping resistor in the injector circuit that limits current going into the injector to keep it from overheating.

Test 2. Instead of using a test light, use a noid light that is specific to the particular EFI system or brand of vehicle being tested. A noid light has a low enough resistance to flash during the test, even when a dropping resistor is used and is more reliable than a test light to verify injector pulse from the ECM.

Test 3. This test uses an inductive ignition timing light to verify injector pulse instead of a test light or noid light. Clamp the timing light's probe around one of the wires going to the injector. Start or crank the engine and watch the timing light to see if it flashes — a flashing light provides confirmation that the ECM is sending an injector pulse to that injector.

Test 4. This final test provides a low-tech method for confirming whether a fuel injector is receiving injector pulses from an ECM. To do this test, simply take a long screwdriver and touch the end of it to a fuel injector and stick the handle end in your ear. If the injector is working, you should be able to hear a steady clicking from the injector as sound waves from the injector opening and closing are transmitted through the screwdriver. A wooden dowel, mechanic's stethoscope, or even a piece of vacuum hose will also work for this test as well.

Conclusion

K.I.S.S. — or Keep it simple, stupid — testing is often overlooked when working on late-model automotive technology. A good example of this is the last fuel injector test. Some technicians have no issues, nor are resistant to using a screwdriver or vacuum hose to verify fuel injector operation. Other techs, who exclusively use scan tools, lab scopes or smartphone apps for diagnostics, will argue that the test is of no value. Another example is the assumption that fuel pressure is correct on a poorly running engine. This can potentially waste many labor hours of diagnostic time, as not all vehicles are equipped with fuel pressure sensors that set a low fuel pressure DTC. One shouldn't forget that underneath today's technology is a four-stroke engine that hasn't changed its basic operation for more than 100 years. Electronic fuel injection has been around since the early 1970s and while today's multiport EFI systems have more processing power and more sophisticated sensors than older systems, they still meter fuel into an engine based on how long injectors are energized. To ensure that you get paid for your diagnostic time, don't go down the rabbit hole of high-tech diagnostics without checking the basics first.

I would like to thank SCM Hotline Diagnostics for help in researching this article. The company offers technical assistance to professional technicians in the automotive repair industry using their exclusive database. The subscriber-based program provides diagnostic assistance for both foreign and domestic vehicles manufactured from 1964 to the present, including those fueled by gasoline, diesel, alternative fuels and hybrid technology. For more information about the services they provide call 800-847-9454 or send them email at scm@autohotlineusa.com.

TRACY MARTIN has covered the powersports industries since 1998. He is also the author of six Motorbooks Workshop Series books published by the Quarto Publishing Group and is a regular contributor for *Motor Age*.
tracy.martin@yahoo.com

MASTERING YOUR METER

PRACTICAL MULTIMETER TIPS AND TRICKS

DAVE HOBBS // Contributing Editor

The most cost effective diagnostic tool you can own is the multimeter. The Digital Multi Meter (DMM), also referred to as a Digital Volt-Ohm Meter (DVOM) is to a technician what a chisel is to a woodworker. Most DMMs contain a digital voltmeter, digital ohmmeter and digital ammeter in one package. Many DMMs include a dedicated diode test and other useful features, such as a digital thermometer display and tachometer function when coupled with the proper accessories. You most likely are comfortable with terms like analog, digital and auto ranging, but you might want to get on the road to mastering advanced DMM features, such as 4 ½ digit mode, Peak-Hold/Relative Delta, Min-Max sampling rates and other practical multimeter tricks. To really know meters, we first take a quick look at why we have the kind of DMMs that we have today.

Meter evolution & input impedance

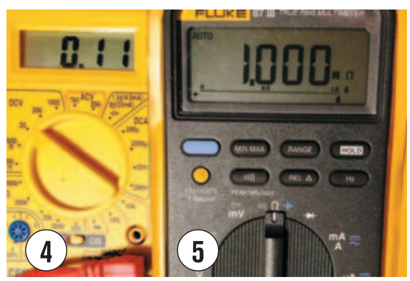
Let's take a look back on some equipment, like the analog multimeter. Like their modern digital counterparts, the quality and features of these instruments varied. Many of the lower- to medium-quality analog multimeters had internal impedances (resistance) that were low enough to load sensitive circuits like ECM 5-volt sensors to the point where a false reading occurred. Some could even damage the 0.45 voltage regulator inside the ECM that fed a bias voltage to the O_2 sensor signal wire. A very cheap digital DMM has the potential to do the same thing. Not all analog meters are low impedance, nor are all digital meters high impedance. For most circuits in the electronic systems you encounter on a vehicle, the high input impedance meter will be essentially "invisible" to the circuit and associated modules. Most DMMs on the market today have impedance specifications of either 1 MΩ, 10 MΩ or 20 MΩ. The higher the better, but with that often goes the cost. Avoid using a meter rated at less than 10MΩ to prevent false readings (see Figures 2-5).

Shopping for a new meter?

If you are considering updating your current DMM, besides looking for a minimum of 10 MΩ input impedance, look for an instrument that is rugged and has a large, easy-to-read display. A backlight is

PHOTOS: DAVE HOBBS

IF YOUR SHOP DOESN'T HAVE a quality analog voltmeter to connect to a charging system, you may want to hang on to an instrument like the one pictured. Watching for a steady or flickering analog voltmeter does have its merits with some types of testing. However, when measuring solid state-related circuits and circuits involving airbags, ALWAYS use a DMM rated with at least 10 MΩ impedance. This Simpson 260 meter has been in my dad's tool box since the 1960s. The exact model is still in production today!



TO VERIFY THE SPECS FOR YOUR METER'S INPUT IMPEDANCE AND OHMS OUTPUT VOLTAGE, simply connect two meters together. Turn one to volts and the other ohms. The meter in Fig. 2 is reading the voltage (0.652 volts) that the meter in Fig. 3 is putting out in its ohmmeter mode. The meter in Fig. 3 is reading the internal impedance (11.12 MΩ) of the meter in Fig. 2. The inexpensive meter in Fig. 4 is connected to the meter in Fig. 5. Notice the lower impedance on the meter in Fig. 5 (1 MΩ) from that inexpensive meter in Fig. 4. A 1 MΩ budget meter can lead to inaccurate readings when testing certain electronic circuits. This is clearly illustrated when you compare the reading displayed by the meter in Fig. 1 (0.65V) to the reading on the budget meter (Fig. 4 at 0.11V). Since both meters in Figs. 2 and 4 are measuring the same thing (a Fluke meter's ohmmeter voltage output), their DC voltage reading should be the same. Why is the meter in Fig. 4 displaying a reading much lower than it should? Because the meter's low impedance is causing the circuit it's measuring to be loaded down. Spend a few extra bucks and get a quality high-impedance meter that won't let you down on solid state circuits!

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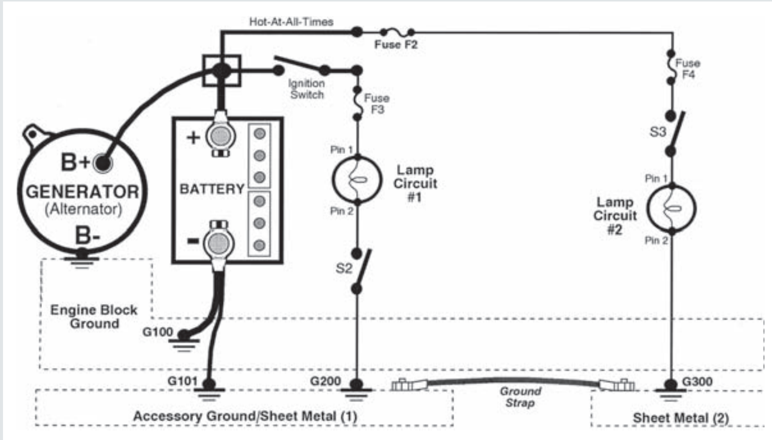
ONLINE EXCLUSIVE: GROUND CIRCUITS — PART 1

VINCE FISCHELLI // Contributing Editor

Part 1 begins a series of online-exclusive electrical circuit articles that focus on the ground side of the circuit.

There is some mystery about the ground side of the circuit among many technicians today. Why is that?

The mystery is caused by thinking of positive current flow in circuits rather than negative current flow. Positive current flow states that current flows from the positive (+) terminal to the negative (-) terminal of the voltage source to explain how "current" flows through a circuit. Since the positive post of the battery is the post that produces sparks when it contacts ground, technicians assume that is where the "juice" is. They note that if you ground the negative post of the battery, it doesn't cause sparks to fly because there is no "juice" there.



It seems logical to therefore assume that when a circuit is connected to a battery, the current flows from the positive terminal, through the circuit and goes to ground. Once the current goes to ground it "disappears," and you don't have to worry about it anymore. This idea has led a lot of technicians to ignore the ground side of the circuit as if it was not important. However, the ground side of the circuit is extremely important.

What actually happens in a vehicle circuit is that electrons (negative charges) leave the negative terminal of the voltage source and travel through the circuit back to the positive terminal of the same voltage source. This is referred to as electron current and is explained in this series of articles. Electron current is measured in amperes, abbreviated as "amps."

Continue reading at ***MotorAge.com/circuitspart1***

a must, as is a kickstand to set the meter upright. High-quality banana-type universal leads are essential. Here are th top 10 essential features to look for in a DMM:

1. Auto Off Function — keeps the meter's battery from running down
2. Auto Ranging Capabilities — reduces confusion when testing unfamiliar circuits
3. Min/Max/Average — for capturing intermittent problems
4. Hold Button — Allows user to freeze whatever is on the display
5. Frequency and Duty Cycle — for pulsing DC square waves and AC sine waves
6. Fuses for Ammeter's High and Low Current settings — prevents the meter from being ruined
7. Analog Bar Graph — for a visual quick look when testing
8. Diode test capabilities — to forward bias diodes while testing (superior to ohmmeter test)
9. Category III/1,000 Volt (or higher) rated — for working on hybrid/EV systems
10. True RMS rated — provides more accurate AC measurements

Many high-end DMMs sport lots of other features, but the 10 I've just listed are must-haves for a daily-use meter in the bay. Let's go over a few of these features and cover some advanced tech tips as well.

Auto ranging or manual ranging

Having to add digits in my head to determine if the reading on my meter is showing a good circuit/component or a bad one is not the easiest task. Add to that the fact that when a manual ranging meter is used in diagnostics there will be lost time for most techs just trying to guess what range to start with (Figures 6, 7).

Min/Max/Average

To use this extremely helpful function, set up your Device Under Test (DUT) or circuit and start measuring ohms, amps, volts, duty cycle and frequency just like always. If you suspect an intermittent connection in a circuit or module, ensure you have rock-solid connections with your meter and go to town tapping, tugging, flexing, heating, cooling, road testing, etc. while the meter is in Min/Max mode. When you're satisfied you've recreated all the gremlin-producing maneuvers you can think of, go back to the DMM and press through the Min/Max button sequences to observe what the extremes were. On most DMMs with this feature, an average value will be one of the sequences in addition to the minimum and maximum value the meter recorded. Many DMMs, such as Fluke, allow for the speed of the samples of values captured during Min/Max functions to be changed (Figures 8, 9). In most cases, faster is better.

