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May 2015

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AUTOPRO WORKSHOP

Vol. 134, No. 5

Advancing the Automotive Service Professional Since 1899

**TRENDING**

### A NEW WAY TO TRAIN TECHS

The first of 15 Garage Gurus training centers opens in suburban Chicago to bring training closer to the technicians.

**OPERATIONS**

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### STAYING ON THE STRAIGHT AND NARROW

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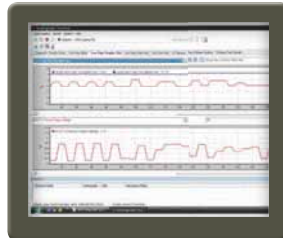
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### The Trainer video series

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### ASA WELCOMES NEW STAFF

ASA has announced two recent hires: Janie Jeffries, director of membership, and John Clark editor/content manager for Autolnc.

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### TELEMATICS DISCUSSION

Early in February, aftermarket leaders met with vehicle makers to discuss telematics.

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The first Garage Gurus training center opened in Skokie, Ill., in April. There will be 15 centers nationwide by year end.

### TRAINING

## Garage Gurus opens its doors to techs

SKOKIE, Ill. — Written around the walls of a new, state-of-the-art training facility in suburban Illinois is a simple, three word phrase: "Onsite. Online. On-Demand."

It symbolizes the three ways Federal-Mogul Motorparts is expanding its training initiatives, reaching technicians around the country with expanded training centers, mobile vans and revitalized online offerings. The first Garage Gurus regional training center celebrated its grand opening in mid-April in the Chicago suburb of Skokie, Ill.

"Training has always been a key part of what we do," says Daniel Ninivaggi, CEO of Federal-Mogul Motorparts, which has had a large training facility in St. Louis for many years. But the difference now is technicians no longer have to travel there. Training is much closer.

The 15,000-square-foot Garage Gurus facility features all the equipment a shop would have as well as a classroom and other learning areas. Each Garage Gurus training center includes multiple vehicle repair/training bays and classrooms and serves as the operating base for one or more "Gurus-On-The-Go" product technology vans.

"It's a mini St. Louis in all of these training centers," says Brent Berman, director, training and consumer experience. "The thing we really pride ourselves on is the hands-on (training)." Berman adds that nothing is staged in the classes that are 50/50 hands-on and classroom

### BREAKING NEWS CONSUMERS

## AUTOMD JOINS AMRA IN SUPPORT OF MAP STANDARDS

The Automotive Maintenance Repair Association (AMRA) announced that AutoMD.com has joined the association as its newest member. AutoMD.com, the most comprehensive and unbiased online automotive repair resource for consumers will work with AMRA to increase consumer trust in the auto repair industry through rigorous standards of service and improved communication between consumers and repair shops. AutoMD.com works with a network of more than 2,000 repair shops nationwide and endorses AMRA's Motorist Assurance Program (MAP) standards.

MAP is dedicated to helping the automotive service and repair industry earn consumer trust

[AutoMD] CONTINUES / PAGE 11

Discussion is on-going in [MotorAge.com](http://MotorAge.com) forums

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Photo: Federal-Mogul Motorparts



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## [AutoMD]

CONTINUED FROM PAGE 8

through the MAP Participating Facility program and by utilizing the MAP Standards of Service and Uniform Inspection and Communication Standards. MAP addresses the need for improved communication between customers and auto repair facilities so customers understand what they agreed to and know what they're getting.

"AutoMD.com is dedicated to a better repair experience for both consumers and auto repair providers and we believe that the standards set by MAP, which include a road map for improved communication with consumers, uniformity in repair recommendations and specific guidelines designed to eliminate confusion and mistrust, are a perfect fit with our mandate, which is to provide consumers with all the information they need to make the best decisions on auto repair," said Tracey Virtue, Vice President of AutoMD.com. "We believe the 2,000-plus repair shops in our AutoMD Insta-Quotes!® network are among the best in the business and our endorsement of MAP standards

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information. "We want to simulate the same problems we see in the shop ... then point out new techniques."

Getting out of the shop and socializing is a part of the training, as evidenced by the product images and Twitter hashtags painted on walls around the facility.

The Garage Gurus curriculum comprises more than 100 diagnostic and repair courses, including onsite workshops, field clinics and modules and webinars offered at [www.FMgaragegurus.com](http://www.FMgaragegurus.com). All training, demonstrations and related assistance are available in English and Spanish.

"Every successful shop needs trained technicians," Ninivaggi says. This new format with the training centers is virtually free, and their jobbers are encouraging the shops to use it. More centers opened in Los Angeles and New York City later in April, with the network expanding to 15 Garage Gurus centers by year end.

Tying together the shops and training facilities are the mobile vans and online

**"We believe that the standards set by MAP...are a perfect fit with our mandate to provide consumers with all the information they need to make decisions," – Tracey Virtue**

underscores our commitment to connect consumers with the highest quality repair shops in the industry."

"Our mission aligns perfectly with that of AutoMD.com. We welcome them to our association and look forward to working with them to help shops improve their communication with motorists and to follow inspection standards within our industry," said Joe Henmueller, President and COO of AMRA/MAP. "By endorsing the MAP process for its network of repair shops across the US, AutoMD.com joins AMRA/MAP in helping strengthen the relationship between the motorist and the automotive maintenance and repair service industry."

courses of Federal-Mogul Motorparts' Tech First initiative. Ninivaggi acknowledges that online training courses are more accessible and convenient, but are just one part with the training centers and mobile vans rounding out the training trifecta.

"We think we've dramatically expanded our reach," he notes. "Unfortunately, online isn't always user-friendly. We have a new platform that's easier to use with better content and more content."

As for the vans, there are 30 now, with 50 on the roads by the end of the year, says Mike Proud, director of marketing.

Gerard DeGelder, technical product specialist, is one of Federal-Mogul Motorparts van drivers. He works with technicians at the shop on problems they might be experiencing with vehicles or leading longer lunch and learn events. He explains how he teaches the technicians how to solve problems, not just throw parts on a vehicle. With the training centers, there is an added bonus that techs can come in to work on the vehicles and learn from one of more than 100 ASE Master technicians about these and other problems.

— *Tschanen Brandyberry, managing editor*

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## ASE GUIDES

### QUESTION OF THE MONTH



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☑ **SURVEY:** Let's see how familiar you are with today's scan tools.

- All of these statements are true EXCEPT:
- A. The CALC LOAD PID is a measure of how much work the engine is doing.
  - B. Global OBDII scan tool functions are standardized.
  - C. Data PIDs in Global OBDII are accurate representations of sensor data.
  - D. Global OBD II Mode \$09 is where you will find the vehicle VIN (as recorded in the ECM) and ECM calibration information.

Visit [MotorAge.com/jun15survey](http://MotorAge.com/jun15survey) to answer and enter a contest from our partner Federated Auto Parts.



## Redline names its Rock Star Performance winner

Iowa man earns top honor from Redline Detection in annual event.

**R**edline Detection, an industry provider of OEM-mandated diagnostic leak detection equipment, recently announced the winner of its 2015 Redline Rock Star Performance Award. Rob McNees of Truck Centers, Inc. (TCI) was selected by the Redline Technical Advisory Board as the winner and received more than \$4,000 in cash and prizes from Redline Detection.

McNees, a top tier ASE Master Certified Heavy Duty truck technician, has worked at Truck Centers, Inc. for 28 years in St. Louis, Mo. As the proven top technician at TCI, he was nominated by manager Jim Pennington

for his exceptional mechanical abilities and dedicated hard work. Having years of experience, McNees is recognized as the "Answer Man" among his coworkers, but also is known for being a humble and patient leader as a mentor for TCI F.I.R.S.T. (Future in Repair Service Technology) apprentice program, where he shares valuable experience and technical knowledge to help the next generation of technicians. He is certified in numerous other areas and the recipient of countless awards.

"At Redline, we have tremendous admiration for the hard-working men and women who get up and give their best to the industry and the communi-

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**BEST OF THE BLOGS** are articles written by bloggers on Motor Age's community pages

### Monroe Shockmobile visits MLB parks

Starting at the Milwaukee Brewers home opener against the Colorado Rockies in early April, the Monroe® 'Shockmobile' was seen by baseball fans across North America during its 2015 tour. The Monroe Shockmobile's "Everything Gets Old. Even Your Shocks" tour included several stops at Major League Baseball (MLB) stadiums this year, including games in Detroit, Chicago, Kansas City and Atlanta.

"The Monroe Shockmobile and the 'Everything Gets Old' campaign have received a wonderful response from fans at ballparks as well as the thousands of consumers who see the message as it travels to and from these venues," said Denise Hanefeld, marketing manager for the Monroe brand. "The Shockmobile gives us a direct connection with vehicle owners who may have never considered the state of wear of their shocks or struts,

vital components in helping to provide safe vehicle steering, stopping and stability in certain driving conditions."

The Shockmobile was designed to be a very eye-catching, 25-foot-long, 10-foot-high, translucent Monroe OESpectrum® shock absorber that helps remind consumers about the importance of inspecting shocks and struts at 50,000 miles.

### ASA welcomes two new staffers

The Automotive Service Association (ASA) has announced two recent hires. Janie Jeffries has been named director of membership, and John Clark has joined the organization as editor/content manager for AutoInc. magazine.

Jeffries comes to ASA from Colorado Springs with experience in direct sales and corporate management at iconic brands such as Sara Lee, Coca Cola, Coors and Kellogg.

"ASA has had a longstanding history of providing valuable membership benefits to automotive service and collision repair shops," Jeffries says. "I'm looking forward to increasing that value and making our whole membership process more efficient."

Clark joins ASA after serving as the editor of in-flight magazines for American Airlines, Southwest Airlines and United Airlines. Most recently, he worked at the Boy Scouts of America as the managing editor of Scouting magazine. He says his priority is "to help evolve the magazine's readability and relevance to further the association's goals and to develop social media resources that provide useful tools for the ongoing success of automotive service businesses."



May 23<sup>rd</sup> 2015  
@ 6:00 PM

## Diagnosing the BUS

Controller Area Network (CAN) fault finding, presented with TST.



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8

## TRAINING: GARAGE GURUS

BY TSCHANEN BRANDYBERRY

First of 15 training centers opens.

PAGE  
14

## Q+A WITH BEN JOHNSON

BY TSCHANEN BRANDYBERRY

Dissecting all the information out there.

PAGE  
124

## THE TRAINER VIDEO

PETE MEIER

The long and short of fuel trims.

ty every day. Our quality products are made right here in America, because we believe that American workers are the finest in the world. Through the Redline Rock Star Performance Award, we hope to honor these impressive

men and women,” said Alex Parker, executive vice president of Redline Detection. “This award recognizes a technician for their commitment to making a difference in the industry, their work and their community.” *ZZ*

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##### Finding the Miss

Tips and techniques for locating the misfire source, presented with TST.

#### MAY 23

##### Diagnosing the BUS

Controller Area Network (CAN) fault finding, presented with TST.

#### AUG. 22

##### EVAP Diagnostics

Tips and techniques for finding the leaks, presented with TST.

#### NOV. 21

##### Performing Routine Maintenance

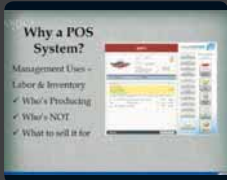
What it means, as well as the dos and don'ts, presented with TST.



2015 ONLINE EVENTS

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### A test drive of MotoSHOP

Scott Avellino, marketing manager for MOTOSHOP Technology Tools, took us on a test drive of the system recently.

[MotorAge.com/mstestdrive](http://MotorAge.com/mstestdrive)

### Finding the miss

Learn tips to find DTCs related to misfires, to isolate cylinder misfire causes, to nail down intermittent problems and more in this webinar.

[MotorAge.com/findthemiss](http://MotorAge.com/findthemiss)

### NASTF meeting

We recorded the NASTF 2015 Spring General Meeting for you to catch up on.

[MotorAge.com/nastfmtg](http://MotorAge.com/nastfmtg)

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## Noteworthy

comments from MotorAge's online communities

The best of what you're saying on Facebook.com/MotorAgeMagazine, Twitter (@Motor\_Age) and in the Motor Age Magazine group on LinkedIn.

**Leonard Howe, via LinkedIn:**  
I predict that as technology advances and systems continue to become more sophisticated and computerized, younger people will make a new shift into the industry instead of away from it. I've seen this at my university. Just over the last few years, the automotive program has nearly doubled in enrollment.

**Randy Pendlebury, via LinkedIn:**  
As a young tech myself, my biggest burden is that

managers and owners expect perfection out of me, and they also expect me to not need any training. This hurts a lot of new techs as well. We aren't perfect, we don't know everything. And most of us want to be taught and be able to learn, instead of getting fired for not knowing what we're doing, or getting in trouble for not being trained properly.

**Jay Douglas, via LinkedIn:**  
It's pretty straight forward. I treat every vehicle as if I owned it. I show the cus-

tomers what I do to my own vehicles. They then see that I'm not selling them a bunch of "fluff."

**Mark F. Babbitt, via LinkedIn:**  
What most fail to do is educate their customers from the moment they purchase their vehicle or bring it to your shop for the first time. There are so many resources, such as videos, third party publications that will support what you are telling your customers about servicing their vehicles.

### Chubby's Management Tip of the Week

Check out this weekly short video management tip from the coaches at ATI.

### Video marketing made simple

Dave Striegel walks you through how you can start using video marketing for your shop.

### State of the NASTF

Watch the State of the NASTF recorded at the spring meeting earlier this year.

### Young technician shortage

Brian Canning discusses showing a young technician value in the career and working with a senior technician to bring him or her on board with the idea of mentoring a younger or even just newer tech and more.



STREAMING PROGRAMS



2015 INDUSTRY CALENDAR

#### MAY 18-21

##### Dynamics of Heavy Duty Trucks at the University of Michigan

Ann Arbor, Mich.

#### JUNE 19-21

##### Arizona Automotive Training and Expo

Chandler, Ariz.

#### JULY 21-25

##### NACE and CARS

Detroit

#### NOV. 2-5

##### AAPEX

Las Vegas

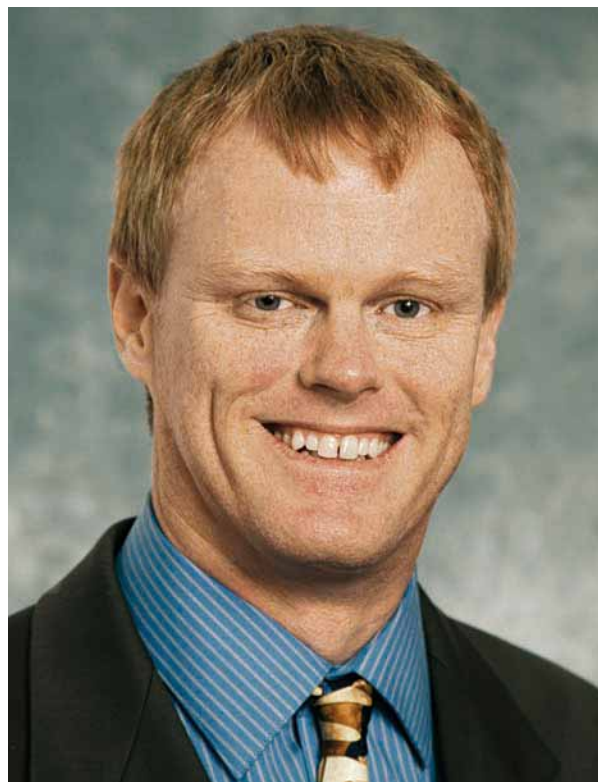


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# Q+A WITH BEN JOHNSON

DIRECTOR OF PRODUCT MANAGEMENT,  
MITCHELL 1



**AS A FORMER SHOP OWNER, THIS EXPERT KNOWS HOW TO MAKE SENSE OF ALL THE INFORMATION OUT THERE.**

BY **TCHANEN BRANDYBERRY** | MANAGING EDITOR

**T**oday's repair shop owners are inundated with information: new parts, new technologies, training opportunities and business management and marketing techniques. We recently spoke with a former shop owner who now works to make some of this information more accessible to owners and technicians.

Ben Johnson is director of Product Management for Mitchell 1. He is a former automotive repair shop owner and has been involved in leadership roles in the automotive aftermarket for more than 24 years. He explained some overall industry problems, solutions in general and what Mitchell 1 can offer.

**MA: What are the biggest challenges facing shop owners and technicians in the industry today?**

**BJ:** It's a really interesting time in the automotive aftermarket right now. There are many different factors converging, but an overall theme that I'm hearing a lot these days goes back to the basic need to get vehicles through the bays faster. I know that sounds familiar — like old news even. But there are some new dynamics that affect productivity, and shops are facing an assortment of challenges they've never dealt with before.

For instance, I read a report recently about the growth in the average number of cars and light trucks per service bay. There are more vehicles on the roads today, but fewer service bays to service them. Those two trends combine to create a 30 percent increase in vehicles per service bay. That sounds like great news for auto repair shops, right? And it is. But the growing demand also comes with some challenges.

For one thing, as vehicles have become more complex there has been an explosion of information to repair them, as well as a proliferation of sources to access that information. What has not changed is the need to keep cars moving through the bays. Customers still expect to have their cars back the day they drop it off, or at latest by the next day. Add the increased volume of vehicles per bay, and this poses a big challenge for shops.

**MA: So, what are some of the tools available to shops to help them deal with rising volume and high customer expectations, while the complexity of diagnosing and repairing vehicles also continues to increase?**

**BJ:** The issue for technicians is no longer about availability of data to fix cars, but how to find the right data — and

more importantly, how to find it quickly. In general, service professionals get the information they need to diagnose and repair vehicles from three main sources:

- Diagnostic trouble codes from the vehicle
- Online OEM reference data
- Real-world information from peers in the industry.

Juggling all of these resources to quickly find the exact information needed can be difficult and time consuming. Many technicians access multiple websites and services to get their information. But to be most efficient, technicians should be able to search for repair information once from a single source. At Mitchell 1, we've been working hard to consolidate all these types of repair information into a single application, so technicians have everything they need together in one place.

This goes beyond OEM repair information, which we've been providing for decades. Our repair information product, ProDemand, now also contains millions of "Real Fixes" based on actual experiences and repair orders from professional technicians. The SureTrack diagnostic module in ProDemand also has helpful tools like guided component tests and a library of known-good waveforms.

Photo: Mitchell 1



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## “REMEMBER, IT’S NOT ABOUT THE QUANTITY OF DATA. RATHER, SHOPS CAN BE MOST SUCCESSFUL USING A SOURCE THAT DELIVERS OEM AND “INDUSTRY-GENERATED” INFORMATION TOGETHER.”

BEN JOHNSON [DIRECTOR OF PRODUCT MANAGEMENT, MITCHELL 1]

### **MA:** Can you give a real-world example of how this works?

**BJ:** Sure. Not long ago I heard from a technician friend who had an issue with a 2011 Toyota Tacoma with 83,000 miles on it. The customer’s complaint was a “noise coming from air conditioning.” The noise varied with increased fan speed, so he was convinced it was a blower motor. His first inclination was to replace that component, but wanted to check. So we looked it up in ProDemand and glanced over the Top 10 Repair list that displays the most commonly replaced parts, most common DTCs and the most common symptoms for the vehicle.

We saw that for this vehicle, “noise heard” was the second most common symptom, so we selected that and came to a Real Fix showing that the problem was solved by replacing the cabin air filter. That technician had a similar symptom and removed the blower motor and discovered there was a lot of debris on the cabin air filter that was rubbing on the fan of the blower motor, causing the noise.

The next thing we checked was the common replaced parts graph associated with the Real Fix. We saw that the cabin air filter tends to fail right around 50,000 miles. So based on these insights, my friend bypassed the blower motor and replaced the cabin air filter and the problem was solved. It was a great example of how another tech’s experience quickly guided him to the correct fix and saved him from unnecessarily removing the blower motor.

**MA:** With different vehicle systems being connected in new ways, diagnostics is getting more complex. For instance, when a tech encounters multiple DTC codes, how can they quickly determine which one to diagnose? Let’s say I’m a technician working on a 2001 Chevy Tahoe with the check engine lamp on and a couple DTCs — a P0442 and a P0155. Where do I start?

**BJ:** Well, standard procedure has been to clear the codes, then drive the car to

see which code comes back ... and then diagnose that. We have a new feature called ProView that helps with this type of scenario. It’s another way of looking at DTC information that shows all the combinations of components that have ever been associated with the code in our system. Let’s say the P0442 has come back on this Tahoe. For that code we see in ProView that possibilities include the EVAP canister, fuel pump, EVAP purge solenoid valve, etc., but the most common culprit is the gas cap.

However, when we add the P0155 to the mix, we see that historically when those two codes have been present, the oxygen sensor is at fault. This would not have been the first thing we looked at. The intent here is not to imply that this is always going to be the definitive diagnosis. The oxygen sensor might not end up being the problem for this particular vehicle, but having this insight guides us in a direction that can then be validated with a component test in SureTrack.

**MA:** In the “old days,” when techs were stumped by the vehicle in their bay, they would turn to their personal network of techs to bounce ideas around and try to get to a solution. Now there are online communities to help, but how fast can techs get an answer this way?

**BJ:** It’s very true that sometimes techs do face vehicles with issues that defy the common fixes. In those cases, they can reach out to their peers and await an answer. At Mitchell 1, we’ve had a very active online community of professional techs for decades, going back to the tip system in OnDemand5, our legacy repair information product.

Over time this has evolved, and we now have a very dynamic group of techs actively participating in the SureTrack Community to help each other out of tough repair situations. Typical response time to questions is under 15 minutes and since this feature is built into the product, techs don’t have to remain tied to the phone. SureTrack will send an email when there is a response to the question. So techs can check at

their convenience for the answer and then get back to work to complete the repair. So, it’s a fast way to pick the brains of other techs who may have already faced that same problem or have information to share.

