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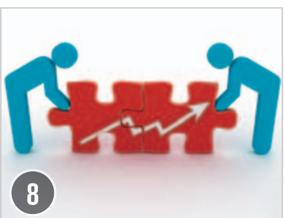

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PHOTO: CHELSEA FREY

THE VALLEY Forge High School Tech Prep Automotive Service Technology program covers the gamut of service repair areas technicians will have to tackle in the industry.

TRAINING PROGRAM

HIGH SCHOOL AUTO PROGRAM GIVES STUDENTS AN EDGE

CHELSEA FREY //
Senior Associate Editor

With a highly focused training schedule, high school automotive programs — such as Valley Forge High School's Tech Prep Automotive Service Technology program in Parma Heights, Ohio — are developing career-ready service repair students.

Accredited by he National Automotive Technicians Education Foundation (NATEF), Valley Forge's program teaches juniors three main topics: introduction to automotive, brakes, and electrical and electronics. Senior students focus on suspension and steering, engine performance and heating and air conditioning.

Gary Mitchhart has been the instructor of the program for the past 10 years. Mitchhart's prior teaching experience at Ohio Technical College and his experience of working at dealerships and independent shops over the past 30 years helps him educate in an environment similar to a repair shop.

Funded by grants through the Carl D. Perkins Career and Technical Education Act, the automotive training facility is equipped with lifts, a tool room, wheel alignment systems and all the necessary equipment found in a repair shop. Valley Forge keeps a lab of 25 vehicles for students to work on while learning. To ensure the students are prepared for the automotive technology they will face in the industry, the program is currently seeking to upgrade the fleet so that the vehicles are no older than 7 years.

While students partake in plenty of hands-on learning in the shop, they also learn in the classroom. Mitchhart explains, "Students need to learn both technical and academic skills. The electrical and electronics portion, for example, is very physics heavy. We start with learning about the atom and matter, and then we gradually move on to topics such as basic circuitry, voltage drop, amperage, checking for resistance and using a voltmeter and an oscilloscope."

>> CONTINUES ON PAGE 6

BREAKING NEWS

NACE COVERAGE

VEHICLE SECURITY: KEEPING TECHS IN & THE BAD GUYS OUT

ANAHEIM, Calif. — With increased connectivity on vehicles for safety, comfort, repair notifications and more, keeping the information secure and the vehicle safe is a top focus of those interested in telematics.

The Technology & Telematics Forum at NACE | CARS 2016 kicked off with a panel conversation on vehicle security and hacking. The growing concern is: How do you keep (or get) the repair shops in and the bad guys out?

It definitely is an issue, as Mahbubul Alam, a panelist with Movimento Group, describes the vehicle as a hamburger: There are parts on top of each other similar to a patty of meat, toppings and sauces. But when the parts were put together to create the vehicle, they were not done so with security in mind.

"Security is just an afterthought that came along," he states, adding that it now is important to design everything from the ground up to be secure. It is covered as the five C's: the chipset that goes into the electronics, client (software security), connectivity, cloud and content.

It is important to make sure the architecture of the vehicle is compartmentalized so that when someone tries to hack the vehicle in ways outlined by fellow

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At the end of their senior year, the students take the ASE Student test, which is paid for by the school, as a way for the state to verify that the students have been properly trained. Even though the content of the ASE Student test is very similar to the industry ASE test, the certificates earned thereafter are not interchangeable. In order to get the industry ASE certificate and patch, one must also have two years of work experience.

"For these students to take the ASE Student test and pass it, it's absolute testament that they can do the job. It's been a very useful way to show that these students are career-ready," Mitchhart says.

Education evolution

Mitchhart has noticed a significant change in the structure of high school automotive programs over the years and the type of students the programs attract. "As cars become more advanced, high school automotive programs are no longer a last resort for students who don't know what they want to do. We've had some students who have entered the program and then left soon after they realized how in-depth it is. Those who stay in the program know that automotive work is what they want to do."

Mitchhart has seen his former students succeed in a variety of different careers. While the majority go on to work at new car dealerships, others are hired at independent shops or specialize in certain fields in the automotive industry.

Mitchhart urges repair shops to seek out high school students for new talent. He expresses, "Businesses really do need to look at the high school students first. We're just as competitive as community colleges or technical colleges that follow the NATEF curriculum because we are all teaching the same exact material. High schools even have an advantage due to small class sizes, which allows for more individualized attention." Additionally, high school students can quickly determine from a young age if the automotive field is a good fit. "There's no doubt these students will make fantastic long-term employees." MA

SECOND ONE-DAY FREE TRAINING SET FOR OCTOBER

APPLETON, Wis. – The second Commitment to Training one-day live training event is approaching, and time remains to register.

The free training is Saturday, Oct. 15, at Fox Valley Technical College in Appleton, Wis. The event will feature top industry trainers in several areas of technical and management repair, similar to the successful one-day event in May at Washtenaw Community College in Ann Arbor, Mich. Registration for the event is open at MotorAge.com/FoxValley.

"More than 100 automotive professionals attended our first training event in May, and we were thrilled to be able to provide top-of-the-line education to them for free," says Pete Meier, director of training. "These pros are positioning themselves to be among the best in their field by seeking out training in areas that repairers need to learn about today."

Meier is one of the featured trainers at the Fox Valley event, along with G. Jerry Truglia. Meier will lead a course on electrical repair and scope usage, while Truglia will teach a pair of classes on diagnostics, trouble codes and more. Other instructors are Greg Marchand, Mike Anderson, Jason Bartanen, Mel Shampers and Jerry Goodson. The course list is:

- Financial Best Practices
- Service Counter Skills
- Aluminum Welding & Attachment
- How to Diagnose P0420s & P0430s
- Vehicle Technology and Trends
- Practical Electrical and Scope Techniques
- Critical Thinking Diagnostic Skills
- Positioning Yourself in the Collision Repair Industry
- Estimating Best Practices
- Capitalizing on Customer Satisfaction

Anderson will kick off the day of training with a keynote address. Courses also qualify for NATEF and AMi credits.

The Commitment to Training is made possible by support from manufacturer sponsors: Carquest Technical Institute, Delphi, Mitchell 1, Pico Technology, Schaeffler Automotive Aftermarket, Abaris Training, PPG, Polyvance, Mitchell International, Axalta, Garmat USA, GFS and Motor Age Training. MA

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panelist Craig Smith with Theia Labs, for example going after the TPMS, they cannot get through the whole system. Alam related it to going from one house key to having a separate key to enter each room in the house.

"We have to make sure each door has a separate key. If you enter through your garage, you should not be able to get into the house," Alam says. "It means you don't allow it to spread." Moving to these compartments allows over-the-air updates to fix these attacks.

But as these technologies come along, Smith says it will be a process to be aware of and vocal about OEs allowing access to firmware. While they want to protect the firmware from the "bad guys," technicians will need to be able to work with these systems and repair future vehicles.

Smith notes, "Only the people who are currently playing the game are going to be able to continue and they will block out others. That's my concern." MA

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MOTIVATE EMPLOYEES TO ACHIEVE SHOP EXCELLENCE

Part of motivating your employees is leading

BRIAN CANNING // Contributing Editor

There are two very distinct schools of thought on motivation. There's one large group strongly of the belief that we are who we are, and if there is motivating to be done, we either bring it to work with us each morning or we don't and our leaders, managers and supervisors have little or nothing to do in determining if our motivated (or unmotivated) self shows up to work each day. Of course, I do not hold it against persons of this school of thought other than to say that they are as wrong as they could possibly be or at least as wrong as they could be as it applies to the automotive repair industry of today.

There is no doubt that there are a lot of unmotivated workers out there certainly in and among the technicians and service advisors who make up the automotive repair industry. There are plenty who could use a quick dose or two of motivation, but relying on them to self-administer this important trait might be a long wait and one that is very likely to end in bitter disappointment and probably bankruptcy. We as leaders have to lead our people in a better direction instead of waiting for them to decide if they want to hop on that bus. My saying this would highlight my strong belief that the large number of unmotivated and under-motivated technicians and service advisors in automotive repair is directly attributable to the very poor state of leadership within the industry. It is wholly chargeable to our poor performance against our goals, our lack of profit as compared to other service industries and our lack of production in our bays. Motivation, or the lack of motivation, is the direct result of poor leadership and in most cases we are getting just what we have asked for: nothing.

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FERODO BRAND IS THE BRAKE PAD OF CHOICE ON 8 OF THE 10
BEST-SELLING VEHICLES IN EUROPE

We as shop owners and service managers mostly would rather jump off a cliff into a swimming pool filled with cactus and fire ants than to have to actually look another human being in the eye and tell them what to do. As sad and unfortunate as this is, it clearly explains why production, sales, profitability, training and employee turnover are in such terrible straights and why the industry is struggling for viability. Leadership — and in this, motivation — is not an easy part of the job, but as unpleasant as it is for many of us, it is much better than under-performing year after year and dying that slow death.

It's time to lead and to motivate our technicians and our service advisors to do the things we want, as we want them done.

The Army describes leadership as "The process of influencing others to accomplish the task or mission by providing purpose, direction and motivation." This is the definition I cut my leadership teeth on many years ago, and I still like it today because it allows me, as a leader, to define the task and relies on me, as a leader, to provide what I see as the appropriate purpose, direction and motivation to assure that the task is completed.

If I am not comfortable yelling, I'm not going to yell. If I choose to give an inspiring speech or provide performance incentives, I have that flexibility. A good leader will use everything at his or her disposal to accomplish whatever needs to be accomplished. If we fail in some kind of way to complete our assigned tasks or the tasks that we assign to one of our staff members, our approach to leadership has failed. It's as simple (or as complicated) as that.

As inconvenient and messy as it is, each of us is unique in how we are best motivated and because of this we as leaders need to know our people and what makes them tick. A common mistake I see here is the mistaken belief that all of us are money motivated, and in trying to move our staff members or motivate them toward something new or better, we build all of our incentives and motivations around more money. For about 30 percent of the population, these efforts might prove appropriate and successful, but for the other 70 percent we have just missed the boat and are likely to see little to no change in effort or behavior.

Believe it or not, far more of us are motivated by time off, recognition or awards than by money. This disconnect and misunderstanding of what motivates us is a clear explanation of why our actual performance is at such variance with our goals. To be motivated by something, we have to care about it, and in this example we are wrong in what motivates us 70 percent of the time. If we come out with a plan that only 3 out of our 10 staff members care about, the chances are very good that we will see little or no change in behavior and therefore little or no change in our results.

Another common mistake I see is the use of fear as a motivator. While fear works extraordinarily well in the short term, relying on fear as a primary motivator over time will almost certainly drive morale down and likewise result in employee turnover. Fear works, but it needs to be used sparingly, if at all. Threatening an employee with their jobs or pay will likely get an immediate response, but if this is an employee you care about, fear is probably not the best choice.

As hard a concept as it might be to grasp, what motivates most of us is simply knowing what is expected, acknowledgement that we are doing our job and some sort of public highlighting of our successes. This might be money, it might be time off, it might be a plaque or it might be a handshake or public and sincere thank you for a job very well done. Celebrating an individual's success is the key, both for the individual and for the entire team. Consistency here is critical!

Everyone (well, almost everyone) wants to believe that they contribute, that their efforts are important and that they are vital to our success. Our job as leaders is to foster beliefs such as these and do everything humanly possible to develop a sense of pride, a sense of team and a sense of mission in all that we do. Though we have to guard against arrogance or cockiness in our employees, making them feel important and that their contributions are vital to our success is the best way to ensure their motivation and continued strong efforts, which then gives you the opportunity to appeal to their sense of pride in assigning additional tasks and setting higher standards. They feel part of something special and significant and will work hard to maintain their status.

This is a very sneaky form of motivation in that we are appealing to pride and ego, but people usually go very willingly and tend to bring their best efforts with them. If we praise them and recognize them for superior effort, we will be able to count on them to be there for us and to improve and grow as we improve and grow.

As Dwight Eisenhower said, "Motivation is the art of getting people to do what you want them to do because they want to do it."

Try something different; find out and foster what motivates your people and get the heck out of their way. MA

BRIAN CANNING is 30-year veteran of the automotive repair industry. He has been a leadership coach, Goodyear service manager, retail sales manager for a distributor, run a large fleet operation and headed a large multi-state sales territory for an independent manufacturer of automotive parts. *brimarc@hotmail.com*

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EDUCATION: A NEW DEFINITION FOR ROI

These terms have evolved to a new meaning for repair shops

It is time to recognize, and essentially understand, the evolved and expanded concept that "education" of shop technical personnel, front counter and office personnel along with its owners/managers in today's world has matured to new, additional definitions for "ROI." The standard meaning of "Return on Investment" now elevates to two important definitions to include "Return on Intelligence" and "Return on Information."

DON'T BE ONE OF THOSE SHOP OWNERS WHO CANCELS A COURSE BECAUSE OF A BUSY SCHEDULE.

To retain valuable employees and enhance management growth, shops should be willing to invest in ongoing education that supports the professional growth of individual staff and management, as well as their general well-being. Comprehensive, on-going education has become a necessary requirement for this new era.

It is critical for shop management to have a professional relationship with employees. Owners/managers must revolutionize the traditional view of only being worried about maximizing the output of employees into a much broader form that now involves participation with every level of management and staff. The interaction between the shop management and staff on effective education and its evaluation is the key to success for high shop morale. High staff and management morale in today's business leads to quality customer/client service.

Employers should prove to their employees their worth to the shop. In other words, always operate with the philosophy of "train to retain." I was once asked, "What happens if I train him and he leaves?" I responded, "What if you don't and he stays?" The right education should give employees the tools to develop technical skills and soft skills necessary to perform well technically as well as socially. When you enrich your employees through professional knowledge in many areas, it increases the company's loyalty.

Competent education should be carried out regularly to keep all minds fresh and the morale high. Shop owners/managers should be aware of the fact that many competent employees are lost through lateral movements to other shops. This is scary because management didn't understand the real reason for the employee leaving and didn't have an interest to find out why.

Don't be one of those shop owners who cancels a course because of a busy schedule. There is nothing worse than an employee being psychologically ready to participate with the owner and then management pulls the rug out from under him/her because of personal reasons. It's a morale and credibility killer.

Providing education opportunities for skills and interests outside of work life is a way to increase staff loyalty and reduce turnover. Before launching such programs, a popularity survey via discussion should take place that gives the employees options to choose from and asks for suggestions. These additional educational experiences can be brought in-house to strengthen team spirit or held at some place or institution to encourage a meeting of minds with outside experts.

Consider education courses that offer phased-in education to the employees and management. This is much easier than learning the whole process at once. The educational courses can be broken down into a session of technical skills and then a session of soft skills or management skills. Consider offering incentives as a retention strategy, as there is nothing wrong with recognizing and rewarding a good effort. When shop education is broken down by skills, it is easier for the shop owner to seek out the right modules and set up the course date and agendas. Also consider that certification and standardized professional accreditation can increase you and your staff's professional knowledge as well as retention rates.