REL Δ or Relative Delta

On some meters, the abbreviation "DEL" next to a triangle symbol is the button for this function. On other meters, the button is simply marked "ZERO." The triangle symbol represents the Greek letter we call "Delta." Sometimes Delta refers to a rate of change. In the case of DMMs, "rate of change" is the most descriptive term for this feature. Oftentimes techs spot this button, clip their leads together and turn the meter on to Ohms. They know that when they are measuring a small bit of resistance in their leads they can press that button and the ohmmeter will go from 0.2 ohms (for example) to 0.0 ohms. So it zeros the ohmmeter, right? Well, kind of. Relative Delta actually takes whatever the meter was displaying and sets that as the "new zero" reading. Any changes in the measurement from that point forward then registers on the meter. This function is not only useful in watching for a change in the resistance of a good connection when you wiggle and tug on wiring, but it can be used for virtually any other function of the meter. It's an alternative to looking at the meter and thinking "did this circuit just lose volts or was it at this voltage all along?" Relative Delta will tell you exactly how much was lost or gained. This feature should be used only on circuits that are steady. You wouldn't use REL Δ to sweep a TPS signal. The "0" you are looking to maintain will quickly begin to vary even though there is nothing wrong with the circuit!

SOME DMMS HAVE A FIXED RATE FOR CAPTURING GLITCHES. This Fluke model 87 III series allows the user to enter the MIN/MAX mode and select the speed for updating the MIN/MAX recording samples by pressing the button marked "PEAK MIN MAX" to change from the default of a 100 ms capture rate (Fig. 8) to a 1 ms capture rate (Fig. 9). The "HOLD" button is featured on a variety of quality DMMs on the market. It is a very useful feature if you are trying to catch intermittents. When your meter's display changes to a value indicating an intermittent problem may have occurred, press the "HOLD" button to freeze whatever is on the screen to allow you to scrutinize the value more thoroughly. "Buttonology" varies greatly from DMM brand to brand and even model to model. Make sure you can access the user manual for your DMM to determine what advanced features it has and how they may be accessed to help you get more from your meter!

TURN THE MANUAL METER TO THE RANGE OF VOLTS, amps or ohms (Fig. 6) that your DUT (Device Under Test) is closest to. The problem is that many times we don't have a clue where to start unless the DUT is a 12-volt circuit, coil primary winding or some other obvious item. The chart in Fig. 7 can help you get started if you're not sure where to start. When in doubt, always go with the highest range and work your way down until you're displaying a reading that's applicable. Or better yet, update your meter to an auto ranging model that powers up in auto range mode and allows you to manually select a range, if you so desire, giving you the best of both worlds.

7

	Component	Action	Result
1	Secondary Circuit of Ignition Coil	Scale down to over range	2k scale
		Go up one range	20k scale
		Reading	8.10
		k = Move decimal 3 places	8100 ohms
2	A/C Clutch Coil	Scale down to lowest range	200 scale
		Reading	4.1
		Value	4.1 ohms
3	MAF Sensor	Scale down to over range	2k scale
		Go up one range	20k scale
		Reading	2.09
		k = Move decimal 3 places	2090 ohms
4	Ignition Wire 12"	Scale down to over range	2k scale
		Go up one range	20k scale
		Reading	4.28
		k = Move decimal 3 places	4280 ohms
5	IAT Sensor	Scale down to over range	20k scale
		Go up one range	200k scale
		Reading	23.9
		k = Move decimal 3 places	23900 ohms
6	EGRP Sensor	Scale down to over range	2k scale
		Go up one range	20k scale
		Reading	4.14
		k = Move decimal 3 places	4140 ohms

More digits — 4½ digit mode

When measuring something like a power ground, it's not that important whether the resistance in that ground circuit is 0.3 or 0.2 ohms. If that ground is for a radio antenna or CAN bus shield wire, the hair splitting can matter. Meters vary in how they allow you to enter this higher resolution mode, but the ones I've had with the feature have a button marked "4½ Digits" that you hold down while you turn the meter from off to your desired measurement category. Instead of one decimal point to the right of the whole number (ohms), there are now two. This is called a "Power Up" setting. These are just a few tricks and tips on mastering multimeters. Do a little research on the multimeter in your toolbox and start using the meter tricks that help you with your diagnostics! MA

DAVE HOBBS is a field trainer and training product developer for Delphi Product & Service Solutions. He holds ASE CMAT/L1 and EPA 609 certifications and is an experienced hybrid instructor. Dave has been featured as an instructor in more than 15 automotive training videos.
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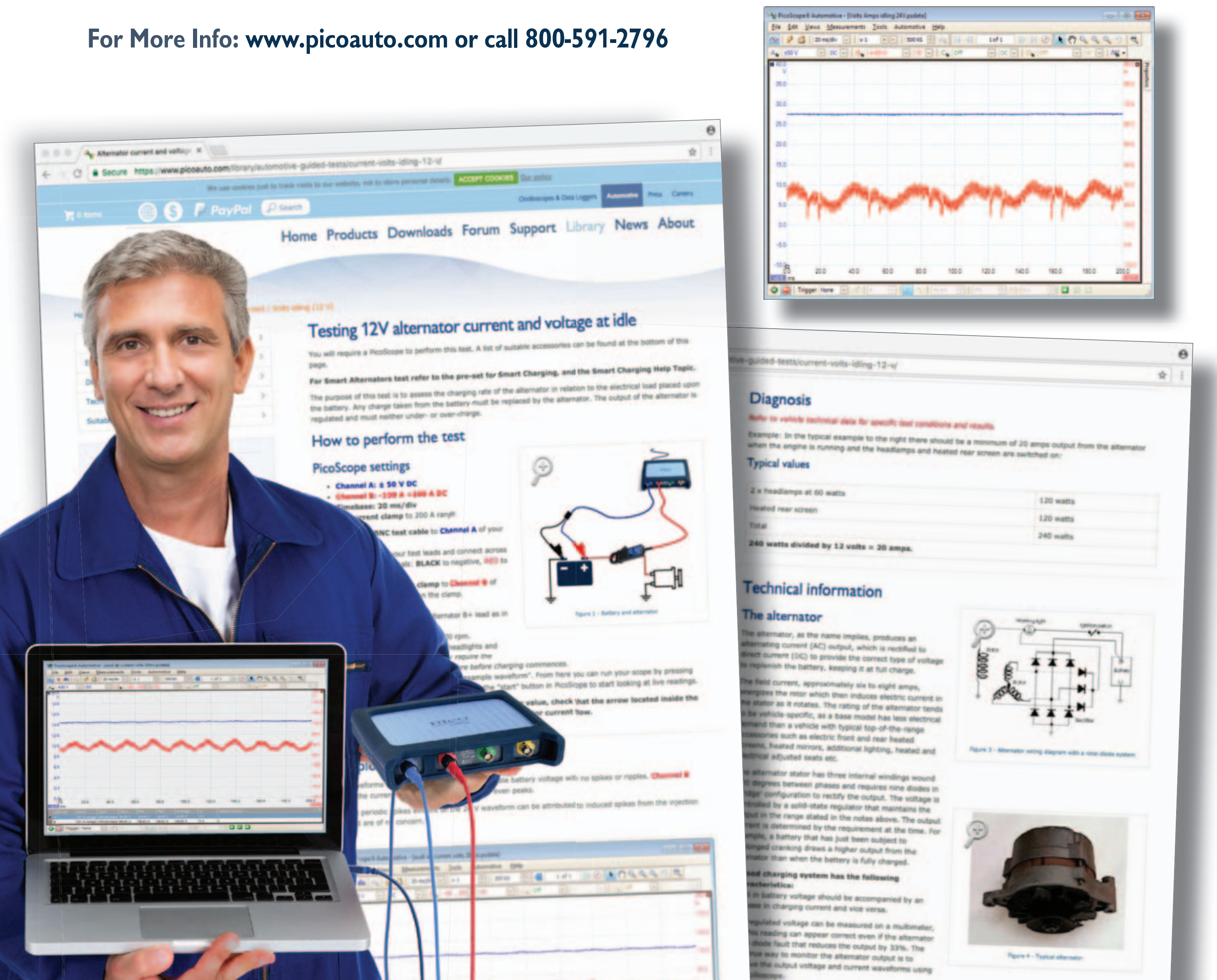

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FIRST-TIME MISTAKES

REPAIR ERRORS CAN COST YOU IN MORE WAYS THAN ONE

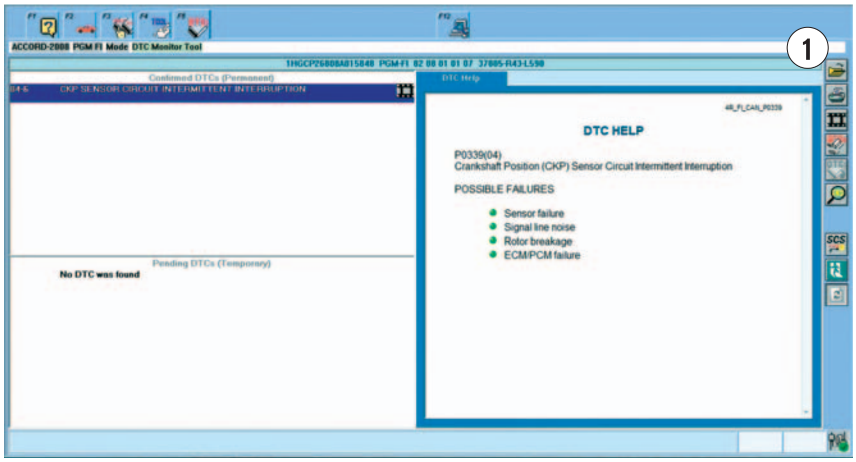
G. JERRY TRUGLIA // Contributing Editor

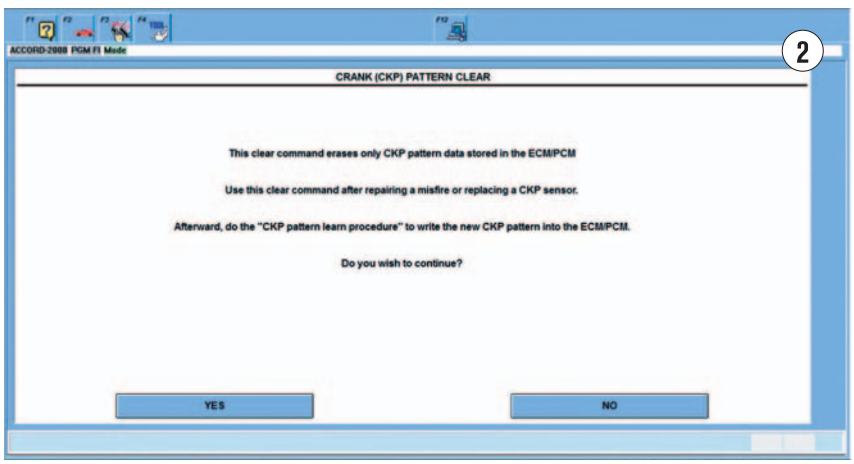
To err is human; to forgive, divine is a phrase that you may have heard at one time or another. In the automotive business, however, an error could be very costly and just may not be forgiven by the vehicle or owner. In this article, I will provide you with real-world shop mistakes that I and others have made. Some are costly in time or parts that both affect the shop's bottom line; and, in other cases, costly in terms of one's reputation.