**MA:** If you had to choose one piece of advice for running a successful auto repair business in today’s market, what would it be?

**BJ:** Today’s repair professionals are getting more and more technology savvy — they simply don’t have a choice given the complex diagnostic and business challenges they face every day. Since the introduction of computer-controlled cars and trucks in the 1980s, vehicles just keep getting more advanced. You can see it in the number of pages of information created to service vehicles. Mitchell 1 currently has tens of millions of pages of data in our system.

Obviously, no technician can possibly keep millions of pages of information in his or her head. Shops should research their options and select the information partner that will help them increase their bay throughput, allowing them to satisfy their customers and open the bays to accommodate the growing number of vehicles on the road today.

Remember, it’s not about the quantity of data. Rather, shops can be most successful using a source that delivers OEM and “industry-generated” information together, and invests in technology that makes it easy for users to search those millions of pages and quickly find the information they need to meet their specific diagnostic challenges. *TM*



Tschanen Brandyberry has been with *Motor Age* since 2008, after writing for *Aftermarket Business* for two years. She is a graduate of Ohio University and served in editorial positions at multiple newspapers in Ohio.

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at [tbrandyberry@advanstar.com](mailto:tbrandyberry@advanstar.com)



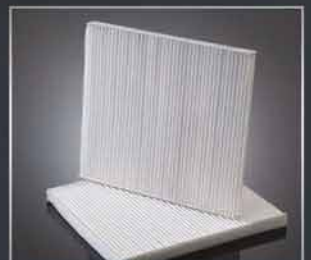
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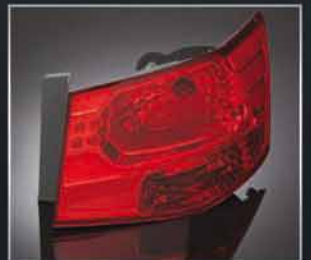
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## IN THIS SECTION

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- 26 Financial Figures
- 32 Shop Profile

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## TECH INVOLVEMENT

Hear more from Brian Canning on how to get your techs involved.

[/techsinvolved](#)

## MANAGEMENT



# YOUR TECHS: A RESOURCE YOU NEED TO EXPLORE

ARE YOU TAPPING INTO THIS WEALTH OF INFORMATION FOR MARKETING AND PLANNING PURPOSES?

BY **BRIAN CANNING** | CONTRIBUTOR

**RUNNING** an automotive repair shop can be incredibly tough in today's environment. But though we probably are doing things to keep in tune with what is going on in the industry and even though we try very hard to listen to what our customers are saying and doing, we cannot be everywhere and cannot be aware of everything.

Our technicians, who are not sales people and certainly are not aware of the challenges we face as shop owners or service managers, do live in our community and it is certainly worthwhile to include them in our planning. Above and beyond this, our technicians are the pointy end of our operational spear, and including them in our planning just makes sense, from the operations and the strategic perspectives and very definitely from the human perspective.

One of the most common complaints I hear from shop owners and service managers is turnover among technicians. Far too often this can be traced to a work environment that does not support technicians. Far too often, outside the actual

hands-on process of fixing the cars we take in, we find an environment that tries to ignore our technicians and discount their perspective. And while our technicians do not understand all the challenges we face as shop owners or service managers (and why should they), we far too often fail to understand the world they live in and that is a problem. Sitting right there in our shop is a huge resource waiting and even anxious to be tapped, and very often we are treating them as though they didn't exist or, more correctly, as though they were a piece of shop equipment. If we want to understand why technicians are not sticking around, we might start with our relationship with them. I can promise they are not leaving because we are making them feel too appreciated or because we have gone too far in listening to them and addressing their concerns.

Now don't get me wrong, our technicians, just like our service advisors and anyone else we employ, need to perform, behave and contribute. I have known my share of hacks, have known my share who could not make it to work on time or as

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## “OUR TECHNICIANS HAVE EVERY POTENTIAL TO MAKE OR BREAK OUR SHOP, BUT THE DIRECTION THAT TAKES IS MUCH MORE DETERMINED BY US THAN IT IS BY THEM.”

BRIAN CANNING [CONTRIBUTOR]

regularly as was required, and I certainly have known my share who were not anything close to capable, competent or productive. But those guys are in the distinct minority. Most of those guys didn't get it, won't get it and fall well outside the items we will talk about in this conversation.

The secret to making our shop successful, and by that I mean productive and profitable, is to make working for us a win for our technicians and a win for us. I can assure you we are not going to get the things we want without our technicians, and we can certainly assist them in moving the shop in the right direction. Shops that are productive are profitable. Technicians who are productive should enjoy enhanced wages and I would hope enhanced job security. There has to be a win in there for both the shop and our technicians.

The very best way to achieve this is to bring them into the conversation, letting them know where we want to go and letting them know what we want to accomplish along the way. It is sad, unfortunate and unacceptable, given the number of shops I go into, how few shop owners or service managers have talked to their technicians about productivity, selling maintenance, the development and implementation of a vehicle inspection process and most especially our vision for the business. All of these are things that are important to the success of a shop in today's environment, and all of these are things that could have a dramatic impact on sales, profitability and technician wages, yet somehow we have forgotten to involve our technicians in the process or the conversation.

And just so we are clear, gathering your technicians around the time clock at the start of a workday and telling them that we are going to implement X, Y and Z effective today and then walking away is not a conversation, and certainly is not going to get their feedback. This is more of just doing the same old things and somehow expecting a different result. Some people would call it insanity.

When we involve our technicians in our solutions, we all share the blame if something goes wrong and all share the credit when things improve and go right. If we support increased production and reduced comebacks with training opportunities and bonuses or a revised pay plan, we address shop concerns and the technicians are rewarded for improved results. Taking the time to listen and understand our technicians and the challenges they face every day will give us a more complete understanding of our shop dynamic and allow us to come up with better, more comprehensive and longer lasting solutions. All of us certainly are stronger and more capable than any one of us. It might be time to make our technicians part of our team.


Our technicians have every potential to make or break our shop, but the direction that takes is much more determined by us than it is by them. If we involve them in our planning, set expectations for their performance and support their efforts with a great work environment and a training plan, the chances are very good that we all will succeed. If we burden them with inefficient or cumbersome shop processes, do not support them with training, great shop equipment and technical resources, then our chances of success and that win we had talked about is very much diminished. Setting higher expectations for production or a requirement for fewer comebacks are nice thoughts, but until we get inside of those perceived issues and understand what might be driving them, we are in essence blaming our technicians before we have even investigated what is going on. It might be training, it might be an inconsistent inspection process, it might be inadequate diagnostic equipment, and it might even be incompetent technicians, but until we start looking we cannot know for sure.

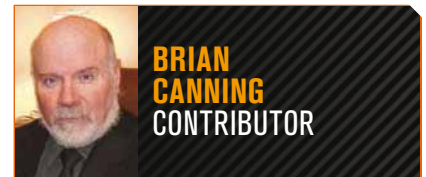
A great way to start this process is to set up a meeting before or after normal operating hours and have a conversation with our technicians where we can begin to express our concerns and give our technicians a chance to give us

their feedback. Listening to our technicians is a free and open discussion, and thoroughly investigating what might or might not be driving shop performance and going to great lengths to include our technicians in this process allows us to move forward and correct our shortfalls while making techs part of the solution.


Doing this gives them ownership and a renewed interest in our success. I can promise you that our technicians have opinions on industry repair trends, technology, diagnostic tools and training. Tapping into this and giving value to the opinions and concerns our technicians have will strengthen the relationship we have with them and expose us to a very relevant resource and perspective we have been ignoring up until now. Who knows we might even learn something we didn't know. We might, in the process of understanding shop issues, choose to ignore the feedback we get from our technicians, but that is OK because we at least went to the trouble of asking their opinion in the first place. Everyone wants to feel they have a voice and are being listened to. This certainly includes our techs.

Our technicians are a very rare and valuable resource and nationally they are in very short supply. You can use and abuse them and suffer consistent and continuous turnover, and all of the shop disruption that goes with that, or you can value them, support them, and invite them into the conversation.

My strong advice is to find the right technicians, give them great reasons to stick around, and make them feel like part of our family. 



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.

 Email Brian at [brimarc@hotmail.com](mailto:brimarc@hotmail.com)



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# ARE YOU A COMPASSIONATE LEADER?

LOOK AT HOW YOU INTERACT WITH EMPLOYEES AND MAKE SURE YOU DON'T RESENT ANYONE BEFORE IT'S TOO LATE.

BY CHRIS "CHUBBY" FREDERICK | CONTRIBUTOR

**IS IT** compassion or fear that is residing in you that is the overriding component in your decision-making process in holding your employees accountable? That is the real question. This month we get to listen to a very successful coach, Brian Hunnicut, explain what he experiences with his shop owner clients on the subject.

When I ask my clients why they make the decisions that they do about their employees, the No. 1 response is because they are not comfortable with how it makes them feel to hold an employee accountable. They do not want to be that "mean person." They do not want to be seen as overbearing or unsupportive. Most of the time in each of our pasts (before we became the boss), we were treated badly by a boss. We swear that when we become the boss we will not treat people that way. We will treat them like an adult, and they will bask in our glory.

So what happens? Why do they slide and not step up? An old team leader and I were in the middle of the break room discussing sales versus leadership. We were discussing it with louder and louder and much louder results. I was saying nothing happens until a sale is made and there is nothing a sale will not fix. The team leader was maintaining that everything hinged on leadership. Our boss, Bryan Stasch, got between us and said we needed to stop it because we were both saying the same thing. Most of us are at least decent sales people, but we never use our sales skills on our employees.

## Sales or Leadership?

The world that we live in has changed a great deal in the last 20 years; our employees used to want to show up and do a good job for the most part. How many of us still find that to be the case? Now we have to think of our employees as internal customers. We need to write the help wanted ad so they know what is in it for them first.

Just as when we want an external customer to come through our doors, we would write the help wanted ad to make the phone ring from a prospective employee. Once the phone rings or they send us the resume, then we need to sell them on coming in for the interview. During the interview we need to sell them on going to work for us and actually showing up to work. Then we need to sell them on



showing up on time and doing a good job while there. We even need to sell them on staying at work with us.

It is hard to find good employees for the most part, so when we get one we tend to be a little fearful of them leaving us. We don't hold them accountable and since they tend to act like prima donnas, the tail starts wagging the dog. We start to lose control of the situation and they get a boatload harder to sell.



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CHRIS “CHUBBY” FREDERICK [CEO OF THE AUTOMOTIVE TRAINING INSTITUTE]

**The Moment of Truth**

This is the defining moment of the employer/employee relationship. How you handle this will decide your leadership/selling style and the relationship you will have with your employees.

We put how we feel about working ourselves and feeling like we should not have to be a babysitter at the forefront of our relationship with our employee. We feel that they should be grateful to have a job. The real deal is that our employees as a group will sink down to whatever level we allow them to and only have moments of greatness or even adequateness. We walk around and see a ton of things of which the employee is taking advantage of us, and instead of stopping and holding them accountable, we let

it slide. We see the work area dirty, the productivity down, the phone not being answered properly and it makes us feel resentful. It feels easier to get busy ourselves than to have the conversation with our employees. Some of my clients hide in their office, some work on cars because that is their comfort zone. Some grow fat (not in a good way), and the stress ends up taking years off their life.

**Are You the Problem?**

Each time we turn away from an employee doing something subpar we reinforce their behavior. If I had a dime for each time I have heard that all we are doing is giving them rope. Why are we giving them rope? You realize that by giving them rope, we are the one responsible for them hanging themselves.

I maintain that by being a hard-liner, I am by far way more compassionate than a supposed nice person that is giving the employee rope. We are so busy trying to survive the day that we can't see a way out. You cannot do it all by yourself; you are being made to feel way more uncomfortable than the employee is in your respective roles.

**“By allowing and tolerating the subpar behaviors around you, you reinforce them and are making the statement that they are OK.”**

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The image of the employee standing on a wobbly three-legged stool with a noose around their neck while I stood in front of them loading my gun to fire them is what allowed me to look at the employee and start holding them accountable. Which comes first? You finally losing it after the straw that broke the camel's back and you pull the trigger when your top blows? Or did the employee finally see that you can't stand to look at them anymore, and you kick the stool out from under them before you can shoot them?


### You Are Responsible for Their Success

It cannot be stressed enough that you are the boss and it is your responsibility to create an environment for your employees to be successful in. It is their responsibility to be successful. There can be a myriad of reasons why the person you hired is not the person who is now showing up to work. Their significant other might have cheated on them, they might be going through family medical problems or they just overspent, to name a few. Now they walk in the victim, and their job performance slipped. You chose not to address the performance slip and they slip some more.

You, being a nice boss, of course take it. You let the performance slip and start feeling resentful and of course a rope magically appears in your hand. You still do nothing to correct the situation so it gets worse. You might even have had enough on a couple of occasions and yelled and did a little rain dance on them. Then they got better for a couple of days and then went right back to subpar behavior and you did nothing. You just lost. That was the exact moment you could have held them accountable and sold them on being a true member of your team, and that in my opinion would have made you truly compassionate.

Are you not hanging yourself when you hang an employee? Have you not been giving yourself rope as you give it to them? This is like committing suicide with all the stress that leads up to it affecting all the people around you as well. By allowing and tolerating the subpar behaviors around you, you reinforce them and are making the statement that they are OK. Stop being nice and quit allowing/tolerating the very things that cause you resentment to begin with. You can create an environment where the path of least resentment is getting the job done right and the employee feels great about their performance. This becomes your culture.

Another way of looking at it would be that as a shop owner you are a masochist.

If you would like some help on this subject, for a limited time you can listen to an ATI teleseminar called "The Secrets to Creating Effective Employees." Go to [www.ationlinetrain.com/2015-05](http://www.ationlinetrain.com/2015-05). 



**CHRIS  
"CHUBBY"  
FREDERICK  
CONTRIBUTOR**

Chris "Chubby" Frederick is the CEO and founder of the Automotive Training Institute. ATI's 108 associates train and coach more than 1,250 shop owners every week across North America to drive profits and dreams home to their families. Our associates love helping shop owners who are having the same struggle as many of them have had, and who are looking for the same answers – and in some cases looking for a lifeline. This month's article was written with the help of ATI Coach Brian Hunnicut.

 E-mail Chubby at [cfredrick@autotraining.net](mailto:cfredrick@autotraining.net)

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# A LITTLE 'RE AND RE'

RENEWING, RELEARNING AND RETOOLING ARE JUST THREE AREAS TO START THIS PROCESS.

BY **BOB GREENWOOD** | CONTRIBUTOR

**STUDIES** of the independent sector of the automotive aftermarket industry are confirming that independent shops are losing the struggle to retain the consumers' ongoing business versus the growth in bay service business that new car dealerships are experiencing as they start to focus on "all makes and models." In close examination as to why this is happening, the main reason is due to a lack of business focus by management of the independent shop. Too many business owners and managers are "too busy" not making money instead of slowing down and preparing their business to meet the customers' real needs and wants in their market area.

Consider that weak shop owners focus on cost to save money, whereas the most successful shops focus on delivering value to make money. Consider that new business standards are required for the new service on need era that most shop owners/managers have not addressed within their business operation. It is time to "Re and Re" the independent shop.

Review each of these items within your own operation to ensure your business is heading in the right direction to retain all your customer/clients business.

## Renew the Business Format

The "same old, same old" does not work anymore. Shops cannot "bang them in and bang them out" to create large car count numbers. The math does not work anymore with that format. In fact, independent shops that concentrate mainly on volume to keep "the boys busy in the back" do not know that, on average, 60 to 65 percent of the work that they do does not create net profit for their business, but only sales and gross profit.



They do not know how to measure this. They are working hard to stand still and, in many cases, move backward in their business. Today, your business must be focused on each individual client, one customer/client at a time and deliver value.

Management's No. 1 job is to build relationships; therefore management must slow down at the front counter and take the proper time to meet, understand and counsel individual clients as to what the manufacturer recommends to ensure safe and reliable driving with their vehicle. Customer vehicle technology and maintenance education is more critical today than ever before. The average consumer is not stupid, just uninformed. Slow down and define the value you are prepared to deliver to each client.

## Relearn the Business

Continuous technical and business training and development is required today. Professionally operating an independent automotive maintenance and repair shop is the most complex retail business in the retail world, requiring not only a great deal of

capital, but also higher in-depth skills than ever before. Consider that technical development of the vehicle now requires highly skilled technicians who embrace vehicle knowledge with a tremendous amount of personal pride. These technicians are highly skilled professionals. The depth of knowledge they must completely understand, and stay on top of, is mind boggling, and it is the shop management's responsibility to ensure these professionals have all the right training and tools to execute their skill. Consider a competent technician today requires 100 hours of training per year just to stay level in their knowledge.

Management (shop owners) must also continuously visit classrooms a minimum of six to eight days per year now to stay on top of the many business issues. It is a new world order today, and this new order affects the very profitability, and potential future viability, of an independent shop. Management must learn and measure the business in a totally different format today. Just measuring parts and labor sales and following the shops bank account up and

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down doesn't work. Management must stay on top of the business numbers to ensure they are measuring net profit on each invoice before the invoice is closed, one invoice at a time. Businesses that are only interested in sales and price of commodities don't get it yet. The question that must be asked is "Do these shop owners have any desire to get it?"

### Retool the Business

Management must ensure the business is profitable enough to have available the funds for continuous investment in the right equipment required for today's vehicles. As an example, consider basic equipment required to properly execute all vehicle fluid maintenance today such as a system flush, carbon clean, oil flush and transmission flush to name a few. Equipment and tool requirements are higher today than ever before in the history of our industry. Without the right equipment, shop inefficiency settles in affecting the profitability of the shop. But ultimately the shop does not service its customer/client base in its most professional manner. This, over time, will

affect the relationship of the client with that shop, potentially driving the client right back to the dealership.

### Recertify the Business

Management must establish standards of execution throughout the shop. Define your standards in print. Each staff member from the front counter to the back office to the back shop must completely understand, believe in and know how to execute their function that in turn exceeds the customer/clients expectations. Certification today is just not a piece of paper or experience. Certification is a daily attitude. "We will not let the client down." "We care!" "We will take the responsibility" to make sure your vehicle maintenance and your experience within the walls of our shop, exceeds your expectations. "We will be second to none."

### Re-professionalize the Business

Management must establish on-going reviews with each staff member to ensure they are continuously aware of

the importance of their personal day-to-day execution of their particular function within the shop and how it affects the customer/clients perception of the shops professionalism. Management also must continuously review the systems within the shop. These systems not only are the software systems, but also include the processes in how the shop delivers its services to the consumer. **ZZ**



**BOB GREENWOOD**  
CONTRIBUTOR

Bob Greenwood, AAM, is president and CEO of Automotive Aftermarket E-Learning Centre Ltd. (AAEC), a company focused on providing business management resources and development for the independent sector of the automotive aftermarket industry utilizing the Internet environment. Bob has more than 36 years of business management experience within the independent aftermarket industry, consulting independent retail shops on all facets of their business operations. Bob is one of 150 worldwide AAM approved instructors.

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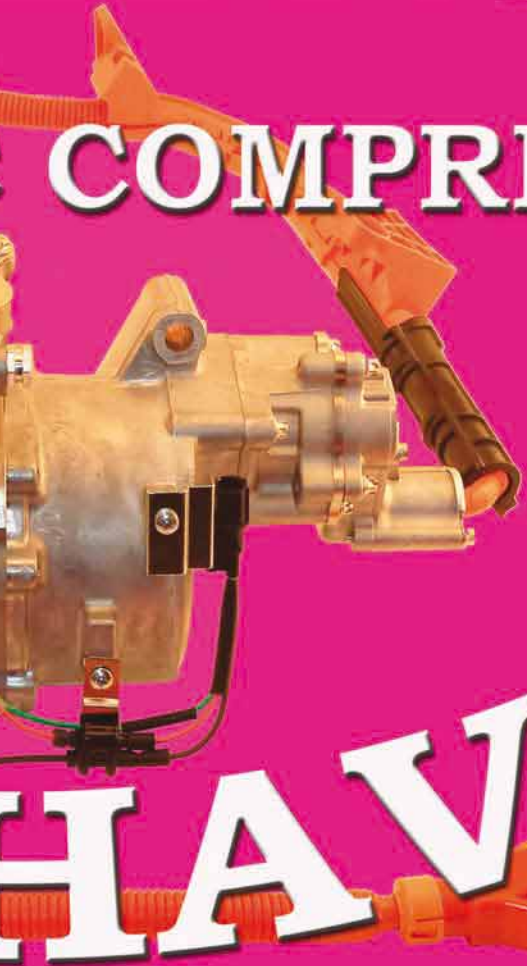
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## OPERATIONS

## SHOP PROFILE

A snapshot of one of the industry's leading shops

WESTSIDE AUTO PROS / CLIVE, IOWA



# Verve Revival

Because you just need a little more than technical know-how to run a successful shop.

BY **ROBERT BRAVENDER** | CONTRIBUTOR

Like any new business owner, Ron Haugen was all verve and vigor when he opened Westside Auto Pros in 1997. A repair shop on the outskirts of Des Moines, Iowa, he soon realized all his experience as a technician just wasn't cutting it when it came to commerce.

"I thought it was awesome. I was making \$100 on an air conditioning compressor, not realizing I was giving away the farm," says Haugen. "That wasn't anywhere near the markup it took to operate a business."

To help achieve BBB — better business brains — Haugen looked into Bottom-Line Impact Groups and found a way. "That was life changing for me," he relates, "not just in business, but literally life-changing, all in a positive manner. The whole key is implementation. They can show you things, tell you what to do, but unless you can go back and implement them nothing is going to change."

Implementation involves a willingness to try everything, something that revived Haugen's celebrated verve. One program he enacted was weekly coaching sessions for his service advisors from Buyosphere, a Des Moines-based company.

"I stumbled across it about eight years ago," he explains. "I was the very first automotive shop that they ever worked with; now all they do is automotive repair shops, and they're quickly catching on in the automotive industry."