Educational courses should not stop after any initial step is started. Employees and management need to be enriched with continuous, updated knowledge to remain at the top of their career. MA

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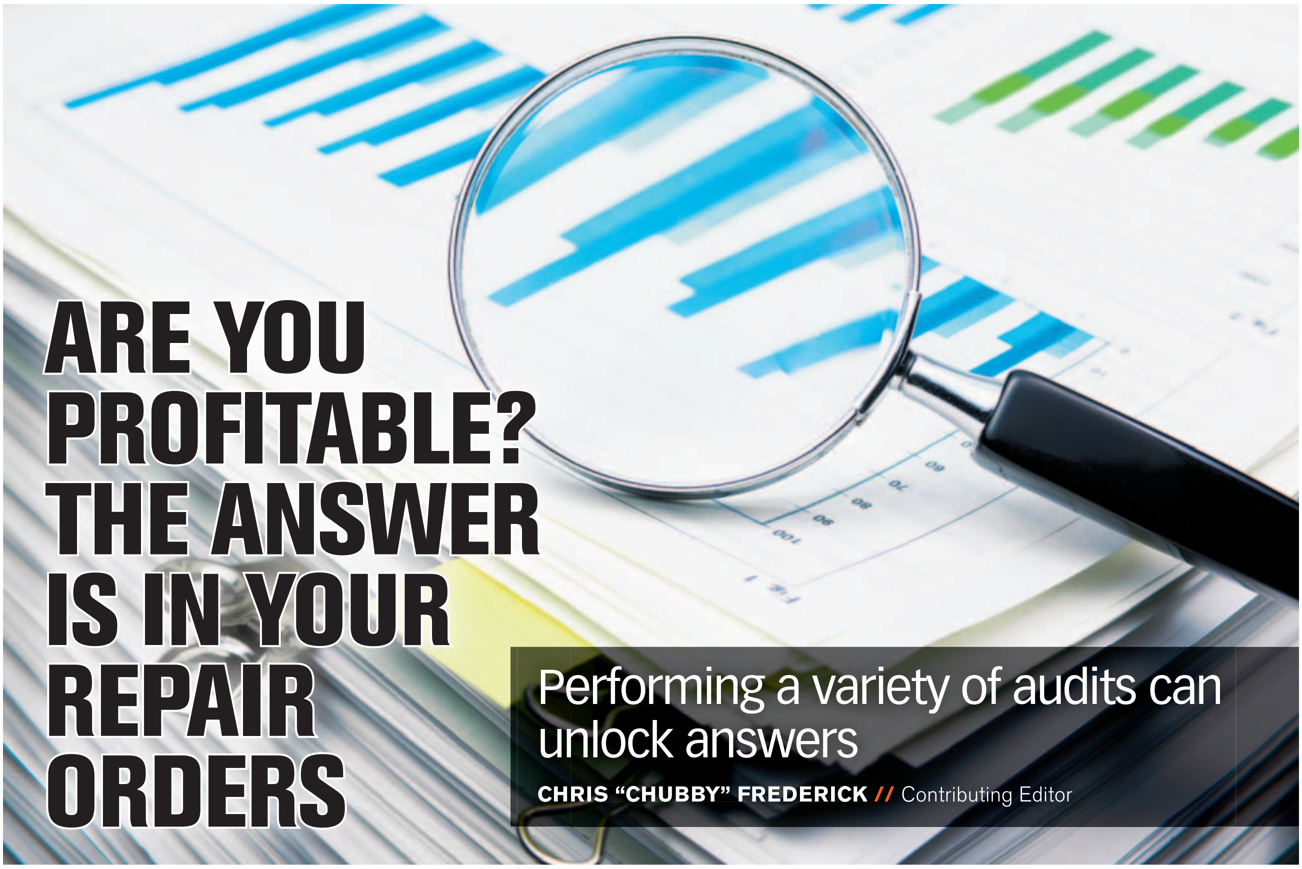

ARE YOU PROFITABLE? THE ANSWER IS IN YOUR REPAIR ORDERS

Performing a variety of audits can unlock answers

CHRIS "CHUBBY" FREDERICK // Contributing Editor

Many successful shops across North America have been noticing a reduction in car count this year — even those with huge marketing calendars. While there are many opinions on what is causing this trend, from weather to a decrease in sales of cars during the Great Recession, the reality is that we have to do something about it or experience a reduction in our income. Actually, many of our clients are experiencing the most profitable year of their career because they are focusing harder on their processes on each car. I'd like you to listen to Coach Steve Privette explain how you can become more profitable by examining your processes on every repair order.

In the 30-plus years that I have been in the industry, I was told to focus on sales, sales, sales, and the profits will come. While sales volume is certainly important, I realized one day that sales alone do not pay bills at all — gross profit does! I have coached shops entering our ATI program doing $10,000 in weekly sales and making money, but also shops doing $60,000 in weekly sales and losing money. Which would you rather have: a $10,000 sales day at 20 percent gross profit ($2,000) or a $5,000 sales day at a 60 percent gross profit ($3,000)? I know, the best answer is a $10,000 sales day at a 60 percent gross profit ($6,000)! You can see why I say both sales volume and gross profit are equally important.

How do I manage both sales and gross profit? I measure the things that affect and provide it. During the time I was a fixed operations director for an auto mall, I decided to start auditing my daily repair orders to make sure my service writers were doing all that they could to produce both sales volume and gross profit.

Auditing repair orders

I asked my service writers to leave that day's invoiced repair orders on my desk at the end of each day for review. Every morning I would arrive at work about a half hour early to review the prior day's business. I used a checklist derived from key performance indicators on each invoiced repair order from the previous day. I would highlight anything I found that either was not done or was done improperly. I would check all the important margins to make sure they were where our goals were with each. I would then return the highlighted invoices back to my service writers to review and justify why any particular item on the list was not to goal and/or standard. This was of course my way of holding them accountable to continue to improve and generate the gross profit dollars we require to run a healthy business.

When I first began doing this process, I was finding many things that required

PHOTO: GETTYIMAGES/TADAMICHI

follow up and attention. As time went by I found myself highlighting less and less. Could it be that my service writers decided to make sure they were doing it right the first time, knowing that there was going to be accountability if they didn't? Of course as I was highlighting less, the sales and gross profit were rising. Imagine that!

Auditing parts margins

A few of the things I would check were things like parts margin, labor margin, effective labor rate, and whether a courtesy check/inspection was performed thoroughly, etc. Doing this process daily was not very time consuming, but it was extremely important.

Checking the overall parts margin on a repair order is quite easy, as in most cases your point-of-sale software will provide you the parts margin. In the event that it doesn't, you would simply add all of your parts cost together divided into the parts sales you collected from the customer. So, if the parts sales were $200 and your parts cost was $100 then you would have a 50 percent parts margin.

Auditing labor margins

Checking your labor margin is very similar; however, many point-of-sale software programs will not automatically provide you this. Just calculate what your labor cost was on the repair order divided into the labor sales you collected from the customer. If your tech is flat rate and gets $25 per flat rate hour, and you credited him or her with 3.0 hours on this repair order, then your cost would be $75 plus tax and benefit load (benefits, payroll taxes, 401k, uniforms, etc.), which is normally between 12 percent and 25 percent. Let's say in this case it is 20 percent, so $75 multiplied by 20 percent = $15. Add the $15 to the $75 and your total labor cost was $90. Let's say the labor sales were $180 to the customer. In this case, dividing one into the other would leave you with a 50 percent labor margin.

Auditing effective labor rate

How about checking the effective labor rate on the repair order to see what your customers are really paying for your time? This is also quite easy. You are tracking your technicians' produced hours, aren't you? If not, you need to start. Just add the total time the technician produced on the repair order divided into the total labor dollars the customer paid for it. As an example, let's say the repair order had a flat rate water pump replacement on it along with a menu/canned oil change and transmission fluid change.

Water pump: 3.2 hours
Oil change: 0.3 hour
Trans service: 0.8 hour

On this repair order, total hours produced were 4.3. Let's say the customer paid $408.50 total labor. Dividing hours into dollars, this would mean the effective labor rate for this repair order was $95. If your door rate is higher than that, you may want to look into why you collected a lower amount. Some things are justified like coupons, warranty, etc. Other reasons are not justified, like discounting to get the sale, etc.

Auditing courtesy checks

Another item I am looking for on my repair order audit is whether we did a courtesy check/inspection, and if so, did we do it right? We always recommend a two-part courtesy check form so you can provide the customer with a copy and retain a copy with the repair order. Many shop owners are using the electronic tablet courtesy checks. Doing it either way will allow you to review to see if a courtesy check was performed and if it was performed thoroughly. How many times do we see a courtesy check done by a tech where everything is checked off as "good" while the vehicle has 120,000 miles on it? Obviously they are pencil whipping or table checking it instead of actually doing it properly. This is an extremely important item to audit, as I believe it is the most valuable tool you have in the shop.

Repair order checklist

You can start to get a picture of all the valuable information by performing a daily repair order review. If you would like a copy of the ATI daily repair order review checklist simply go to www.ationlinetraining.com/2016-09 for a limited time to download your own copy. MA

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 Steve Privette.
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DO-IT-YOURSELF SEO

You have the tools you need to keep your business front and center online

CAITLYN WILLIAMS // Contributing Editor

If you're like most shop owners, the idea of managing your own search engine optimization (SEO) may sound as appealing as a trip to the dentist's office. The discomfort often associated with SEO is understandable. Even those of us who are experts in the field can find SEO confusing and overwhelming.

That's why shop owners often choose to either ignore SEO or tap outside consultants to handle the task. While I'd much prefer to see shop owners seek help for SEO rather than simply dismiss the need for optimization, the truth is that most of you have the tools you need to keep your businesses front and center online. No one knows your shop like you do and with some guidance, you can harness that information to build a very visible digital brand. My goal with this article is to give you the strategies you need to execute do-it-yourself SEO easily and effectively.

Before we discuss specific tactics, let's talk about why SEO is so important and worth your time. While some of your customers are still finding you via word of mouth or a direct-mail postcard, a growing number are locating you after searching online. A 2012 Yelp survey found that 85 percent of consumers used the internet to find local businesses. More specifically, those consumers are looking for goods and services using search engines, online directories and review sites. To increase your visibility on those channels, you need SEO.

Thankfully, there are a variety of ways to optimize your presence on those frequently visited stops on the information superhighway. Focusing your efforts locally, choosing keywords carefully, crafting compelling content and establishing strong external links are all great ways to stay in the spotlight.

We've all heard the phrase, "Think globally, act locally," in reference to a number of causes, including energy conservation. Well, the term can also be useful when considering your SEO strategy. While the aim of your business is always to be the best you can be on a large scale, to have the greatest impact, you should focus your efforts in your own backyard. Let your location guide all your SEO activities.

The first step is to think like your potential customers. A Chicago resident needing automotive repair would likely

PHOTO: GETTY IMAGES/EPOXYDUDE

search for shops in their neighborhood rather than the city overall. Make sure your website reflects those types of consumer habits by including the specific areas you serve. It's also wise to list your business on as many local directories as possible — from Yelp and Google Maps to up-and-coming sites, such as Thumbtack, which allows users to search for services by zip code.

It's key to ensure that your name, address and phone number are listed the same way wherever your business appears. Even minor spelling errors or typos can make it difficult for new customers to find you. For example, let's say an auto repair shop's name has an ampersand in it (Martin & Sons Auto Repair). If one directory has the ampersand written out as the word "and" or the apostrophe is added to the word "Sons" by mistake, the listing could get confused with other similar sounding businesses. It's also crucial to update your listings any time your name, location or phone number changes.

Staying on top of these listings can be a daunting task, but there are some ways to make the job a bit easier. Moz Local is a useful service that offers a free "check your listing" tool. The company can also perform updates and make changes for a minimal fee.

The goal of consistent and abundant listings is to drive customers to your website. You'll want your site to reflect the keywords that are relevant to your customers. As noted before, the "Think globally, act locally" phrase should come into play. Have the neighborhood you serve featured prominently on your home page. Highlight the services that are most frequently requested by your customers (a Houston-based shop, for example, might focus on A/C repair). If there are certain models that are popular in your area, make it a point to emphasize your expertise servicing those vehicles by either including them on your home page or creating a landing page dedicated to those models.

Choosing keywords is a delicate balancing act. If you select keywords that are too broad, say the term "Toyota experts," then you'll probably find yourself competing with too many shops and may end up coming up short in the rankings. Some words are just too saturated and need to be tailored to your audience. Adding a neighborhood name to a key phrase (i.e. Wicker Park Toyota experts) can often help narrow the field and generate better results. On the other hand, picking words that are too obscure isn't wise because there may not be enough people searching for those terms. Keywords should also be designed to attract people who want to make purchases rather than those just browsing for information in hopes of performing a repair at home.

One last word on keywords: don't go overboard trying to fit key terms on your website. "Keyword stuffing," as the practice is commonly known, is no longer recommended because not only has Google gotten wise to the tactic, but it can also result in a stiff, robotic-sounding website. Again, Moz can be a great resource because it offers an "on-page grader" that will evaluate your individual pages to determine if the right keywords are used in the right places.

Another way to improve your SEO status is by developing unique content. Shop owners are often reluctant to commit to creating content because they fear it will take too much time. The trick is to avoid overthinking your content – whether it appears on social media, a blog or even in an email blast.

Use the various platforms where you communicate with customers to educate them about what you do. Tap your existing knowledge by sharing car care tips, safe driving advice or the latest automotive industry news. I also advise shop owners to use their content to reinforce the keywords they've chosen to target. If, for example, you hope to attract Subaru owners, keep potential customers updated on recalls and other issues unique to that brand.

Reviews are also a good source of content and help provide credibility for your business from unbiased sources. Always encourage your customers to review your business either at the time of service or via a follow-up email.

Finally, link building is emerging as a more important method of enhancing SEO. Link building is the process of increasing the number of external links that point back to your site. One of the best ways to acquire more links is to look at who your partners are in the community. Most shop owners have relationships with associations, coaches, chambers of commerce and local non-profits. In most cases, those organizations are happy to provide website listings of their members or sponsors. Always check to make sure the URL that an organization lists for your business works and sends visitors to the right place. Lost links can impact your search engine rankings.

Remember that all of these strategies are meant to work together. Unfortunately, there is no magic bullet that will automatically send your business to the top of the search rankings. But working steadily to implement the various approaches outlined in this article should increase your visibility and, hopefully, your sales too. MA

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Commit to training and see a return on your investment

SEEING A RETURN GOES BEYOND JUST PAYMENT FOR REPAIRS

CHRIS CHESNEY // Contributing Editor

If this is your first visit to this section, I encourage you to review my first two installments in previous months as a precursor to a deep dive around this latest installment — the cost of creating a training plan, where to find quality content and how to measure your return on investment (ROI) and effort. ROI is an interesting discussion when it comes to training, no matter the industry.

In a past life, I worked for a major tool company where I helped form a technical training program. We had a tag phrase about training ROI: 'Training Doesn't Cost, It Pays!' We had buttons made and other collateral material to promote the fact that there is, in fact, a positive return on investing in training people. But we really didn't have metrics that could support this statement, and in reality, it is difficult for a training organization to measure ROI. It's also difficult to measure a return in the conventional sense of how much was spent versus how much additional revenue was generated.

So this month, let's look at ways we can measure training's ROI and discuss how you can implement them into your business today.

Having spent the last 25-plus years training technicians and shop owners, I can tell you that there are two desired, measurable points that are incredibly difficult to pin down. The first is measuring the student technicians' abilities to apply what they learned during a training event or class. And the second, did the investment in training my team positively impact the shop's bottom line?

Let's look at the variables in each ROI scenario. The desired result for a shop owner committed to training their team is ultimately a team member who grows their skills and abilities, which should result in a positive return on investment.

If I send Joe to an air-conditioning update class in the spring, I should expect Joe to be more productive when servicing A/C issues. Makes sense, right? However, this example is wrought with assumptions that prevent any chance of accurately measuring ROI, let alone seeing a measurable improvement in Joe's skill set. Unfortunately, this scenario is typical of how shop owners choose to train their team.

Using the A/C update class as an example, it's usually held prior to A/C season, and most likely delivered by a parts supplier in an effort to sell him A/C products that year. However, there are problems with this strategy. Sending your team to an annual update class is not a well-planned learning program. It is simply throwing training at a perceived problem. All training should be assigned for the purpose of improving a skill that has been measured and deemed inadequate. Sending your team to training that they see no value in because they weren't involved in the decision or because they already understand the topic or skill only creates animosity in your team. They will come back and say it was a "waste of time" or "I could have taught the class" because the content didn't match their skills gap.