Our first tale

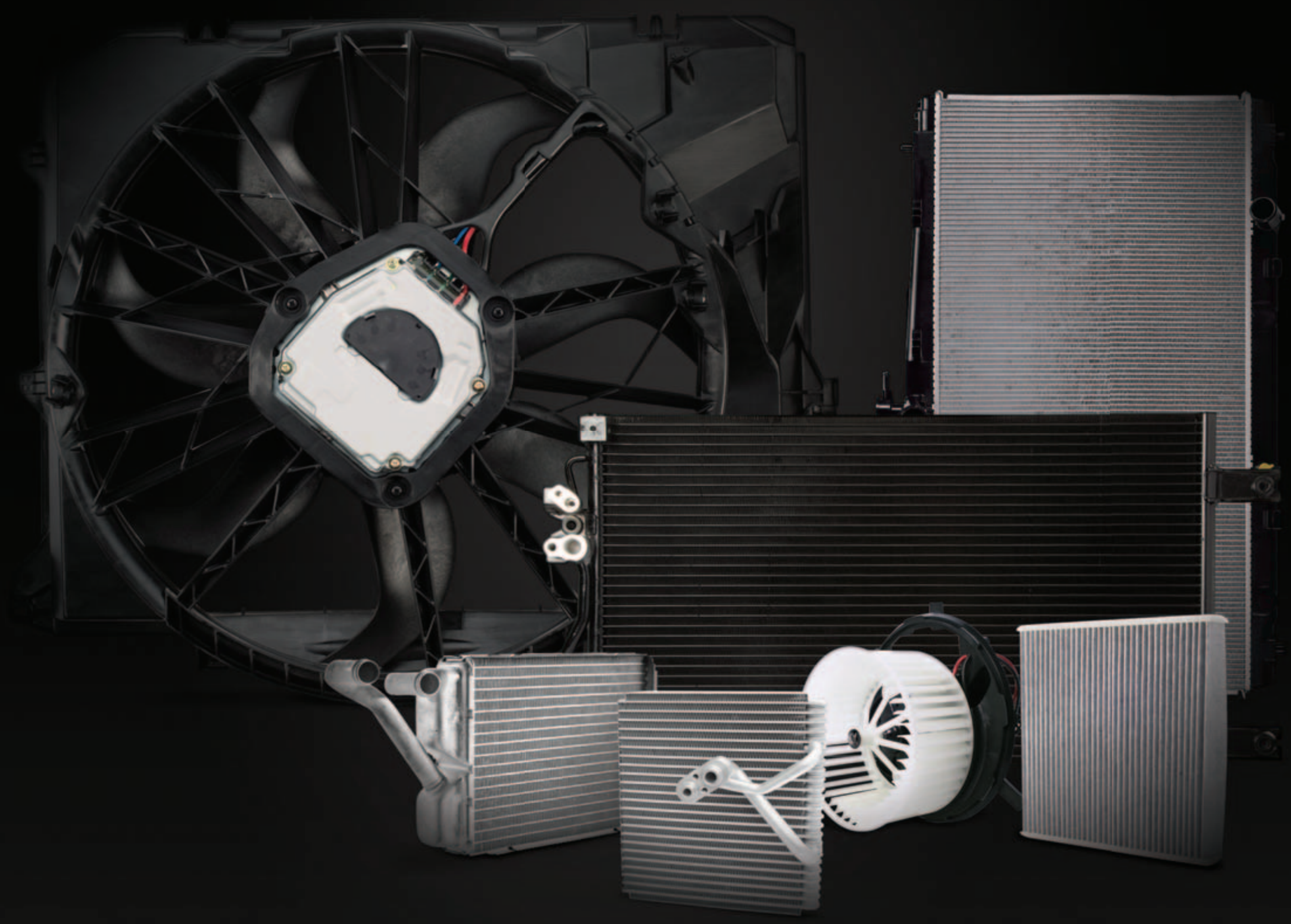
One of the problems that we encountered in our shop recently was on a 2008 Honda Accord with 125,000 miles that had come back after a timing belt and tune up were performed. The owner returned to our shop because of an illuminated check engine light that resulted from an engine misfire. After the tech connected the Honda factory scan tool, he retrieved the misfire DTCs (Figure 1) along with a P0339 Crank Sensor DTC. It's never good when a customer returns with any problem after a repair has been recently performed on their vehicle. The return of the MIL light is the telltale sign that the vehicle's computer system sees something wrong and is going to alert the driver. There is no way, at least with drivability issues, that you can hide from doing it right. So, we had to handle the vehicle owner very carefully and be honest with her on what the problem was. We explained what went wrong and caused the MIL light to illuminate and what we were going to do to make it right.

Before we dive too deep into this misfire and crank sensor problem, a good suggestion would be to read up and understand the DTC description before moving forward. Since this looked like a simple problem that may be the result of a possible defective ignition part, the tech performed the usual diagnostic routine. Well, in this case it was a lesson that was going to be learned the hard way. Since many technicians would start testing the ignition and fuel system as the first part of the diagnosis, they would not find the root cause of the problem on this Accord. The next logical step that the technician would most likely perform is checking the crank sensor and possibly replacing it without repairing the problem. Some of the first steps to perform are having a vehicle owner Q&A, visual inspection, system scan and a TSB check. In this case, there was a TSB for this Honda that describes the DTCs and lists the potential problems,



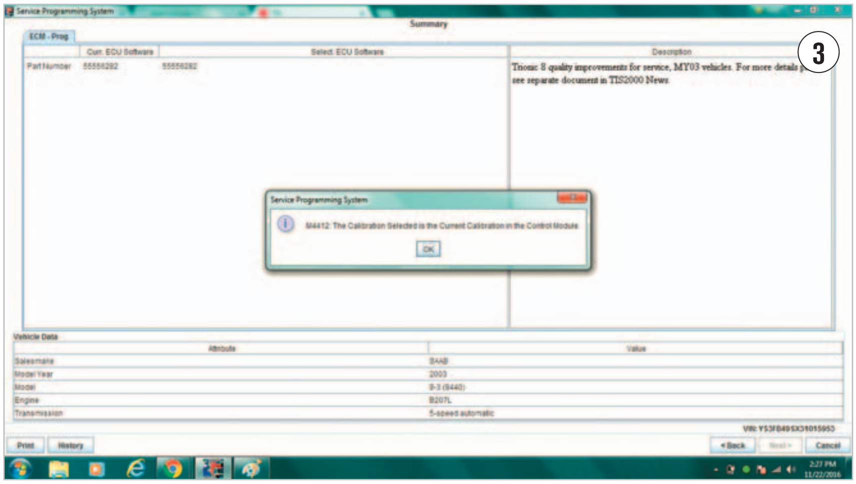


PHOTOS: G. JERRY TRUGLIA



such as a weak battery that can cause the P0339 DTC. Reminder: It's also a good idea to check service information and TSBs on every vehicle you work on. After all, you don't know what you don't know. My technician checked the crank sensor and the circuit without finding any problems. After checking the vehicle for over an hour, my tech was still baffled on what the root cause of the misfire could be. He decided to ask me if I had any idea what was causing the problem since he could not pinpoint it.

I proceed to check all the basics from the battery, engine mechanical condition, ignition and fuel systems, as well as the CKP circuit, only to find the same results as my tech. My suggestion was to perform a Crank Relearn procedure (Figure 2) on this vehicle, since it's the procedure that Acura/Honda recommends. I connected the MVCI along with the Honda factory software, showing and explaining the procedure to the technician so he could get a better understanding of the problem. Once the procedure was complete, the vehicle was road tested, then returned to the owner without any DTC or MIL illuminated. We assured the vehicle owner that her engine was in very good condition and all the issues were addressed. We explained that there was really nothing wrong with the work we performed on the engine, but by accident we forgot to perform the relearn procedure. The vehicle owner left our shop with a smile and even called us about 10 days later to tell us that the Accord was running great.



Lesson No. 2

Our next mistake was on a 2003 Saab 9-3 that had a DTC P1681 Control Module Internal fault that one of my techs brought in the shop for his cousin. After my tech checked all the basics, he confirmed that the problem was in the ECU. This problem on the 9-3 had only one fix for the P1681 DTC and that was to replace the ECU and program it. Since we all know that Saabs are no longer made, my tech went the cheapest way and found a used ECU to install. With the new ECU installed, his next step was to program it with the correct information by updating the programming file. Without asking anyone else in the shop, he proceeded to program the car with a J2534 tool (Figure 3), rather than using our factory Saab tool.

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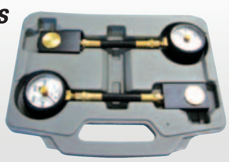

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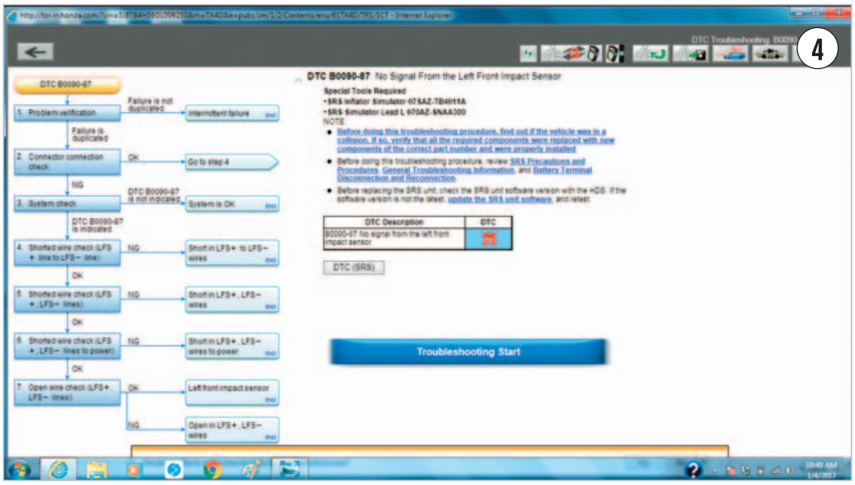
It's wasn't his first time programming a vehicle, but there are some things that he just did not know about programming a Saab. After trying the program procedure two different times without success, you would think he would have asked one of us for some assistance. Not sure why he didn't ask, but he decided to wait for the weekend and contact one of my students. Jamie is a good technician that already took his lumps with a Saab and is knowledgeable and helpful, so he showed my tech the correct procedure. Jamie explained that the only way the vehicle could be programmed was with the factory Tech 2 Saab scan tool. When it comes to programming a Saab, you must go through the Tech 2 scan tool and not a J2534 device. Sometimes you just have to ask others for help and not be embarrassed to say you don't know everything. Once the procedure was properly performed on the 9-3, the vehicle ran great without any DTCs.