Meanwhile the technicians are presented with "every training opportunity that we have access to," Haugen reports, "whether it be ASA, VISION, Bosch, NAPA, Carquest-CTI; we utilize all of those resources, and we pay for any (the techs) want to go to. They know they're required to take at least 40 hours of training a year, but since our technicians are career-driven, most will take close to 60 hours."

Of course implementation requires finding out what works and doesn't work; with referrals through Buyosphere, Haugen works with about eight other shops throughout the country for peer reviews. "I talk to them weekly

## WESTSIDE AUTO PROS

**Ron Haugen**

Owner

**Clive, Iowa**

Location

**1**

Number of locations

**18**

Years in business

**17 / 5**

Total number of employees/techs

**12,000 square feet**

Shop size - main location

**14**

Number of bays - main location

**\$3 million**

Annual gross revenue combined

**ASA, AAA, BBB**

Shop affiliations

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and try to travel to each of those shops quarterly," Haugen reports. "Of course they also go over internal stuff like pricing, financial, work load, benchmarking, etc. We share information and data; I've learned as much from them as they do from me — everybody has new ideas that they're trying."

Procedures like secret shoppers helps Haugen with input outside the industry. "It provides accountability,"

Photos: Westside Auto Pros





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he explains. "If I send a service advisor to a telephone skills class and they don't do what they were taught, then that was a waste of my time and theirs."

One thing to come out of this process of implementation and review has been that Haugen has increased his technicians' involvement with time estimates. "Labor guides from Mitchell or ALLDATA are looking at average, real world scenarios," he comments. "If a vehicle comes in from upstate New York where there's salt on the roads nine months out of the year, there's heavy rust and corrosion and all of a sudden we've got an issue with the brakes. The labor guide doesn't take that into account; we didn't create the issue, therefore we allow the techni-

cian to have input into what I would call extenuating circumstances."

But where Haugen's verve really shines is in branding and media-savviness; for one thing, he's good on camera (and if you think that sounds easy, try it sometime). As "Ron the Car Guy," he does a live segment on a morning TV show every Tuesday, as well fielding questions on his own website. This is augmented with TV commercials that run on the three local broadcast networks.

Then there's Westside's extensive Internet presence. "About eight years ago I got intrigued with Google's search engine and Internet marketing," relates Haugen. "At that time there weren't a lot of options as far as Autoshop Solutions or DemandForce."

So Haugen learned it from the ground up. Attending a seminar in Atlanta, he found himself about the only brick-and-mortar business in the room, "but a lot of the same principals applied," he reports. "So I really got into it, and to this day I enjoy doing it, although now I've got outside companies to help me with some of that stuff because there are only so many hours in a day. Plus there are now tools out there

to better manage some of the social media stuff.

"If you look at our page, its something that people can engage in," Haugen observes. "Humorous pictures, funny information and quotes; people want to see what we're saying. And it has built up a huge following; our company Facebook page has over 6,000 followers, and that's larger than almost any auto repair business I've ever seen."

Take Westside's "Bumper Sticker of the Day." Once the meme message board of the 1970s and '80s, Haugen posted these quirky quotes for about seven months, but dropped them since they seemed anachronistic. "How often do you see a bumper sticker anymore?" he notes. "Why not just do 'payphone of the day?'" But within a week he started getting calls about their absence and soon put them back.

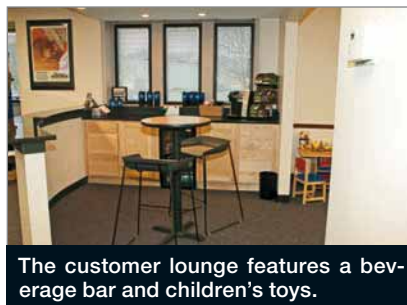
"All you're trying to do with social media is create top-of-mind awareness," Haugen explains. "If I put something like '15 percent off any car repair' on social media, that's worthless to you if your car is fine. But if I keep myself in front of you on an ongoing basis, the day that car does need something, hopefully you'll think of me first. That's what branding is all about."

For who can forget features like Haugen's online stories, like the time a customer came in with an angry woodchuck under the hood. "Every time I turn to the right, it screams," was the client's sole complaint. Yet nothing the technicians did would dislodge the grumpy groundhog; eventually animal control had to be called, and they tranquilized the beast and peacefully removed it.

"We didn't charge the customer of course," Haugen notes, because trying finding that in the labor guide. *TM*



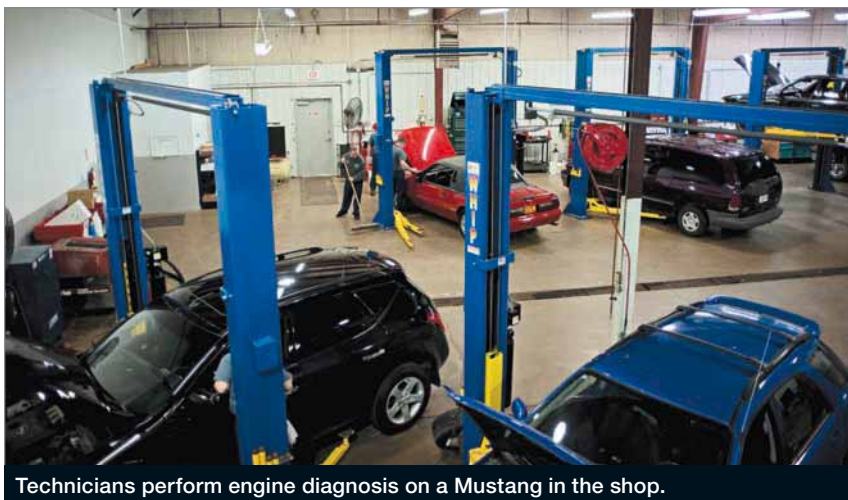
A panoramic view of Westside's front counter and lobby.



The customer lounge features a beverage bar and children's toys.



The employee lounge doubles as a training area.



Technicians perform engine diagnosis on a Mustang in the shop.



**ROBERT BRAVENDER**  
CONTRIBUTOR

Robert Bravender graduated from the University of Memphis with a bachelor's degree in film and video production. He has edited magazines and produced shows for numerous channels, including "Motorhead Garage" with longtime how-to guys Sam Memmolo and Dave Bowman.

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See how one transmission shop celebrated National Car Care Month.  
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# Can it be fixed?

**THE PATH TO ANY RESOLUTION ALWAYS BEGINS WITH FINDING OUT SOME INFORMATION.**

BY **WAYNE COLONNA** | POWERTRAIN PRO PUBLISHER

**SEVERAL** points were brought up in a seminar presented at the Automechanika Chicago show in April about the frustrations that come with diagnosing transmission concerns. To determine if the cause of a malfunction is related to an engine management problem, an ABS issue or an actual transmission malfunction can be, at times, quite challenging. If the malfunction has been determined to be a transmission problem, the next

step typically is to decide if it is a minor or major repair. Of course it is always nice when a cause to a problem has been discovered and is passed along to others saving them the grief it took to resolve it.

Through many years of experience diagnosing transmission concerns in shops and on ATSG's technical help line, a general diagnostic approach has been developed to find that silver bullet as quickly as possible. The list begins with information, meaning we look

first to see if there are any bulletins or articles already covering the subject. The available diagnostic equipment as well as the ability to use the equipment is considered if handling the problem over the phone.

Understanding the codes received, checking power and grounds, doing a cursory view of the wiring and connectors while looking for cross connect possibilities are on this list. Checking into the four main critical PCM/TCM inputs (Engine load, Speed Sensors, Gear Shift Position Switches or Sensor and Temperatures) as well as how the signal is generated and delivered to the controlling computer and computer strategies (ABS, torque reduction, sport and economy modes, adaptations, manual tap shift controls, start/stop technology or neutral controls, etc.), transmission misapplication, transmission fluid and aftermarket programming, products and parts round out the list. Having this comprehensive overview goes a long way in determining which avenue one needs to take based on the problem at hand to get to the cause as quickly as possible. Of course it doesn't completely eliminate every possible headache, but it sure can eliminate many of them.

One reason we are seeing frustration levels increase diagnosing transmission concerns are programming issues. The complexity of today's vehicles brings a



Figure 1



**WAYNE COLONNA**

is President of the Automatic Transmission Service Group (ATSG) in Cutler Bay, Fla., and a frequent speaker/instructor for transmission training around the globe.

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whole new dimension of diagnostics to the table. Shift strategies are becoming reliant on a multitude of inputs that if they become skewed, affect transmission operation. Put that together with a program not written well and you have malfunctions that cannot be totally corrected. Sometimes malfunctions are discovered and corrected through reprogramming, which is why the first step in our

general diagnostic list is information. Nothing can be more frustrating than trying to fix a problem that can only be achieved via reprogramming.

A simple example of this was a call we took from a shop that decided to put its toe in the water to fix a CVT transmission for the first time. It was a 2007 Nissan Altima that arrived to the repair facility with a vehicle speed sensor code P1722. The shop had diagnosed it down to a problem with the tone ring and wheel bearing rather quickly. After repairs the code was cleared and they drove the vehicle. All was perfect for the exception of an approximate five-second delay into gear, both forward and reverse. Once engaged, the transmission drove flawlessly (as far as a CVT is concerned).

This particular CVT utilizes a torque converter allowing a forward or reverse clutch to apply like any other conventional transmission. This means all that is required to engage the clutch is to move the manual valve into the Drive or Reverse position. A select control valve in the valve body would then control the engagement of the clutch. Not only is the intention of the select control valve's function to provide a nice comfortable garage shift into gear, it primarily is used to prevent a damaging jolt to the drive pulley assembly.

For this reason the shop checked the manual valve adjustment and the transmission range sensor signal,

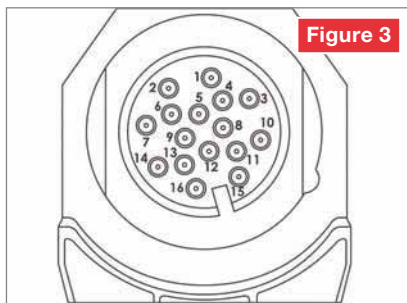


Figure 3

PIN #	DESCRIPTION AND FUNCTION
1	TOW/HAUL SWITCH
2	CAN LOW
3	NOT IN USE
4	NOT IN USE
5	NOT IN USE
6	CAN HIGH
7	BACK UP LAMP RELAY POWER
8	NOT IN USE
9	IGNITION VOLTAGE
10	PARK NEUTRAL SIGNAL-PN
11	NOT IN USE
12	NOT IN USE
13	GROUND
14	BATTERY VOLTAGE
15	BACK UP LAMP RELAY CONTROL
16	GROUND



Figure 2





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which proved to be in order. The valve body was then removed to inspect the condition of the assembly and particularly the select control valve. In the process they noticed the fluid was still in good condition and the pan was fairly clean. The disassembly and inspection of the valve body revealed nothing. With the valve body removed, they checked the apply of the forward and reverse clutch with some compressed air and they applied nicely. So it all went back together with the sense that the transmission was in good shape.

The subject of initializing the EEPROM inside the transmission then came up. Part of the initializing process requires stepping into the throttle just enough so that the idle and wide open throttle signals are both in the Off state. For this reason, the wide open and closed throttle signals were inspected just in hopes that maybe something was amiss. But once these signals were verified, it then lead to the idea

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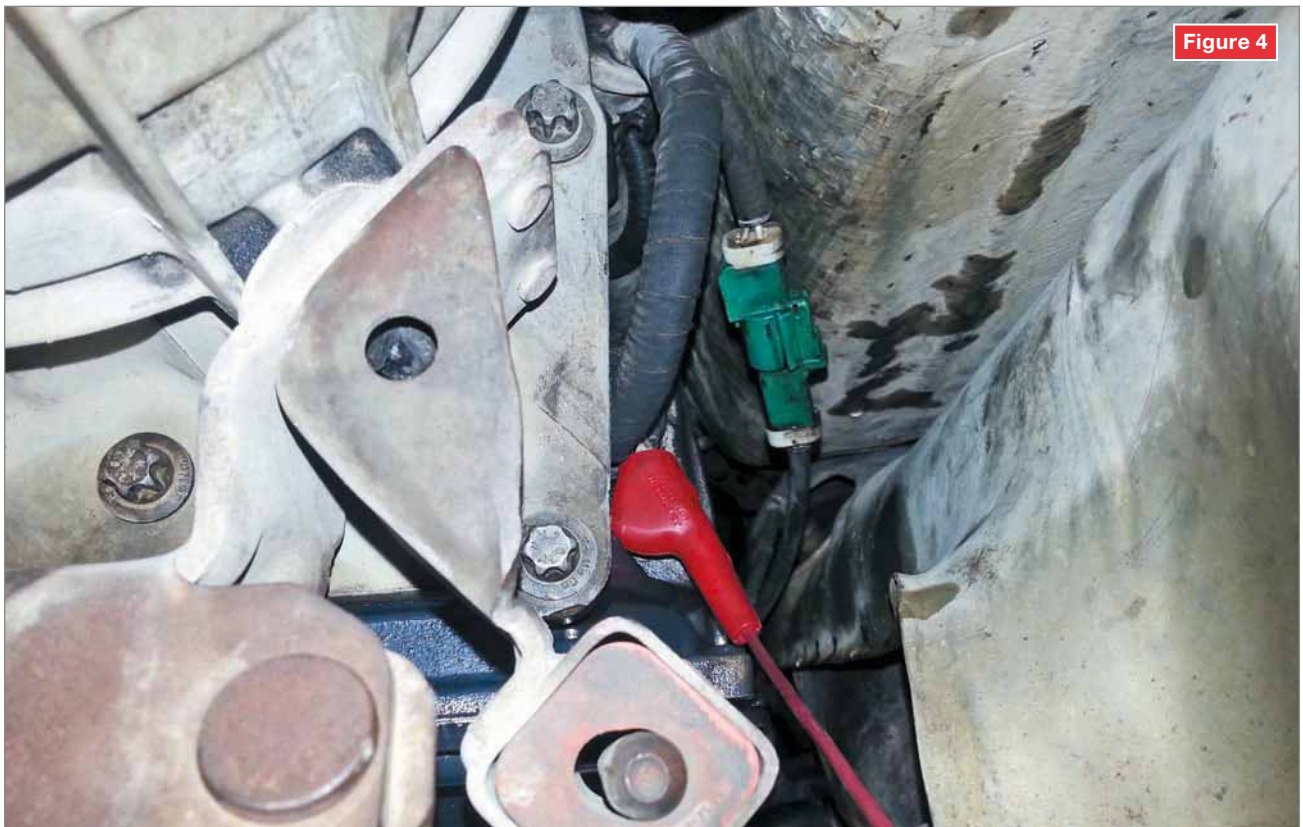
of performing an Idle Air Volume Learning procedure. This too did not resolve the delayed engagement problem. It was at this time the call came in to ATSG to see if we could help.

A delayed engagement into gear is somewhat of a fairly common call with this transmission, as it could have a two- to three-second delay and is considered normal. As much of a nuisance this slight delay might be, it is the result of the way the select control valve operates. But a lengthier delay is a problem and ATSG knew of a bulletin by Nissan that identifies specific Transmission Control Modules that have this problem (NTB 10-147). If the vehicle in question contains a TCM part number listed in the bulletin, there is a reprogramming procedure to fix the delayed engagement problem. Again, it is a simple example of trying to fix something only programming can fix. The bigger problem is a malfunction due to a programming problem without

a reprogramming procedure available to resolve it. Unfortunately, this type of situation is on the rise beginning with some 6-speed automatic transmissions and increasing with some 8- and 9-speed transmissions.

**“Another area of frustration can at times be related to aftermarket tuners designed to enhance engine performance. This does not come up too often, so when it does it can be elusive since it is not in the forefront of one’s thinking.”**

With shops being faced with such a dilemma, it becomes all the more important to have some form of an organized diagnostic routine as previously mentioned in an attempt to nail







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down a possible programming problem. Admittedly this at times will take skill, equipment and time that might be difficult to bill.

Sometimes programming problems can be quick to determine, such as an incident that came up recently in a Miami shop. It was a 2010 Ford F150 4 wheel drive with a 4.6L engine and a 6R80 transmission (Figure 1). The customer concern was that when he tows his boat, the Tow/Haul switch located on the end of the column shift selector lever seemed inoperative (Figure 2).

The Tow/Haul feature delays upshifts to reduce frequency of transmission shifting and provides engine braking in all forward gears when the selector lever is in the (D) position.

The Tow/Haul switch is a momentary contact switch, which when depressed will illuminate the words TOW HAUL in the Instrument Cluster indicating the strategy has been activated. Just press the button again to turn the light and strategy off. All of this was working yet the delayed shifts and engine braking were not present.

The computer for this transmission is located inside the transmission. MY 2010 Ford trucks with 6.7L engines have the TCM mounted externally. MY 2010 4.6L and 5.4L applications have the TCM inside the transmission. In 2011, the TCM is external for 3.7L, 5.0L and 6.2L applications. This has caused quite a bit of confusion when looking for accurate wiring information.

With the TCM being inside the transmission with this 2010 4.6L F150 truck, the connector at the transmission contains power, ground, CAN BUS wiring, P/N signal, Back up light signal and a

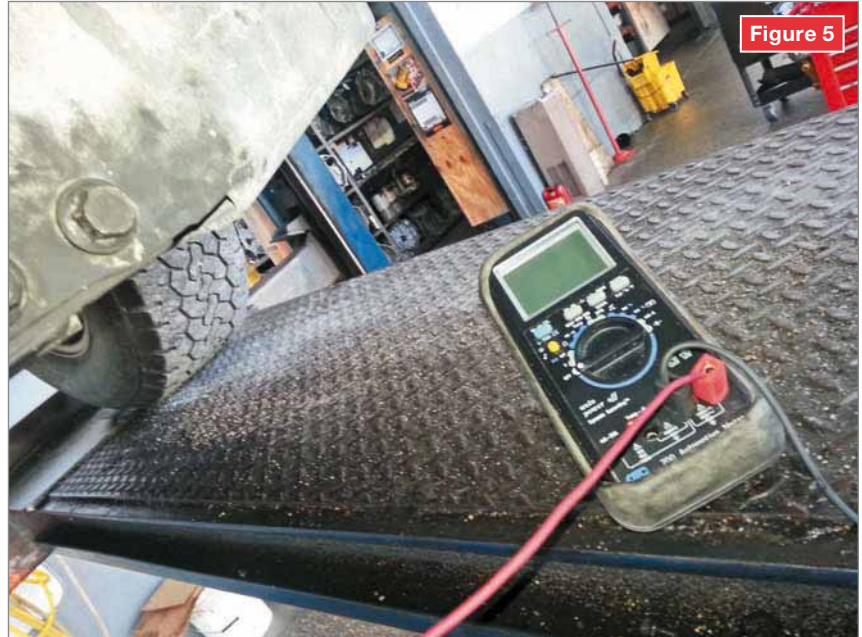


Figure 5

Tow/Haul signal input on terminal 1 (Figure 3). This is a 12-volt signal wire that the Tow/Haul switch toggles to ground. When this signal was checked with a meter Key On Engine Off 11.57 volts was observed (Figures 4, 5 and 6). When the Tow/Haul button was depressed, the voltage dropped to 0.01 as it should (Figure 7).

Once the button was released, the voltage returned. This verified that the TCM was receiving the Tow/Haul signal. No response to the shift strategy when the Tow/Haul was activated indicates a computer strategy malfunction. No bulletins for a reprogramming fix have been published to fix this concern. The only option would be to purchase a new computer with the hopes that it will correct this concern. Not a happy conclusion, but this was the

reality and the customer chose not to go that route (no pun intended).

Another area of frustration can at times be related to aftermarket tuners designed to enhance engine performance. This does not come up too often, so when it does it can be elusive since it is not in the forefront of one's thinking. We had experienced tuners burning out 6-speed Aisin Seiki transmissions in Dodge diesel incomplete chassis applications as it blocked shift adaptations. We now are seeing overdrive clutch burnout with the 68RFE transmission behind diesel engines even when you tell the tuner to return to street settings.

There are other possibilities for premature overdrive clutch failure, but when you put in a new pump, drum assembly, valve body, solenoids and line

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Figure 6





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pressure transducer, if you still burn out the clutch, the tuner is pushing it past the clutch assemblies holding capacity. From seeing how some of these trucks are outfitted and modified without any tuners, it doesn't look like it would take much to take out the transmission. Pump up some more horsepower and you'll find the weakest link in the chain. In this transmission it could be the sprag and/or the overdrive clutch.

Many new Dodge and Jeep vehicles now have 8- and 9-speed transmissions experiencing programming issues affecting transmission function. Someone who I know personally purchased a 2015 Jeep Rubicon with a 9-speed transmission that went down in 1,500 miles. After a new transmission and reprogramming, it now takes off in third gear and he has to go down a hill doing 60 mph for it to finally shift into ninth gear.

An interesting article concerning the front wheel drive version of the transmission appeared in the Feb. 16, 2015, issue of Automotive News entitled "Honda to offer ZF 9 speed in Pilot" by

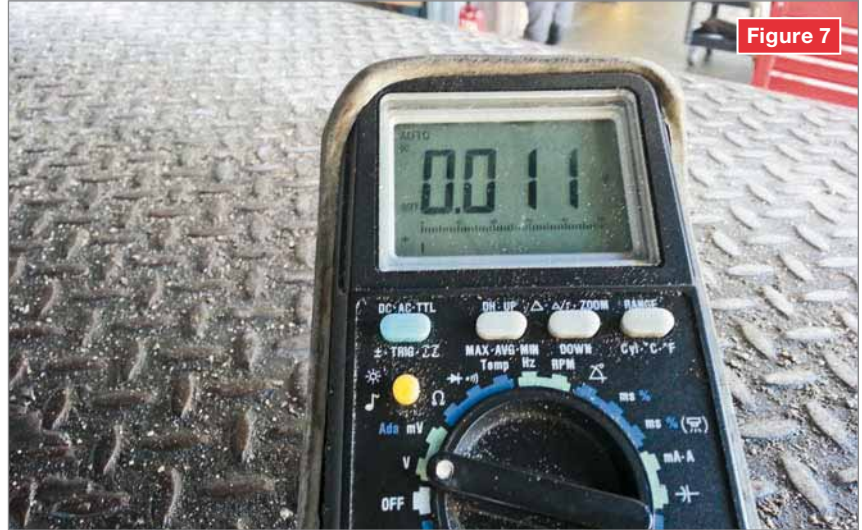


Figure 7

Lindsay Chappell. A quote from this article reads, "Fiat Chrysler officials said last month that they were making software improvements to address some complaints about the transmission's performance." This transmission is also in the Acura TLX and MDX.