So, let's assume you have gained your team's commitment and identified the learning manager for your company, who in turn has created all the job roles and identified the team's knowledge gaps. Fur-

>> CONTINUES ON PAGE 29

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OCTOBER 24-28
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Seattle, Washington

NOVEMBER 1-3
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Sands Convention Center
Las Vegas, Nevada

NOVEMBER 1-4
SEMA
Las Vegas Convention Center
Las Vegas, Nevada

NOVEMBER 19
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SOCIAL INSIGHTS

OLDER VEHICLES ARE NOT NECESSARILY EASIER TO FIX

The majority of calls we receive on our technical help line are with vehicles 15 years old and newer. With the complexity of newer vehicles, these calls have become increasingly more difficult to do. Suffice it to say that when a call comes in for a vehicle that is from the '90s or the early 2000s, it usually becomes a break against the brain burners we normally receive. That doesn't mean the older vehicles are immune to being difficult. There are plenty of times when those seemingly "easier" calls come in and end up being a "lunch eater."

Wayne Colonna continues at Motorage.com/NotEasier

MASTERING GAS DIRECT INJECTION

For many years, gas direct injection was an oddity on a very small number of cars dating back decades. It has become so common now, however, that if you purchase a new vehicle, there is a very good chance you'll own your first GDI-equipped ride. This article covers some operational and diagnostic highlights for GM and Ford.

Continue reading about GDI at Motorage.com/MasterGDI

REPLACING TIMING BELTS

In theory, replacing a timing belt is pretty straightforward: remove everything in the way, line up the components, replace the belt, set the tension, top off any fluids lost during the procedure and then neatly reinstall everything that came off — no problem. In reality, one mistake or oversight can cause drivability concerns or damage a very expensive engine, and it's quite easy to make a mistake or forget something critical during routine timing belt replacement.

Learn more about replacing belts at Motorage.com/BeltReplace

WHICH WAY TO GO?

Diagnostic techs are truly creative when it comes to inventing testing methods. We think of ways to apply theories we've learned to applications not originally intended. For instance, I may apply the training I received about a Ford Drive-By-Wire Throttle Body to some other manufacturer as the testing procedures may be the same. This article discusses the steps, tools and tests performed to prove without a doubt what is causing a complaint.

Read the testing methods used here Motorage.com/Testing


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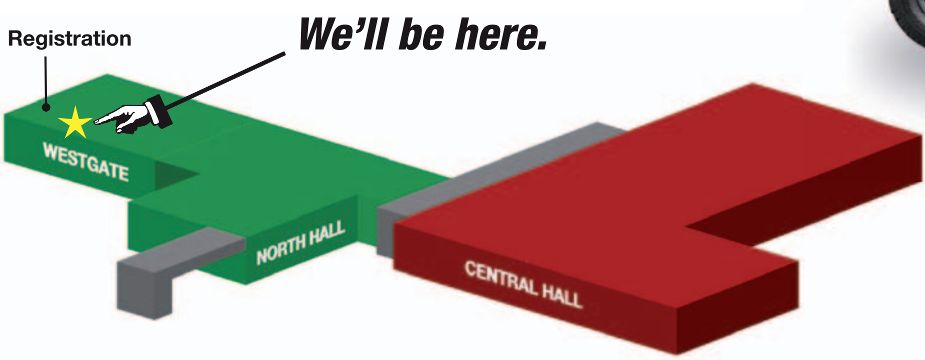

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ther, assume you have engaged everyone on the team in designing the program and you've chosen the content provider, resulting in a well-thought-out plan. As spring arrives, you are approached by your parts supplier with an A/C update class opportunity to which your learning manager responds by identifying team members who can actually benefit from the class or by saying, "Thanks, but we included that topic in our current learning plan." Only then will you see a positive impact on your bottom line. Anything else is wasting money by providing untargeted training and not including your team in the plan to leverage those funds effectively. Do you see the difference?

To summarize, having a well thought-out learning plan prevents you from just wasting training on a perceived problem, and instead results in a team that is more likely to engage in the training prescribed, which will deliver a better ROI.

Now let's look at the first measurable we described: how to know if a team member is able to apply the knowledge learned during training. There are a couple of traditional methods used today that are limited in their accuracy. One is the typical test that uses multiple-choice questions to try to measure the student's knowledge base. Considering there are more than a few systems on a modern vehicle, it is nearly impossible to accurately measure a student's knowledge base by asking only a handful of questions. The other traditional method is probably what most do today: nothing. You send a tech to class and hope they come back and apply what they've learned. This assumption will typically not work out well. You might send a tech who really needs A/C training to a good A/C class with the goal of helping them reduce their return rate on A/C services. If, in fact, the tech did not choose to apply any of what they learned in class, it may take months for you to realize this as the vehicles they serviced start returning for re-repairs.

One other legacy method of knowledge transfer confirmation consists of having a mentor who is knowledgeable about the system in question observe the tech who attended class to determine if they can apply the new skill effectively. Continue reading at MotorAge.com/trainROI.

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SERVICING SAFETY

PHOTOS: VANESSA ATTWELL

WHAT YOU NEED TO KNOW ABOUT SERVICING VEHICLES WITH ADVANCED SAFETY SYSTEMS WHILE ENSURING YOU DON'T CAUSE ANY PROBLEMS

VANESSA ATTWELL //
Contributing Editor

Advanced vehicle safety systems used to be found pretty much only on expensive, higher-end vehicles — but that's no longer the case.

Systems that can prevent or mitigate crashes and compensate for occasional driving errors seem to be very common now, even on less expensive units from most vehicle manufacturers. And while it's great that safety is no longer an expensive luxury, well-meaning technicians performing routine service procedures can easily damage advanced safety systems, which is not good news and can be prevented.

For the most part, the systems consist of computer-controlled inputs and outputs, and there's not much maintenance or service required to keep them operating well. However, those advanced safety features can cause big headaches if you're not careful during routine service. But there's no need to worry.

With a little planning and know-how you can avoid causing any problems, fix a few common faults in the systems and definitely keep your customers happy and safe on the road. Here's a quick overview of some the common systems used and some typical service precautions that will keep repairs problem-free and keep the systems functioning as they should — and keep you stress-free at the end of the day.

Lane Departure Warning and Lane Keep Assist systems

Frankly, it seems that even economy vehicles are equipped with fairly advanced, computer-dependent technologies that keep drivers, passengers and pedestrians safe on the roads.

One of the most common advanced safety systems used is the Lane Depar-

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ture Warning system that tells drivers they're wandering too far out of the marked lanes, very much like "rumble strips" or rough pavement along the edges of the road are intended to do.

This electronic version, however, sounds an alarm (typically a buzzer/light combination) and sometimes even vibrates the steering wheel or seat to let the driver know that the vehicle is wandering too far out of the acceptable zone and that they should take corrective action immediately.

These "passive" warning systems use lane markings as the basis for their calculations, and while these systems can be useful, manufacturers are quick to point out that the systems are only as good as the road markings. They often can malfunction when the markings aren't clear. They can also malfunction in the rain and snow, which can be very frustrating indeed. In fact, from personal experience, many customers will actually shut these systems off using the interior switch or controls because the false alarms are incredibly annoying — even though the false activations tend to amuse passengers in the vehicle who watch the driver get "zapped" repeatedly when the system activates.

Many vehicles seem to have auto-correcting Lane Keep Assist systems as well, which take Lane Departure Warning systems a step further by actively correcting the vehicle's direction when it wanders too far out of the traffic lane rather than just passively alerting the driver to the problem. These "active" systems also typically use lane markings for reference (though a few systems do use the road edge to judge road position instead of lane markers so, again, it's critical to consult service information for the exact vehicle involved to understand the systems used) and the control

SENSORS FOR BLIND SPOT DETECTION SYSTEMS are typically located on the bottom of the side mirrors.

module decides when corrective actions are needed and acts accordingly using the steering or braking systems. Even though corrections are made without driver input, the computer's corrections can typically be overridden by the driver using the normal steering controls, and the system can be completely disabled if desired.

And as with Lane Departure Warning systems, the Lane Keep Assist systems aren't foolproof either. The systems can be adversely affected by reflections from road debris, large shiny objects or trucks that reflect into the camera, so the driver (or technician test driving the vehicle) still needs to be vigilant and maintain control.

System limitations aside, however, there are a few things to be mindful of when servicing vehicles with Lane Departure Warning and Lane Keep Assist systems to avoid inadvertently causing problems.

For example, even though systems vary among manufacturers, most vehicles use a camera located in the base of the rear view mirror at the top center of the windshield in the system. Because light travels back and forth through the windshield to the camera, using non-OE quality replacement glass has been known to adversely affect the system's operation, as have dark tints and even

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just general grime on the windshield. In fact, anything in the path of the camera can adversely affect system operation, so it's important to be careful when working in that area.

A few manufacturers do use a more expensive radar-based system for their lane departure warning systems, with the sensing unit mounted at the front of the vehicle, usually in the front bumper or grill area. Always consult service information to be sure.

If the system vibrates the seat to alert the driver to problems, keep in mind that the vibrating motors inside the seat use wiring harnesses that might crack or break if abused (broken or crushed harnesses have often been found in certain light-duty trucks), so be particularly careful about throwing anything onto or under the driver's seat — the harnesses may not like the extra stress.

Finally, like any other computerized system or program, Lane Departure Warning and Lane Keep Assist system operation is only as good as the inputs and outputs. It's a nice touch during routine service to clean any dirt, bugs or grime from the sensors so that the system operates as reliably as possible. It's a small thing, but it's a professional touch that can make a difference when your customer decides where to bring their vehicle for the next service.

Collision Avoidance Systems

Another safety feature that used to only appear on higher-end vehicles but is fairly common now is the Collision Avoidance System that warns drivers of impeding front-end collisions so they can take evasive action — or in some cases brake or steer the vehicle without any input from the driver at all.

Always consult the owner's manual and service information for the details on how a specific system operates and what software and components are used, but at a very general level the systems are similar to lane departure warning systems. Instead of watching lane markings these systems scan for other vehicles (though not so much small vehicles and motorcycles) and in some cases also scan for pedestrians. Some of the advanced systems scan for large animals by the side of the road at night.

If a problem or impending collision is detected, the system alerts the driver with an alarm or vibration, and depending on the system, it also might pre-charge the brakes so that the vehicle can stop quickly to shave valuable milliseconds off braking time and avoid the collision completely — or at least slow down for an extra few milliseconds to get the vehicle to a lower speed to minimize damage and injury to both the vehicle occupants and whatever is being hit. Some systems will prepare the vehicle and occupants for impact if it determines that a collision is unavoidable by doing things like closing the windows and tensioning the seatbelts.

It's also worth noting that some systems will use the steering and braking systems without driver input to avoid an impact if the controller determines that no driver action is being taken to avoid the impending collision.

During routine service the system will probably go unnoticed (especially if you're careful on the test drive) but there still are a few important things to keep in mind to ensure that service goes smoothly.

For example, be aware that changing anything that affects ride height, braking, steering or lighting can also affect Collision Avoidance System operation. Always consult service information to be sure. To be safe, tire pressures and sizes should always follow manufacturer recommendations and shouldn't vary from side to side.

Also, it's important to be mindful of doing anything to the brake switch circuit on certain systems since this critical input may be monitored to determine if the driver is trying to stop the vehicle and avoid any impending collisions. Consult service information before proceeding.

Finally, ensure that the base braking system doesn't bind or pull and always use high-quality replacement parts to avoid introducing problems into the system. Again, the automated system is only as good as the mechanical components it controls.

The Collision Avoidance System is pretty advanced, but working around it just takes a bit of know-how, which is really easy to do once you know how.

Adaptive Cruise Control

Usually vehicles with Collision Avoidance Systems will also have Adaptive Cruise Control, which is easy to work around with a bit of knowledge.

Active Cruise Control systems typically use radar or a laser-based system to maintain a set distance between the vehicle and the vehicle ahead. This system is useful in heavy traffic but still not perfect, so drivers (and technicians on road tests) still need to monitor traffic and road conditions and be ready for surprises.

As with other advanced safety systems, there are definitely a few things to keep in mind to prevent causing problems in the Adaptive Cruise Control system during routine service.

CAMERAS SHOW OBJECTS drivers may not easily spot and it's important to know where they're located to avoid problems.

First, it's worth pointing out that Lexus' service information cautions that exposure to radio frequency emissions (like those used by certain radar systems) is hazardous to your health and therefore warns techs that it's "…hazardous to be within 20 cm (7.9 inches) of the device's radio frequency aperture." Good to know, indeed.

Also, any wheel and suspension

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modifications, including mounting a temporary spare tire or different sized tire can affect system operation. And, as with Collision Avoidance Systems, brake problems such as grabbing or pulling can also affect this system operation, so it's important to ensure that brake components operate smoothly without any grabbing or binding.

And, of course, installing heavy accessories on the vehicle can affect operation, as can loading heavy cargo into the vehicle. This really isn't that much different from before these systems were widely used — it's just much more important now.

Additionally, be careful that any components removed are reinstalled securely; loose mounts (especially at the front of the vehicle) are a common cause of problems that can easily be prevented. Components in this system may also need to be calibrated when they're removed and reinstalled. Check service information as well as tech tips and bulletins and be sure before removing anything.

Finally, after servicing vehicles with these sensitive systems, it's wise to park them out of direct sunlight if possible because extreme heat has been known to adversely affect operation (the system only operates within a certain temperature range). Explaining why the system suddenly doesn't work anymore after it's been serviced is an aggravation no one needs at the end of a long day.

Blind Spot Monitoring

Blind Spot Monitoring systems also are widely used now. These systems act like an electronic "shoulder check" to alert the driver to objects in the vehicle's blind spots and will sound an alarm if a problem is detected. There's usually an icon on both the mirror and driver information center that illuminates when the system activates.

REAR-FACING CAMERA located in the tailgate handle

Typically the system relies on a small sensor on the underside of each side mirror for information and the driver is able to disable the system using a simple switch, which happens surprisingly frequently since they're also prone to annoying false activations.

Fortunately, these systems aren't hard to work around, other than being careful not to damage the mirrors or get the sensor dirty. But just as with Lane Keep Assist and Lne Departure Warning systems, rain and snow adversely affect operation, as do reflections from shiny objects on the road that reflect into the sensor. Cleaning the sensors off during service is a nice, professional touch your customers will likely appreciate.

Surrounding view cameras

Although cameras that show objects near the vehicle that might not be readily visible aren't new technology, they are being used on a wider range of vehicles, and that means it's important to be aware of them so that problems aren't created during routine service procedures. These are the systems that use cameras at different places along the vehicle to alert drivers to things very close to the vehicle that may not be noticed, which is useful in driveways and parking lots.

From experience, the systems do tend to be relatively straightforward and won't need to be calibrated — even after battery replacement— but always check service information for the specific vehicle and be sure before you disassemble anything to prevent surprises from happening.

That being said, it's still important to be aware of where any cameras on a vehicle are located and to be sure not to install options that block them, especially on work trucks. Transferring optional equipment to a new vehicle from the old one may not be as straightforward as it once was.

BOTH AFFORDABLE AND LUXURY VEHICLES have advanced safety systems and use cameras located in the front grill.

Additionally, it's important to be aware of cameras mounted in the front grill since they may be jostled or wiggled while servicing components under the hood. The camera may need to be removed to access the components behind it or, if you use the front bumper as a step to access the engine compartment, it may inadvertently be damaged. Bumpers may be resilient and bounce back, but the components behind them may end up damaged or loosened as a result.