On to No. 3

A 2016 Acura RDX came in from one of the body shops we do work for because it was involved in an accident and had two codes stored: BD0090-87 DTC (No Signal from the Left Front Impact Sensor) (Figures 4, 5) and B18C7 (Blind Spot System) error. Since this is a new vehicle, the only way we were going to diagnosis it was by connecting our Honda factory scan tool. With the scan tool connected, DTCs were visible, along with helpful information on what to check and test right in the scan tool.

As you can see (Figure 5), the BSI (Blind Spot System) indicator problem could be everything from an open in a wire or connector to a bad connection. We decided to tackle this problem first since it looked the easiest out of the two DTCs. We performed all the suggested checks and did not find a problem, so we performed a drag test on the BSI indicator connection along with applying Stabilant 22, then retested the circuit. The good news was that this problem was now repaired, but now we had to move on to the tougher of the two problems.

With our attention now directed to the BD0090-87 DTC, we first tried to clear the DTC again only to find it would not erase. This result meant that we had a hard code that was caused by either an open circuit, a defective impact sensor or defective SRS computer as per Acura/Honda factory information. The body shop stated that they had replaced the impact sensor and the SRS computer with new Acura parts. After performing all the system checks, wiring and connector checks, we did not find any issues that would cause this hard DTC. I called the body shop and inquired about the impact sensor, asking if they knew where the old part was. The body shop informed me that the impact sensor was replaced with an updated part number and that they were sure it was installed correctly. I stopped him to ask if he was sure that there was an updated sensor for this vehicle. He replied that his information system that he uses for collision work provided him with that information. I suggested he locate the original part and please drop it off so I could check it out. The body shop located the old left front impact sensor and dropped it off.

While examining the impact sensor we noticed that the part looked the

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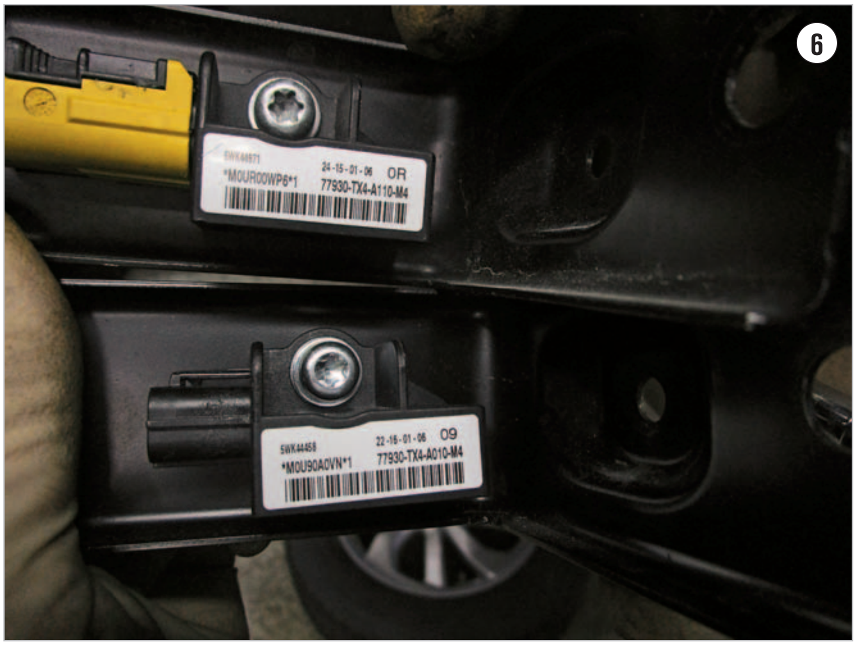
same but the numbers did not match (Figure 6). For the hell of it, and since we could not find anything else wrong in the circuit, we thought we would plug in the old sensor to see if we could clear the DTC and prevent it from returning. Bingo — the old sensor cleared up the DTC, along with removing the message from the dash display. Our conclusion was that the old sensor was good and the new one was either bad or it was the wrong part.

The Acura was not finished just yet. Due to body repair regulations, once a vehicle is involved in an accident, the sensors and computers for the SRS system are required to be replaced. It would now be up to the body shop to contact the dealer and get the correct Left Front Impact Sensor for the vehicle before returning it to the owner. The lesson learned here is to never fully trust a part information system or parts person 100 percent, since the part was obviously wrong. With the new Left Front Impact Sensor installed, the vehicle was back to proper operation with no codes or warning messages displayed.



And the lessons continue

A 2008 Mercedes-Benz ML350 with 254,697 on the clock came in with a bunch of different problems from the common intake manifold to the tail lights staying on all the time. Our customer's issue with the rear tail lights staying illuminated even when the vehicle was turned off, along with the icon for the rear hatch being illuminated, killed the ML350 battery. The vehicle owner stated he noticed that the lights were not turning off, but since the vehicle started, he just keep driving.

I am happy to report that my technician performed the proper diagnostic procedure, finding the issue with the lights staying on, as well the problem with the hatch light illumination. Since the rear hatch door assembly was worn and damaged, he installed a new one. With the new part installed, the hatch closed properly, but the hatch warning light was still on. The rear lights were now off and the rear hatch was closing and locking properly, but the mistake was that the SAM was not properly programmed before the vehicle was returned to the owner. So even though all the correct parts were replaced, including the SAM (Figure 7), it had to be programmed or there would still be issues. The tech thought that since the rear lid closed properly and the rear lights were now off, the vehicle was fully repaired. Well, we received a call from the ML350 owner complaining that his seats and mirrors were not adjusting to the driver preset position, and they could not be moved manually. We told him to bring the vehicle back in. Once the vehicle was back in the shop, my other technician connected the scan tool and programmed the SAM, making sure everything it controlled on the CAN BUS worked properly. For his inconvenience, we gave the vehicle owner a credit for his next oil change, helping ensure his return to our shop. We explained that the programming of the new module was not executed correctly, and that was causing his seat issue. We performed a checkup of all the vehicle systems by performing a complete vehicle system scan. We provided a printout of the system scan to assure him that all was now good with his Mercedes.

Last lesson for today

Now on to our last vehicle, but I'm sure this will not be our final lesson learned, as we are human and most likely capable of making a mistake in the future. This vehicle came to us from a different body shop than the one I mentioned before with a dash light illuminated for an adaptive headlight issue. The vehicle was a 2013 BMW X5 that had been hit on the right front side of the vehicle. The body shop replaced all the sheet metal, including the fender, hood, grill and headlight assembly on the right front side of the vehicle. The body shop thought the only thing that needed to be done was to clear the DTC and adapt the headlight. Well, the DTC could not be cleared because this was

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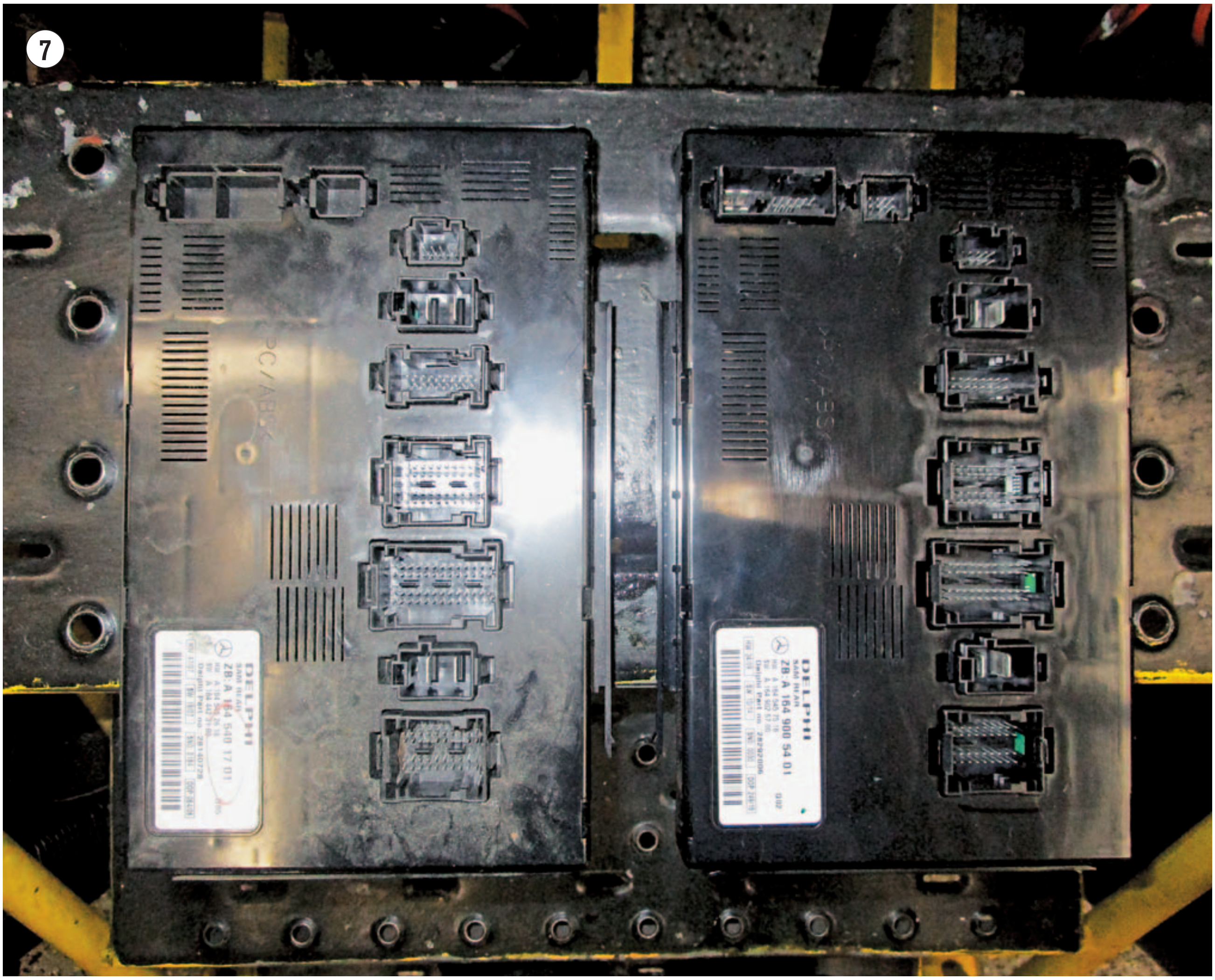
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a hard code for an open circuit. Having seen this problem before, I called the body shop and told them they most likely forgot to remove and install the motor assembly from the old unit to the new replacement unit.