I think I said previously that nothing can be more frustrating than try-

ing to fix a problem that can only be achieved via reprogramming. I need to correct myself. Nothing can be more frustrating than trying to fix a problem that cannot be fixed. Hopefully many of the programming issues will be resolved before they come into shops for repair once out of their warranty period. **TM**



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# MASTERING YOUR SCAN TOOL

The Autologic tool is one option for shops servicing European vehicles.

## WHILE THE TOOL YOU NEED MIGHT VARY, THE SKILLS YOU NEED TO MASTER IT DO NOT.

BY **G. JERRY TRUGLIA** | CONTRIBUTING EDITOR

In order to master a scan tool, you need to understand that there is much more to it than reading codes. It's the ability of interpreting the Parameter Identifier (PID) data displayed on the screen that will lead you to a successful diagnosis and repair of the vehicle. Knowing a good scan tool PID from a bad one makes all the difference in a proper diagnosis.

Remember that Diagnostic Trouble Codes (DTCs) are not set for everything. You can have a thermostat, for example, that does not reach the proper temperature in the specified amount of time, preventing the vehicle from completing monitors, shifting right or running correctly. Just because the vehicle produces heat does not mean that the

thermostat is functioning correctly. Another example could be a Barometric Pressure (BARO) sensor that is out of calibration causing a drivability problem but is not bad enough to set a DTC.

My objective in writing this article is to help you get the most out of your scan tool. I will provide some highlights of some common scan tools that are used in America's service bays. I am not going to cover OE scan tools in this article, because the majority of shops are using aftermarket tools. I will cover different tools in order to provide you with some of their best features. This will help you utilize them more effectively to capture the most information in the least amount of time.

### Using the Scan Tool for Drivability Problems

Before we go too deep, let's get the caveats out of the way. When it comes to diagnosing engine performance, DTCs or drivability problems, use the Generic/Global functionality of your scan tool to expedite the diagnosis. Generic/Global OBDII allows us to view information quickly while allowing access to pending DTCs, monitor status, Mode \$06 data, Freeze Frame records and a lot more. You won't get all that information in the Enhanced side of your scan tool, so start with the Generic/Global side first. If you need more data PIDs or bi-directional control, switch to the Enhanced side. Also, Generic/Global PIDs are the same

Photo: Autologic



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on every vehicle, whether it's a GM or a Porsche, and are easy to understand.

It's always helpful to know and understand all aspects of your scan tool along with the vehicle systems that you are working on before diving into a problem vehicle. There is nothing worse than going in blind — not understanding or utilizing the functions of the scan tool or knowing how the vehicle system operates. A good understanding of both will allow us to diagnosis and repair the system we are working on.

It's setting up a game plan that is going to save you time in diagnosing the problem. Knowing where to start, such as what scan tool to use on the problem vehicle along with knowing where to find the correct information for the vehicle is the key to success. We all have wasted time in diagnosing a problem vehicle whether it was using a scan tool that could not provide the information we needed to view or allow us the bidirectional control to activate a component we needed to test. Some shops decide to purchase a second scan tool out of frustration of not being able to diagnosis a problem vehicle. Let's face it — you need the right tools in order to perform the correct diagnosis.

Because some scan tools work better than others on different vehicle lines, another scan tool might be the correct option to invest in if you

haven't already done so. A good example is when a Mercedes-Benz rolls into my shop. I know what scan tool I am going to connect to the vehicle. I don't want to connect a scan tool that is going to provide only a partial list of information, limiting my ability to repair the vehicle. The scan tool that I will connect to the Benz is Autologic, because it has the proper software displaying engine to body data and everything in between including bi-directional control, module coding and the ability to reprogram modules.

I understand that not everyone reading this article has the variety of scan tools that I have, but you might be thinking about which one to purchase to fill the hole. Some of you may not work on every vehicle line that's on the road; maybe you just work on domestic, Asian, European or even one vehicle from that selection such as BMW or Toyota. There are many specialty shops in the country that focus on just one vehicle brand, making their selection of a scan tool easier and less expensive in most cases. Most scan tools today provide a full system scan that queries

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all of the vehicle's control modules (ECUs) to see if any contain system faults. Sometimes a fault in one system can affect another system.

For example, our shop once had a Dodge Dakota with a complaint of a hard shift into first gear. The shifting problem turned out to be caused by a PO136

(O<sub>2</sub> Sensor Bank 1 Sensor 2 heater malfunction). After Wayne Colonna (transmission expert, ATSG president and publisher of *Motor Age's* POWERTRAIN Pro) turned us on to the correct diagnostic path, we found the connection between the O<sub>2</sub> heater to the shifting problem along with help from the OTC all system scan.

To be successful using a scan tool, you need to connect it to a bunch of vehicles and see what good data looks like so you can identify bad data. For instance, you should check short term fuel trim (STFT) and long term fuel trim (LTFT), engine temperature, BARO, calculated load, rpm, MAP or MAF and the O<sub>2</sub>/AF sensors on every vehicle you test. You always should start your diagnosis by using the Generic/Global section on your scan tool even if you have the factory level scan data available. The reason is that Generic/Global OBDII PID data is limited to a select number of the most important data PIDS that the Engine Control Module (ECM) can provide for emissions and driveability related failures in OBDII.

Remember that Generic/Global PIDS are the same on every vehicle, so whether it's a Ford or a Subaru, the data PIDs all are the same and not confusing to understand. Another important reason is that Generic/Global will not substitute a PID value as Enhanced data often will. Of course, as you can expect in the automotive field, there is an exception, which concerns the Air Fuel Ratio/Wide Range sensors. Some scan tools will display a Toyota AF sensor voltage at approximately 0.685 volt, when in reality it's at 3.3 volts in the Enhanced side of the scan tool.

The best way to master scan tool data is to connect a Generic/Global scan tool to known good vehicles and record

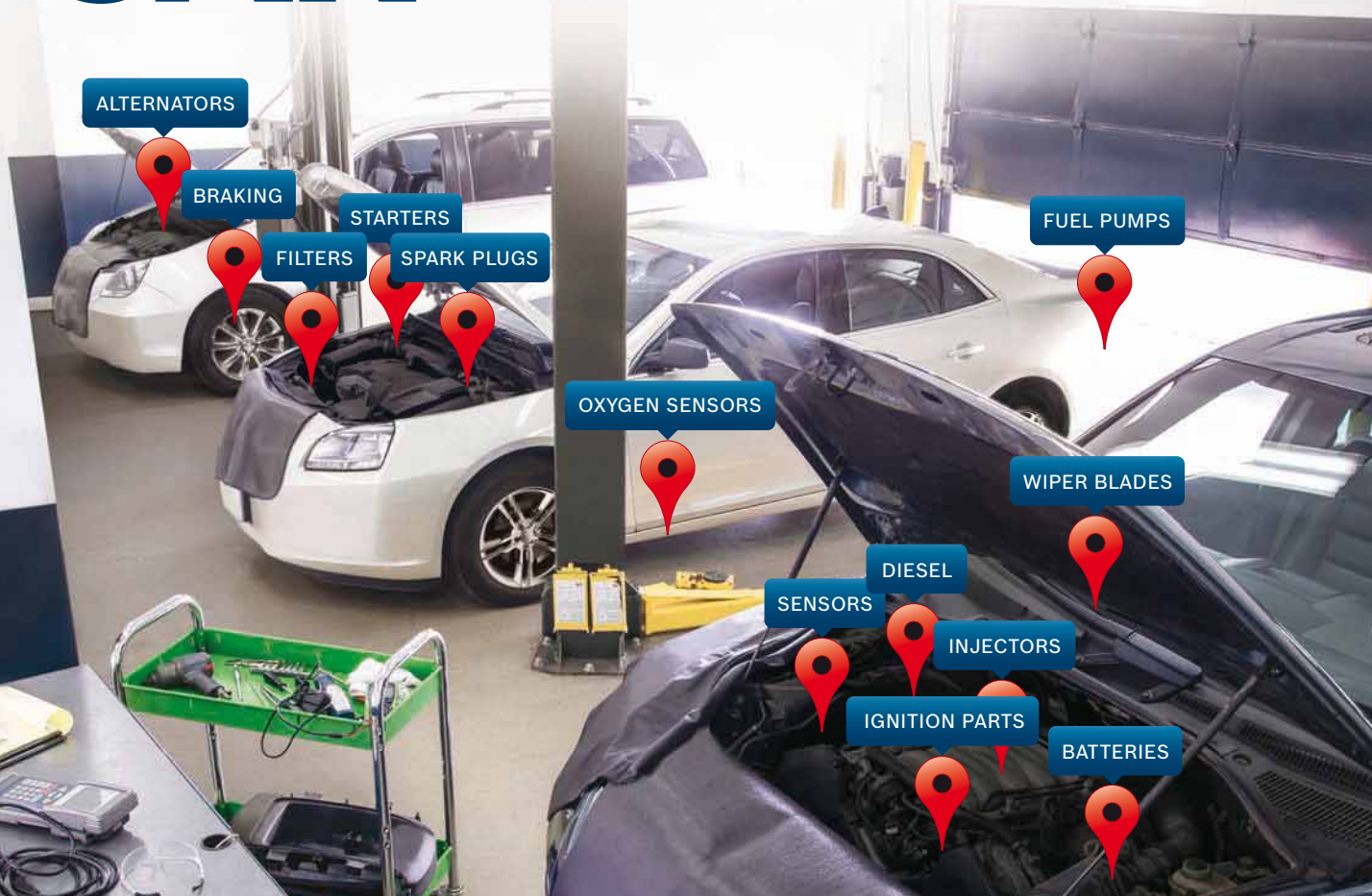


The Snap-on line of scan tools includes the VERUS, the SOLUS and the MODIS. All are capable additions to a techs' toolbox.

Photo: Snap-on Diagnostics



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the data. Remember that there is much less data to deal with and decipher in Generic mode. Start by checking the following PIDs and make it a habit on every vehicle that comes in for you to diagnosis: barometric pressure (BARO), calculated load (CALC LOAD), engine temperature (TEMP), long-term fuel trim (LTFT), short-term fuel trim (STFT), manifold absolute pressure (MAP) or mass air flow (MAF), O<sub>2</sub>/air fuel sensors (HO<sub>2</sub>SxBx), and RPM for starters.

When diagnosing an illuminated malfunction indicator lamp (MIL), do not erase the DTCs unless the original equipment manufacturer (OEM) states in its service information to do so or you will reset all monitor statuses to "Not Ready." When vehicle monitors

are Not Ready, it will be difficult to tell if you really solved the problem. When monitors are "Ready," the vehicle's ECM will be checking for parameters that are out of range and will record the failure as a pending code or turn on the MIL. On many newer vehicles (2010 and up), you most likely won't have to erase the DTC; they will clear on their own if the right conditions are met. The ECM will check for three consecutive passes in the failing system and turn the MIL off on it's own.

In the case of permanent DTCs, it's the only way to clear the code. If you do erase the DTCs at the start of your diagnosis, it's like using bleach on a crime scene erasing all the evidence. It makes no sense to clear anything from the ECM



MAHLE's new scan tool is slated for release later this year.

without printing, screen capturing, or writing down all the PID information along with the mature DTCs, Freeze Frame records, Pending DTCs, Mode \$06 data and monitor status. Using the information on when and what speed, temperature, load, etc., is very important in diagnosing the problem.

### Scan Tools

One Generic/Global OBDII scan tool to use when performing drivability diagnostics is the EScan scan tool from Automotive Test Solutions. The tool makes scanning easy along with providing a wealth of information at your fingertips. In addition to the standardized OBDII PIDs, the EScan also provides some very helpful diagnostic information in the left panel. The EScan has eight other tabs on the upper part of the screen that offer even more options, including its exclusive "Sharp Shooter" section.

In this section there are additional tabs that allow the user to take an in-depth look at Fuel Trim, Volumetric Efficiency, Simulated Injector, Power, Fuel Efficiency, Timing, Catalytic Efficiency, Time to Temperature/thermostat time and Auto Diagnosis\* (\*this will be completed in the near future providing a comprehensive report on the vehicle being tested). The EScan does not have Enhanced data or bi-directional control, except for Mode \$08 that allows the EVAP vent solenoid to be commanded closed.

The Autoenginuity PC-based scan tool is another option for technicians on a budget. Users can start out with a basic Global OBDII tool, or add one of the 48 different car lines the company supports for enhanced data. Enhanced offerings are also bundled to make growing the tool's capabilities easy. In addition, a J2534 Vehicle Communication Interface is available



The OTC Encore is the company's first tablet scan tool. It is on the Android platform.



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for use with the scan tool software or as a standalone reprogramming tool.

The OTC Encore™ is a mini-tablet scan tool that uses the Android operating system. Like many new tablet-based tools using this operating system, it boots up quickly and is ready to go in just a few seconds. The tool provides for Global OBDII information including decoded Mode \$06 information and also offers Enhanced options for domestic, Asian and European vehicles (a feature common to most tools) as well as the ability to perform a complete system scan (another increasingly common feature).

The tool also provides a variety of diagnostic aids including Identifix Quick Fixes, Pathfinder, BOB (break out box) pin locations and other helpful information. The tool is updated via the Internet. OTC also offers the Genisys Touch™ tablet that has all the same functions but includes a J2534-1/-2 compliant Vehicle Communications Interface (VCI) that can be used for reprogramming. There also is the option of adding on a two-channel labscope, adding more diagnostic power to one tool. This Windows-based unit speeds up your diagnosis by allowing you to connect to helpful technical websites such as

iATN, Identifix, Alldata and TST. It also has a library of embedded training videos you can access right from the tool.

The Snap-On VERUS® is another Windows-based PC tablet that provides many of the same features other high-end scan tools offer. The Mode \$06 function of the scan tool with v14.2 and up software decodes many of the Mode \$06 data. The scan tool performs bi-directional control, codes modules and performs relearn procedures. The unit also has the ability to function as a four-channel labscope along with the built-in aids to help you with connections and pin locations, making it easier to incorporate labscope testing in your routine.

For even more diagnostic help, there is Snap-on's FastTrack® Troubleshooter diagnostic database and Guided Component Testing information.

The Launch X-431 Android-based tablet is a very capable scan tool that uses a Class 1 Bluetooth connector and has the ability to search Google for DTC information. It also has a built-in vehicle maintenance and repair database along with the ability to update the scan tool via the Internet. The tool can graph 15 data PIDs at once, code modules, perform bi-directional control and perform relearns while performing very fast.

Delphi's AutoIQ scan tool can be purchased as a software addition to your own PC or as a PC-based tablet. It uses a VCI to connect to the vehicle, providing reprogramming capabilities in addition to solid OE-level Enhanced coverage. One feature is the Health Check of all onboard modules that can complete a total system check in only a few seconds. The tool has deep coverage that performs OE level functions very well. When I used the tool on a new GM vehicle, I thought that I was using the factory scan tool.

Another good test was when I used it on a 2009 Subaru and found very good data, bi-directional functions and module coverage. The scan tool connected very quickly without a problem while performing a complete module scan and I have to report that was very impressive.

Autologic is for the serious shop that wants complete coverage for European vehicles. This scan tool graphs, saves screens, logs files, codes and reprograms. This is one of the few scan tools that I use that does not let me down when diagnosing a vehicle. It's easy to use on every

function, while being capable of reprogramming with ease. The tool also comes with live tech support that is helpful to a tech working on a problem vehicle.

Autoland Scientech iScan II WT is another good scan tool that has excellent coverage for European, Asian and now domestic vehicles. It has most of the features I described on the other scan tools along with a very strong bi-directional and coding function. With a recent download via the Internet, the tool now is able to perform BMW offline programming on many models, with more coming in the future. The tool can also be used as an interface with factory software such as Audi/VW, BMW, Ford, Jaguar, Mazda, Mercedes Benz, Range Rover, Toyota and Volvo. To connect to this software, you will need the optional laptop that has the software load on it. In some cases, using the laptop software also provides for reprogramming when available.

There is a new scan tool worth mentioning. MAHLE recently introduced a tablet-based scan tool. While I was at APPEX 2014, I saw the tool in action and was impressed with the speed and functions of the tool. The tool is scheduled for release later this year, providing at first domestic and Asian coverage, and adding European coverage by 2016. The scan tool performs a complete module scan, provides decoded Mode \$06 data with constant refresh, graphs, has bi-directional control, full data recording that can fill your hard drive, coding but does not support programming yet. The tool also comes with remote customer support.

This listing of scan tools is by no means complete. There are others offering a wide range of features and coverage. Which one is right for you is a decision based on your individual needs and the vehicles you typically service. **TZ**



The Launch tablet uses an Android operating system, popular with several of the newer scan tool offerings.



Autoenginity is a PC-based scan tool that provides a lot of power in an economical package.



**G. JERRY TRUGLIA**  
CONTRIBUTING  
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G. Jerry Truglia, president of Technicians Service Training, has been in the auto repair business for a long time as a tech, shop owner and nationally recognized trainer/author. He founded TST to bring affordable training to his fellow techs and shop owners.

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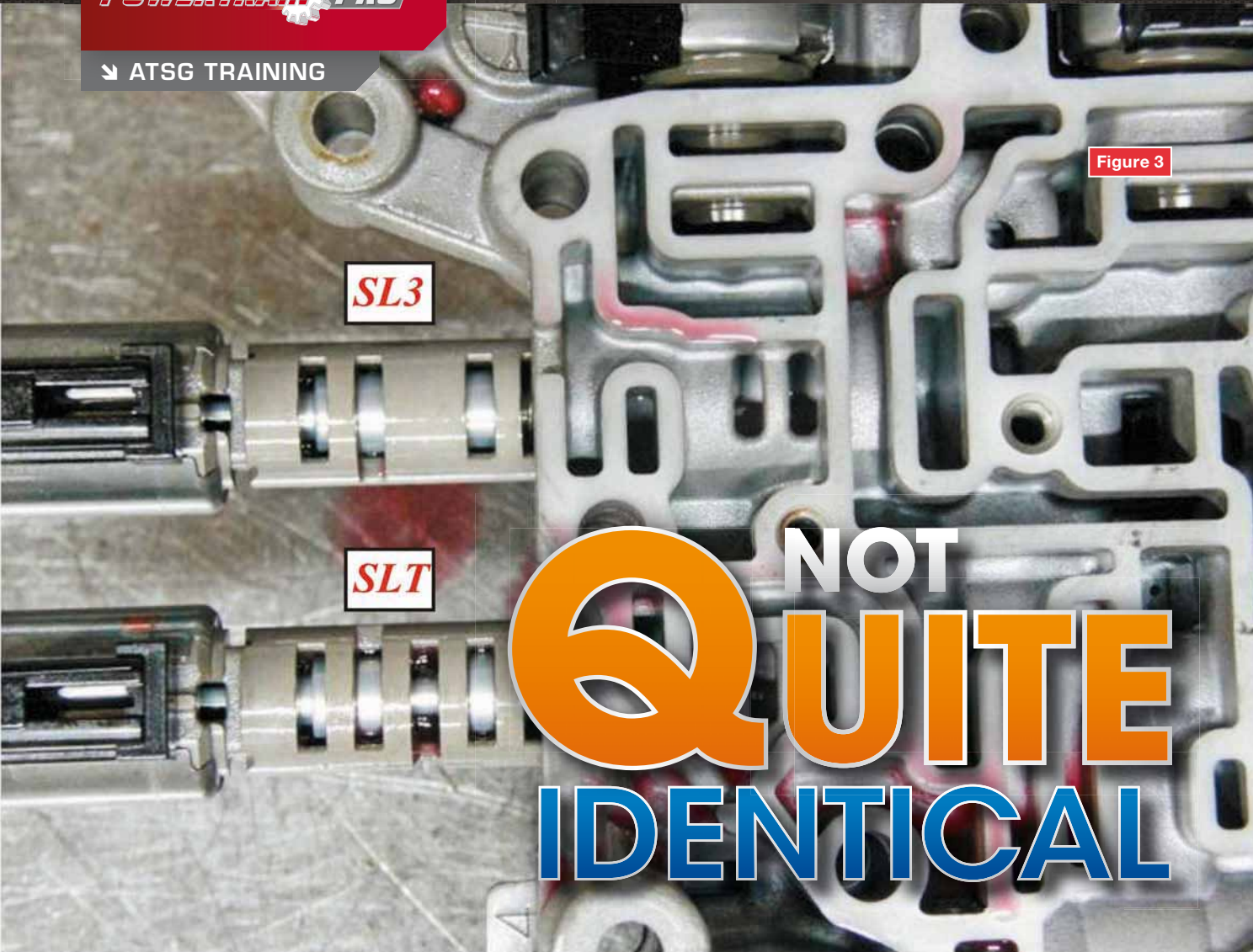


Figure 3

**YES, THERE ARE MANY SIMILARITIES AMONG SOLENOIDS. BUT THEY ARE NOT ALWAYS THE IDENTICAL TWINS THEY FIRST APPEAR TO BE.**

BY **WAYNE COLONNA** | POWERTRAIN PRO PUBLISHER

**O**n occasions, solenoids that appear to be similar may be mistaken as identical. Toyota's U150 series transmission is a good example of this (Figure 1). This valve body contains seven solenoids of which four look very similar (Figure 2).