Being aware of where the cameras and components are located so they're not inadvertently damaged during service can prevent much aggravation.

What's on the drawing board?

Advanced safety features have certainly become common features on mainstream vehicles, and both new safety systems and improvements to existing technology are already being dreamed up for the not-too-distant future.

For example, driver fatigue monitoring systems likely will be appearing on more and more vehicles as automakers adapt and implement the technology. The systems currently in use vary both in operation and in what they monitor to determine if a driver is drowsy behind the wheel. Some systems monitor elapsed time between stops, some monitor movement in a lane and steering wheel movements and some even monitor eye movement and eye droop using a camera pointed at the driver.

If a drowsy driver is suspected, the systems typically vibrate the seat or sound an alarm or even warn the driver to get some rest — and on some vehicles even lets the driver know where to get coffee close by.

Additionally, aftermarket fatigue monitoring systems (like those used on fleet vehicles) might monitor for "offenses" like cell phone use or "distracted driving events" and alert a dispatcher or supervisor when they occur. Most systems then generate a report, including photographs, of the offense. The camera-based systems, however, can be affected by light reflecting off of eyeglasses or safety glasses. One of our clients who installed the system on their fleet of trucks has several images of a frustrated driver flipping the middle finger at the monitor after light reflecting off his glasses caused several false activations in a row, which was not what they had in mind when they installed the system. The entire fleet of vehicles can also be tracked and located using an app on a cell phone.

Vehicle-to-vehicle communication technology is also being developed, which would allow vehicles to communicate with each other to, among other things, prevent collisions and make driving in heavy traffic safer. Additionally, uploading and storing driving information wirelessly into the cloud (or similar) is on the drawing board, which would allow driving information and preferences to be used by traffic management systems or even rental car companies.

And, of course, completely automated vehicles that can be operated with no driver input are being tested and used with mixed success — an interesting development indeed.

Customers and drivers might not be ready to accept and trust the upcoming technology, but it's good to know about what's coming, because it may appear soon on a vehicle in your service bay. It's good to be prepared.

Conclusion

Privacy and cyber security issues aside, there are definitely ways to prevent causing problems when servicing vehicles with advanced safety systems that are widely used on so many vehicles.

Checking the basics like ensuring that tire sizes and pressures are in accordance with manufacturer specs, sensors are clean, all lighting works and that brakes and steering systems operate without problems has always been essential — it's just even more so now. And, as ever, avoid poor quality parts (especially replacement glass).

There's no substitute for alert, non-distracted driving and solid driving skills — after all, the driver is still responsible for controlling the vehicle — but there are systems that try to compensate for brief lapses in judgment and sudden changes in driving conditions to minimize damage and injuries. It's important to know how to service those vehicles without affecting any advanced safety systems and to be ready for what's coming next.

Until automated technicians are developed and implemented, you'll still need to think ahead and be mindful in order to prevent problems from ever developing, which is a challenge you'll definitely be ready for with a bit of preparation. 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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INSIDE CODING AND PROGRAMMING

DIAGNOSTIC EXPERTS DISCUSS THE OPPORTUNITIES AND PITFALLS OF DEALER-LEVEL MODULE REPLACEMENT AND RELATED FUNCTIONS

DAVE MACHOLZ // Contributing Editor

We all have been faced with a vehicle that needs a module or component that is part of the onboard vehicle network. We have tested inputs and outputs to come to the expensive conclusion that we need to call the dealer and place the order.

"This is just the beginning of the 'Wild West' that is module coding and programming," says John Rogers of JWR Automotive Diagnostics. To make things more interesting, the Massachusetts Right to Repair law ultimately will be a game changer for the independent repair industry in regard to dealer-level diagnostics becoming available to the independent service sector.

To get a glimpse of what the current world of diagnostics looks like, I sat down with several of New York's top diagnostic minds who are in the business of offering these factory-level services both as mobile repair techs and support personnel. Rogers, Mike Burmester of Advanced Mobile Diagnostics, Justin Kidd of Autologic, Inc. and I work together as part of the automotive advisory board at Suffolk County Community College on Long Island, N.Y., where this very topic came up recently. We later sat down to discuss the ins and outs of coding and programming. This is not another J-2534 how-to, but rather a look at the realities of module replacement and related functions.

PHOTO: JUSTIN KIDD AT AUTOLOGIC

THE AUTOLOGIC ASSISTPLUS has the diagnostic scan tool company prepared for Right to Repair.

Coding, programming, initialization, flashing, calibration and bears, oh my!

The first step in understanding all of these confusing terms is to realize that some are synonymous. The terms largely vary by manufacturer. These terms all refer to the installation and connecting of a module or programmable device to the vehicle network and to inputting the information needed for the module to perform as designed.

Kidd had a great analogy for explaining these terms and described them as follows: "Imagine you go to the Apple store and buy an iPhone. The iPhone has the capability to function as a calculator and a camera and can perform a variety of functions because it has an operating system, or program, that allows it to function. However, until the phone is connected to the network and coded with the appropriate account number and phone numbers, you will not be able to place a call."

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Thinking of this in this way really simplifies the process. When we purchase a module, it will either arrive with an operating system already installed or it might need to have the program installed with the use of a pass-through device and a factory service information and diagnostic program subscription. In many cases, the module will need to be coded and connected to the other modules on the vehicle in very similar fashion to the cell phone description. Again, these processes vary greatly from manufacturer to manufacturer.

His explanation sounds easy, right? It can be, if you are working solely with one manufacturer and specializing on one particular platform. But the reality is that most independent service providers are working on multiple lines.

As with any service procedure, be sure to consult the factory-level service information and follow the procedures to the letter.

Hardware, operating system and application issues

When venturing into dealer-level programming, "computer knowledge is a must," says Rogers. You are going to have to get familiar with Microsoft Windows operating systems, updates and the various versions of applications such as Internet Explorer, Java and Flash.

Kidd brought up the fact that if you are working with multiple brands you need to use the "no shared laptops" rule due to the fact that each manufacturers' requirements for Windows, Internet Explorer and programs such as Flash and Java will vary.

"I have 18 laptops for this very reason," Rogers says. "Turn off Windows automatic updates. Different update levels will give you varying levels of performance and can lead to programming failure."

PHOTO: JUSTIN KIDD AT AUTOLOGIC

AN AUTOLOGIC TECHNICAL SPECIALIST will be able to take over your scan tool remotely to guide technicians through complicated diagnostic and programming functions.

"If you are going to perform these functions on multiple brands, it's a full-time job," says Burmester. "You need to be an IT guy in order to keep up to date. The need for making sure your equipment is ready to roll prolongs the length of the overall process and requires constant updating and in some cases means keeping the laptop you are using out of date so that the software will work properly."

Some of the software updates can cause manufacturers' software to perform poorly or not at all. "In a lot of cases, Mercedes wiring diagrams won't appear if Adobe is updated to the current version," says Kidd. In a worst-case scenario, out-of-specification software could lock up a programming event and possibly destroy a module.

What does Right to Repair have to do with it?

By now you have probably heard about the Massachusetts Right to Repair law. The law specifies that vehicle manufacturers must provide dealer-level diagnostics and functions to the independent service sector by 2017. The *Readers Digest* version is that independent shops will now have the ability to perform the same level of diagnostic and programming functions through a single pass-through device — no more need for multiple expensive interfaces. Simply purchase the factory subscription, and you are ready to go.

While this is a state-specific law, it is widely considered throughout the industry to be a 50-state legislation. While the general automotive public is slowly catching on to Right to Repair, scan tool manufacturers have seen the writing on the wall for a while now.

"We knew this was coming," Kidd says of Autologic. "This is an industry game-changer." So much so that Autologic, a company known for its high level of diagnostic capabilities on European platforms, went to a new approach with its scan tool platform, the AssistPlus. This leverages the power of live technical support from brand experts, most of whom are Master Technicians within their brand. An Autologic expert can work in real time and take control of the scan tool remotely in order to guide technicians through complicated diagnostic and programming functions for various manufacturer applications. This approach seems to speak to the common theme throughout our sit-

PHOTO: JWR AUTOMOTIVE DIAGNOSTICS

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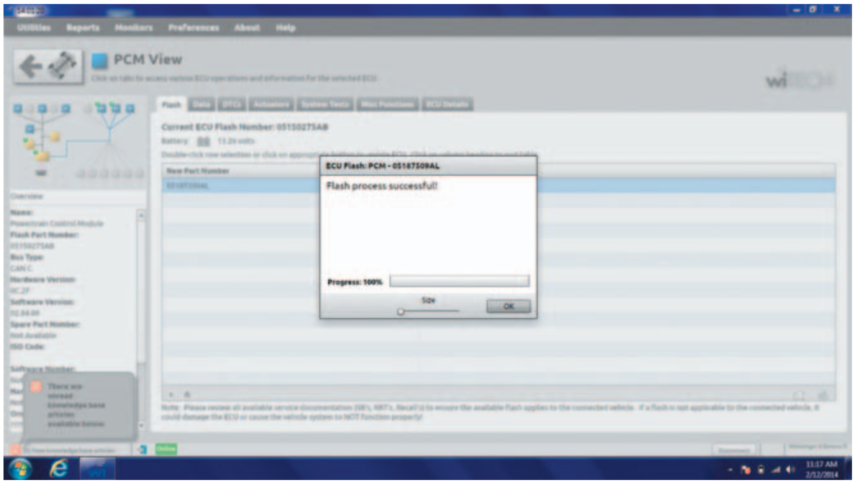

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down in that the biggest problem shops are facing when it comes to providing high-tech services such as reprogramming and module replacement is one of information.

The search for good information

"One of the biggest challenges I face on a day-to-day level is the lack of information on the shop-owner side of the business. They don't know where to go to get the info they need. Misinformation is also a big problem," says Rogers, whose main line of business is as a "hired gun" mobile diagnostician called in when a shop is stuck.

While the Right to Repair law has a lot of upside, it will indeed come with its share of issues. Information and technical support seem to be a common theme among our diagnostic experts. While the availability of the information and capability to perform advanced functions will be a new line of revenue, shop owners will be challenged with navigating multiple manufacturer service sights without the help and support generally available to the dealers.

Rogers referenced a recent tangle with a Ford 6.0 Powerstroke diesel and an FICM replacement: "I encountered a failure to program an FICM. I called Rotunda, Ford's vendor, for assistance, and was told that the failure codes the tool reported were engineering codes that even Rotunda didn't have access to." This is typically where a field service engineer or a technical assistance hotline comes in at the dealer level, which, of course, in most cases won't be available to the independent repair facility.

Burmester has encountered similar problems on Volkswagen and Audi products when installing new factory modules. "I have had error codes before and have been told by technical support that they couldn't help." Again, in this case a dealer could most likely get another module from VW/Audi, but how will this work in the aftermarket? It remains to be seen.

Our group did, however, point out a few manufacturers who are easy to work with.

"The GM tech line is among the most helpful," said Burmester. In the aftermarket, Drew Technologies, a provider for nearly all of the pass-through and J-2534 devices on the market, provides a high level of technical support. It is at the apex of the reprogramming food chain and is widely considered the "go-to" throughout the industry. "Drew Technologies often has patches for some of the problems we encounter when using a pass-through device to program high-end European vehicles," Kidd says.

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Building a support network

Locating information, coupled with navigating complicated software configurations and an attempt to take on every job that comes through the door, will present their share of problems. Our group mentioned the importance of building a network of other shops, mobile diagnostic technicians and support personnel.

"I speak to John three or four times a day," said Burmester. An amazing factoid is that they are competitors working in the same geographic area. However, the two pointed out the importance of being able to bounce ideas off of each other.

NASTF

The National Automotive Service Task Force is a partnership between manufacturers and the independent service sector that formed as a result of the very issues discussed here so far. According to NASTF.org: "The National Automotive Service Task Force is a not-for-profit organization established to facilitate the identification and correction of gaps in the availability and accessibility of automotive service information, service training, diagnostic tools and equipment and communications for the benefit of automotive service professionals. NASTF is a cooperative effort among the automotive service industry, the equipment and tool industry and automotive manufacturers."

NASTF provides the industry with a much-needed voice for the independent sector. In addition, it provides resources such as the information needed to purchase manufacturer service information and subscriptions in one common location. They also provide a wealth of information on trending problems with factory tooling, licensing and other emerging issues.

While it is a great wealth of information, like any other resource, it cannot be used as a sole source. Their information comes from technicians like you, as well as manufacturers who report problems with service information or tooling. Oftentimes they have fixes, and sometimes they don't. Our panel felt that this resource was indeed a good place to start, yet has reported that some of the problems they face in real-time have not yet made it to NASTF for dissemination to the automotive public.

The pros and cons of Right to Repair

While discussing coding and programming, the topic of Right to Repair goes hand in hand. "The upside to Right to Repair is now anyone can perform the dealer-level functions," comments Kidd. "Subscriptions can often be had inexpensively with per-day, monthly or yearly options." Some of these options, such as those available through Toyota, can be had at less than $20 for the daily option.

The downside to Right to Repair is also a cause for concern. "No specific automotive affiliation is needed to subscribe and use the factory service information. My sister could download it and attempt to reprogram her own car," Kidd says jokingly. Of course, there is some truth hidden in his sarcasm.

Cost and availability are also reason for concern. While some manufacturers have provided the information and services at low costs, others are priced at an unreachable level while others still don't yet have a solution. "Mercedes does not have a full service solution available today. They have coverage for engine and transmission, but what happens when someone needs to code a headlight?" asks Kidd.

While the Right to Repair law has been taken seriously by some, others are not yet ready. Time will tell on how they answer the call. There is still some feeling in the business that not all manufacturers will comply. "This law was passed in Massachusetts," says Rogers.

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"What will happen in other states if the manufacturers decide not to comply?"

"There are going to be growing pains. Who was lobbying for this? Were they car guys? I have always said be careful what you wish for because you just might get it," he adds.

The margin for error when it comes to performing these dealer-level diagnostics is huge. Our panel was all in agreement that it is going to take a lot of the independent garage's time. "Shops that are committed to dealer-level diagnostics will need a tech whose sole job is performing these functions and staying up to date with the technology," says Burmester. "Dot the i's and cross the t's when making the decision to perform these functions."

"I make sure I follow the programming procedures to the letter of the law. I make sure to take each responsible step," adds Rogers. If and when something fails to go the way it is supposed to while programming, you can take user error out of the equation when following all of the recommended procedures.

Another piece of Right to Repair that had our group concerned was the question of just how much information will be made available. Will we have access to Toyota or other manufacturers' technical assistance hotlines? Likely not. "Chrysler Star cases, which are field engineering reports, are not available to the aftermarket. This is often the information you need to make sure you will be able to perform a critical module replacement," says Rogers. When assistance is available, it is often incomplete. "Nissan's Tech Support cannot provide me with proper calibration IDs. We are on our own and we need each other for support."

PHOTO: JWR AUTOMOTIVE DIAGNOSTICS

JUNKYARD MODULES are just part of the "Wild West" of dealer-level programming, says John Rogers of JWR Automotive Diagnostics.

The last piece for concern is that once independent service providers take the plunge into dealer-level functions, they may also be taking on some liability if a vehicle is still within warranty. "There is a bit of a Big Brother aspect here. The OE will know who did what to which car, as there will be a record of the work that is done. If a shop does a programming event and the vehicle winds up back at the dealer for a warranty concern, who knows what will happen," states Rogers.