The body shop was adamant that the assembly was installed with all the parts correctly. In fact, they were dropping off another vehicle to diagnosis that the owner of the body shop was delivering so he could personally read me the riot act. He said he was 100 percent sure that I was making a mistake and should just get the headlight coded and clear the DTC. Rather than getting into a drawn-out argument with him, I assured him we would get the headlight working. After he left, we removed the right tire and fender well to access the headlight assembly. The headlight was installed without the motor assembly.

I called up the body shop and told him that I had pictures, along with access to the headlight assembly, so he could see for himself. I suggested that he look around his shop for the original assembly and bring it to us if he wanted the headlights to work properly. Lucky for him, he found the old assembly in the dumpster, or he would be calling the dealer and spending a lot of money on the replacement headlight motor that the insurance company would not be paying for. Once he brought down the old assembly, we showed him where his tech had made the mistake. We fixed the vehicle, but did not receive an apology. We don't know everything, and we learn something new every day. So, it is not a bad thing to admit when we are wrong and apologize for our mistakes.

G. JERRY TRUGLIA, ASE World Class Triple Master Technician Auto, Truck & School Bus, L1, L3, F1, A9, X1 C1, is president of Technicians Service Training and a nationally recognized trainer/author. He founded TST to bring affordable training to fellow techs and owners.
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SEND IT TO THE DEALER?

A FEW SIMPLE DIAGNOSTIC TRICKS CAN KEEP WORK IN YOUR BAYS AND IMPROVE YOUR BOTTOM LINE

A THICK LAYER OF DUST AND SALT is covering the sensor located in the lower corner of the bumper. It's still securely mounted and not cracked, so it just needs to be cleaned off.

VANESSA ATTWELL //
Contributing Editor

Even though newer vehicles can be complicated to diagnose and repair (and very expensive to misdiagnose) it's still very possible — and often profitable — to do the work yourself rather than send it along to the dealership to be fixed.

True, dealership technicians often have access to special tools and help from technical assistance centers to make diagnosing and repairing challenging problems easier, but quite often seemingly complicated problems can be repaired successfully without going to the dealership by using a good scan tool, detailed service information and vehicle-specific wiring diagrams if you've prepared for the challenge and done a bit of research beforehand.

It is possible, and people do it successfully every day.

Obviously, that doesn't mean it's a good idea to just open the hood and start stabbing connectors wildly, hoping for the best — in fact, quite the opposite is true. Understanding how possible problems could develop in a system and then understanding what it takes to fix them is now more critical than ever. For example, some newer high-end vehicles will need to have every single one of their modules reprogrammed if the vehicle's battery goes dead, which can take hours. Yikes! So knowing what you're getting into is critical to keep work on track and problem-free.

But if you're facing a diagnostic challenge, and you've got a systematic plan of attack, good diagnostic tools and a few clever tricks at your disposal, you may well be able to diagnose and repair the vehicle right in your own bay profitably and without undue stress or aggravation.

Here are a few tips to help out along the way.

PHOTOS: VANESSA ATTWELL

Preliminary checks

True, there are times when sending a vehicle to the dealer is the smartest move. For example, when a special tool is needed and you rarely service that type of vehicle, so it's not worth purchasing it or getting involved at all — that's an easy situation to pass on.

But in other cases, such as failed emission tests, MIL lights illuminated or communication issues on relatively common vehicles, it's wise to check a few things before passing on the job. Even a 10-minute inspection can be well worth the trouble.

For example, a minivan came in with an airbag light on and a code stored indicating a problem with the passenger seat sensor. Quickly inspecting the area revealed a water bottle had been jammed underneath the seat, pressing upwards on the sensor, which created a negative pressure signal and set the code. Removing the stray bottle solved the problem. Easy.

In another instance, a small, high-end import came in for a complaint of no power on acceleration. A quick check revealed a rodent's nest in the air filter compartment (a common event for farm vehicles, but this vehicle was always parked indoors at a downtown condo). There was no sign of the critter, but clearing out the nest and installing a fresh air filter fixed the problem quickly and effectively.

SALT AND ROAD GRIME is covering the forward camera. Clearing it off is a nice professional touch.

So in other words, it's worthwhile to quickly ensure there's no obvious problem with the vehicle before simply closing it up and sending it away. After all, you never know — you may get lucky and find the problem right away.

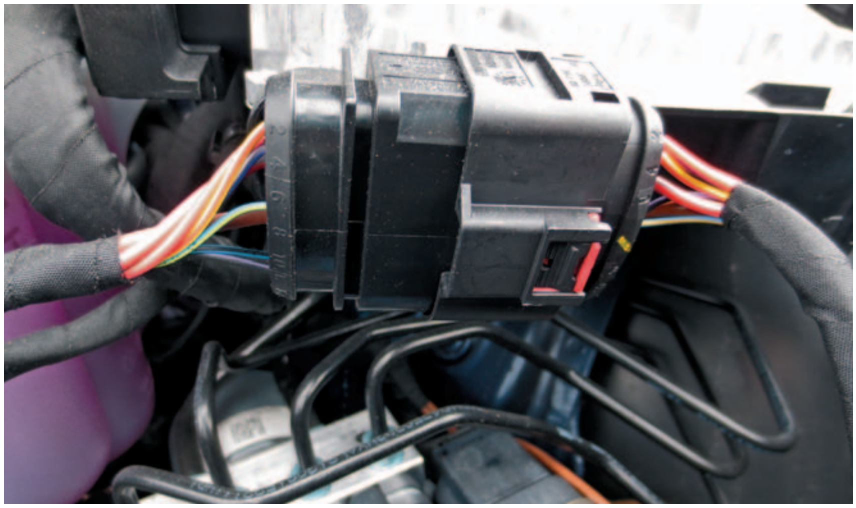
In particular, during your inspection ensure that any sensors exposed to the elements are intact (not cracked), securely mounted and free of mud and debris. Since so many newer vehicles have plastic front bumpers that catch on concrete curb stones used in parking lots, this is a fairly common area to find cracked or damaged sensors or mounts that affect system operation. Quickly looking at the front of the vehicle can be well worth the time.

THE TINY WARNING LIGHT on this 2017 Audi A4 Quattro indicates a problem in the forward warning system — part of the pre-collision system. It's worth having a quick look around before sending this off to the dealer for repair since it might be a simple fix.

Since poor-quality replacement windshield glass can cause problems ranging from noise and leaks to cruise control malfunctions, it's worth checking for signs of recent replacement if the problem you're chasing is related to systems that use sensors or cameras in that area. Unfortunately, fixing the problem involves replacing the windshield again, using parts that won't interfere with the system operation — not likely something the customer is going to want to hear.

Also look for any recent repairs including any suspicious-looking replacement parts or harnesses routed at extreme angles that just don't seem right. If the repairs weren't done correctly or poor-quality replacement parts were used (or wrecker parts that don't quite match the system or vehicle), that may indeed be the cause of the troubles. Newer vehicles have very strict tolerances and even tiny differences can affect system operation.

One tip to keep in mind is that from experience, it's usually not a good idea to randomly wiggle harnesses while doing the preliminary inspection on a



TRY NOT TO WIGGLE HARNESSES and connectors too much during the initial inspection since it may inadvertently fix the problem without positively identifying what fixed it.

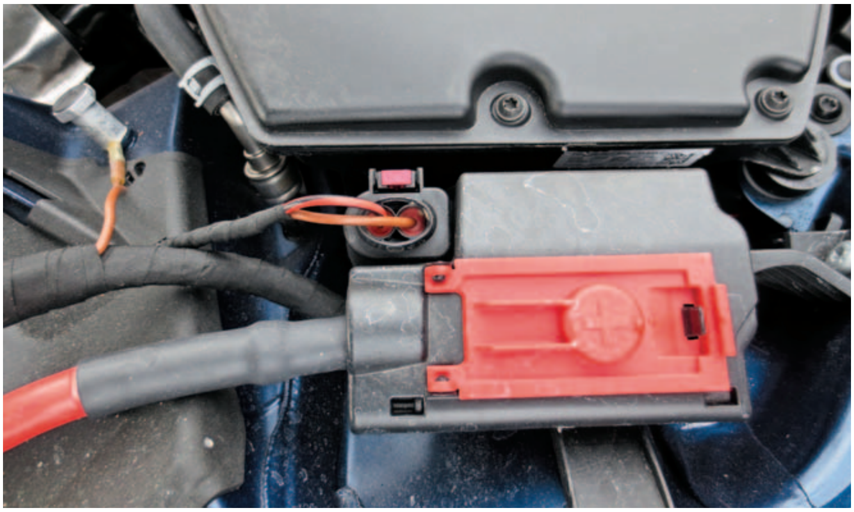
vehicle with an intermittent problem since shifting the harness may inadvertently fix the problem without actually being sure what fixed it. Wiggle harnesses after the diagnostic tools have been set up so that any fluctuations or changes can be monitored, positively located and the problem can then be repaired so the vehicle doesn't return with the same issue later on. Come backs definitely aren't good for business.

And, as ever, look for poorly installed alarm systems, lighting systems or accessories that may be causing problems. These systems can actually keep causing problems even after they've been removed if the removal wasn't done carefully. One customer had an intermittent no-start condition on his Toyota RAV-4, which was traced to an alarm system with a remote starter that a friend had attempted to remove for him a few months earlier. The harness was so badly damaged it took hours to repair, but afterward the problem was indeed fixed and the vehicle's intermittent no-start condition never returned.

In addition to looking for any accessories that have been installed or modifications to existing systems that may be causing problems, it's worth checking to see if the vehicle's software was changed to increase or modify engine performance in some way. Thanks to the Internet, do-it-yourselfers can reprogram their own vehicles quite easily, and the results aren't always as flawless as expected. It pays to quickly check early on in your diagnosis.

And also make sure to check all of the fuses in all of the fuse blocks, on both sides of the vehicle and at both ends of the vehicle, especially for problems that involve modules communicating with each other. Newer vehicles have an awful lot of fuses, and checking them all is critical. It helps to look at the entire wiring diagram to make sure you've inspected them all, not just the little section that's often included with a description of the system. This will also show all of the fuses and splices in a circuit, too. You may need to hunt or click around a bit to find the complete wiring diagram, and it may help to print it all out, tape the pages together and use colored highlighters to trace the circuit completely from power to ground — it can make finding the problem much easier. Turning away a job that could easily be fixed by replacing a hidden fuse is not a good idea.