They all have the same type of electrical connection both in configuration and color (early style color). The snouts also are the same in diameter and length, and they all have the same design retaining bracket slots. Yet when these solenoids are

Photos: Wayne Colonna

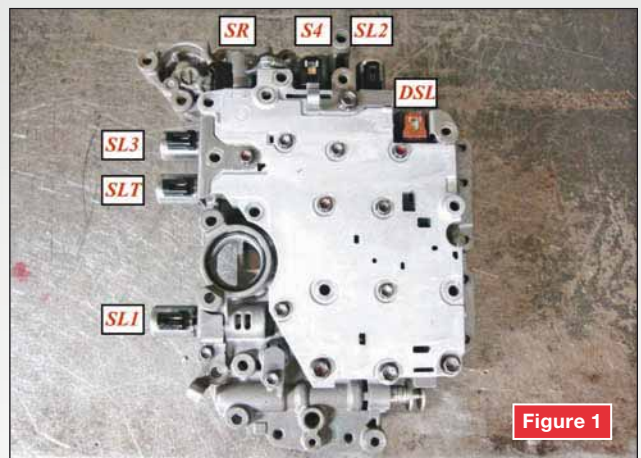


Figure 1

laid side by side for comparison, one easily can see the SL1 solenoid is very different than the others.

The SL2 and the SL3 are the same, and the SLT is similar yet still very different. The SLT and the SL3 solenoid

are installed into the valve body correctly as seen in Figure 3, but can be swapped easily and installed incorrectly (Figure 4). This would cause two problems. With the SL3 solenoid in the SLT location, a slight boost in pressure might be seen due to the manual valve routing pressure to the boost valve, but there will be no line pressure rise with throttle opening.

The SLT solenoid being in the SL3 location prevents the proper operation of the C1 Clutch Control Valve prohibit-

ing a forward engagement. In short, no forward and a slipping reverse backing up a slight grade when these two solenoids are accidentally swapped.

Some 2005 to 2007 Toyota Camrys equipped with the 2AZ-FE engine and U250 transaxle might exhibit a harsh 5-4 downshift after driving at speeds above 45 mph and decelerating to 28 mph. Toyota TSB numbers, TC013-05 and TC010-06. One cause can be due to pressure instability problems with the SLT Solenoid (Line Pressure Control Solenoid) requiring replacement.

The new design SLT solenoid has a brown connector (Figure 5). Beware;

there are new design SLT solenoids with a black connector allowing for the same incorrect placement of the solenoid. To know if you have the newer style SLT solenoid, the screw cap at the tip of the solenoid has a slot for a flat blade screwdriver as opposed to an Allen/hex wrench pocket.


For your reference, this is Toyota part No. 35290-45010. 



Figure 2

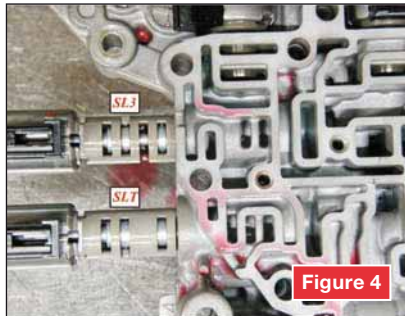


Figure 4



Figure 5

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## ELECTRICAL



# ELECTRICAL PROBLEM ANALYSIS

## DO YOU RUN AND HIDE WHEN AN ELECTRICAL FAULT IS PULLED INTO YOUR BAY?

The low amp current probe, used with a labscope, will give the technician a graph of the current flowing in the circuit.

BY **ALBIN MOORE** | CONTRIBUTING EDITOR

**W**hen vehicles with electrical concerns come to your bay, do you run and hide or jump up and down with joy with anticipation of another electrical challenge? If not, why not? Electrical problem analysis can be very rewarding if the technician is properly trained and has the proper equipment.

Ah, the proper equipment? This could be something as simple as a good quality digital multimeter or as advanced as a labscope with all the trimmings. While we are talking about equipment, let's not forget about the need for a great source for wiring diagrams. Without the proper wiring diagram (the electrical road map), the technician is wandering around in the dark electrical world without a flashlight.

After working with electrical problems for many years, I have found a few things that can help simplify electrical circuits and make your troubleshooting challenges a little less challenging.

- Electricity goes in circles, and without a completed circle, it does not go. In other words, the electrical circuit must be complete for the circuit to perform its required task.
- Any ungrounded circuit (open circuit) will have system voltage anywhere in the circuit between the power source and the place where the circuit is open.
- Any simple circuit will have the same current flow anywhere in the circuit.

These few pieces of information seem very simple, but they are very important things to keep in mind when

working on electrical circuits. I always smile when I hear someone say, "I have a short to ground, since there is voltage everywhere in the circuit. A short to ground would have one of two things, a blown fuse or a fire!"

When working on late model vehicles, there are several different kinds of circuits. There are computer communication circuits, computer sensor circuits, very high current circuits (starter supply circuits) and high current circuits such as headlight and taillight circuits. Each of these circuits conducts electricity but performs different tasks. This is a very good reason to familiarize yourself with the circuit before you start the problem analysis. Knowing what the circuit is designed to do and the purpose for its function will give you a head start on



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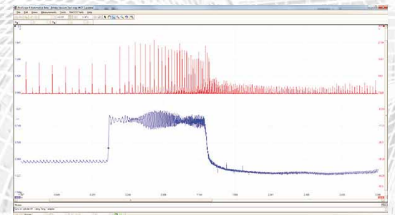
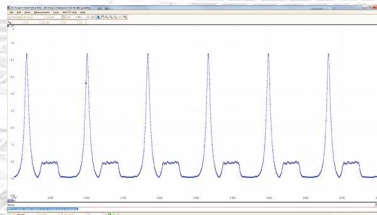
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ALBIN MOORE [CONTRIBUTING EDITOR]

a direction before you start the testing process.

One great way to get an understanding of the circuit function is to study a wiring diagram. This might give you enough information to start the diagnostic process. You might need to dig a little deeper and research how the component or system works. Armed with this information, the technician will have a good idea which tool will be needed to analyze the problem and what settings on the meter to use. Time spent in research is time well spent and in the end will be a great value.

In the photographs, I have listed a few pieces of diagnostic equipment: bulb test light, headlight bulb, graphing multimeter or lab scope, digital volt/ohm meter and a low amp current probe. Each piece of test equipment has its place, and each diagnostic tool

can be used for multiple purposes. Have you ever considered using a test light or a headlight bulb as a power limiting source for a shorted circuit or a circuit with an intermittent short to ground?

Each circuit in an automobile has one paramount purpose: to conduct current. Sometimes this current will be very low (in the micro amp range) and some circuits are designed to carry current in the hundreds of amps. This leads to a different diagnostic approach on each kind of circuit.

Testing a computer or sensor circuit for integrity will use the same testing principle as testing the integrity of a starter circuit, but the technician should use a different tool for the proper testing procedure. Failure to do so can result in component damage to some very expensive parts.

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The headlight bulb can be used for a high amp test light or a current limiting device. This headlight bulb will flow 2.7 amps of current. Used as a current limiting device, this will limit the current flow through the circuit to 2.7 amps of current.

For the very low current computer sensor circuit, an ohmmeter would be the tool of choice to test its integrity, but for the starter circuit, using an ohmmeter is not a very accurate way to test the circuit. When testing a starter circuit, I would recommend using the starter motor for the load, and using either a digital voltmeter, or a graphing voltmeter and test the voltage drop of the circuit. The starter motor will need to be turned on to get this valuable information. By using the voltage drop method of testing the circuit, the circuit is tested dynamically, under real world working conditions. Years ago, this test was referred to as a dynamic resistance test. In other words, the circuit is tested while it is working (dynamically) and the voltage drop method of testing will tell you the actual resistance of the working circuit.

Most electrical circuit problems can be narrowed down to four different kinds of problems: open circuits, short to ground, internal shorts between two wires in a harness or high resistance in the circuit. Each of these problems can be found easily, if you use the proper test equipment and proper test procedures. The object of diagnostics is to get the problem to come to you. Each type of electrical problem will require a different approach, although



The bulb test light can be used as a conventional test light to test for power on a circuit, but it can also be used as a load limiting device. This test light will flow .73 amp of current.



The DVOM has many uses from testing voltage, to testing the resistance of circuits.



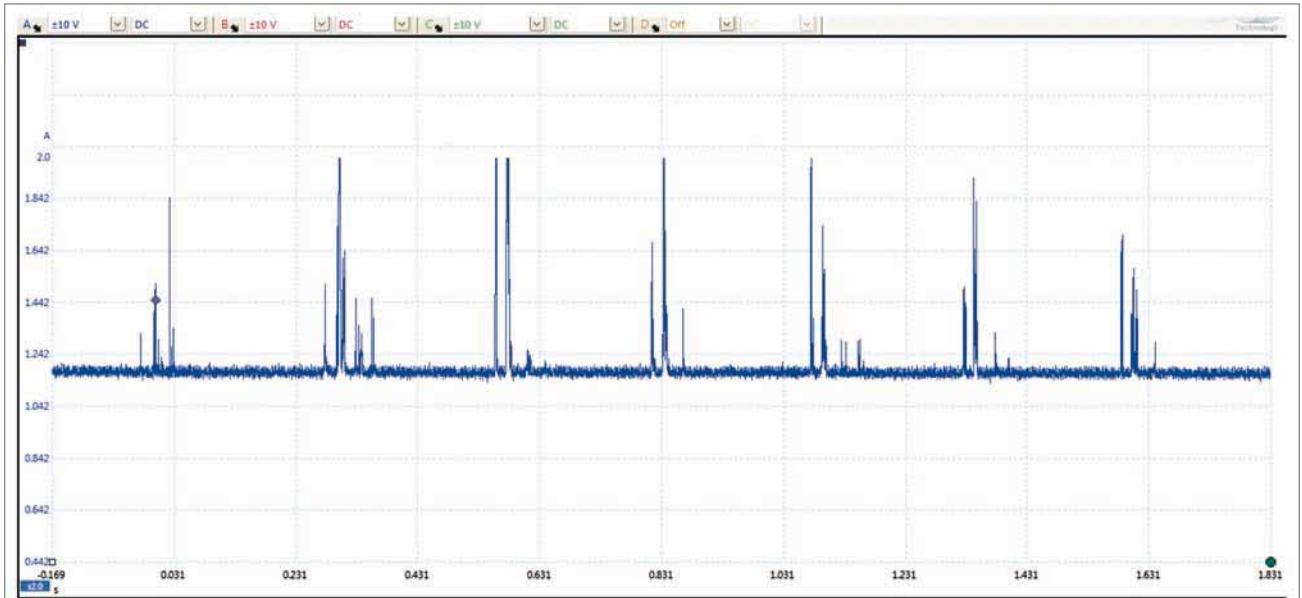


Figure 1: While bumping the dash with my fist, the current probe shows the intermittent short to ground happening.

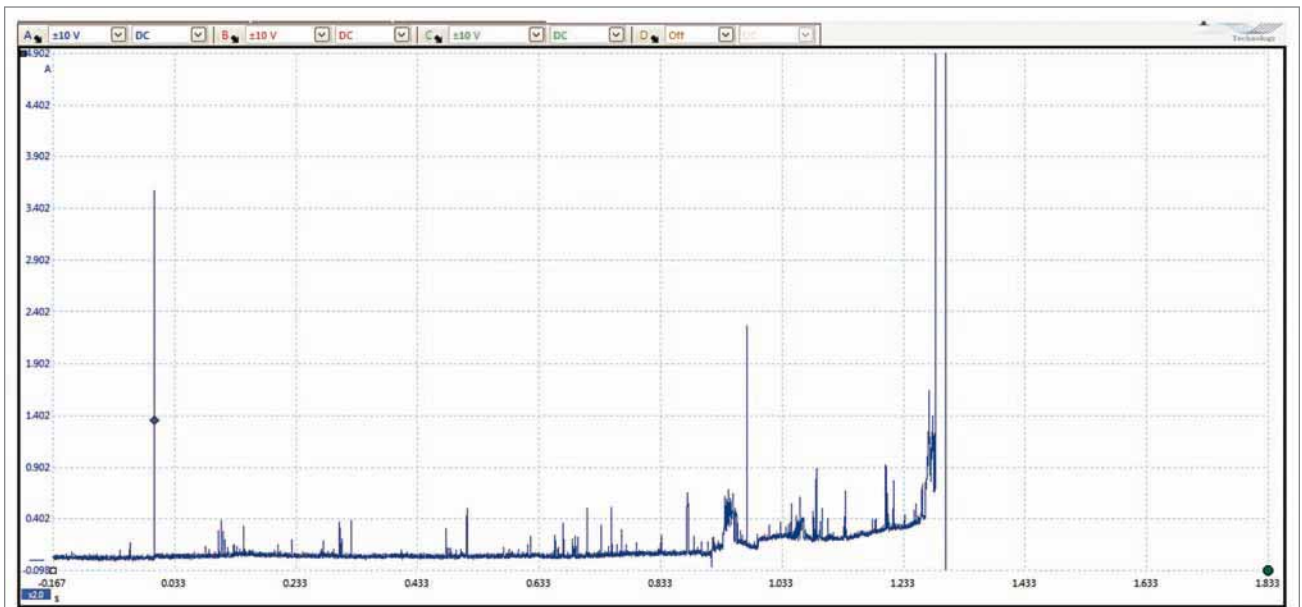


Figure 2: While bumping the dash with my fist, I got closer to the intermittent short, and then the 15 amp fuse blew.

every electrical problem analysis should always start with learning how the circuit works, what the circuit does and how the circuit is laid out in the vehicle. Every piece of this information is found in the published service information for the vehicle.

### Fun With Fuse 15

As an example of an intermittent short circuit problem, I will use a case study from a 1997 Subaru Legacy/Outback. This Subaru has been ridden hard and put away wet many times. The vehicle lives on top of a mountain and is driv-

en two miles each way on washboard road every time it comes to town. The odometer is showing 208,000 miles and still has the original automatic transmission. The customer concern is that intermittently the instrument cluster lights will go out, the high beam headlights will go out, numerous instrument cluster lights will come on and if driven long enough, the engine will finally stall.

Looking into the driver's compartment, the floor is littered with several blue 15-amp fuses. There is also a good supply of fuses in the ashtray,

too. This vehicle has been driven for 25 miles without the fuse blowing. Because driving it until it blows the fuse will bring us no closer to knowing when and why this problem occurs, the best thing to do is to first learn how the circuit works and then what the circuit powers.

There are several diagnostic paths that can be taken on a problem like this. Some things I have seen used by techs to troubleshoot a shorted circuit include installing a higher amperage fuse to power the circuit or installing a circuit breaker in place of the fuse so the circuit



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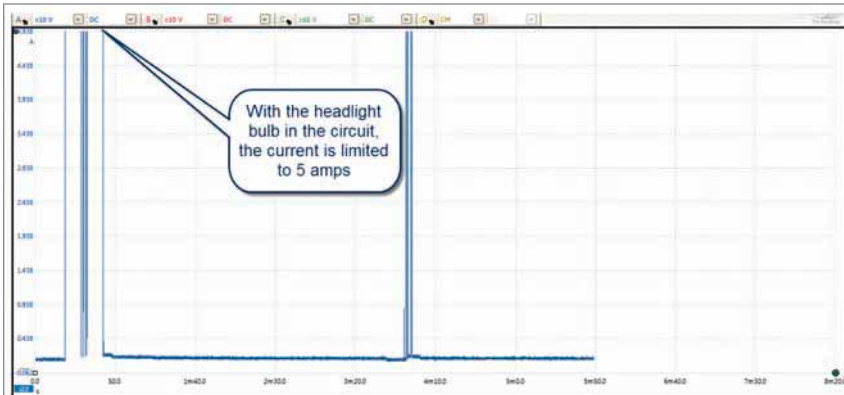
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breaker will still protect the circuit. This will close and supply power to the circuit and after all, this is an intermittent problem and we all know intermittent problems are hard, if not impossible to find. I do not like any of these diagnostic approaches so let's think out of the box a little and use a solid diagnostic approach to the problem.

Any time I work on intermittent electrical problems, whether they be short to ground problems or intermittent open circuit problems, I always am afraid I am going to move a wire or wire harness and the problem will go away, never to resurface no matter what I do. This always leaves an unfixed car leaving the shop and wasted labor that is unbillable.

Starting with a logical diagnostic process for this concern begins by examining a power distribution wiring diagram for fuse 15 (the location of the intermittent fuse failure), and it uncovers a lot of useful information. Some things I pick up on right away include learning that fuse 15 powers only small electrical loads like some



**Figure 3:** With the headlight bulb installed in place of fuse 15, the suspected wiring harness was gently moved. This time the headlight flashed and the amperage spike was captured on the scope. The short to ground was located.



The fuse loop is inserted into the fuse 15 cavity. The low amp current probe is hooked to the fuse loop so any amperage change on the circuit can be recorded on the lab scope.



Here is our test case vehicle, a 1997 Subaru Legacy Outback powered with the 2.5 L DOHC engine with automatic transmission. The odometer is showing 208,000 miles.



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relays and the instrument cluster, the fuse only has system voltage when the key is in the start or run position and everything fuse 15 powers is located under the dash. This gives me a good direction where to look for the intermittent short to ground. Keep in mind, I want this problem to come to me. I do not want to take this whole dash apart and start opening up wiring harnesses to find the problem.

To accomplish this task, the system needs to be tested dynamically, which means to be able to make the short to ground happen in the shop where I can easily capture some data and pinpoint the location of the problem without having to take the car apart. The first thing is to install a fuse loop in place of fuse 15. This allows a low amp current probe and lab scope to record any current flow on the circuit.

Because fuse 15 will blow when the car is being driven on rough roads, the way to get this problem to happen will be to cause some vibration to the dash. With all loads on the circuit turned off and the ignition key turned on, I started using my fist to bump the top of the dash. Within a few seconds, the lab-

scope started recording amperage spikes as seen in Figure 1. At this point, I know the problem lies inside of the dash, but I'm not sure exactly where.

The dash thumping was increased in intensity and the location was narrowed down to a place between the

---


**“Any time I work on intermittent electrical problems, whether they be short to ground problems or intermittent open circuit problems, I always am afraid I am going to move a wire or wire harness and the problem will go away, never to resurface no matter what I do.”**

---

right end of the instrument cluster and the radio. Figure 2 shows the intensity of the amperage spikes increased as the vibration of the dash got closer to the place where the harness was shorting to ground. At this point, the 15 amp fuse burned and it is time to pull the instrument cluster to gain access to the wiring harness that lies behind the dash.

With the instrument cluster removed, the wiring in the dash can be seen easily. There is only one large wiring harness that runs across the dash and the dash is all made from plastic. A headlight bulb was installed in place of fuse 15, the current probe was clipped around one of the headlight wires and the harness was moved very gently. A few seconds of gently moving the harness made the headlight flash and the waveform in Figure 3 was recorded. At this point, I can make the electrical short happen and with the headlight limiting the current flow in the circuit, there is no possibility of doing harm to the harness, or setting the vehicle on fire.

Back in the dark dungeon in the interior of the dash is one small steel brace for the radio. This wiring harness had been rubbing on that one little black steel brace for 200,000 miles and finally had rubbed a very small hole in the insulation. When examining the harness, the hole in the insulation was about the size of a straight pin head. There was just one little tiny copper speck showing through the insulation, which was on the back side of the harness and I had to use a mirror to see the problem.

The problem was found and fixed in short order. How long would this repair have taken without a logical diagnostic process? 




The graphing multimeter can be used to test circuit voltage or graph and record amperage flow through a circuit. Many times, being able to see a voltage trace will aid in the analysis of a problem circuit.



**ALBIN MOORE**  
CONTRIBUTING  
EDITOR

Albin Moore spent 21 years in logging before opening in 1992 a shop that specializes in drivability problem analysis. He is an ASE CMAT L1 technician with 40 years of analyzing and fixing mechanical and electrical issues.

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## KEEPING THE PRESSURE

# ON

**FUEL SYSTEM PROBLEMS USUALLY AREN'T THE FIRST THING CHECKED WHEN THERE'S A DRIVABILITY PROBLEM. MOST OF THE TIME THEY APPEAR AFTER EVERYTHING ELSE HAS BEEN INSPECTED AND ELIMINATED.**

BY **VANESSA ATTWELL** | CONTRIBUTING EDITOR

**R**emember when checking a fuel system for correct operation meant checking that fuel was simply present at the injectors? Those days are all but gone. Most of today's systems are returnless, so the old diagnostic methods of clamping off return lines to isolate issues aren't in much use anymore. As well, modern direct injection systems use extremely high pressures that can't be safely or accurately tested with the

same gauges and testers that have worked well for years.

The problem with fuel system faults is that they can seem to be an awful lot like other system faults. For example, rough-running and back firing could be caused by an ignition system problem or it could be a fuel system problem. A no-start condition could be caused by problems in any or all of the engine management subsystems — mechanical, ignition or fuel. No doubt, figuring

out what's going wrong and putting it right can be quite a challenge.

Successfully diagnosing fuel systems means thoroughly understanding how it works and operates, using the correct tools for the job and having a solid diagnostic plan of attack. Components tend to be expensive, so simply replacing parts until the problem goes away (or the vehicle does) usually isn't a valid option. That's not to say that there aren't a few tips and





This 2012 Ford Raptor doesn't have a fuel cap, the 2007 F150 does. Either way, it's really important to keep the area clean so dirt doesn't end up in the tank or the fuel rail.

tricks that can make diagnosis easier, because there certainly are.

However, diagnosing these systems still involves understanding the problems that could be causing the fault, creating an educated guess as to what the cause of the problem is and then taking measurements to verify or disprove your theory just as with any other vehicle control system. It's just the tools and technology that have changed.