As the British say, keep calm and carry on. There are going to be some growing pains, but if you have determination, information and a network of colleagues for support, you may have just discovered a new avenue for business revenue. It's just not as glitzy as some would have you think — take it from a few street-wise New Yorkers. MA

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G. JERRY TRUGLIA //
Contributing Editor

Our first vehicle is a 2006 Audi A4 2.0L Turbo (Figure 1) that was towed in for a no-start concern. The young guy who was driving the vehicle stated that the vehicle had been losing power and smoking from the tailpipe before it shut down and no longer started. Our next step after the owner interview was a visual inspection that revealed a motor that was down a quart of oil and looked like no maintenance had been done for a while. The visual was followed by a scan of the computer system, which revealed a P2293 (Fuel Pressure Regulator 2 Performance), P1093 (Fuel Trim 2, Bank 1 Malfunction), P0300 (Random Cylinder Misfire), P301, P302, P303 and P0304 (Cylinders 1 – 4 Misfire) DTCs.

Checking our service information system, we found a Technical Service Bulletin (TSB) No. 2013147/1 that detailed a problem with the camshaft, camshaft follower and fuel pump. Armed with the TSB information, we decided to call the local dealer and provided them with the VIN number to see if the vehicle was eligible for the warranty repair. Unfortunately for the vehicle owner, his vehicle was not eligible for the repair, as the car was over the 10-year, 120,000-mile limitation. Now the vehicle owner was on the hook for the repairs that needed to be performed.


1

PHOTOS: G. JERRY TRUGLIA

We called the owner and requested additional time to check fuel pressure and for the labor necessary to remove the fuel pump so that we could visually check the cam follower, fuel pump and camshaft for damage. The fuel pressure test was not conclusive because it tested only the low-pressure side (the delivery from the fuel tank to the low-pressure side of the high-pressure fuel pump). Because there was no way for us to test the high-pressure side of the pump, we had to remove the fuel pump and visually inspect the cam follower (Figure 2). Take a look at the worn one verses the new one. The camshaft was also damaged (Figure 3), along with the tip of the high-pressure fuel pump.

During our visual inspection, we had noticed an oil change sticker from a tire shop that advertises a $19.95 oil and filter change. We have seen a variety of engine problems over the years

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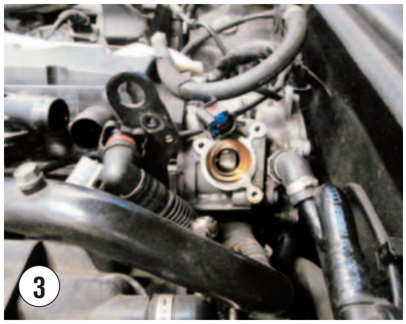
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caused by improper oil changes using the wrong type of oil and suspected the same here. As most of you know, you cannot purchase the correct oil and filter for $19.95 for an Audi, let alone perform the service for that price. With that information at hand, we thought that we better do a bit more digging into to the engine before providing the owner with a price for the repairs.

When we removed the air filter box and tubing to the turbo, we found oil in the intake (Figure 4). Upon finding oil in the intake upper tubes, we thought that it would be a good idea to remove the lower turbo intake hoses and inspect them for oil as well. My tech Bill found about a quart of oil sitting in the lower turbo hoses that poured out in a steady stream. After collecting all the information, Bill and I concluded that the engine was using oil for a while, most likely due to a turbo seal problem. Since the vehicle owner's father would be paying for the repair, he naturally wanted to know what the cheapest alternative was to getting his son back on the road.

Bandaging an Audi

Rather than doing the job right (replacement of the camshaft, cam follower, fuel pump, timing belt and parts related to this type of repair), we had to put a bandage on it. Because the main problem was a no-start due to fuel, the most logical step was to order the least expensive part — the cam follower. We were able to order an OE Audi cam follower from WORLDPAC, who had it available for a reasonable price. With the new cam follower installed, the engine cranked over and ran, but blew so much smoke out of the tail pipes that it looked like a five-alarm fire. We moved the vehicle out of the shop to one of our outside parking spots so we could run the engine and see if the smoke from the oil would burn off.

There was no letting up with the oil burning, and that most likely indicated that the turbo seals and possibly the turbo bearings were wiped out. I had an idea to bypass the turbo, going directly to the air intake system. This would allow the engine to run while eliminating the turbo's oil burning and would allow us to make sure the engine could run properly. In order to do this, we had to remove the airbox that has the MAF attached and directly connect it to the intake.

The engine was now running without smoking, allowing us to concentrate on checking if there was sufficient fuel delivery without setting a DTC. The outcome of our test revealed that the fuel pressure was still not building enough pressure. The problem was not only the cam follower but also (as we knew) that the camshaft and the fuel pump were


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worn. After the vehicle was running for a while, the same P2293 DTC returned, so we had to try something else.

With a vehicle owner who wanted the cheapest way out, I had to be creative on how to get this engine to deliver enough fuel without installing all of the needed components. I removed the cam follower and installed three washers inside the cup part of the follower that contacts the high-pressure fuel pump. We restarted the engine and found that it ran better, but it still illuminated the MIL. Once again, we removed the fuel pump and added two more washers. Now the engine would run without setting the DTCs. It was time to call the customer and tell him that, in order to get this engine running, he would at least have to replace the cam follower, high-pressure fuel pump and turbo.

With the owner's approval, we began the repairs. We removed the old turbo and found that the blower vanes were not able to turn due to the bearing being severely damaged. We installed the new turbo along with the new high-pressure fuel pump and test drove the vehicle. The engine ran remarkably well, but was far from perfect since it needed the camshaft replaced. What we found was that under normal driving, the engine ran fine even up to speeds over 65 mph. If you pressed the pedal to the metal, though, the check engine light would illuminate and the same P2293 DTC would return.

You do what you have to

Often, the hardest part of our job is not

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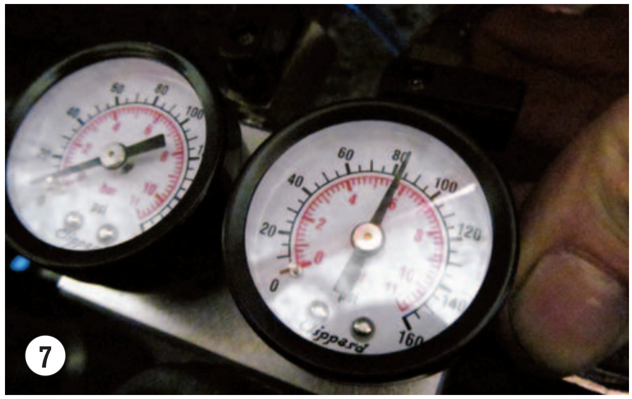

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fixing the vehicle but rather trying to fix the customer. Trying to get the vehicle owner to perform the proper repairs is really their call since they dictate what happens. We told the vehicle owner and his father that due to poor maintenance and the lack of a full repair approval, the job was not totally complete. We explained to them that since the recommended parts were not installed, they could expect the check engine light to come back on. We also stressed that at some point the engine would stop running due to the worn camshaft, so they should stay local and prepare to break down.

We highly recommended that he trade in the vehicle or perform the necessary engine repairs. As you can gather, I am annoyed that I could not perform my job properly because I am not the real boss when it comes right down to fixing the vehicle — the owner is.

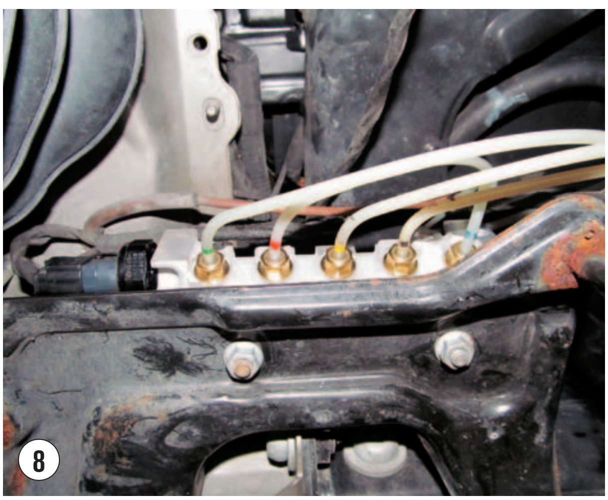
A rebel Mercedes

Our next vehicle was a 2005 Mercedes Benz S430 from South Carolina (Figure 5) that came as a referral from our listing on the RepairPal website. The vehicle had a problem scraping the road since the air suspension system was not working correctly. The vehicle owner at first went to the closest European shop he could find driving up to New York.

After experiencing his vehicle suspension system problem, he was in for another shock when the European shop provided him with prices for OE replacement parts. Thinking that it was too expensive, the vehicle owner decided to purchase the air suspension components himself online. The shop charged him for a diagnosis and installed four air struts, a level control valve unit, axle damping valve units, AIRmatic central unit and AIRmatic compressor unit. Once all the parts were installed, the system would still not function properly, and the shop was not able to locate the leak problem.

After spending all the money and virtually replacing every air suspension component on the car, he lost confidence in the shop and pulled his car out of there. He began his search for another shop on the internet. During a phone conversation with us, we discussed his problem and assured him that we would diagnosis his suspension properly and recommend only the needed repairs. He decided to have his car towed rather than driving it to prevent any further damage to the new parts that were just installed.

Before we started the diagnosis of the vehicle, we reviewed the information about the system. Before we diagnose any system that we are not fully



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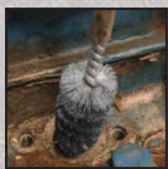

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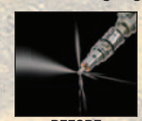
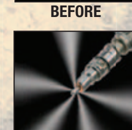


BEFORE



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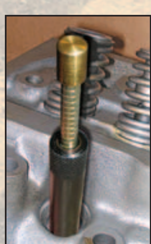

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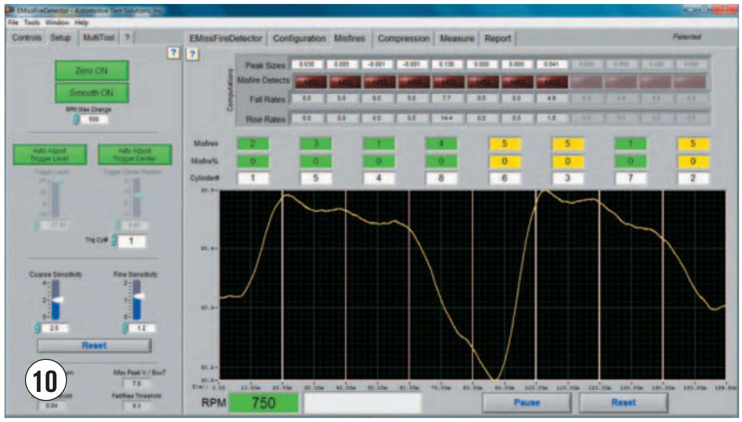
familiar with we research how the system works. The system level control allows both manual and speed-responsive adjustments by automatically raising or lowering the ride height.

The AIRmatic control system levels the front and rear of the vehicle, ensuring that the vehicle remains level for a particular driving condition. The system has three levels for comfort, sport or damping forces that can be used for the road conditions and or driving style. It's normal for the air suspension to lower when the vehicle is parked and locked, then rise again once the vehicle is started.

Basically the vehicle is realigned or leveled to adjust for any additional weight. The vehicle level system is continually monitored and readjusted whenever there is more than a ± 20mm difference. The most common failure items are the air compressor, air struts, leaking lines, faulty relay or fuse, valve block leaks, faulty level sensor or the valves on the top of the strut towers. If the system encounters a problem such as not rising to the proper height, or if it's touching the ground, codes will be set and an error will be displayed on the instrument cluster.



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Locating leaks

After reading through the system description, we drove the vehicle into our bay, then connected the Autologic scan tool to activate the suspension system (Figure 6). We found that the right front would not go up while the left side seemed to reach normal height. In the rear of the vehicle, the right rear went up but would not reach the proper height, while the left side seemed normal. When it comes to testing air suspension systems, it can be difficult to find problems if you do not have the correct tools and proper understanding of the system.

To make our diagnosis easier, we used the Automotive Test Solutions (ATS) Bullseye Air Ride Suspension Test Kit for Voss Systems (Figure 7) that we connected to the suspension level control valve unit. We ruled out the AIRmatic compressor since it was able to pump air and obtain the normal height on the left side of the vehicle. We started flowing CO_2 to the attached Bullseye tool (Figure 8) and started testing with the leak detector tool (Figure 9) so we could locate the leaking areas. We located two areas that were leaking and confirmed the defective components by spraying the Bullseye foam on the suspected components. The components that were found defective were the front and rear right struts, so we informed the owner to order replacements.

We had to wait a week or so for the new air struts to arrive at our shop. After the replacements were installed, the job still was not over, because there is a special leveling procedure that has to be followed in order for the suspension system to function properly. The proper level calibration settings would now have to be set by using the scan tool and special tester. In the factory information, the procedure requires the use of a special MB tool called the Romess CM-09606 inclination measuring instrument, along with their scan tool. The specifications are 3.1° to 4.1° front inclination and -1.5° to -0.9° for the rear inclination settings. If the level settings are not in the proper range the system will not function properly.

Because we do not own the special MB Romess tool, we

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had to use a tape measure from the floor to the center of the fender well. The reading from the floor to the center of the fender wheel for the front should be about 27 inches, while the rear should be set to 28 inches. With the presets completed to the proper level, the next step is to perform the calibration with the scan tool. After the scan tool's setting was completed, the vehicle leveled properly. This was followed by a shut vehicle down and restart, along with a few test drives and the S430 was no longer hitting the pavement.

11

A rough BMW

Next, we move on to a misfiring 2011 BMW 550iM sport model that came in with a concern of rough running and some performance problems at times. The vehicle owner had returned to the BMW dealer multiple times with the same complaint only to be told that there were no problems found. The BMW dealer tested the vehicle with the factory scan tool, finding no DTCs present, so they sent the vehicle owner on her way. After carefully listening to the vehicle owner, we test drove the vehicle and felt the misfires she was speaking about.

We all know that it is very possible to have a misfiring engine that doesn't set a code. It all depends on the test threshold for misfires that particular OEM uses in the computer software. Our next step was to connect our scan tool and check for DTCs as well as scan data. Since no DTCs were uncovered and the scan data looked OK, we switched scan tools to the EScan so we could easily check for volumetric efficiency, fuel trim and Mode 6 data, only to find them all acceptable.

Coming up empty handed, we decided to use the ATS misfire tester. This system uses a pressure transducer installed in the tailpipe, using the exhaust pulses as an input to the ATS special software. As you can see by the screen shots of ATS misfire detector (Figures 10 and 11), taken in both tailpipes since the vehicle had dual exhaust, cylinders 2, 3 and 6 all displayed misfires, which confirmed what the vehicle owner was experiencing.

We looked up TSBs and found that there were numerous bulletins covering everything from ignition coils problems to injector issues. The vehicle owner also had repair orders from the dealer stating that the coil and injector problems were addressed. We removed one of the spark plugs to check inside the cylinder for carbon build up on the valves and pistons. The inspection revealed that there was, in fact, carbon build up on the valve that is very common on GDI (gasoline direct injection) engines.

The vehicle owner was informed of what we found and decided to install a bottle of carbon build-up cleaner and fill the tank up with a Tier One gasoline such as Shell or Mobil in an effort to clean out the carbon. After driving the vehicle for a few full tanks, she noticed an improvement but decided that she had enough of the problems with this vehicle and traded the vehicle in at a non-BMW dealer.

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Test results can be found here: http://www.ferodo.com/en-US/Competitor-Benchmark/Pages/Test-nr1-Stopping-Distance.aspx

FIAT MULTI-AIR ENGINE TECHNOLOGY

THE 4-STROKE INTERNAL COMBUSTION ENGINE CONTINUES TO BE REFINED AND OPTIMIZED FOR GREATER POWER, EFFICIENCY AND LOWER EMISSIONS

SCOT MANNA // Contributing Editor

There is a large amount of research and technology applied to valve control, especially on the intake side. For as long as 4-stroke internal combustion engines have been built with camshafts to operate intake and exhaust valves, engineers have known that the camshaft is always a compromise. No other component has as much influence on the power characteristics of a given engine as the camshaft.