Additionally, make sure any sensors inside the vehicle haven't been covered up by coffee holders or papers or the like and that nothing is physically



CONNECTORS AND TERMINALS tend to be the weakest links in the system, so it's worth checking terminal grip carefully if you're chasing down an intermittent problem.

interfering with (or spilled on) critical parts of the system. Humans and environmental issues still find ways of disrupting even the most intelligent vehicle systems.

One final point — make sure the system isn't just operating as it's intended to. Many systems shut off automatically after a certain amount of time or won't operate when it's raining, snowing, in 4WD, or the ambient temperature isn't within a certain range. Reading the owner's manual or the description of the system operation can prevent chasing problems that don't actually exist — and also prevent expensive embarrassments.

TSBs, programming updates, tech tips and pattern failures

If the preliminary inspection doesn't identify the cause of the problem, there are a few more diagnostic tricks that may pinpoint a problem so you don't need to send the car away — if you have a good scan tool and good service information at hand, that is.

One important note though — it's wise to make sure the battery doesn't go dead during diagnosis or repair because the battery may then need to be replaced (not simply recharged), and the customer may not be happy about paying for it. One customer took his Equinox in (to the dealer) for a no-charge programming update and was handed just such a bill for a new battery when it couldn't be successfully recharged after the repair. He wasn't impressed to say the least.

Actually, checking battery voltage and strength beforehand is an excellent idea anyway since even a difference of .1 v below specification has been known to cause problems with the electrical systems on newer vehicles. In other words, any battery problems need to be fixed before any other diagnosis happens to avoid wasting time and resources, and it's best to know this right away. A good battery is essential for the vehicle to operate correctly.

From experience, many of the diagnostic challenges that roll into service bays can only be fixed by replacing or reprogramming modules (or replacing and then reprogramming modules), so checking for applicable TSBs and updates early on is critical. Since customers also use the internet and know this, it's wise to ensure that a wrecker, alternate source or donor module hasn't been used in an attempt to save money and fix the problem frugally. The modules might not be compatible or programmed correctly and any problems you're chasing may be the result of the frugal fix.

This issue of mismatched modules might come up if you're using global scan tool data to see if any codes are present rather than specific scan tool data that can help diagnose problems and monitor parameters. Global data is quick, but it's not what you need for complicated diagnostic problems. Take the extra time and get specific data for the vehicle. Understanding what the tool is telling you and how to test systems is essential to fix the vehicle correctly the first time.

One experienced technician who works on a dealer's help line has said a few times that too many technicians still look at a scan tool like it's a Rubik's cube, and it simply doesn't need to be that way anymore. Scan tools are there to help, and there's more information available than ever before (some phone apps can even do output tests) and it's just a matter of practicing and learning what to expect from the equipment.

FIVE THINGS TO CHECK BEFORE SENDING A VEHICLE TO THE DEALER

1. Preliminary inspection for damage, debris, any previous repairs gone wrong
2. TSBs, programming updates, tech tips and pattern failures
3. Scan tool data, stored information and output tests
4. Wiring diagrams, pin and terminal grip and integrity, common splices and related problems on the vehicle
5. Swap parts from another (known good) vehicle or another area of the vehicle

However, in the interest of saving time, be sure to check for service tips and for any pattern failures that have been identified. The reality is that these simple checks save time and can help quickly pinpoint a problem so you can fix it quickly and go on to the next challenge. Diagnosis can be tough, so it's wise to use all the resources available to get the job done quickly.

Wiring diagrams, pin and terminal grip and integrity and related problems on the vehicle

If all the modules are communicating and the programming is indeed correct and current, there are still a few more things to check before sending the vehicle away — in particular, checking known problem areas like connectors and splices.

In the old days, diagnostic techs used to check the ground straps and ground bolts when chasing hard-to-find problems. That's still excellent advice, but from experience, tough-to-find problems are now more commonly caused by poor terminal grip and issues that develop between connectors and splices rather than from resistance in ground paths, so if you're chasing a problem that's tough to locate, it's worth checking the connectors carefully.

Connectors on newer vehicles can't take being disconnected and reconnected more than a few times before the pins lose their grip and problems develop. Additionally, the tiny micropins used in many body harnesses have been known to actually break off and get stuck together, creating intermittent problem as they shift around inside the plastic housing. Visually inspecting connectors for damage and checking that the connectors still grip may identify tough-to-find problems without sending the vehicle to the dealership to get fixed.

One good diagnostic tip that might help is to make note of any other symptoms in the vehicle and then use the wiring diagram to check if any of these problems share a common element, such as a pass through, junction block, connector or splice. If so, it's worth investigating the shared area a bit more closely because the problem may indeed be in that area.

YES, IT'S COMPLICATED, but it's still quite possible to repair many problems yourself rather than sending a vehicle off to the dealership to be fixed.

And if all else fails, swapping in a known good part from another vehicle or another location on the vehicle may not be a glamorous strategy, but it's an old trick that still works to locate tough-to-find problems (this doesn't apply to programmed modules; they often can't be switched between vehicles without causing big problems).

For example, swapping the location of a suspected bad ignition coil to see if a misfire moves can be helpful and conclusively diagnose the problem. Or swapping extremely expensive headlight components from side to side (if possible) can help pinpoint a faulty component before ordering a new one. Swapping is definitely not a strategy techs brag about, but it's often one that's effective, and one many dealer technicians themselves have used at some point to save time. Sometimes the old tricks are still the best tricks, even on newer vehicles.

Conclusion

It makes financial sense to send certain jobs to the dealership rather than wasting time and resources fixing them yourself — but that's not always the case. In fact, certain independent repair shops make excellent money by taking on the diagnostic challenges dealers don't want to tackle (or have given up on) and fix them successfully and efficiently with minimal problems. It's not always easy, but if you're up for the challenge, it can be quite profitable. Just be sure to use a good scan tool, vehicle-specific service information and understand the systems involved and what can go wrong before you start. Perform a good preliminary inspection, check for TSBs and programming updates, use the scan tool data and wiring diagram strategically, and test the things that commonly go wrong, such as pin grip and bad connections.

You never know — you may surprise yourself with your diagnostic ability and improve your bottom line in the process. MA

VANESSA ATTWELL is a Master Technician for two major manufacturers and has also worked on the bench of an independent shop. She has developed and delivered training for both vehicle manufacturers and independents, and helped develop government training and regulations standards.

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FIVE DIRTY WORDS

SOME OF US USE THESE WORDS TO AVOID FRUSTRATION, WHILE OTHERS USE THEM WHEN THEY ARE AT THE END OF THEIR ROPE. WHERE DO YOU FALL?

PETE MEIER // Technical Editor

IF YOU HAVEN'T YET, check out *Motor Age* Magazine on YouTube. Our How2, Trainer and In The Workshop segments are there to help you grow as a tech.

Send it to the dealer!" That's a phrase heard often in independent shops around the country. In the shops I worked for, it was typically heard under two very different circumstances, though. Often, it would be uttered by technicians who just didn't want to be bothered by any kind of diagnostic work, preferring instead to earn their pay doing nothing but "gravy" work. You would also hear these five dirty words when a technician who did tackle a diagnostic challenge raised their arms in defeat after spending more time than they could ever hope to be compensated for trying to uncover the culprit and finding themselves no closer to an answer than when they started.

Let me start this discussion by saying that I've worked at both OE dealerships and independent shops over the course of my career, and I can tell you that the quality of technician is not dependent on the sign on the front of the business. If you have the guts to tackle that job with what you have, allow me to share some ideas that will help you be successful at fixing that son-of-a-gun.

Win more than you lose

Over the last decade or so of my career as a full-time tech, I would be "that guy" that was given the problem cars — those that had been in more than once and still weren't fixed. And I didn't mind! I liked the challenge and won more often than I lost only because I stubbornly refused to spew those filthy five words until I couldn't get up off of the canvas. My motto was, and still is, "A human designed it, a human built it, a human broke it — a human should be able to fix it." Sounds better when I think of it in my head than it does when I see it in print, but you get the idea. Even if I took a loss monetarily, I knew I was going to gain in the long run from the experience and lessons learned — good and bad — from tackling the challenge.

One key to success is following a logical process and working smart, not hard. The very first step for me was to learn as much about the system(s) involved as I could. That often required a lot of reading — and not just on the service information platform the shop used. On some particularly tough challenges, I would spend my own time researching online and availing myself of every resource I could find. And thanks to the efforts of organizations like the National Automotive Service Task Force and Equipment Tool Institute, access to this information on the OE level is easier than ever.

One such case that really stands out in my memory was a Lexus with an evaporative emissions fault that I couldn't make heads or tails of. I literally wrote up a stack of notes on the Toyota EVAP systems in use from the beginning and by the time I was done, I was pretty comfortable with how everything worked and was ultimately successful in resolving the customer's concerns. Those notes turned into the very first story I ever wrote and actually got me involved on this side of the business!

The next step in success is following a testing process that starts in a general way, eliminating as many possibilities as you can and narrowing down the list of potential suspects. Then, pinpoint testing will help nail down the ultimate

PHOTOS: PETE MEIER


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NOTHING BEATS ATTENDING a good training event in person. Only then can you interact with both the instructor and your fellow students in a way that can't be duplicated.

cause of the concern. These are tests and techniques that may be listed in the OE flowcharts, but more often than not the most successful approaches are the techniques developed by your fellow technicians and learned by your own continuing education efforts. Maybe you follow certain threads on iATN, maybe you dig into your SI's resources (like Mitchell 1's "SureTrack"), maybe you subscribe to a capable teacher on YouTube (like ScannerDanner, South Main Auto Repair and of course, *Motor Age*!) or maybe you get out of the shop and attend aftermarket webinars or live training events. My whole point here is that you cannot remain stagnant, relying on what you learned yesterday alone to carry you into tomorrow.

The final step is to make sure your tooling is up to the task. I remember my very first scan tool, the venerable Snap-on "brick," that used cartridges depending on the genre of the vehicle you wanted to work on. Its narrow screen only displayed, if I recall correctly, 6-9 PIDs at a time, and I can't imagine trying to rely on that tool alone today! And it's not just the diagnostic tooling. Certain repair procedures require special tools in order to perform the repair properly and without damage to the system or other components. The times I had to finally throw in the towel, it was because I didn't have the tooling I needed to continue. But hold on my fellow independent techs — the times are changing and that may be an excuse that will no longer fly for many of us.

Many of you reading this get it. You've invested in your tooling and your training and are willing to tackle any challenge that comes your way. In fact, there are those among you who are actually benefiting from your efforts and tackling those problem cars the dealer can't handle! Imagine that — a dealer tech telling his service manager, "Send it to [insert your shop's name here]!"

DON'T SHIRK from a challenge. Instead, consider it an opportunity to grow and learn.

DIAGNOSTIC TRAINING AVAILABLE — FREE! — AT NACE AUTOMECHANIKA CHICAGO 2017

Looking for diagnostics training? Here are some options available during NACE Automechanika Chicago, taking place July 26-29 at McCormick Place West.