Working on these systems does take a bit more effort and knowledge, and there really aren't any magic bullets or one-size-fits-all rules that apply to everything and make testing easier because the systems differ so much. But even so it's definitely possible to quickly and accurately figure out what's going wrong and fix it right the first time. If you're ready for the challenge, here are the basics of properly diagnosing and testing modern fuel systems.

### Preliminary Steps

Because it usually takes a while to realize that a vehicle's problem is fuel-related rather than any other system-related, time is of the essence in testing the fuel system components and that's why a good preliminary inspection is so important.



The most important part of the preliminary inspection is taking a few moments to review how the system works and also understand how to test the components properly, making sure to review not only system operation but also to understand what pressures, voltages and parameters to expect during operation for two reasons.

The first reason this is essential is because the systems operate differently, with direct injection systems often using extremely high pressures (up to 2,000-plus psi) that can cause serious injury to techs who go in unprepared. Modern fuel systems deserve the same healthy respect as high-voltage electrical systems or extremely hot exhaust components. They require special safety considerations to prevent damage or injuries. Understanding how to relieve system pressures and how to test components and check operating pressure safely is critical.

The second reason is to make sure that what you're trying to fix is actually a problem and not a normal operating condition. Many vehicles use multispeed fuel pumps to vary pressure when more or less is needed, so it's really important to know what the fuel pressure should be under

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various operating conditions. Chasing a low pressure situation that's actually normal because of a variable-speed fuel pump or an ECM (Engine Control Module) override condition (such as clear flood or theft deterrent) can be time consuming and embarrassing. Monitor what the pump is commanded to do by using a capable scan tool.

On that note, a good step in the preliminary inspection is making sure the problem isn't simply that the fuel gauge is incorrect. Ensure that there's actually enough fuel in the fuel tank for the vehicle to start and run (tap on the fuel tank and listen for noises or check the wiring and connections for signs of corrosion or damage, especially if the connection is exposed to the elements). Do not bang on the tank to see if you can get the fuel pump to run! Modern pumps are so quiet you may not hear the "hum" you're used to, and banging on the tank actually can cause damage to the pump motor.

One excellent tip is to have a look at the fuel gauge as part of the preliminary inspection and note if the vehicle has just been filled up, something a tech who worked in an area known for discount fuel stations taught me. In fact, having the service advisor ask the customer about recent fuel purchases is a good idea if you can manage it. A drivability problem, like a misfire that develops immediately after a fill-up, might indicate bad or contaminated fuel problems and it's better to realize that early on in the diagnosis than figuring it out late in the day.

When a vehicle with Distributorless Ignition (DIS) has multiple and random cylinder misfire Diagnostic Trouble Codes (DTCs), from experience it's almost always caused by the fuel. If each cylinder has its own ignition coil, the only thing that can really cause

most of the cylinders to misfire at the same time is the one thing they have in common, the fuel. (Well, OK, the random multiple cylinder misfire could be caused by low fuel pressure, too, but then there would be starting issues and other problems as well.) In other words, check if the fuel level is at maximum and be suspicious if it is.

Also, check quickly for any signs of the problems that modern fuel systems are prone to. For example, direct fuel injection systems are notorious for developing carbon buildup on the valves and intake components, which causes drivability problems, so it's worth taking a quick peek to look for excess buildup. Returnless systems have in-tank fuel filters that may be restricted on higher mileage units so it's worth noting the mileage on the vehicle and proceed accordingly.

And, of course, look for bulletins, tech tips and even for programming updates in your service information sources. Realistically, most customers use the Internet to look up their vehicle's symptoms so it's smart to quickly do the same — even though you may not find anything accurate or applicable this step is an important preliminary check.

#### Fuel Pressure and Volume

Fuel system problems tend to be caused by a lack of pressure or volume, poor quality fuel, or problems in the fuel control system (electrical control components). The trick is finding out which one it is — quickly and without damaging anything.

Testing system pressure usually is pretty straightforward. Attach the correct gauge to the service fitting and check that pressure is within specifications with the key on engine off (KOEO). If there's no port to connect the gauge to, then relieve the pressure



From experience, newer vehicles that are regularly driven on an empty tank tend to have problems with their fuel supply system.



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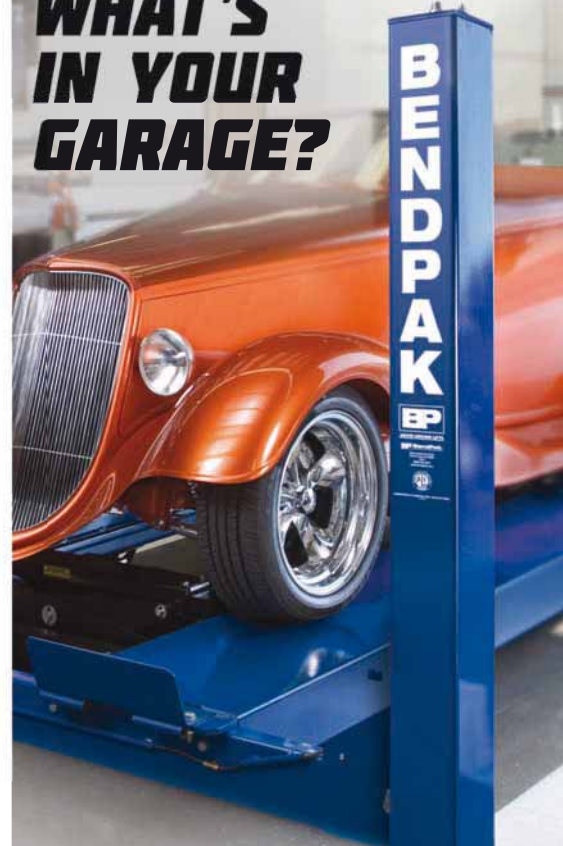


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in the fuel system as directed by service information and install the tester inline using the correct fittings (also as directed by service information and your tool's manufacturer). Never simply press the valve core of the service fitting with a screwdriver or similar device to see if fuel pressure is present. At 2,000 psi if pressure is present, it will do a whole lot of damage and the results can be long-term injuries or expensive broken components. Not good at all.

The correct fuel pressure gauge and diagnostic tester are essential for verifying correct operation and diagnosing any concerns. Vehicle systems using direct injection have extremely high high-side pressure (in excess of 2,000 psi on some systems), and using a conventional gauge to check pressures might not be possible or advisable. True, the gauge might be able to check the tank supply or primary pump pressure but it won't be able to check the high side of the system where many problems are found.

In these cases, many manufacturers have built pressure sensors into the fuel system so that the fuel pressure can be checked safely on a diagnostic tester. This also allows for the fuel systems to be tested dynamically to confirm the pump and other equipment are operating correctly under different loads. Service information will have the specifications, and I can share from experience, if the actual pressure is close but



**Note the sensor on the fuel rail rather than a regulator in the 2007 F-150 returnless fuel system.**

not quite within specs then that might be the problem. On these systems "close enough" usually isn't good enough, so paying attention to details matters.

It's important to note that volume of fuel is just as important as fuel pressure. If the flow rate isn't within specification, the vehicle won't run properly even if the fuel pressure is. Test for volume as directed by service information, usually using a flow meter, but if the system is a lower pressure one then a clean container can be used to evaluate fuel flow. Don't even think of trying that on a high-pressure system though. Use the scan tool and look for the Parameter Identifier (PID) in the data list.

If pressure and volume aren't within specifications, then find out if the pump isn't doing its job or if there's a leak or blockage somewhere in the system (it doesn't take much to plug those tiny little passages). One very smart tech I work with swears by having a shut off valve in the gauge connection to help isolate the engine and tank sides when checking for fuel pressure loss, so he can distinguish between a loss on the injector side or a problem with the fuel pump.

If you suspect that the injectors are leaking (not uncommon on high-pressure systems), pull out the engine oil dipstick and look (and sniff) for signs of fuel leaking past the rings and into the engine oil. Common indications include an oil level that is far too high, a noticeable fuel smell, or even the ability to ignite the oil (gas, really) on the dipstick with a pocket lighter.

If the problem is indeed the pump, quickly look and see if you notice something that would have caused the failure. Nearly every fuel pump manufacturer I know says dirt or sludge in the fuel tank is a common cause of pump failure (and failing to clean the tank leads to new pump failure and a comeback that could have been prevented). Another common cause is voltage drop in the pump circuit. Fixing the cause of the problem can prevent the new components from failing and the vehicle returning.

Once you're ready to install the new pump, fill it with fuel and let it sit for a moment so that it doesn't start dry and possibly cause damage or premature wear. Replacing the fuel filter and screen (if applicable) at the same time



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as the pump (if it doesn't come as part of the unit) is cheap insurance against repeat failures, as is also filling it up with fuel before installing it and starting the vehicle. One final step to ensure a quality repair is never reusing O-rings and only using approved ones to complete the job. Successfully diagnosing and repairing modern fuel systems means paying attention to small details to ensure an accurate, lasting repair.

### Restrictions and Debris

If the pump is OK, then make sure the fuel lines or filter aren't restricted or plugged. This seems to happen more often on vehicles that are frequently driven on an empty tank or that use poor quality gas.



Checking the fuel gauge to see if a vehicle was just filled up is a smart step in the preliminary inspection. Misfires that develop immediately after fuelling tend to be fuel-related.

A wise tech I know used to sell fuel filter replacements by pointing out that all the fuel in the tank was pumped, filtered and recirculated every few hours so it was important to keep the fuel filter free from contaminants. This logic isn't true anymore, because on returnless systems only the amount of fuel needed is pumped off to the injectors and fuel filters are often located in the tank as part of the sending unit and are intended to work for the "lifetime" of the vehicle.

### Preventing Problems

Because repairs to modern fuel systems aren't cheap, it's worth working with your regular customers to prevent problems from ever developing in the first place. If possible, replace the vehicle's fuel filter regularly (don't let it wait too long and then get seized in place or stuck tightly to brittle plastic lines). Don't forget about the diesels; they need fuel filters changed, too. Make sure the arrow points in the direction of fuel flow and mark the fuel lines as they are removed if there are more than two of them to prevent problems. MAHLE has a great YouTube video on this topic on its YouTube channel.

Point out to your customers that driving around on an empty tank is likely to cause problems and

encourage them to use quality fuels when they fill up. Additionally, when repairing or servicing the system, stick to high quality parts from trusted manufacturers and suppliers (this isn't the place to get frugal; it's nice when the vehicle starts easily and runs well and repeatedly dropping the fuel tank to replace components is simply not fun).

Pay attention to details like using the correct engine oil because it matters and affects engine operation — it's not one oil for all vehicles anymore. In other words, there's certainly money to be made in preventative maintenance and it's easier on everyone involved.

### Conclusion

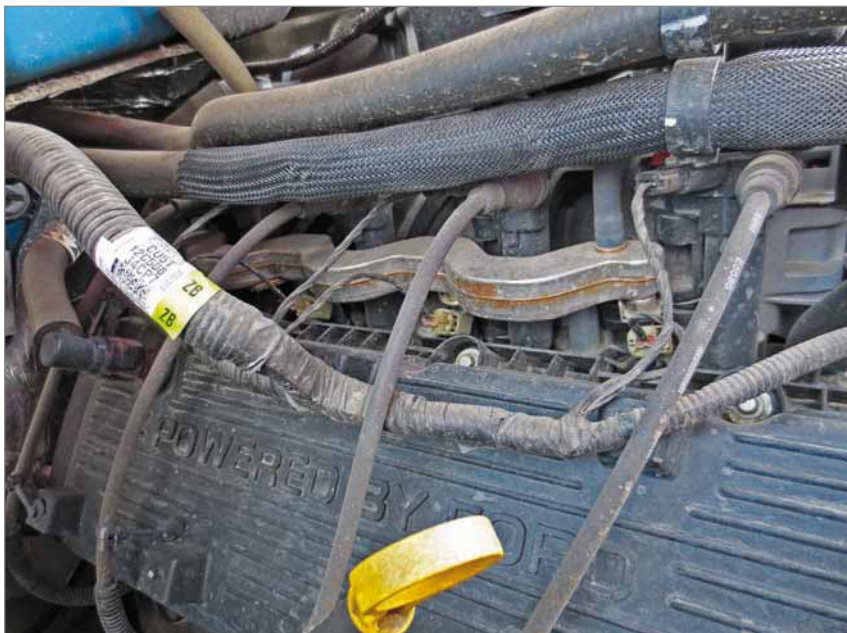
Diagnosing newer fuel injection systems can be challenging, but using the right tools and information make it much easier and profitable to deal with — actually it's also the only way to deal with it. Diagnosing these systems — and all other systems — means developing a theory about what could be wrong and then taking measurements to prove or disprove that theory.

The important things to remember when working on these systems are to understand the system and know what you should see during your diagnosis and what to check if it's not there — and remember to depressurize the system before working on it and keep the repair area very clean. Pay attention to details because small things make a big difference.

Repairing and maintaining these systems isn't cheap, so there's definitely money to be made if you're willing to take on the challenges. Use the correct tools, understand the system and pay attention to small details and you'll be just fine — and your bottom line will thank you for it. *MAZ*

### VANESSA ATTWELL CONTRIBUTING EDITOR

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.



The fuel rail on the 2012 Ford Raptor's returnless fuel injection system has no service port to tap into and no vacuum or return lines to aid diagnosis.





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# STAYING ON THE STRAIGHT AND NARROW

SPEED IS NOTHING IF THE CAR CAN'T STAY ON THE ROAD.

BY PETE MEIER | TECHNICAL EDITOR

Every tire has a story to tell. Can you tell what causes this abnormal wear?

**S**peed costs money. How fast do you want to go?" We've all heard that old saying, and in motorsports of every genre the ability to go fast often is considered the primary element in getting to the winner's podium. But even in the high horsepower world of drag racing, where the race is over mere seconds after it began, horsepower means very little if the car can't get it to the ground and keep it there. Add in the need to shift direction shared by most other styles of racing, and you soon can appreciate just how serious a role the suspension and steering systems play in the final outcome.

And while your customer may not be rounding the corners at Pocono or blazing down the quarter mile at the Gator Nationals with the family minivan, the role the suspension and steering systems play is no less important.

## Starting at the Beginning

"Where the rubber meets the road" might be another antiquated adage, but there is a lot of truth in those simple words. The ability of the driver to maintain control of the car is tied to keeping the tire in contact with the pavement. Consider the weight of a modern automobile or light truck and then imagine for a moment the area of a tire's "contact patch," or that part of the tire that is in physical connection with the road surface. That contact patch is roughly the size of an average man's hand and, times four, is all that stands between control and loss of control.

Tire pressure is a critical part of maintaining that contact patch. Too little or too much air in the tires will alter the amount of contact and impact the stability of the vehicle. And while slicks might be great for traction on a race car, tires with tread worn below minimums are unable to channel water

away from the contact patch and could lead to loss of control. These two conditions alone make routine tire inspections on every car he services mandatory for a technician that considers himself a professional.

Of course, there are other factors that you should inspect on every tire that comes into your shop. Signs of physical damage, overall age and condition and abnormal wear are just a few to consider. The latter, abnormal wear, is a great indicator of other problems in the steering and suspension systems; problems that, left unattended, increase the likelihood of an accident or loss of control. After all, the reason the tire is abnormally worn is due to the fact that its contact patch hasn't been what it's supposed to be!

## Stick to It

The tire can grip the road only while it is in contact with the road. Think a





Believe it or not, that's the way I found this BMW. The sway bar nearly hit me in the head after I removed the undercar panel.



If the suspension/steering system is fitted with lube points, take a minute or two to wipe them down and grease them up.

moment about what happens when the tire encounters an obstacle in its path, say, a pothole. The tire rolls forward to the lip of the hole before the surface falls out from underneath the contact patch. Now all the weight of the vehicle being applied to that wheel drives the tire downward into the hole until it reaches bottom. The impact of that force is felt by the tire and with no other way to dissipate, is returned up the chassis connections to the vehicle and ultimately, the occupants. That is, unless we have some way to control that energy.

That is the role of the suspension system. The tire/wheel assembly is connected to the car by springs (coil, leaf or torsion bar). This allows the wheel to move up and down in response to the road surface. The springs are preloaded

(compressed slightly) by the weight of the car. When an obstruction is met, whether it is a hole or a bump, the tire/wheel assembly is free to move with the obstruction. But the force of that moving mass is taken in by the spring and passed on to the vehicle and ultimately the occupants. And because energy cannot be created or destroyed, that same force follows the same path in reverse back to the road through the tire. A small amount of that energy is dissipated through the spring in the form of heat, but not enough to prevent the car from acting like a pogo stick.

What was needed was a means to dissipate that energy more quickly and controllably. In 1901, C. L. Horock came up with a design that used hydraulics as a means to dampen energy, but it worked only in one direction and was

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not readily used. More common were mechanical dampening systems like the Gabriel Snubber, invented in 1907 by Gabriel founder Claude H. Foster. The Snubber, and other similar devices, used a belt coiled into a housing and designed so that the belt could retract easily with the motion of the leaf springs but would meet a friction resistance when drawn out. This converted energy of motion to heat, leaving less energy behind to pass back up to the car.

From these humble beginnings, modern shock absorbers were born. Their only role is to dissipate (dampen) the energy of that moving mass and keep the tire firmly planted on the ground, while providing for the comfort of the vehicle occupants. I can't stress how important this job is. Worn shocks

impact handling, steering ability and braking distances.

That builds the case for routine replacement based on mileage intervals with many suspension manufacturers suggesting replacement at 50,000 miles for conventional designs. I admit, I was one of those techs that didn't like to recommend replacement unless a car failed the "bounce" test I was taught back in the 1970s or if I saw signs of definite fluid loss on the shocks themselves. But I have changed my mind after learning more about how the innards of a shock work.

### Inside the Tube

Think of a shock absorber as a little piston/cylinder assembly with a small hole in the top of the piston and the piston assembly submerged in oil. The oil acts as a resistive element that opposes the motion of the piston as it tries to move in and out in synch with the wheel. It takes energy to force the piston through the oil — or more accurately, to force the oil through that little hole — and that frictional resistance is what changes the energy of motion (of the wheel/spring) to heat that can then be dissipated to the air.

Above the piston is a small air pocket. The air pocket is there to accommodate for the change in fluid level as it is displaced by the piston rod. Shocks actually use high-pressure gas (nitrogen) to prevent cavitation of the fluid,

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Different strokes for different folks? Not when it comes to suspensions. They ultimately have the same job to do – control the spring and keep the tire on the road.

Photos: (TOP LEFT) MOOG; (TOP RIGHT) GABRIEL; (BOTTOM) KYB



which would lead to a loss of frictional dampening. When inspecting shocks, a slight amount of fluid at the piston seal is normal but traces of fluid leaking down the shock body is a definite indication of the need for replacement.

**“We’ve all seen the pictures on the Internet of failed tie rod ends leaving some unfortunate soul stranded on the side of the road with both wheels pointing in totally opposite directions. My question is, ‘Have you ever seen one posted that was just in your shop a few days before?’”**

The basic explanation I gave is fine for a shock that moves at one speed under one load. But of course, that isn't what happens in the real world. There are a variety of bumps — from pavement grooves to New York City potholes — and shocks use pistons with calibrated holes matched to highly engineered friction discs to allow for a wide range of dampening rates to meet that need. Consider that the lightest spring discs, the ones that are in charge of smoothing out normal pavement so the driver's rear end doesn't have to, are moving almost continuously as the

piston in the shock moves and that the piston moves approximately 1,500 to 1,900 times per mile and it doesn't take an engineering degree to do the math — that's 75 million strokes over 50,000 miles.

Like any other component, that kind of use wears parts out. Spring discs fracture or separate, pistons and seals wear, mounting bushings wear out. All of that leads to loss of performance of the shock, and it occurs at such a slow rate your customer likely will not feel the difference in how their car performs. So what's the big deal of an additional 10 feet of stopping distance when a distracted Mom is taking the kids and groceries home and suddenly finds she's heading for a rear end collision with a dump truck? You're the professional technician — you know exactly what the big deal is.



components (and sometimes with suspension components) requires a check of wheel alignment after the repair is made. Are you also performing any required recalibration of any steering angle or yaw sensors at the same time? This is an important part of the alignment process on many

vehicles today and should not be overlooked. It can impact vehicle safety systems (electronic stability control comes to mind) and that any action (or inaction) you take that causes a safety system to be disabled is a federal no-no.

**Taking That Extra Step**

If at all possible, take every vehicle you service for a test drive on a standard route near your shop. It should simulate a variety of driving conditions and loads. Does the car accelerate well? Decelerate and brake without obvious issues? Does the car feel stable in turns? If you can perform this run before any service or inspection work is done, that would be the best-case scenario. That way, any issues or problems you discover can immediately be brought to the customer's attention.

Absolutely the test drive should be done before returning the vehicle to the customer. This provides you the opportunity to make sure the work you performed did indeed correct the initial concern. It also provides one last opportunity to make sure there is nothing going on with the car you don't know about. That protects your customer — and provides a little CYA for you. **ZZ**

**A Change of Direction**

So far we've talked about what it takes to keep the tire on the ground in a straight line. Now it's time to add in a change of direction. After all, what fun would driving straight all the time be?

We've all seen the pictures on the Internet of failed tie rod ends leaving some unfortunate soul stranded on the side of the road with both wheels pointing in totally opposite directions. My question is, “Have you ever seen one posted that was just in your shop a few days before?” I hope not! Performing a functional inspection of the steering system should be a part of every vehicle inspection you do.

Notice I said “functional” inspection. Just grabbing the wheel and giving it a good shake might find some issues, but it won't find them all. Be sure you follow the service procedures when checking for excessive play in ball joints and tie rods. Look for torn, damaged or missing dust boots. If grease fittings are present, be sure to lube them each time the vehicle comes in. Inspect the power steering rack mounting bushings for wear and tear, and the rack bellows for damage or signs of fluid leakage.

Repair or replacement of steering



Modern electronics allow suspension systems to be “active,” adjusting constantly to meet the ever-changing loads placed on it.