The crucial events the camshaft controls are intake valve opening (IVO), intake valve closing (IVC), exhaust valve opening, (EVO) and exhaust valve closing (EVC). The timing of these four events determines the power and torque curve, idle quality and where the power is produced, such as a low-end torquey engine, an engine with good mid-rpm power or a high-rpm screamer. The compromise comes from the fact that changing the cam lobe profile is not possible once a conventional cam is ground. Having a cam profile with early intake valve closing will produce good low-rpm torque, but this will limit higher rpm power and vice versa.

Fiat powertrain engineers realize this and have come up with a unique solution to the problem of a fixed cam lobe design. By utilizing modern, high-speed computer and hydraulic technology, they have built a high-output 4-cylinder engine that incorporates fully variable intake valve lift and timing control through the use of hydraulics to control valve operation. The Fiat Multi-Air engine is a 4-cylinder engine with four valves per cylinder and a single overhead camshaft that operates the exhaust valves directly through inverted bucket tappets and a unique hydraulic actuator assembly that sits above the intake valves and controls their operation.

Multi-Air technology was patented in 2002 and introduced in Europe in 2009 on the Alpha Romeo MiTo. The first U.S. application was the 1.4-liter Multi-Air engine in the 2010 Fiat 500,

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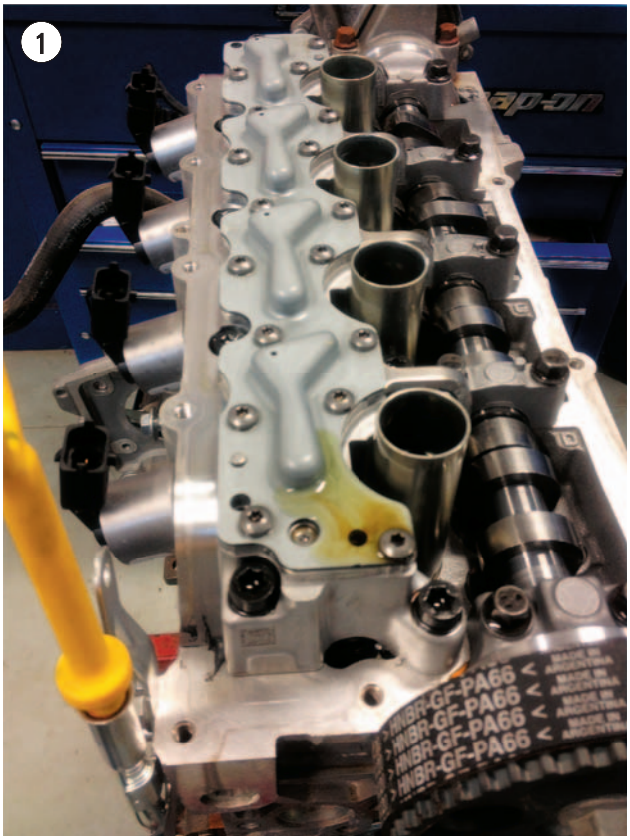

PHOTOS: SCOT MANNA

FIAT MULTI-AIR ENGINE with valve cover removed, revealing the Multi-Air actuator or "brick."

along with a turbocharged version for the 500 Abarth. A 2.4 liter Tigershark engine with Multi-Air is available in the Dodge Dart and Jeep Cherokee. Current Multi-Air engines are port fuel injected and do not use EGR valves or cam phasing systems.

Multi-Air technology can be adapted to many different engine designs and allows Fiat the opportunity to license the technology to other manufacturers. Multi-Air benefits include increased power and torque, reduced fuel consumption, faster

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throttle response, reduced CO_2 emissions and lower pumping losses. All of the benefits are due to instantaneous, fully variable intake valve lift and timing control. Intake valve actuation is no longer directly controlled by the intake cam lobe profile but rather by electrical control of the hydraulic actuator. Let's take a closer look at exactly how the intake valve really works.

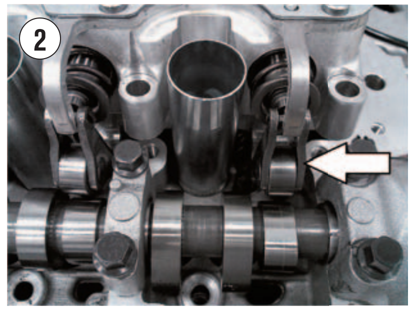
Inside the 'brick'

Sitting directly above the intake valves on the cylinder head is the Multi-Air actuator, often called the "brick" (Figure 1). A look at the camshaft reveals there are three lobes per cylinder, two identical exhaust lobes and a single intake lobe that operates a follower, which moves a piston in and out of a bore in the Multi-Air actuator — this is the high pressure oil pump (Figure 2).

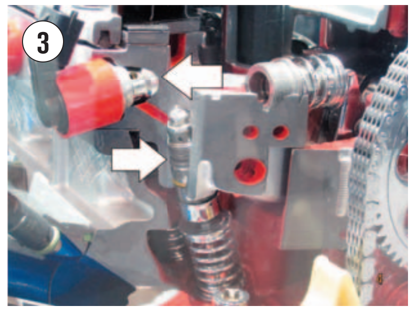
The stroking movement of this piston pressurizes engine oil that will be directed to a hydraulic piston, which will open the intake valve. A close look at the camshaft lobes reveals that the lobe lift appears much greater on the exhaust lobes than the single intake lobe. Service manual information lists the exhaust valve lobe lift at .295 inch or 7.5 mm and intake valve lobe lift at .145 inch or 3.81 mm. In actuality, due to rocker arm ratio and hydraulic system multiplication, the actual intake valve lift is .370 inch or 9.3 mm. The Multi-Air actuator contains a high-speed oil control solenoid and two hydraulic brake-pumping elements per cylinder, each operating a single intake valve.

In Figure 3, the camshaft driven hydraulic pump can be seen on the right with a return spring attached, the oil control solenoid in red on the left and the hydraulic brake/pumping element in the center directly above the intake valve. The hydraulic brake/pumping element receives high-pressure engine oil from the solenoid and pushes the valve open. This actuator has several functions: it limits the maximum travel of the valve, acts as a hydraulic lash adjuster and also as a brake as the valve closes to slow the valve down and prevent hammering of the valve seat and face.

Also located inside the Multi-Air assembly is an oil accumulator for each cylinder to absorb pressure pulsations when the solenoid valve is opened and to maintain pressure in the low-pressure circuit. The oil control solenoid is the component that allows the Powertrain Control Module (PCM) to control when the intake valve opens, how long it stays open or whether it opens at all. Keep in mind that this is a lost motion system, meaning that if the valve opening point is delayed or the closing point is advanced, some of the cam lobe lift is lost and the valve lift and duration will be less than the lobe profile.

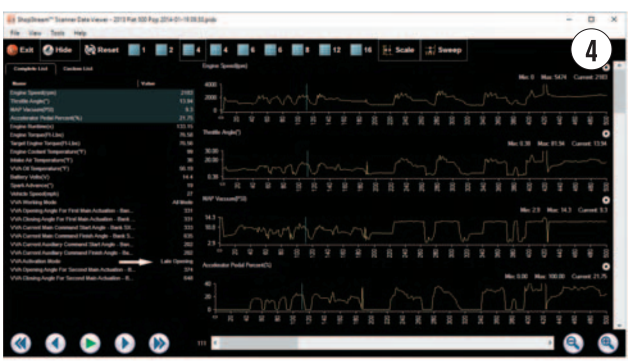


MULTI-AIR INTAKE CAM follower and HP oil pump

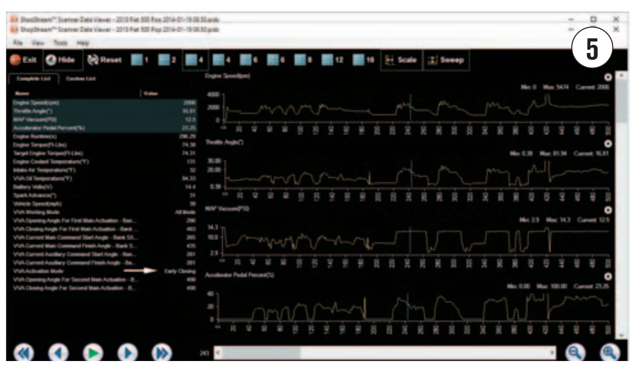


CROSS SECTION OF CYLINDER HEAD showing oil control solenoid and hydraulic brake/pumping element

The oil control solenoid is normally an open solenoid and in this condition, high-pressure oil provided by the camshaft-driven pumping element will be vented to the accumulator chamber in the Multi-Air brick and no valve opening will occur. When the PCM energizes the solenoid, the vent chamber is blocked and high-pressure engine oil is directed to the hydraulic brake/pumping elements and the valve is opened. This means the PCM has to energize the Multi-Air solenoid to open the intake valves.



SCAN DATA GRAPH WITH CURSOR showing how manifold vacuum follows throttle angle in LIVO mode



SCAN DATA GRAPH SHOWING the change to EIVC mode and manifold pressure remaining high at light load

Multi-Air modes

Any fault that prevents the circuit from working, such as a failed PCM fuse or relay, may cause a cranking no-start that mimics an engine with no compression, like a broken timing belt. This computer control of intake valve actuation allows for a number of unique Multi-Air control modes: Full Lift, EIVC (early intake valve closing), LIVO (late intake valve opening), Multi Lift (multiple valve opening events) and No Lift (no valve opening).

Full Lift mode is used when maximum engine power is requested or when there is a stored engine fault, such as a misfire code. In Full Lift mode, the solenoid is commanded on before the intake cam lobe contacts the hydraulic pump roller follower and remains energized during the entire cam lobe duration, providing maximum valve lift and duration. This mode is seldom in use as was seen during extensive test driving of Multi-Air equipped vehicles.

EIVC mode is used extensively while driving and can be used as a primary load control mode that allows for less throttle control by the throttle body. The PCM determines the required engine torque and will close the intake valve once the necessary air mass has been inducted into the cylinder. Thus, you can think of this as throttling via the intake valve. It can be seen while driving that during light engine load there is very little vacuum in the intake manifold, thus lowering intake pumping losses and making the engine more efficient.

The two scan data captures (Figures 4 and 5) are from a Fiat 500 and show how as the engine is warming up it operates in LIVO mode, and the intake pressure closely follows the throttle angle, as in all throttled engines. After frame 220 as the engine accelerates, it changes to EIVC mode and the intake manifold pressure remains high at about 12.5 PSI (3.5 in.hg.) and no longer mirrors the throttle angle. Similar to how BMW targets a small vacuum level in the intake manifold on valvetronic equipped engines, the approximately 3.5 inches of mercury vacuum seen in Multi-Air engines appears to be a target level and allows for crankcase ventilation and charcoal canister purging. Due to this relatively high manifold pressure, or lack of intake vacuum, the engine is equipped with a camshaft-driven vacuum pump to assist the vacuum brake booster.

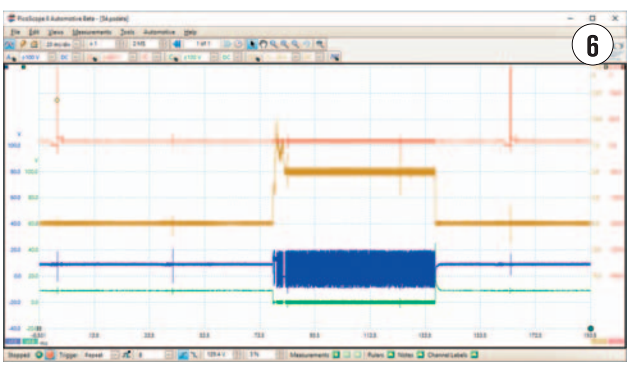
The LIVO mode is used primarily at idle and low engine speeds. By delaying activation of the oil control solenoid, some or most of the valve lift profile is lost depending on how late activation occurs. This allows for no valve overlap and very smooth idle and low speed operation. Any chance of charge dilution with exhaust gases from valve overlap is not possible, and no EGR effect occurs with LIVO, so it can only be used at idle or very light load.

Multi-Lift mode is a combination of EIVC and LIVO and can be used to increase valve open duration with small valve opening levels. Multi-Lift might allow for good charge motion that may prove helpful if GDI is adapted to these engines. No-Lift mode would allow complete cylinder de-activation and would be helpful on larger V6 or V8 engines. As of this writing, Multi-Lift and No Lift modes are not in use on current engines but may be implemented in future applications.

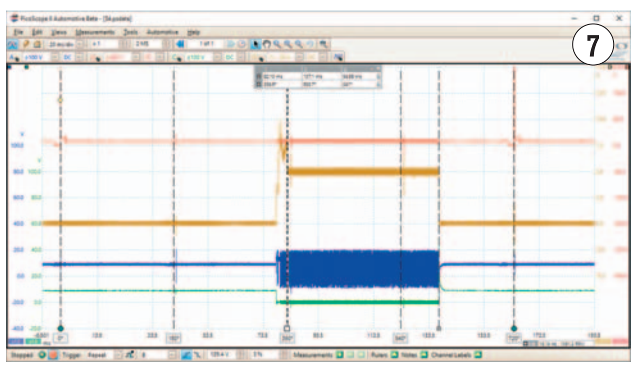
Oil control solenoid

The oil control solenoid is precisely controlled and closely monitored by the PCM and produces a unique current signature. By scope testing the oil control solenoid, a better understanding of system operation can be gained. It must be understood that regardless of when the solenoid is turned on or off, the valve movement is still dependent on the intake cam profile stroking the oil pump and producing oil pressure that can be applied to the hydraulic brake/pumping actuator. You cannot confuse solenoid activation current with intake valve movement, as sometimes the solenoid is activated ahead of when the cam actually moves the follower.

When scope testing the oil control



SCOPE TEST with Multi-Air solenoid low-voltage circuit on bottom, solenoid feed-voltage circuit above that and solenoid current above that. Cylinder No. 1 ignition firing is the top pattern.



ROTATION RULERS used to measure Multi-Air solenoid on time in crank rotation degrees

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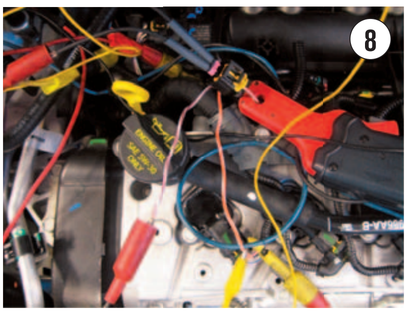
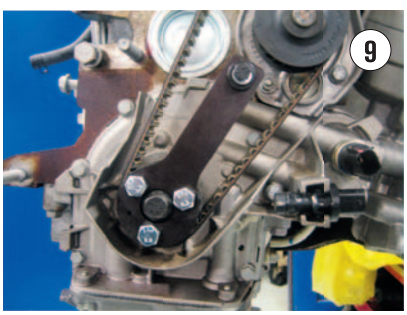
By adding rotation rulers to the waveform framing the cylinder ignition firing event, you can see the current waveform hold section shows the solenoid was energized for 241 degrees of crank rotation (Figure 7). The engine was running in LIVO mode at the time. The turn-off event of the current waveform happens much sooner in EIVC mode.