Critical Thinking Diagnostic Strategies

Attendees of the course, taught by G. Jerry Truglia of Automotive Technicians Training Services, will learn how to sharpen their diagnostic skills, set up a diagnostic game plan, use strategy-based diagnostics and diagnostic routines, and PCM strategies and enabling criteria. Register for the course today at ***MotorAge.com/strategies.***

Integrating Repair Information into Your Diagnostic Strategy

In this session, Mike Alberry with Mitchell 1 and Jim Mortiz with Snap-on will teach attendees how to use repair information systems — like Mitchell 1's ProDemand — to improve their diagnostic strategy. Get tips that will help you diagnose and repair vehicles faster and more confidently while maximizing your repair information subscriptions in conjunction with your handheld diagnostic platforms. Register for the course today at ***MotorAge.com/usesystems.***

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Inductive current probes are not just for checking starting and charging systems anymore. Couple these tools with the modern DSO, or lab scope, and they are incredibly powerful diagnostic instruments! Current probe tooling options and techniques will be discussed in this class, led by Eric Ziegler of EZ Diagnostic Solutions. Case studies will support some interesting approaches to some unique diagnostic dilemmas. A technician is only limited in the shop by his or her imagination and creativity when it comes to this affordable and often underappreciated tool. Register for the course today at ***MotorAge.com/probes.***

A great opportunity is coming!

Back in February, I participated in a panel discussion that was supposed to be about the "must attend" training conferences offered here in the States. The end result for me was simple. The "must attend" events for you should simply be an event you can attend — meaning, you can get the time off, and you can afford to make the trip. One such opportunity that is coming soon is the one we're hosting, NACE Automechanika. There is a lot going on over those few days this July, including the training we've put together with the help of the best independent trainers and the best aftermarket training organizations this country has to offer. And I'm sure that, by now, you know that this training is offered at no cost to those who attend. You just have to make your own travel and lodging arrangements, and there are plenty of ways you can do that on a budget. Even there, though, we have help. Partnering with TST, AMi and NATEF, we are able to offer scholarships to help cover those travel and hotel bills. For full info, log on to www.naceautomechanika.com/scholarships.

If the Chicago event is still out of reach, check out the regional opportunities near you. Most of the big aftermarket companies have expanded their training arms in a big way over the last few years and host a variety of training platforms from live events held locally to online "virtual reality" programs. All of these programs have one goal in mind — to help you become a better technician. MA

PETE MEIER is an ASE certified Master Technician and sponsoring member of iATN. He has over 35 years practical experience as a technician and educator, covering a wide variety of makes and models. His primary goal is to bring working techs the information they need. ***pete.meier@ubm.com***

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EXPLORING FRUSTRATION

HOW CREATIVE WE BECOME AFTER ALL ATTEMPTS TO FOLLOW PUBLISHED INSTRUCTIONS FOR A REPAIR FAIL HELPS DEFINE HOW GOOD OF A TECHNICIAN WE ARE

JAIME LAZARUS // Contributing Editor

Frustration is a part of this game, or so I was told early in my career. I've learned to expect it so much so that when a job goes easily anymore, it's almost scary! I start to retrace my steps, making sure every bolt and screw are installed and properly torqued. I look again and again for the unintended leak or that strange sound or maybe some other sign that would reveal what it is that I had forgotten. I scrutinize every data PID's value so carefully to ensure all are displaying correctly. I end up spending a lot of time needlessly when a job goes smoothly, but if it's not the norm then....

It is this frustration that motivates me when I encounter those times when everything doesn't go as planned. It consumes my thoughts, causes me to overly focus and sometimes even robs me of sleep. This frustration can be caused by an incorrect part, a procedure followed or a wiring diagram that doesn't actually apply to the vehicle I'm working on or it could be caused by unknown forces. In almost all cases, it is completely out of my control. Have you ever felt like aliens have possessed the vehicle you're working on?

The call comes in

Don owns a shop in a remote area of the county about an hour from my home.

PHOTOS: JAIME LAZARUS

FORD EXPLORER

His shop has an excellent reputation. He and his technicians are known for being able to solve any problem on almost any kind of vehicle. The shop has serviced everything from go-carts to aircraft; once when I showed up, they were repairing a trailer-mounted BBQ/Smoker that was built by hand, made from — among other things — thousands of stainless steel disks welded into the shape of an eight-foot long armadillo that must have weighed thousands of pounds!

I assist with diagnostics and reprogram modules for them. Most of the time when Don calls me in, it's because he has gotten frustrated by a vehicle that just doesn't want to play by the rules. Have you ever had one of those? I know of no one who's exempt from that! He is very methodical in the manner in which he diagnoses problems, and he's quite thorough. I can't remember ever finding something he missed that fixed a car in his shop! Now, that's good!

Needless to say, he doesn't require my diagnostic skills very often. So, when I do get a call from his shop, Don has a huge amount of information already documented, usually a long list of tests performed — along with the detailed results of those tests — and I can trust the basics have been covered

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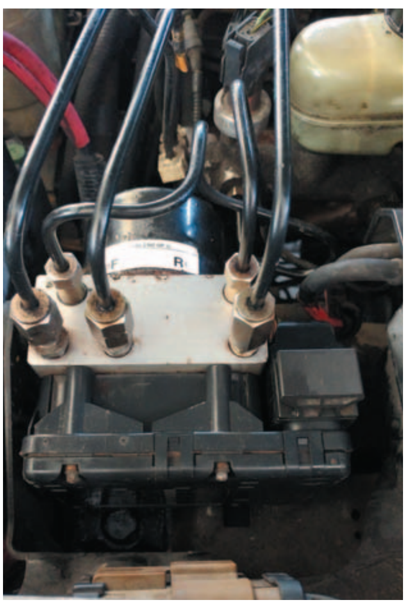
to the point that I don't even consider performing them again. We will work together to resolve whatever the problem is and in all cases, both will learn from the experience.

The other times when he calls on my services, he has performed a repair that requires a configuration using an OE diagnostic tool (that maybe he doesn't have), or he's installed a module and it needs to be programmed. Don has the ability to flash a variety of makes, but prefers to leave that stuff to me. He'd much rather be doing anything else, as he just doesn't like doing that kind of work. And that's usually okay with me! Yes, I said usually. As a matter of fact, it was in his shop that I encountered a stubborn apparition-infested 1998 Ford Explorer, 2x4, 5.0L. This vehicle, which had an automatic transmission, California emission, "believed" it was a four-wheel drive but it had a two-wheel drive powertrain! Now, you and I both know this should be an easy fix! This should take a maximum of about 15 minutes when everything goes right. "Piece of cake," I thought to myself on the way over. Oh boy, did I jinx myself!



ABS MODULE

A "simple" job?

I said Don's thorough. He received this vehicle when the proud new owner brought it in for an evaluation of why the ABS light was on. Don tried to perform what I call "play 20 questions" — that is, when the customer drops off the vehicle, you ask everything you can about the problem and the history of the vehicle. Unfortunately, the owner had just purchased the vehicle, knowing there was an indicator illuminated, and because of that fault, paid a lower price than what the dealer wanted. He thought he negotiated a great deal!

Don's techs performed a standard series of tests and visual inspections. Stored in the ABS module's memory was the DTC C1102- (ABS/TCS) — Acceleration switch (aka "G-Switch") circuit failure, and there was a history code (Ford identifies these as CMDTCs – Continuous Memory Diagnostic Trouble Codes) of B1676- (ABS/TCS) — Battery Voltage out of range.

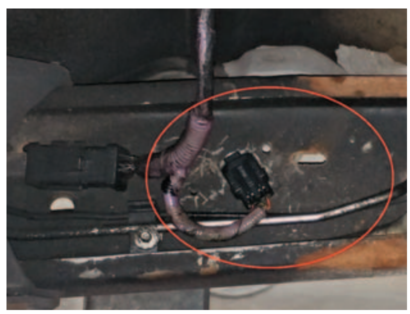
Remember how I said that this shop is located in a remote area of the county? They're actually in a National Forest, which means there are lots of various driving conditions that vehicles may get put through when test driven. The ABS data was observed on a scan tool instinctively — no DTC chart had been called up yet at this point — and the Acceleration Sensor PID (Parameter Identification) value never changed under any driving condition.

The diagnostic procedure for this, and for any code, has the technician first perform a visual inspection of the components and wiring. In this case, inspection of the G-Switch was in order. The technician stopped at this point, unsure where he would find these items. With his initial evaluation complete and the test results documented, the tech provided Don with everything he'd amassed and answered Don's questions. This is a

ARMADILLO SMOKER

FORD VCM I

FORD VCM II



MISSING G-SENSOR

standard procedure at this shop, and it ensures everyone involved is on the same page at the same time throughout the whole diagnostic procedure.

It's at this time that Don steps out of his comfort zone and sits down in front of his computer to do some research. He wants to make sure he completely understands the system he's working on and the criteria for the code(s) to set, he

HOT TOPICS

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1 Independent testing conducted by B83 Testing & Engineering, Inc. on ball joints for a 2007 Toyota Camry, 2013 Ford F-150 and 2007 Chevrolet Silverado. Testing was performed on a Multi-Axial Durability Suspension Simulator to simulate ball joint service life on a vehicle. For complete details, visit www.moogparts.com.
2 IMR Research Study 2015

looks to see if there are any TSBs related to the problem and he searches technician-oriented websites as well. When he finds the component locations diagram, Don asks that the vehicle be raised in the air while he prepares to check electrical circuits. He gathers the wiring diagram print out, some tools and a DVOM. After reviewing the self-test results and the scan data, he visually inspects the ABS module wiring connector and harness, then follows the wiring as far down as he can see without noting any damage. Once in the air, it becomes obvious why the code is setting; the G-Switch is not installed! In fact, there was no evidence that one had ever been installed.

The electrical connector that would have attached to the G-Switch was capped with a factory-installed device made to seal the terminals and wiring from environmental contamination. The frame rail had the bolt holes through which fasteners would pass that would have held the G-Switch in place, but those holes still had the paint that was applied from the factory. There was no impression made in the paint to indicate anything had ever been tightened onto the area, and there was a sufficient amount of road grime in the area that was the same across the whole undercarriage. It appeared someone may have temporarily installed something in this area, but this truck never had a G-Switch!