Photo: MONROE



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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# REPROGRAMMING WITH J2534

**MANY ISSUES ON CARS BUILT DURING THE LAST 10 YEARS REQUIRE PROGRAMMING TO SOLVE. HAVE YOU TAKEN THE PLUNGE INTO FLASHING YET?**

BY G. JERRY TRUGLIA | CONTRIBUTOR

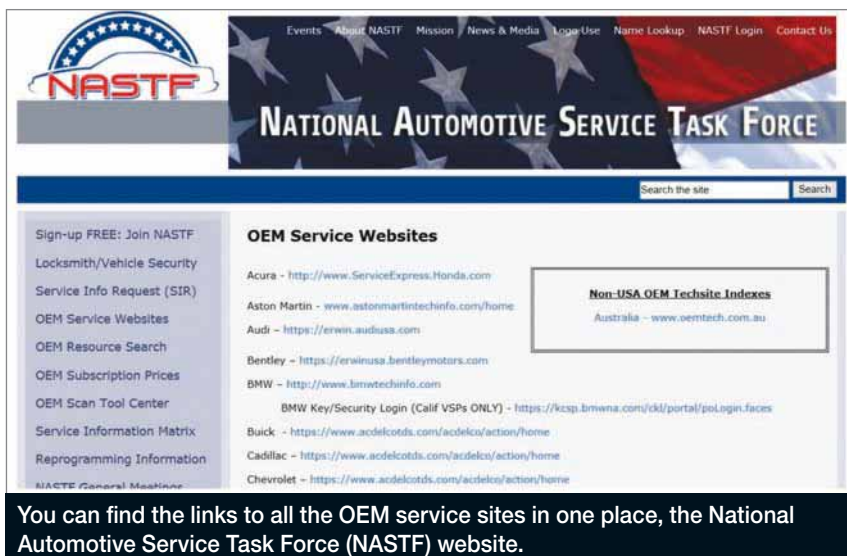
**B**elieve it or not, reprogramming is nothing new. In the 1980s, most likely you worked on GM vehicles and changed a MemCal/PROM or two. The purpose of the MemCal PROM then and reprogramming today is to update the Engine Control Module (ECM) with the most current information. Since we are concerned with today's software reprogramming issues, we will discuss the generic J2534 unit and how and why to use it. So let's get started.

## What is J2534?

J2534 is the regulated standard for installing software in onboard light duty vehicle computers. It sometimes goes by different names like ECU reprogramming, flash programming, Pass-Thru programming, calibration updating and software updates. J2534 was created for aftermarket shops as a means to repair vehicle emissions systems without purchasing the OE scan tools.

Pass-Thru reprogramming dumps software downloaded (or CD, old style) to a laptop from the OEM service site on the Internet to the J2534 tool. The J2534 tool is then connected to the vehicle Diagnostic Link Connector (DLC) and the data is transferred to the ECM.

Some OEs, including GM, BMW, Jaguar, Toyota, Volvo and VW, use the J2534 interface not only for reprogramming but provide full factory scan tool functions through the device as well. As with any software and hardware configuration, you have to make sure that your laptop meets the require-



ments for the OE that you are working on. If an aftermarket shop wants to get into the reprogramming business, they will need to have (at a minimum) a laptop or PC (Windows-based operating system), a solid high speed Internet connection, a J2534 tool that is proven compatible with the make you intend to reprogram, a subscription to the OE service website (or purchase access, usually on a one- to three-day basis) and the vehicle that needs the update.

Remember that not all OEs use the same requirements for software or hardware. Make sure you read their requirements before purchasing anything. A good rule of thumb is to purchase a laptop with Windows 7 Professional using an Intel processor (not a Celeron) with at least 4 GB of RAM, 32 BIT (some require 64 BIT) minimum 2 USB, and wireless connection. The laptop will need Windows Internet Explorer, Acrobat Reader and

Java with NO virus protection. Next you will need access to the OE information. You can find a complete listing of all the OE service sites at www.NASTF.org. Once you're on that web page, select the OE websites tab that is on the left of the page and read the information on programming.

Your next step would be to log in and provide all your information, including a password so you can continue to the page where you will select the programming information or scan tool access. After that is completed you are able to download the updated data from the OE website to the laptop. Make sure your laptop meets the hardware and software requirements for the manufacturer. Connecting your J2534 tool to the vehicle DLC follows these steps. Software tools such as Drew Techs Tool Box make sure that the J2534 box has the correct firmware and software installed. The Tool Box

Photos: G. Jerry Truglia



application also checks the laptop connection to the J2534 box and vehicle along with the ability to check DTCs and provide helpful information and videos. This application takes the guess work out of proper connection of the device and device to vehicle.

## Logging On

One of the easiest OEs to learn on is GM, so let's use that as our example. From the GM website, we selected Service and Reprogramming Information from the list. The next step is making sure you select TIS2 Web Service Programming for J2534, filling out the form, paying a fee, then downloading the program that will be installed into the vehicle's computer(s).

Make sure that the following are all in order before you begin: laptop is plugged into a power source, all the connections to the DLC are tight, the J2534 box is attached to the laptop and a very important step is making sure a battery maintainer such as the Fronius, Assocoated or Midtronics GR8 is connected to the vehicle. All of these special chargers maintain battery voltage with very low AC voltage output that is important in order to prevent any problems during the process.

Do not reprogram any vehicle without using one of these maintainers. Do not use a battery pack, because it will not maintain the proper battery voltage. Do not use a conventional battery charger, as the AC ripple normally present could cause the programming session to crash. Make sure that all



Every OEM site will provide you with programming information (compatible tools, system requirements, etc.) for free. Accessing the actual files, though, will usually cost you.



Drew Tech is one of several companies that offers Pass-Through programming interfaces. Check the OE site for a list of compatible devices for the make(s) you want to program.

vehicle accessories are turned off and that there are no interruptions during the procedure.

Make sure that doors are not opened during the process and if needed, make sure that the recommended fuse (some Toyota vehicles) is removed so other modules will not be affected. Make sure to read all of the information from the OE website along with everything in the Drew Tech Tool Box related to reprogramming of the vehicle.


## Case Studies

A 2012 GMC Yukon 5.3L with an illuminated MIL came in with an idle problem along with a P2135 (Throttle Position Correlation) DTC. If you follow the GM recommended procedure for the DTC, you will be instructed to check voltages that in this case were all within specification. Following its chart will lead you to replacing the throttle body only to find out you still have the same problem.

We had a few other GM vehicles from other shops that had already replaced the throttle body with new GM units only to have the same problem. In cases where the throttle body is defective and needs to be replaced, the unit must be relearned following the procedure on the scan tool. But you're not done there. You will need the capability to reprogram the vehicle in order to complete the repair and prevent the P2135 from coming back. The fix on this vehicle was just to reprogram the vehicle without changing the throttle body. It's not always replacement of parts that fixes the vehicle.

A 2012 Nissan Altima came in from

another shop with a P0101 (Mass Air Flow (MAF) Sensor) that to some might be a simple diagnosis. If you are thinking that the MAF sensor needs cleaning or replacing you would be dead wrong and the vehicle would still have the same problem. Selecting any Generic/Global scan tool along with the proper service information would be the right place to start. In fact, doing the research was what led to the proper diagnosis. Had the shop taken the time to check for Technical Service Bulletins (TSBs), they would have found the answer without us.

The fix for this vehicle was not a cleaning or replacement of the MAF, but rather a reprogramming of the PCM. Reading the TSB provided us with all the information we needed. Next I connected my Drew Tech CarDAQ J2534 device to the vehicle along with using the Nissan NERS (Nissan ECU reprogramming software) and purchased the update software. Within an hour the vehicle was fixed without replacing any parts. 



**G. JERRY TRUGLIA**  
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# IS YOUR CUSTOMER'S VEHICLE 'IMPAIRED?'

**A DRIVER IS IMPAIRED WHEN HE'S HAD TOO MUCH ALCOHOL. WHAT HAPPENS WHEN YOUR CUSTOMER'S CAR IS THE ONE THAT'S HAD TOO MUCH?**

BY **DAVID DECOURCEY** | CONTRIBUTING EDITOR

**A**t this particular time, gasoline is commercially available in two blends in the U.S.: E10 and E85. E10 refers to gasoline that has been blended with a volume of 10 percent alcohol per gallon [V%]. E10 is the most commonly dispensed fuel. Excluding a few exceptions, all vehicles can operate on E10 blended gasoline.

E85 refers to gasoline that has been blended with a volume of 85 percent alcohol per gallon [V%]. E85 was blended for use in Flex fuel vehicles. Flex fuel vehicles can operate on blended fuels from E10 up to E85.



## BAD INFLUENCE

### 2009 HONDA CR-V

Vehicle Year/Make/Model

80,000

Mileage

2.4L, 4-CYLINDER

Engine

AUTOMATIC

Transmission

MIL ON

Complaint

The EPA has approved the use of E20 for vehicles manufactured from 2001 and newer, but due to ongoing lawsuits, dispensary issues and logistics, implementation of E20 is on hold.

### The Letter E

The alcohol for use with internal combustion engines is called ethanol (Ethyl alcohol), and primarily is made from corn. Because ethanol is derived from feedstock that is grown, it is considered a renewable fuel. The ethanol blend dispensed at the pumps is regulated. The signage on the pump will display the volume content of ethanol per gallon [V%] of gasoline being dispensed. At the end of 2010, more than 90 percent of all gasoline sold in the U.S. was blended with ethanol.

Each ethanol molecule contains 35 percent oxygen. Blending ethanol to gasoline is adding a liquid oxygenator.

This article is a discussion of a vehicle operating "impaired" due to an excessive amount of alcohol in the fuel system. With the blended gasolines commercially available to consumers, what type of vehicle do you think would be most affected by excessive alcohol, a flex fuel vehicle or a non-flex fuel?

With a non-flex fuel vehicle, the ideal alcohol percentage in the fuel should

fall between 7 to 10 percent. If the alcohol percentage becomes greater, fuel control issues can result.

As a diagnostic technician, I am hired when the diagnosis becomes stalled or the vehicle has returned repeatedly for the same initial complaint. I am a strong believer of covering the basics and performing the simple tests that will give you a baseline of the vehicle regardless of the system being diagnosed. This thought process can save valuable shop time and prevent replacement of known good components in an attempt to locate the root cause of the complaint. Let's take a look at an example.

### A Hungover Honda

A 2009 Honda CR-V was brought into a local repair facility with a customer concern of an illuminated Malfunction Indicator Lamp (MIL) preventing a yearly state inspection from being performed. The vehicle has a 2.4 liter engine with approximately 80,000 miles. During the diagnosis the technician finds a stored fuel trim control fault (P0171).

For a P0171 test to fail, the long term fuel trim (LTFT) and short term fuel trim (STFT) have had to had reached or exceeded a pre-programmed thresh-



old set by the manufacturer (LTFT > 25 percent, STFT > 5 percent, for example).

I look at two screenshots taken from the Honda factory scan tool that contain all the information I needed to verify the complaint.

The factory tool has guided fault help. Is excessive alcohol in the fuel supply listed under possible failures? Well, kind of if you read the "fuel does not meet O/M specifications" cause with a broad definition.

Looking at the data display, it was hard to not notice the fuel trims. Both STFT and LTFT combined added up to a total +49% correction, well over the maximum limit and verification the P0171 was legitimate. The total fuel trim (STFT and LTFT=1.49) is +49 percent! Yes, I'd say the code is verified.

If this Honda CR-V vehicle came into your repair facility, what would your first diagnostic step in locating the root cause of the P0171 be?

- A smoke test of the intake system.
- A fuel pressure and possible volume test.
- Scope and inspect the MAF sensor (if equipped).
- Graph the data PIDs under various RPM and load ranges.
- Clear the fuel trims and road test the vehicle.

As a diagnostic technician, I typically will interview the driver of the vehicle whenever possible. Next, I will record all the vehicle information as well as the stored and current information and data. Then I will verify the complaint. What is important to know on this Honda is that the customer voiced no drivability concerns, only that the MIL was on and it wouldn't pass the state inspection requirements.

After I've verified the customer's concern, I typically will perform a Keep Alive Memory (KAM) clearing procedure and test drive the vehicle again while monitoring the fuel trim data to see if the P0171 failed test is a hard fault or intermittent occurrence. (A sec-



Take 50Hz off of the meter reading to get alcohol percentage. In this case, a little over 13 percent.



This is a pure alcohol reading on the Kent Moore tester.

ond road test will illuminate the MIL if P0171 is a hard fault).

With this vehicle the Total Fuel Trim (TFT) was greater than +45 percent, and the MIL was again illuminated during the second consecutive road test.

Let me ask you a few questions. If the TFT stayed high — greater than +45 percent during all rpm and load conditions — would you ever consider an excessive alcohol percentage issue?

I find in most cases this is not considered or is the last possible scenario the technician would bother considering during his/her diagnosis. In years past I had overlooked this possible issue, and wasted valuable diagnostic time. Now it is part of my basic testing for fuel system control (DTCs) failed tests.

We need to remember there is a low

fuel volume demand at idle. The fuel demand will increase with rpm and load. If a fuel delivery issue caused the P0171, the adjustment would increase substantially with rpm and load.

With a fuel trim correction of more than +45 percent, is the engine management system in fuel control or impaired? (Is it operating normally? Can the engine management system keep the air/fuel mixture at stoichiometric during normal operating conditions?)

This is where a simple alcohol test of the vehicle's fuel supply can reveal a lot of valuable information. (Note: Do not drain the fuel filter for a fuel sample to analyze. It would be best to take a sample prior to the fuel filter if possible.) By checking the fuel sample, you can learn if there is:

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- Excessive percentage of alcohol in the fuel.
- Rust/debris in the fuel.
- Excessive water in the fuel (ethanol is hydroscopic).

This simple test can confirm either there is a problem with the fuel supply or eliminate the fuel supply as being the root cause.

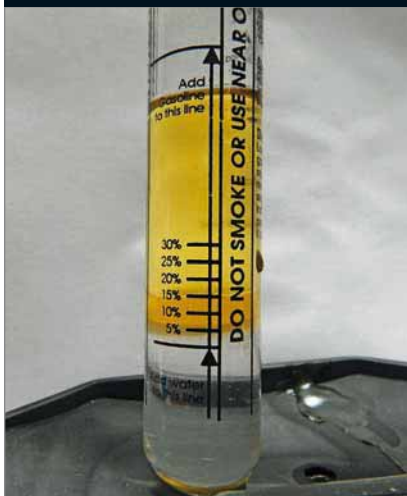
**Diagnostic tip:** Larger percentages of ethanol greater than E10 in the vehicle's fuel system of a non-flex fuel



Turn the tester "on" after adding the fuel sample to the test tray.



This is an older Kent Moore fuel composition tester I use for checking fuel samples.



Water will combine with any alcohol in the fuel, causing the fuel to separate and rise in the test cylinder. This is an E10 fuel.

vehicle will cause the fuel trim values to increase (positive correction) as the ECM attempts to keep the air/fuel mixture at stoichiometric.

Also, my experience is that large percentages of alcohol in late model vehicles equipped with Wide Band Oxygen sensors (these sensors can provide actual air /fuel mixtures as rich as 9.0:1 and as lean as 2.0:1) can illuminate the MIL due to a fuel control failed test (DTC) without any drivability complaints or symptoms, as was the case with this Honda CR-V.

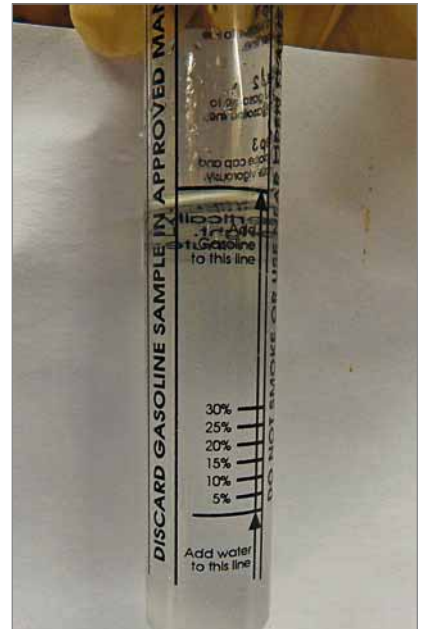
Testing the fuel supply using a graduated cylinder revealed an alcohol content of almost twice what E10 should be. This is clearly a case of excessive ethanol in the vehicle's fuel supply. This higher than normal ethanol percentage could have been a dispensary issue (wrong fuel in the station's tank) or human error. Either way, our real concern is only to locate the root cause of the customer's complaint of MIL illumination.

**“If the TFT stayed high – greater than +45 percent during all rpm and load conditions – would you ever consider an excessive alcohol percentage issue?”**

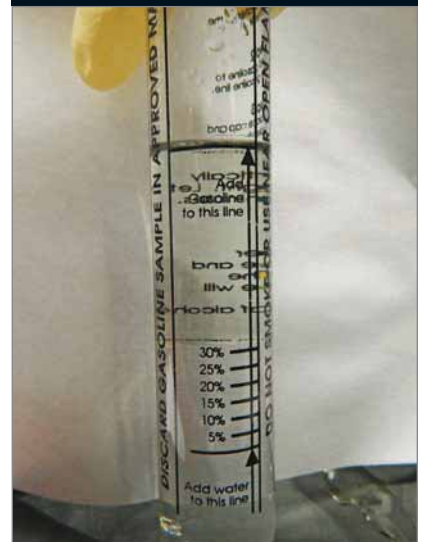
Now, what two options are available to us for properly repairing this vehicle? We could drain the fuel tank and refill with properly regulated <E10 fuel and reset the fuel trims. Or we could have the customer drive the vehicle until the fuel level goes below ¼ tank, then refill the tank at another location and drive the vehicle until the MIL lamp is no longer illuminated?

These would be our two repair methods, both with the same goal of replacing the fuel in the tank. (The second option would require some patience of the customer.)

If the alcohol percentage is higher than regulated with (E10) fuel, it would not be an issue what-so-ever with a flex fuel vehicle because the engine management system is designed to operate on an alcohol percentage rate



This is a good E85 winter grade fuel sample.



E85 is clear in color, not dyed. That can make detecting any separation harder to see.

as high as 85 percent (E85). It would be more of an issue with the non-flex fuel vehicles. If we overlook a basic fuel test of the vehicle's fuel supply and the root cause of a fuel system failed test (DTC) is a higher than normal alcohol percentage, there is the strong possibility techs would attempt to correct the lean condition through the replacement of known good components (MAF sensors, HO<sub>2</sub> sensors etc.). There is also the possibility of consuming excessive shop time.



### Tools for This Trade

There are several fuel test kits available through the OEMs and the aftermarket. Here are two examples of fuel test kits and how to use them.

One test method uses a graduated cylinder. The one I use is made by BG. There are three quick steps for the alcohol percentage test using the gasoline fuel graduated cylinder. After you shake the graduated cylinder, let it sit for a minute, so the ethanol has time to separate from the actual gasoline.

Take a look at the different illustrations accompanying this article for samples of good and bad test results. Remember that only E85 and E10 blends are being dispensed, and the E85 fuel is colorless, making the separations harder to see. Typically, I see problems when the two are accidentally mixed, with most of my cases

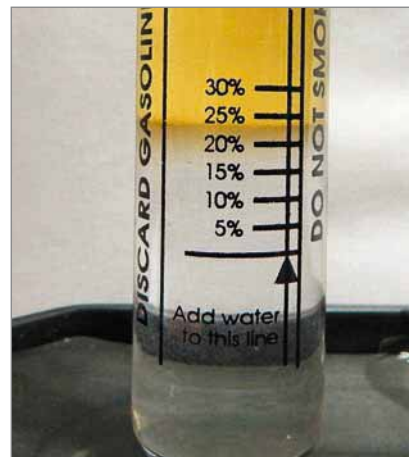
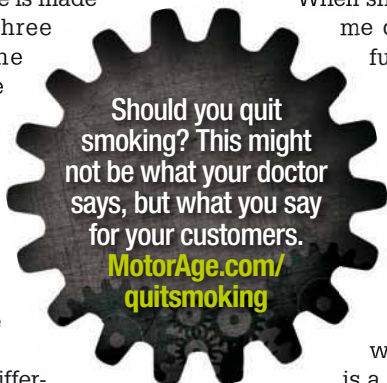
resulting in alcohol content measurements in the 20% range. This is enough to cause drivability DTCs in non-flex fuel vehicles. Remember, alcohol percentage will create failed Fuel System tests (DTCs) in non-flex fuel vehicles.

When shops or technicians call me describing an elusive fuel system failed test (DTC), the alcohol percentage typically is in the lower to mid-20 percent amount.

The SPX Kent-Moore fuel tester in an electronic tester. Performing the ethanol percentage test with this type of tester is a simple and quick test.

There are only three quick steps to using this fuel tester.

First, connect multimeter leads to end of tester handle (lead polarity is shown on tool). Place the meter selector on the Hz setting and zero the meter. Note: Remember to zero the multimeter prior to each test. Second,



This is what I typically see – alcohol concentrations in the 20 to 25 percent range.

pour the fuel sample into the test cavity (opposite end of handle as previously shown) and turn the tester on.

Third, observe the Hz value on the multimeter. Then remove 50Hz from this value to obtain the ethanol percentage in the fuel sample.

I had a technician at a repair facility I frequently visit inform me of the root

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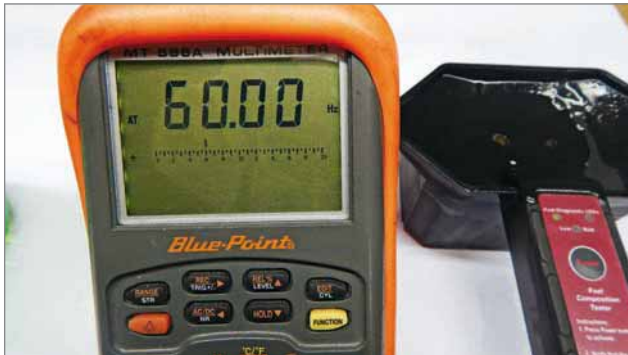
### HARD CLUTCH PEDAL: CAUSES AND FAILURE OVERVIEW

**H**ard pedal is a common complaint in vehicles equipped with manual transmissions and can be caused by many factors. Hard pedal can also be described as a stiff clutch pedal. This condition can be an inconvenience to the driver. Inconsistent pedal feel and difficult engagement of the clutch are symptoms of a hard pedal often resulting in driver fatigue.