PICTURE OF THE SETUP with jumper wires installed for the circuit resistance experiment



MULTI-AIR crankshaft locking tool

Diagnostics

Due to close monitoring of the Multi-Air system, diagnosis of the system is highly DTC driven. There are extensive circuit codes for the solenoids that allow not only electrical fault identification but also hydraulic system problem diagnosis. There is a P1523 code for low oil pressure in the Multi-Air brick. By monitoring overall manifold vacuum, vacuum pulsations and RPM fluctuation during cranking, the PCM can determine if the intake valves are operating.

The engine must be cranked for 10 seconds to set this code and no theft codes must be present, as active SKIM codes might cause the PCM to disable the oil control solenoids, but the parameters for the P1523 code are still monitored. No MAP sensor codes can be present for this code test to run. To prove the reliability of the self-diagnostics, some experiments were performed. Using small diameter 18-gauge jumper wires to add some resistance to the solenoid circuit, the engine was started and the oil control solenoid current was tested. Figure 8 shows the setup; the engine had a constant misfire with the jumper wires in place.

The AC-coupled MAP sensor voltage confirms there is no intake pull even though there is solenoid current present, but the current level is low. This experiment set two codes: (1) a P1041-00 Implausible data from cylinder No. 1 oil supply solenoid valve received and (2) P1061-00, Cylinder No. 1 oil supply solenoid valve stuck. The system can identify issues but the installed resistance was well below the threshold allowed using an ohmmeter to test the circuit as mentioned in the code chart, so scope testing is the best way to identify problems.

There are only four serviceable items in the Multi-Air system: the entire Multi-Air brick, the roller followers, a screw-in oil temperature sensor and the oil supply O-ring between the brick and the cylinder head. While the oil pumping elements and hydraulic brake/pumping elements can be removed from the brick, they cannot be purchased separately at this time.

MULTI-AIR camshaft locking tool

Speaking of service, there are a couple of special tools required to perform timing belt service on the engine as there are no timing marks.

There is also a special spring compressor tool to collapse the pumping elements for easier Multi-Air brick removal and installation. The cam timing tools can be seen installed on the engine. The crankshaft locking tool is Miller No. 10276 (Figure 9) and the camshaft locking tool is Miller No. 10277. The spring compressor is Miller No. 10259B. The camshaft locking tool is affixed to the back of the cylinder head once the camshaft-driven vacuum pump is removed (Figure 10).

Fiat Multi-Air technology is expected to spread to further applications and will be showing up in your service bays sooner or later. Getting familiar with this innovative technology will keep you ready to service and repair these powertrains when trouble crops up.

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A CHANGING INDUSTRY?

CHANGING TECHNOLOGY IS MODIFYING THE JOB MARKET AND ALTERING OUR JOB DESCRIPTION AT THE SAME TIME

PETE MEIER // Director of Training

It's hard being one of the "old guys" in this industry at times. I entered the business somewhat by accident, needing a part-time job while I was in high school, and pumping gas at the local service station seemed better than flipping burgers at McDonald's. That alone will date me with many of our readers who are even now asking some of the older techs in the shop what a service station is!

I come from an era where we helped our dads work on the family car and the idea of owning one of your own took hold early, as if it were part of the process of growing from boy to man. For many a young teen, the idea of having a "hot" car was more important than having a "hot" girlfriend. The reasoning was simple. If you had the first, you would have no trouble securing the second.

And cars "back in the day" were mechanical beasts that demanded attention beyond the casual oil change. Points needed to be cleaned and set, carburetors needed cleaned and adjusted, belts needed to be inspected and tightened. It was one thing to do this on the weekends on your own ride and quite another to do it as a full-time job. The job was hard, dirty and physically demanding. Some entering the profession had the advantage of high school shop classes, but most of us learned from those we worked with on the job. The systems were not complicated to learn, though, especially when compared to the technologies new technicians face today.

PHOTO: BEEPI

THE ONLINE USED CAR buying and selling service, Beepi, is actively looking for experienced technicians to act as inspectors, adding to the already high demand for good techicians.

As a young man, I didn't entertain thoughts about my future in the business. My focus was on enjoying my youth and the cash in my pocket, and I spent a lot of time hanging with like-minded friends. Then I met a girl, THE girl, and now I was taking on the responsibility of providing for another human being. A few short years after that, and one became two as my girl became my wife and a child entered our lives. I had a series of jobs, some on the motorcycle side and then back to the automotive side, and I even tried my hand at management — but soon figured out that wasn't for me. I enjoyed the repair side of the business, the challenge of figuring out what was wrong and how to make it right again.

The technology explosion that started in the late 1970s and early 80s was inspiring, too. I watched more than one coworker seek other career options as computers and their related technology became more prevalent. I was only energized by the changes, because the new systems required you to actually think about what was happening, and required you to learn in order to remain proficient — something that is just as true today, if not more so.

As I entered my 40s, I began to realize that I would more than likely spend the rest of my life with a wrench in my hand, not that that's a bad thing. My dad always told me that a man who could work with his hands would always be able to provide for his family, and for me that has held true even in the more trying economic times. I never held dreams of being rich, or having the newest cars or biggest home. I was satisfied with a clean home, food on the table and the ability to care for my wife and children.

In my late-40s, I noticed that I wasn't as fast as I used to be in the shop. Parts of me that didn't ache before were now making their voices heard and I sounded like a bowl of Rice Krispies whenever I got out of bed. I began to wonder if I would be able to stay in the bay until my retirement and considered my options, which leads me to the whole point of this conversation.

Career options – then and now

A few of my coworkers left the back of the shop for the front, choosing to move into a service advisor role or into management as a shop foreman or store manager for any of the several chains that were in our area. A few others opted for teaching positions at the local schools. And a daring few opened their own shops with mixed success. If you wanted to stay in the automotive industry, these were (at the time) some of the more common alternatives to turning a wrench.

But those options began to change over the last few decades, as the technology of the industry grew. Now, successful mechanics were known as "technicians" and all new skill sets were coming into play. The ability to apply critical thinking skills to new and increasingly challenging problems and come up with a solution were in demand in all areas of the industry, from the local shop to the global OEM. And that demand meant increased options for those of us in the back of the shop.

It isn't just the automotive industry seeking out top talent — every technical field has need of the same skill sets and according to a statement attributed to Mike Rowe of "Dirty Jobs" fame, "There are over 300,000 skilled job openings today that are unfilled because we don't have the people to fill them." It's nice to be in a position where the demand outweighs the supply, isn't it?

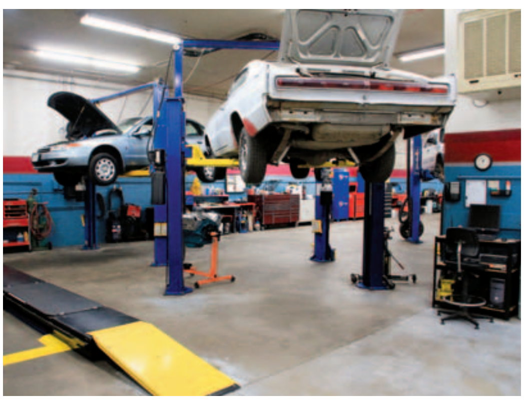

PHOTO: HAGLIN AUTOMOTIVE

ACROSS THE COUNTRY there are service bays in need of technicians — technicians who are being lured away by new market opportunities.

A change in direction

Recently, there was an article on our news feed that caught my eye. It described the growth in demand in a sector of our industry I had never considered but certainly would now if I were an experienced technician in search of an alternative career path. The demand is happening, in of all places, Silicon Valley. Established companies and new startups are looking for those with the exact skill sets we already possess. Contributing Editor Jim Guyette opens the article with this statement:

"Within just a few short years the auto-oriented rivalries and differences between Detroit's muscular Motor City manufacturing might and the Silicon Valley's software expertise have become wafer-thin as collaboration and investment are booting up to establish the San Francisco/San Jose region as a key center of vehicle design developments — opening up significant industry job opportunities in the process.

"While it might be helpful for an aspiring Silicon Valley technician to have the term 'engineer' included somewhere within your list of qualifications, employment listings indicate that hands-on knowhow is in high demand to actually execute the technological innovations."

Guyette goes on to share a laundry list of statistics and job descriptions that exist right now in this growing segment, and they involve companies like Mercedes-Benz, Ford, General Motors, Honda and others. Some are start-ups, like the Bay-area based company Beepi, an online used car "buy and sell" service. Guyette notes:

PHOTO: PETE MEIER

A TECHNICIAN TODAY still has a physically demanding job, but now it is also a mentally challenging one.

"'We are hiring great people for many positions,' reports Jocelyn Rivera, an executive at the Bay Area-based Beepi online used-car buying and selling site. Vehicle inspection specialists with Automotive Technology degrees and ASE certifications are especially in demand.

'In some areas we're also hiring apprentices — entry-level technicians who want to get their foot in the door and grow into the vehicle inspection specialist role by taking on operational responsibilities at our different warehouse locations,' she says. 'In addition, we hire car haulers for both long and short distances to move our Beepi cars to and from our different operations centers.'"

And these are just a few examples of how a changing industry is creating new opportunities. A young technician has more career paths to explore than ever before. Shop owners, take heed — the competition for qualified people is only going to grow. What will you do to keep your talent at home?

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.
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THE SOS SYNDROME

THREE JOBS WHERE ALMOST NOTHING WENT RIGHT BUT WE WON THE FIGHT ANYWAY

RICHARD MCCUISTIAN //
Contributing Editor

PHOTOS: RICHARD M CMCCUISTIAN

THIS LITTLE COBALT had a lot of life left in it and was worth the replacement Ecotec, but it hadn't been without its problems leading up to that oil pan breach.

We run through quite a bit of work in my department, and the ones we really learn from are the hardest ones to figure out. We also learn from our mistakes, and yes, I know I'm the only one who ever makes a mistake (or not). Anybody who has ever worked with students knows how people who are learning to do this kind of work can make mistakes — some of them quite memorable. They sometimes disassemble things they didn't need to because of inexperience, and other times they'll have to backtrack because of some important part that was left out during assembly. Then there are those times they'll approach a big or complicated job without even looking at the shop manual, and they'll put themselves in a bind.

For one example among many, I had a guy replacing the engine in a 2005 Kia Sportage a few years ago, and he just plowed into it without doing any reading at all. Well, when he disconnected the engine from the transaxle, he discovered that there wasn't enough room to get the engine out of there without bringing the transaxle with it. Had he simply perused the information system verbiage before beginning that task, it would have gone a lot smoother.

Then there are times when following the shop manual is a really bad idea because some of the information in the shop manual is SOS — i.e. "Stuck On Stupid" — as if the procedures were written by a desk-bound service engineer who never actually laid eyes on the vehicle. Surely I'm not the only one who has ever run afoul of such misinformation! We did work on a Kia Sedona that provides a perfect example of the misinformation malady, meaning we would have been better off not to have even checked the shop manual R&R procedures.

The Sedona came to me from a family member who had noticed compressor noise that was so bad he couldn't stand to operate the A/C unless it was really hot outside. The A/C was cooling just fine, but that noisy compressor needed to be gone, so I put a couple of my people to work on it. We replaced the compressor, the drier and the expansion valve. Knowing the Asian penchant for stuffing the expansion valve in the evaporator case, I wasn't surprised to read in ALLDATA that the evaporator case needed to be removed in order to replace this TXV. When we took those published procedures for gospel, we made a wrong turn. Most shop manual publishers get their information from the manufacturer's shop manuals (with permission), but some of the Asian manuals leave a lot to be desired. This one was no exception.

In strict obedience to the ALLDATA service procedure on this platform, they removed the instrument panel, which, by the way, on a Sedona is no small feat if you haven't done one. I usually stay out of the way when it seems like my folks are making progress and following procedure. But as I walked by this van about the time they got the panel out, I mentioned that those "block" type expansion valves usually are just inside the engine compartment rather than in the evaporator case (except on Toyotas). That's when I peered into the dark recesses of the engine compartment on the passenger side and found that this van was no exception to that rule of domestic normalcy. The entire dash removal was totally

THESE WERE THE THREE SOS jobs all lined up on the heavy side of the shop. Frankly, we were glad to see these three depart.

THIS IS WHAT A PIECE OF REBAR does to a cast aluminum oil pan at 70 miles per hour. The owner's new rule? "When in doubt, stop the car immediately."

unnecessary, because the valve was right there where it was supposed to be. Oh, well. They needed to yank a dash and put it back anyway. So be it. The end of the story was that the dash went back in well and the compressor is now cool and quiet.

SOS No. 2

The second SOS job we'll peruse is a cute but intrinsically boring little 2007 Chevy Cobalt. The first time we saw this one, it was running awful. The girl who drives it is a gentle soul who wouldn't speak a harsh word to or about anybody. In this case, she had good cause to complain, but she told her story with a smile. She had gone to a shop in a nearby town a few days earlier to have them look at the car because it was running so poorly at idle. She said the shop replaced the spark plugs (that's all they put on the bill) and charged her $500, but the car still ran like a three-legged dog. When she asked why the bill was so high, their reply was that half of it was labor. She didn't even ask why the car still ran so poorly, she just drove away and came to us. She was "Stuck On Sweet." Too sweet, if you ask me!

What my guy found was a sizeable split in a hose, and when he fixed that vacuum leak, the little car idled smoothly, but when we drove it, the right front wheel bearing was quite literally so loud it sounded like a two-cycle engine running at wide open throttle in the right front floorboard while you were driving along. The owner didn't even mention that totally off-the-charts bearing noise, and if the shop that replaced those very expensive spark plugs had done a verify-the-repair test drive, they would certainly have heard it. We got the green light to replace that right front bearing and after we did, the Cobalt drove like a little piece of heaven compared to what she had been experiencing before.

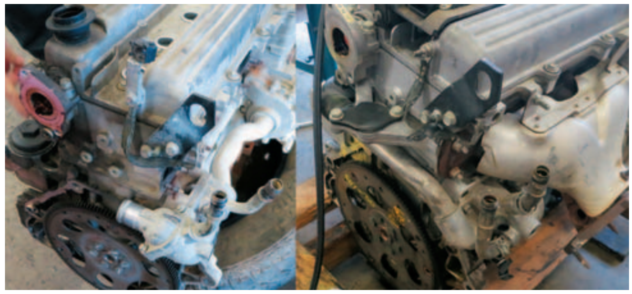
About three weeks later, she called me again and said she had run over something in the road she thought was a stick, only it turned out to be a piece of rebar that created a massive breach in the aluminum oil pan, and all the engine's oil found its way onto the highway in very short order. She indicated that she hadn't driven it far after the impact, but when we got the oil pan off, it turned out that one of the rods had been hot enough to change color — it was deathly gray.

The local chain parts store typically is pretty good about getting replacement powertrain components through LKQ. I used to deal directly with the local LKQ depot, but it has moved. I had them price me out a replacement engine, and the owner gave the go-ahead. My guys got the engine out of the Cobalt with the powertrain lift, then they rolled it over to the area where we do our disassembly/reassembly and they disconnected the engine from the sub frame and the transaxle, then removed it and put it on an old tire while the new engine was headed our way. That's where the SOS syndrome kicked in at the parts store.

Two weeks went by; the engine should have already arrived. I called every day to ask about the ETA, and my industrial sales parts guy kept saying he was expecting it "any day." It turned out that the LKQ truck had dropped it off at the parts store when the industrial sales guy was absent. Then another truck came in with pallet loads of parts, and the second-string crew stacked a bunch of pallets in front of the engine, which had been shoved against the wall. It sat there for 10 days before anybody figured out what happened.

When the engine arrived, we pulled the flywheel off to check the rear main seal and removed the valve cover to check for sludge. The rear seal was seeping, but the innards of the power plant were sludge-free. They popped the seal out, and we ordered a replacement. When it arrived, one of the guys came carrying the new seal holding it up next to the old seal he had picked up from the table, and it was obviously a different size. Now we were in SOS mode, but we didn't know it.