Setting a ghost code

Upon closer inspection, it was determined that very recently the ABS module had been replaced with one from a recycler, as it was much cleaner than its surroundings and had the telltale yellow marker paint writing on its cover. When researching online, he came across some posts made by techs who also had Ford Explorers storing the same codes! Can you imagine that? He learned that the four-wheel drive Explorers were

NGS

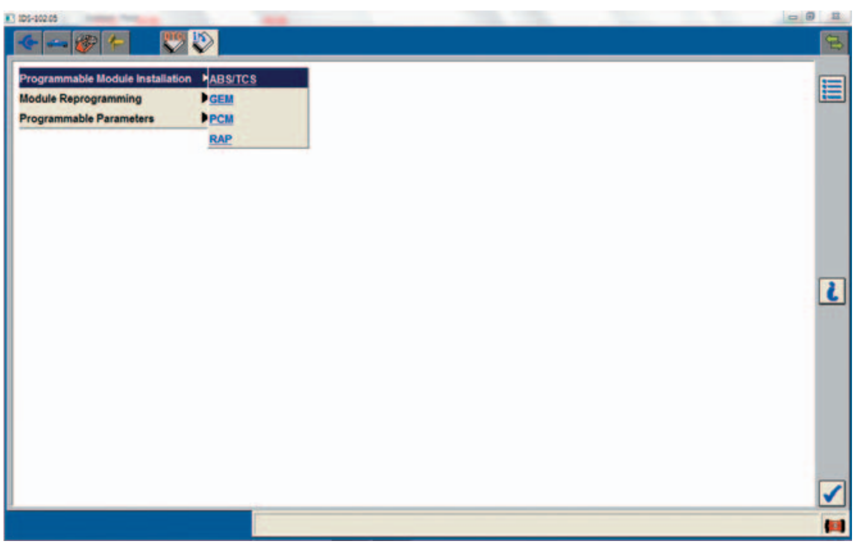
NGS OPERATIONAL 4X4

fitted with an Acceleration Sensor; the two-wheel drive models weren't. Further online research indicated that the vehicles with C1102 codes that were never "solved" — the ones that didn't have a "fix" associated with them — all had one thing in common: they were all two-wheel drive vehicles! Unfortunately, so is the one in Don's bay.

The diagnostic charts, or Pinpoint Tests as Ford calls them, direct the user to test for voltage at certain pins of the G-Switch connector, and if all fall within the ranges specified, the tech is instructed to replace the G-Switch and then retest. This leaves us running in circles when trying to follow the diagnostic information. So, dear reader, what would you do next if you were in Don's shoes?

As you know, Don called me. We discussed the details of this vehicle and decided most likely, the EBCM needed to be properly configured. I did some research before I headed to his shop. Having access to Ford's Professional Technician Society (Ford PTS) Portal, aka the Technical Resource Center, allows me access to most of what a Ford dealership technician has available. For instance, I verified there were no Service Manual Updates, which are what get issued when the manufacturer recognizes errors in the previously-published service information. I also verified the procedure used to configure the EBCM that I should follow when I got to Don's shop.

Once there, we compared the procedures and found them identical. Then I hooked up my Ford VCM II and opened the Ford IDS software. I performed some tests and verified the customer complaint which, in this case, was Don's and not the vehicle owner's. I attempted to configure the EBCM using what's called Programmable Parameters per the service information



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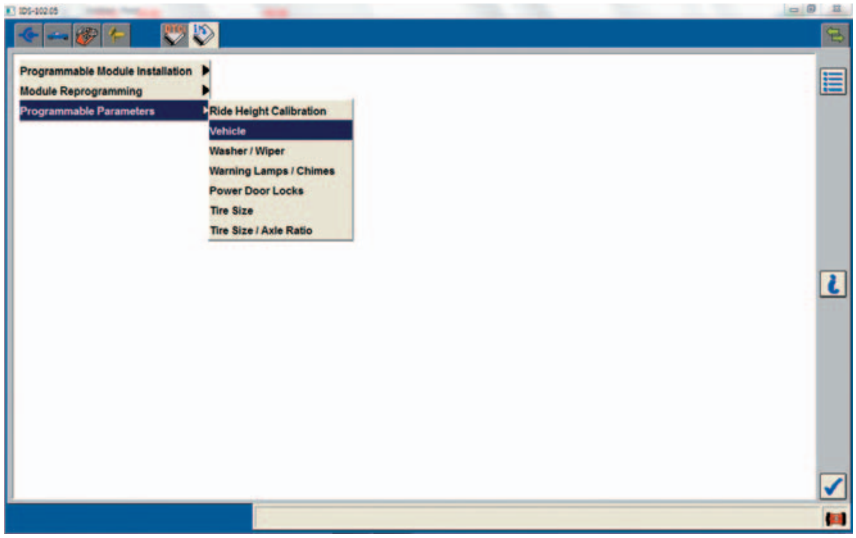
instructions. I was offered choices to select 2-wheel ABS or 4-wheel ABS, Tire Size, Differential Tone Ring Size and what type of vehicle the module was installed in (Explorer/Mountaineer/Ranger was one choice). I wasn't offered a choice of powertrain configurations!

I followed it step by step and ended up with the same results. I selected each of the choices I was given in every one of the drop-down menus for the various ways one could program the module. I even made wrong selections, in an attempt to see if something would change. After all, if following the directions doesn't work, why not choose another way, just in case it fixes the problem? Unfortunately, nothing worked. I could not get that Explorer to believe it was a 4x2!

I performed some more tests, looked at information in other modules, then in agreement with Don, decided possibly the wrong module had been installed in this truck. He wanted to install a different one before proceeding. The module Don received a few days later came pre-programmed from a rebuilder. Neither of us had heard that such a thing was possible on a Ford EBCM. He had given the company the VIN and answered a few questions when he ordered it. Upon arrival, he had his technician install it. Afterwards, a Key On, Engine Off (KOEO) test result was the same as with the module the vehicle arrived with and like it, the C1102 DTC would not clear. Once again, I was called in to configure the module and once again, I was unsuccessful.

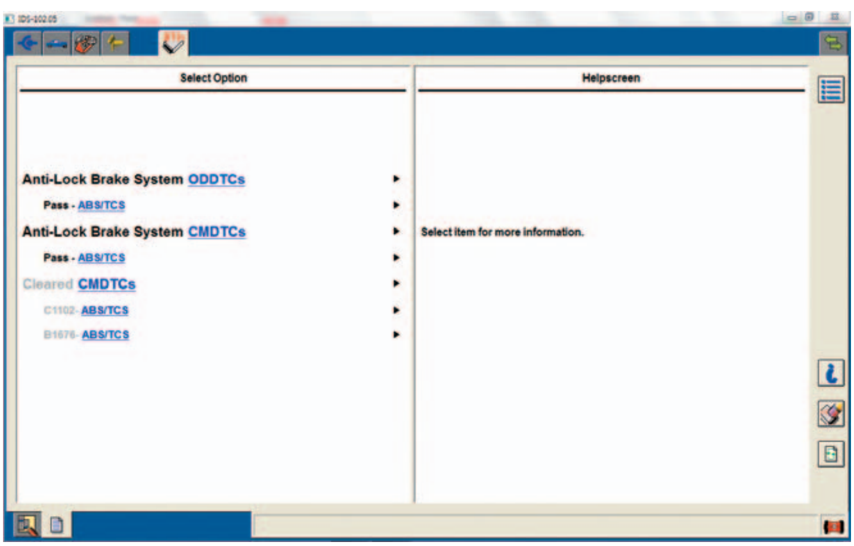


PROGRAMMABLE PARAMETERS

I was frustrated. I had to get creative, and I had a hunch. This time, I tried using the older interface, the one Ford originally used when the IDS first came on the scene in 2003, but I got the same results. Knowing the vehicle was made before IDS was used in the dealerships, I decided to borrow an NGS (New Generation Star) tester, the tool that was being used at the time the truck was produced, and see if using it made any difference.

When I got to the NGS module configuration menu, called Operational Strategy, there was a different selection available. I was given a choice, in addition to the same options the IDS offered, to choose whether this truck was a 2x4 or a 4x4. After I made the correct choice, I ran the KOEO test again and the C1102 was gone! It had become a CMDTC!!!

Wow. We sometimes forget our tools that are described as "backwards compatible" may not work 100 percent like the tools they are replacing. We also may forget that when we are working away and think something like, "As soon as I'm done with this gravy, I'm going to..." just remember, you are inviting frustration! You're tempting fate! Don't jinx yourself! MA



PROBLEM RESOLVED

JAIME LAZARUS has regularly presented technical seminars since 1985. He recently taught instructors at the North American Council of Automotive Teachers conference and the NASCAR Technical Institute.
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AD INDEX

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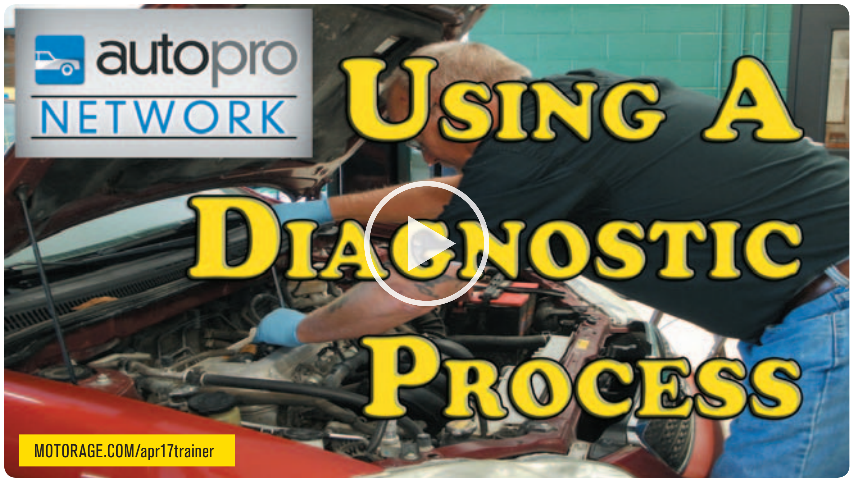
PRODUCTS

FINDING THE QUICKEST PATH

USING A CONSISTENT DIAGNOSTIC PROCESS WILL SAVE YOU TIME AND EFFORT

PETE MEIER // Technical Editor



The focus of this year's The Trainer series has been on the diagnosis and repair of common emissions-related Diagnostic Trouble Codes (DTCs). Dealing with a customer concern of an illuminated Check Engine light is one that many of us cut our diagnostic teeth on, so we'll take what we've learned so far and move on one more step — learning a diagnostic process that will help lead us to the cause of the DTC and from there, to its successful repair.

When I worked fulltime in the bays, I paid attention to the process many of my fellow techs seemed to be using when faced with an "MIL on" concern. **Step 1**: Connect a scan tool and read the DTC(s) stored in the Engine Control Module (ECM). **Step 2**: Clear the code(s) before removing the scan tool from the vehicle. **Step 3**: Select the replacement parts based on the ones referenced in the DTC (an oxygen sensor for all oxygen sensor codes, an MAF sensor for all MAF sensor-related codes, and so on). **Step 4**: Install said part and return the car to the customer. **Step 5**: See if the customer came back with the same code (if not, the repair was successful. If so, refer customer to the dealer).

No, I'm not kidding. I knew several techs who worked just that way!

Needless to say, this approach is not the best way to tackle the problem. So, log on, sit back and come watch as I take you through a more logical process you can apply to any diagnostic situation! MA