I called the parts guy, thinking the engine we had received was a newer model or something, because there were other differences that had to be addressed between the old and new engines and other parts that needed transferring. The parts guy was bewildered, and when our personal cloud of SOS smoke cleared, we discovered that my guys had picked up a rear main seal we had replaced from a 1991 F-150 for comparison to the replacement seal and the first seal had been the right one all along. We lost another day or two sorting that nonsense out.



THESE TWO ENGINES were different enough that it wasn't much of a stretch to believe the rear main might be different as well, but it turned out the seals were the same.

We finally got the Cobalt back together (we installed the other shop's $250 set of spark plugs in the replacement engine for good measure), filled it up with oil and coolant and watched the ECT with the EASE Wireless Vehicle Interface while the thermostat opened and closed and the fan cycled, test drove it a few times and she was back on the road.

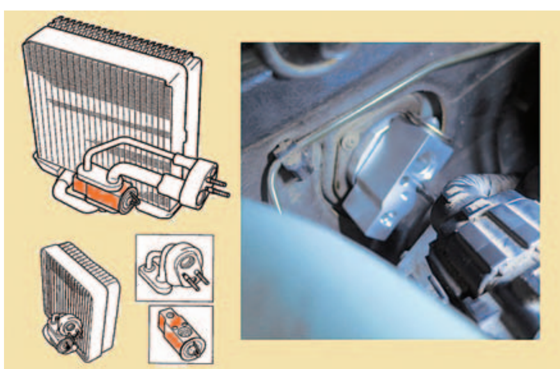
SOS No. 3

This one was one part SOS and one part ground-breaking experience, which is never a good combination but always interesting. The car was an ancient 1997 Mazda 626 V6 that was featured in a previous article (they had dragged it out of a barn and we had cleaned the fuel tank and replaced the fuel pump to get it going). Later we had replaced a weak ignition coil because it was sputtering and misfiring under load. They drove it for a year or two and then it started making some funky rattling noises and they wanted that checked.

My substitute was running the shop while I was at ASA-Midwest VISION, and the students thought they needed to remove the engine oil pan, which was totally unnecessary, but the sub let them do it. In the process of checking the bottom end, one of the guys managed to do the not-too-smart SOS thing and turned the engine backwards, which caused it to jump a few timing belt teeth. I figured this out when I returned, because there was a big half-inch drive ratchet hanging on the crank bolt and it was set to turn the engine counter-clockwise.

I had them yank the timing cover to check the marks, and, sure enough, the engine was out of time. But while we were there, we discovered the reason for that rattling noise, which I recognized, but they didn't. That self-contained hydraulic timing belt tensioner was all squishy and needed replacing. We replaced the tensioner and put a timing

THIS IS WHAT HAPPENS when you keep driving after all the oil has found a new home. It's interesting that only one rod burned out — the others didn't suffer at all.



NOTE THE KIA shop manual illustration to the left and the actual TXV location. We didn't need to remove the dash, but found out too late. It was our own fault we didn't look here first before diving in — Stuck on Stupid.

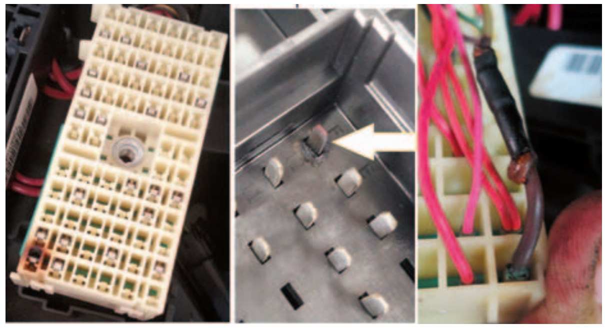
belt kit on it along with a water pump. We put a set of serpentine belts on as well, reinstalled the oil pan and poured in new oil with a new filter and new coolant in the jacket.

We got it running without a rattle, but it had an annoying misfire. When we investigated that, we found a split plug wire insulator and most of the spark plug wells nearly full of engine oil. The customer wanted that fixed, too, and so the intake was removed, the valve cover gaskets, spark plugs and wires were replaced. Because the starter tended to click a few times before it would spin most of the time, the starter was replaced as well at the customer's request. This bill was climbing really fast on a car that might be worth $500 sitting by the road with a for sale sign on it.

That's when SOS kicked in again. The car wouldn't start after the work was done, and the guy working on it said he couldn't hear the injectors but that it had fuel pressure. Long story short (too late), the O-scope showed injector pulse, so he had taken a wrong turn thinking the injectors weren't operating. After the guys all left one day, I found that he had mixed up the banks when installing the plug wires, and I fixed that to get it started. But the starter was spinning so slowly that it would barely crank the engine. We got it off and I bench-tested it to find it spinning very slowly and with great effort.

WHEN THE REPLACEMENT COMPRESSOR arrived (center), the curvature of the suction line prevented proper alignment and sealing because the rear housing didn't have the recess. Note the back housing on the original compressor (top left) and the same design on the second compressor the parts store sent (bottom right), which worked perfectly.

A second replacement starter was sent, and it was bench-tested as well — it spun aggressively and powerfully in the vise. We installed it, but on the car it would spin slower than normal, even with good strong battery power. A voltage drop test showed some ground-side loss, so we replaced the ground side cable, connecting it directly to the upper starter bolt, but the starter still spun slower than normal.



FINALLY, WE DID SOMETHING RIGHT. Mechanics at two other shops had replaced the fuel pump (two times) in this 2007 Buick before it came to us, and we found this scorched terminal (left) and the oxidized junction box pin (center). Somebody had replaced the terminal already (right) but we replaced the entire junction box with a used one and replaced the terminal yet again. They drove away happy.

This was getting weird. Sometimes the starter wouldn't spin at all, and during one of those times, my guy used a low-impedance test light to check for power at the solenoid terminal with it disconnected from its spade and got really good power. What the heck was going on here? SOS, I figured.

I took my pocket screwdriver and shorted the starter's hot terminal to the solenoid spade and the starter spun like brand new. The conclusion of this matter was that the ignition switch was dropping enough voltage with current flowing to the solenoid so that the solenoid windings weren't getting enough current to jerk that big copper washer against the internal contacts. That test light that burned brightly was a deceptive test, because it doesn't pull as many amps as the solenoid. A meter and a high impedance test light are pretty useless in situations like this too. Best to use a headlight bulb to check for adequate amperage.

I was going to demonstrate this to some of the other guys so they'd get a better understanding of voltage drop and what it means, but when I did the pocket screwdriver thing, that copper washer welded itself to the contacts inside the solenoid and the starter wouldn't stop spinning until I removed the battery cable. The solenoid's washer needs to pop hard against its contacts like a hybrid vehicle system's battery contactors, and it had been compromised by not smacking the contacts hard enough too many times. We had to install yet another starter and an ignition switch to finish the job.

The end of the story is that, like the vehicles we have to work on, we don't always operate at our full potential. Further, we're all human, and sometimes things come at us so fast that we make snap decisions, taking things at face value, and draw false conclusions that lead to wrong turns. But we don't have to stay Stuck On Stupid — even if we're having a bad day. And as I tell my guys and gals, any time you get so sick of a car that you want it gone worse than you want it fixed right, you're out of touch with what it means to be a good technician. We can stay in the fight, fix it right and win if we do. MA

RICHARD MCCUISTIAN is an ASE-certified Master Auto Technician and was a professional mechanic for more than 25 years. Richard is now an auto mechanics instructor at LBW Community College/MacArthur Campus in Opp, Ala.
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FILTRATION TECHNOLOGY

The best way to prevent fuel flow issues is to always make sure there are no contaminants in the fuel supply. Many Carter assemblies utilize CleanScreen™ multilayer filtration technology, as well as internal and external strainers, to trap finer particles and provide 40 percent more dirt-holding capacity, improving fuel pump life in dirty environments.

WWW.CARTERFUELSYSTEMS.COM

CODE READERS

The Launch CRP123 & CRP129 code readers have been upgraded to a "Premium" edition. The new Premium series boasts a larger 4" color display, increased storage, revised button layout for improved navigation and a direct USB connection for ease of updates. Competitively priced, the CRP Premium series also includes live data for engine, transmission, anti-lock brakes and air bags.

WWW.LAUNCHTECHUSA.COM

HIGH CARBON BRAKE DISCS

Textar, the world's leading manufacturer of OE brake pads, offers a range of German engineered, high carbon brake discs for European applications. Engineers have developed a brake disc to ensure ultimate braking performance, and the brake discs are available at WORLDPAC.

WWW.WORLDPAC.COM

LAUNDRY DETERGENT

Permatex® Fast Orange® Grease X is a professional grade laundry detergent formulated to clean grease, stains, tar, oil, automotive fluids and odors from work clothes. It features a built-in pretreater that removes up to 99 percent of automotive stains and odors and a proprietary soil release/antistatic agent to repel future soils. It also keeps the washing machine clear of grease residue.

WWW.FASTORANGELAUNDRY.COM

AIR COMPRESSORS

BendPak introduces its Elite Series air compressors. V-Max Elite models have 7.5 or 10 horsepower motors with 4-cylinder 100 percent cast iron pumps on 80-gallon or 120-gallon tanks. The smaller TS-5 Elite has a 5 hp motor with twin cylinder pump. All Elite model pumps deliver air in almost total silence, and forced-air after-coolers chill the air for reduced heat and condensation.

WWW.BENDPAK.COM

APG // AUTOMOTIVE PRODUCT GUIDE

ENGINE, TRANSMISSION MOUNTS

NAPA DriveTech offers OE-equivalent engine and transmission mounts for the aftermarket. Only the highest quality materials and components are used during the manufacturing process to ensure exact form, fit and function. NAPA DriveTech is manufactured exclusively for NAPA AUTO PARTS stores. Contact your local NAPA AUTO PARTS store for ordering information.

WWW.NAPAONLINE.COM

WIRELESS WHEEL ALIGNMENT SYSTEM

John Bean® introduces the VAS 701 001 Wireless Wheel Alignment System. Fast and highly efficient, the continuous camera calibration on the John Bean VAS Aligner provides accurate readings and reliable alignment results. Automatic vehicle height tracking allows the camera system to follow the height of the vehicle, eliminating the need to adjust the aligner when moving the lift.

WWW.JOHNBEAN.COM

FUEL MODULES

TI Automotive has announced the release of complete drop-in, high performance fuel modules for several Volkswagen (VW) models. The TI Automotive VW fuel pump module comes complete with a fuel level sensor and has application coverage for the 1998-2010 Beetle (1.8L, 2.0L, 2.5L) with a plastic fuel tank; the 1999-2006 Golf (1.8L, 2.0L, 2.8L) with a plastic fuel tank; and the 1999-2005 Jetta (1.8L, 2.0L, 2.8L) with a plastic fuel tank.

WWW.TIAUTOMOTIVE.COM

WHEEL DOLLIES FOR TRUCKS, HEAVY EQUIPMENT

Rodcraft launches two new wheel dollies for bus, truck and heavy vehicle service. The new RHW703 and RHW120 dollies will bring more comfort and flexibility to users in all wheel service applications, such as disassembly and assembly of wheels and break drum maintenance. Both wheel dollies are equipped with a hydraulic pump to help adjust the load, which can be secured by a chain (RHW703) or an extra arm (RHW120).

WWW.RODCRAFT.COM

AIR BLOWER UNIT

For quick cooling, Maradyne® High Performance Fans offers the Fast & Cool Air Blower. The rugged Fast & Cool Air Blower is designed with durability and high performance in mind. Able to be positioned at three convenient angles — 0 degrees, 45 degrees and 90 degrees — Maradyne's Fast & Cool Air Blower is ideal for the shop, where rapidly cooling engines, brakes and clutches is essential.

WWW.MARADYNEHP.COM

ELECTRIC BRAKE FORCE METER

Innovative Products of America®'s #9107 Electric Brake Force Meter with Dynamic Load Simulation and Circuit Testing simulates trailer brakes, reads brake-controller output, troubleshoots faults and tests tow lighting functions. Designed for 7-spade equipped vehicles, this new technology automatically recognizes the electronic signature of Integrated (ITBC) and Aftermarket Trailer Brake Controllers, simulates trailer load and displays brake-controller output and application timing.

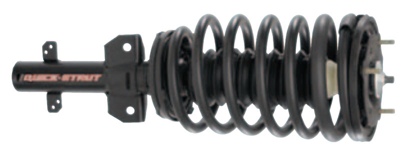
WWW.IPATOOLS.COM

AIR FILTER REBATE

Your customers can save $5 on the installation of a Purolator Air or Cabin Air Filter with a mail-in rebate. The offer includes point-of-sale materials for your shop to help promote the rebate, get more customers in the door and drive sales. For more information, visit pureoil.com/rebate or contact your Purolator sales representative.

WWW.PUREOIL.COM/REBATE

QUICK-STRUT ASSEMBLY



Advance Professional offers ready-to-install Monroe Quick-Strut replacement assemblies from the industry leader in premium shocks and struts parts. Each assembly includes all the components needed for a strut replacement, eliminating the need for special installation tools and allowing technicians to finish strut jobs faster. For more information on quality Monroe parts, call your local Advance or Carquest delivery location.

WWW.ADVANCEAUTOPARTS.COM

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PRODUCT INDEX

DEMYSTIFYING VW/AUDI DIAGNOSTICS

HAVE YOU TAKEN THE VW/AUDI CHALLENGE?

BY PETE MEIER // Director of Training

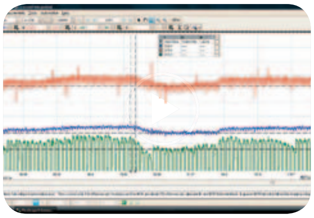
MOTORAGE.COM/sep16trainer

This past August, we hosted a live webinar on the diagnostic use of Global OBD II. As you all know, Global OBD II is a standardized format for emissions relative data access that all vehicles offered for sale in the United States must have. It allows access to any module that is associated with maintaining the emissions integrity of the vehicle, typically the ECM and sometimes the TCM. However, Global OBD II does not require OEMs to provide any access to these, or any other modules, that are not related to emissions monitoring. That means something as simple as resetting an oil life monitor or performing more detailed drivability diagnostics may not be available to you.

That requires "enhanced mode" or a scan tool mode that more closely mimics the factory tool. Right away you'll notice a difference in code numbering and data available in any module you take a look at. But the differences overall are not that significant and making use of the information is usually a comfortable process — until you look at VW or Audi, that is. Their scan data and module accesses are a little different. Scan data is sorted by relative "groups" and the data PIDs themselves are referred to as "measuring blocks." Modules are accessed via two-digit codes, as are certain functions. Using any scan tool that emulates the factory tool or trying to understand the OEM service information takes a little getting used to.

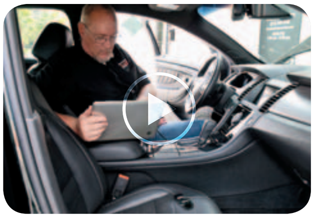
But, like anything else in our business, you can learn it and become comfortable with it. To help, I enlisted the aid of Ross-Tech's (the makers of the VW/Audi VCDS diagnostic system) Jef Damewood to help explain the differences and share some examples to help "demystify" VW/Audi diagnostics. Check it out in this edition of "The Trainer!"

VIDEOS



Battery and charging system tips

MOTORAGE.COM/aug16trainer



Reprogramming: Come on in — the water is fine!

MOTORAGE.COM/jul16trainer

Defining the 'connected' car for your shop

MOTORAGE.COM/jun16trainer

Don't cause a cooling system problem!

MOTORAGE.COM/may16trainer

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