Most newer, and some older, vehicles use hydraulic clutch release systems that may include a master cylinder, slave cylinder and hydraulic line. Hydraulic release systems also incorporate mechanical components to engage and disengage the clutch. Some vehicles may be equipped with a concentric slave cylinder. A concentric slave cylinder is a release bearing and slave cylinder combined into one unit.

If a hard pedal condition exists, the vehicle should be inspected and diagnosed by a technician. The hydraulic portion of the release system is not usually the cause of hard pedal, unless the hydraulic line is kinked, or the slave cylinder and master cylinder seals have become swollen due to fluid contamination or the use of incorrect hydraulic fluid. Typically, a hard pedal condition can be diagnosed by a technician through concentrating on inspecting the mechanical parts of the hydraulic system.





Be sure to zero the DVOM before each test to avoid errors. This reading is an E10 fuel.




Connect your DVOM to the Kent Moore tester and select the frequency function, measuring in Hz.

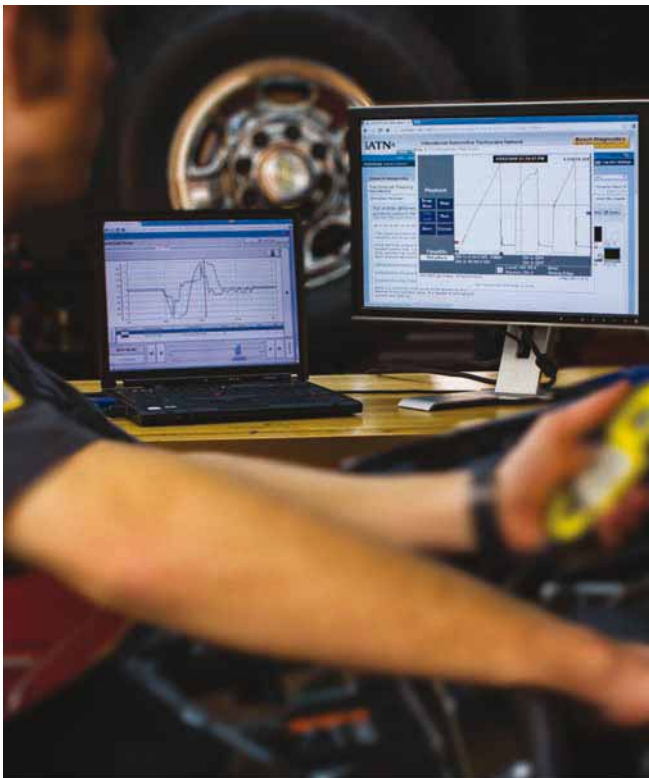
cause of a no start he had been working on. The vehicle was non-flex fuel vehicle. I had shown him in the past how to determine the ethanol percentage in fuel, so when he performed the test on the vehicle's fuel supply, he found the fuel blend was actually (E85).

Interviewing the customer revealed that the tank was low and filled by the customer (this is where human error becomes a factor). Within a short distance the engine started running rough, and the MIL illuminated on the dash. The vehicle became a no start and was towed to the shop for a diagnosis. The tank was emptied and the fuel replaced with (E10). A new fuel filter was installed, and a KAM procedure was performed. The vehicle was road tested without any further issues.

Here are some other tips to keep in mind when you suspect a fuel quality problem on your customer's car.

- Alcohol fuel is clear in color, and not dyed as gasoline usually is.
- At greater than 35 percent, ethanol percentage in the vehicle's fuel supply, there is a distinct alcohol odor from the gas tank with filler cap removed.
- With high ethanol percentage in the vehicle's fuel systems of a non-flex fuel vehicle; a distinctive smell is present from the tail pipe while vehicle is running and a light whitish color smoke can occur during periods of acceleration.
- Remember, ethanol is hygroscopic and will mix with water. Long time storage of ethanol blended fuel should be in a sealed container to prevent the ethanol mixing with the moisture in the atmosphere (similar to brake fluid for example). Remember, do not overlook the basic test procedures.
- Visual inspections (unsecured engine harnesses, loose, worn or missing components). If you notice recent work performed with new components installed especially sensors; take a moment to verify the component(s) is the correct one for the vehicle.
- Checking the charging system and cabling. (Battery connection, and V/drops).
- Fuel volume testing (remember you can have the correct pressure but with low/no volume).
- After diagnosing and replacing a faulty component that is creating a fuel system failed test to occur, perform a KAM clearing procedure before you retest the vehicle.
- Keep in mind that with some late model flex fuel vehicles it might take several miles before the engine management system can relearn the ethanol percentage.

Basic test procedures on any of the systems of a vehicle could save you valuable shop diagnostic time, and prevent replacement of known good component. Also could prevent the vehicle from returning to your shop with the same initial complaint. 



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# LOOK TO MOTORSPORTS FOR CLUES ABOUT THE TECHNOLOGIES YOU WILL FACE IN YOUR SERVICE BAY TOMORROW

By **Chris Chesney**

It's kind of fun to look back on this industry and see how racing has influenced the vehicles we work on every day. While there are many who don't like to watch racing on TV or even live, these same people purchase vehicles equipped with technologies that were designed to win races. The engineers and "racers" who create innovations that win at the track are typically the best of the best. Most manufacturers put their best and brightest through their motorsports channel allowing them to hone their creative skills by solving the problem of winning within the rules. If you follow motorsports, you will quickly recognize the changes over the last few years as the sport seeks to be more green and more relevant to the world economy. Changes in permitted fuels and mandatory alternative technologies such as electric drive systems have created an amazing environment filled with challenges for the engineers, resulting in an exciting future for our industry.

So how does racing influence the vehicle in your bay? They don't really look like what we drive or buy from the dealer. They get horrible fuel mileage and put out massive amounts of emissions; so how can we say they influence the vehicles we service? Consider the limitations

of the rules. For example, Formula 1 cars in 2015 are limited to 100kg of fuel for the entire race. This means in a typical 185-mile race they use about 26.4 gallons of fuel, resulting in about 7 miles per gallon. Still not what your customers' cars should get but probably better than you thought. Now consider they get this mileage while driving to win a race and are breaking track records set by cars equipped with 1,000 horsepower engines. In this light, the achievements are amazing. Even more so is the fact that teams accomplish this with only three monitored testing sessions prior to the first race. There is no testing allowed during the season.

So what technologies does this bring to your bays? The engines used in Formula 1 today are 1.6L turbocharged gas direct-injected V6 systems that rev up to 15,000 RPM, producing over 550 horsepower and are designed to last for four races, including practice. This means a typical engine will last upwards of 1,500 to 2,000 miles running at maximum power and efficiency. Also, the vehicles are equipped with a Kinetic Energy Recovery System (KERS), which recovers energy during braking and provides a boost using electricity during acceleration, much like a Hybrid Electric Vehicle such as a Toyota Prius. The technologies that you need to be ready to service include: Gas Direct Injection

(GDI) systems; Variable Valve Timing; robust data networking systems that manage the fuel and ignition systems; electric drive systems; high voltage batteries; and the list goes on. You will also see the materials used in racing find their way to our bays such as titanium alloys, carbon fiber, magnesium alloys and metals treated with technologies such as cryogenics.

All of these technologies and many more are in your bay today and create a challenge for you and your team to be ready to serve your customer prior to their arrival. To recognize what is on its way for the future, just take a look at motorsports, and you will see the amazing people, challenged with winning, creating your future opportunities.

To learn more about these new technologies and training available, visit [www.CTionline.com](http://www.CTionline.com) or contact your local Advance or Carquest delivery location.

**Chris Chesney** has more than 20 years of technical training experience in the automotive aftermarket and currently serves as senior director of professional markets at CARQUEST where he leads the CARQUEST Technical Institute (CTI) and eCommerce teams. Chesney received his ASE certification in 1972 and has led thousands of technician trainings across North America.

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# GEOFF SYKES RACING TEAMS UP WITH QUICKJACK

**G** Geoff Sykes of Global Rallycross fame is pleased to announce the recent partnership with BendPak-Ranger to help promote their newest product, the QuickJack™ portable motorsports jack system. The QuickJack is a lightweight, fully portable low-rise car jacking system that professional motorsports teams can use to get their cars in the air quickly.

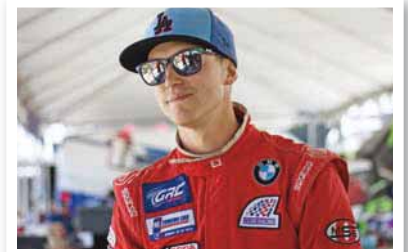
Commented Geoff Sykes, a world class driver and new QuickJack spokesperson; “When I’m racing, time saved in the paddock means extra time on the track. We’re always looking for products to help my crew work faster and perform better. In the past we were always forced to use floor jacks and jack stands after every track run. The QuickJack allows

us to put the floor jacks and jack stands away and get the car off the ground in less than a minute. My crew can’t live without the QuickJack.”

## About Geoff Sykes

A world class professional racing driver with a proven reputation, Sykes is known for delivering results-driven marketing solutions to long-standing business partners with his fierce passion for motorsports. He’s a Global Rallycross driver, X Games athlete and current national USTCC GT 2013 champion; won the national BMW CCA Racing championship as a rookie with new track records and multiple wins and now sits as a 3 time regional and national champion. See more at: [www.geoff-sykes.com](http://www.geoff-sykes.com)

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**QUICKJACK™**  
By Ranger Products

# AUTOENGINUITY RACING THE PRO MAZDA CHAMPIONSHIP PRESENTED BY COOPER TIRES

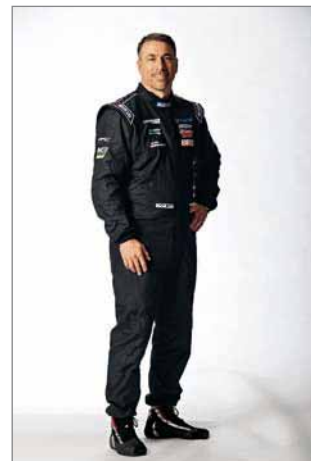
**A**utoEnginuity was founded by a car enthusiast and avid motorsports race fan. This is the third year in sponsoring the Mazda Road to Indy driver, Jay Horak. The Pro Mazda Championship presented by Cooper Tires is a long running series that feeds drivers into the IndyCar Series. IndyCar is the premier and most competitive open-wheel series in North America.

Jay Horak has been racing and winning in regional racing for almost two decades prior to starting his professional debut with this series. In the two years racing with the Pro Mazda Championship presented by Cooper Tires, Jay has succeeded in winning the Expert

Championship and Runner Up, consecutively.

The opening race at St. Petersburg, Florida on March 28th and 29th, was a good start to the season for the AutoEnginuity driver. On Saturday gearbox issues would cripple the car; only allowing an 18th place finish. The second race on Sunday was much better. Starting from 18th place, Jay charged up to 9th overall and won the Expert class. Jay was also pleased to win the QuarterMaster Hard Charger Award.

“St. Petersburg is a challenging place to race because the corners are tight and fast; and the walls are unforgiving. But the circuit layout and the city of St. Petersburg make up for challenge.” said Jay Horak. “I can’t wait for the rest of the season.”





# AUTO ENGINEUITY

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[www.autoenginuity.com](http://www.autoenginuity.com)

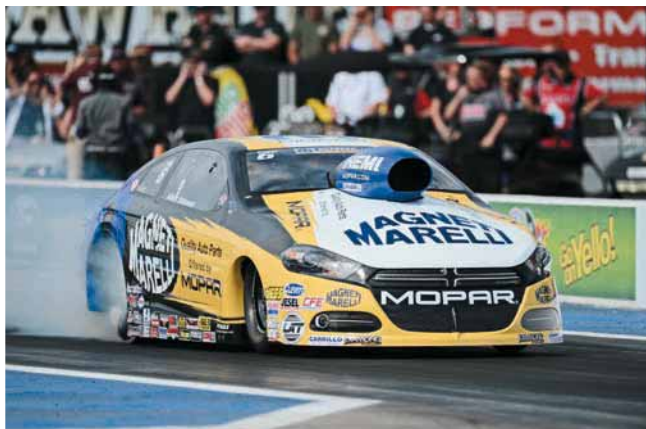


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## MAGNETI MARELLI OFFERED BY MOPAR IS FULL THROTTLE IN NHRA PARTICIPATION



It's only a couple of months into the 2015 NHRA Mello Yello Drag Racing Series schedule, and Magneti Marelli Offered by Mopar® is already in the midst of an exciting season. With Magneti Marelli Offered by Mopar on board as an associate sponsor of his Dodge Charger R/T NHRA Funny Car, Matt Hagan raced to victory in the first two NHRA events at Pomona and Phoenix. Meanwhile, in the Pro Stock ranks, Allen Johnson shattered his career-best time behind the wheel of his Magneti Marelli Offered by Mopar Dodge Dart and (briefly) set a track record with the quickest pass in class history at the NHRA Four-Wide Nationals in North Carolina early in the season.

Although Johnson's record was bested and he exited early at Charlotte, the driver of the new-look, yellow-and-black Magneti Marelli Offered by Mopar machine rebounded with a semifinals finish in Pro Stock at the spring NHRA Vegas event, and was listed in the top ten of the standings at press time. Hagan was also energized at Vegas, earning the pole and reclaiming his lead in the point standings after the event. The roller-coaster ride of the season is what makes NHRA racing great, and a win for all race fans.

Magneti Marelli has done plenty of winning as well since it started manufacturing O.E. and aftermarket components in 1919. One huge win occurred when the brand became a major NHRA sponsor in 2013, and the Magneti Marelli Offered by Mopar paint scheme first appeared on Matt Hagan's Dodge Charger. For the last two seasons, Magneti Marelli has served as the primary sponsor on Johnson's Pro Stock car. The brand has teamed up with winners — Johnson captured the Pro Stock championship in 2012, and Hagan is the reigning NHRA Funny Car champion.

The Magneti Marelli team got involved in racing long before its entry into NHRA competition. The team has provided innovative, high-tech components to Formula 1 and rally car race teams. It also supported several world championship teams, with drivers capturing many two- and four-wheel victories. The on-track success bears out that the brand is passionate about motorsports and devoted to innovation.

That winning innovation also translates into the ability of Magneti Marelli Offered by Mopar to supply a full line of quality maintenance and repair parts for all major vehicle makes and models, including Chevy, GMC, Ford, Toyota, Nissan, Honda, Kia, Hyundai,

VW and more. Magneti Marelli Offered by Mopar distributors stock over 30 product lines, consisting of high-quality, easy-to-install parts that feature excellent warranty coverage — a win for you.

The 2015 NHRA Mello Yello Drag Racing Series doesn't end until November 15. That's when the hot rod action comes to a close at the Auto Club Finals at Auto Club Raceway in Pomona, California. With such storied racing heritage, suffice it to say that Magneti Marelli Offered by Mopar drivers will likely be in the championship mix all season — with many more records to be broken and races to be won this year.





# NASCAR SPRINT CUP RACE PLUS ARCA AND DIRT TRACK RACES EQUALS GREAT SEASON OF RACING FOR FEDERATED MEMBERS AND CUSTOMERS

The Federated 400 NASCAR Sprint Cup Race, the “Last Race before the Chase” is the cornerstone of another exciting motorsports program that Federated has developed for its members and customers. Federated will also continue its long-time relationship with NASCAR and dirt track legend Kenny Schrader as well as sponsoring NASCAR Sprint Cup driver Justin Allgaier’s Federated dirt track team.

“We always try to put together a motorsports program that our members can utilize to entertain their customers and we feel that our 2015 racing schedule and sponsorships achieve that goal,” said J.R. Bishop, director of motorsports and event marketing for Federated. “From the Federated 400 NASCAR Sprint Cup race to ARCA to over 80 dirt track races across the country, we have put together our most comprehensive program ever.”

On Sept. 12 at the Richmond International Raceway (RIR), over 1,500 Federated guests will participate in another great weekend of racing and hospitality at the Federated Auto Parts NASCAR Sprint Cup 400. In addition to attending the Federated 400 race, select Federated contest winners will also partake in a driving experience the next day hosted by Schrader.

“This will be our fourth year sponsoring the Federated Auto Parts 400 at RIR and it truly has been a very effective sponsorship vehicle for Federated” said Bishop. “Our members have incorporated the race into their annual marketing plans and have used the race as a great way to thank their customers with promotional activities related to the race.”

The long-time partnership between Federated and Schrader will continue in 2015 with Federated sponsoring the Ken Schrader Racing ARCA car, which Schrader himself will drive in eight races, including the two stops at the Salem (Ind.) Speedway: the Federated Auto Parts ARCA 200 on April 26 and the Federated Car Care ARCA Fall Classic on Sept. 10. Matt Tiff (8 races), Clay Campbell (2 races) and Ross Kenseth (2 races) will also drive the Federated ARCA car this season. Federated will sponsor Schrader in over 50 dirt track races as well this season.

Federated will also sponsor Allgaier’s dirt track team in over 30 events in 2015. The NASCAR Sprint Cup driver will also serve as the official spokesperson for Federated Auto Parts.

“We are thrilled to have Justin be a part of our Federated motorsports program this year,” said Bishop. “Justin is one of the top young drivers in NASCAR and we are fortunate to have him on our team. We are looking forward to him driving a Federated dirt track car and participating in our hospitality events. I know our members and customers will enjoy having Justin representing Federated.”

One of Federated’s most popular events for its Car Care Center

## 2015 Federated Motorsports Highlights

- Federated Auto Parts NASCAR Sprint Cup 400 at Richmond International Raceway on Sept. 12
- Official auto parts supplier of Richmond International Raceway
- Annual “Get Dirty with Kenny” promotion
- Primary sponsor of Ken Schrader Racing ARCA car for entire season
- Primary sponsor of three ARCA Races
- Federated Car Care presenting sponsor of five ARCA races
- Primary sponsor of Ken Schrader in one NASCAR truck race
- Primary sponsor of Matt Tiff in one NASCAR Truck race
- Primary sponsor of Ken Schrader Racing in over 50 dirt track racing events
- Primary sponsor of Jason Allgaier in over 30 dirt track racing events
- Primary sponsor of Jim Inglebright in the NASCAR K&N Pro Series Sonoma race on June 27
- Federated Batteries Ironman 55 at Federated Auto Parts Raceway on August 8
- Federated Auto Parts Racing Hospitality events coast-to-coast

members, the “Get Dirty with Kenny” promotion, returns, with Schrader, as well as Allgaier, teaching some of Federated’s lucky Car Care winners a few things about dirt track racing at the Federated Auto Parts I-55 Raceway in Pevely, Mo.

“We have a wide array of events that our members can use to create a variety of promotional and fun opportunities for their Federated Car Care customers,” said Bishop. “We are looking forward to another great year of racing and hospitality.”



# FROM OE TO AFTERMARKET - DELPHI'S 360° CYCLE OF INNOVATION COMES FULL CIRCLE

## Why Delphi

Delphi supplies OE technologies to the world's top 25 vehicle manufacturers, so you can benefit from the 360° world of Delphi products and services. Today, our aftermarket technologies cover every aspect of what makes a vehicle go, from ignition to engine management to fuel systems – whether the vehicle is a hybrid, or powered by gasoline or diesel. Because of this we can also offer the right diagnostic tools, training and technical support for a more efficient, accurate and affordable repair.

## Our Coverage

In 2014, we launched 3,800 new part numbers globally:

- More than 850 part numbers in our diesel injector and pump offering including parts for light, medium and heavy duty applications, as well as filters, turbos, EGR, DPFs and supporting test equipment.
- 475 part numbers for ignition coils with more than 95 percent coverage.
- More than 550 part numbers in our engine management sensors offering with more than 95 percent coverage in MAF and O<sub>2</sub> sensors.
- More than 150 part numbers in our A/C product portfolio.
- Almost 650 part numbers for our fuel systems product portfolio where we have 95 percent coverage.

## Our Services

But it's not just about the products. We also make sure we deliver the tools, training and technical support our customers need to service and repair the vehicles of today and tomorrow.

- We answer more than 64,000 hotline calls annually
- We have a 95 percent customer fill rate
- We train more than 10,000 technicians at our 13 training centers worldwide with 126 training courses every year.

That's what we mean when we say it's not just quality, it's Delphi Quality.

## Our Promotion

And in 2015, we will be launching our Delphi Dream Shop Sweepstakes in the U.S. and Canada. For the grand prize, Delphi will give one lucky technician \$10,000 to use toward filling their own Dream Shop, upgrade an existing workspace with tools and equipment, or even buy a favorite classic car for their garage.



Technicians can register at the dedicated Delphi Dream Shop website ([delphidreamshop.com](http://delphidreamshop.com)). They can also access it through [delphiautoparts.com](http://delphiautoparts.com) or through Delphi's Facebook page ([facebook.com/DelphiAutoParts](https://facebook.com/DelphiAutoParts)). In December, three finalists will be announced and then flown to the Detroit for the North American International Auto Show in January when the grand prize winner will be selected.

In addition to the grand prize, registrants are eligible to win monthly, weekly and instant prizes. Technicians are encouraged to visit the website to enter early and visit often. Each visit is worth another entry into the prize drawings and each day in another chance to win instant prizes.

Connect at [delphiautoparts.com](http://delphiautoparts.com) or visit us Facebook, Twitter, LinkedIn, Google + and YouTube at [delphiautoparts.com](http://delphiautoparts.com). Official rules can be found at [delphidreamshop.com](http://delphidreamshop.com).

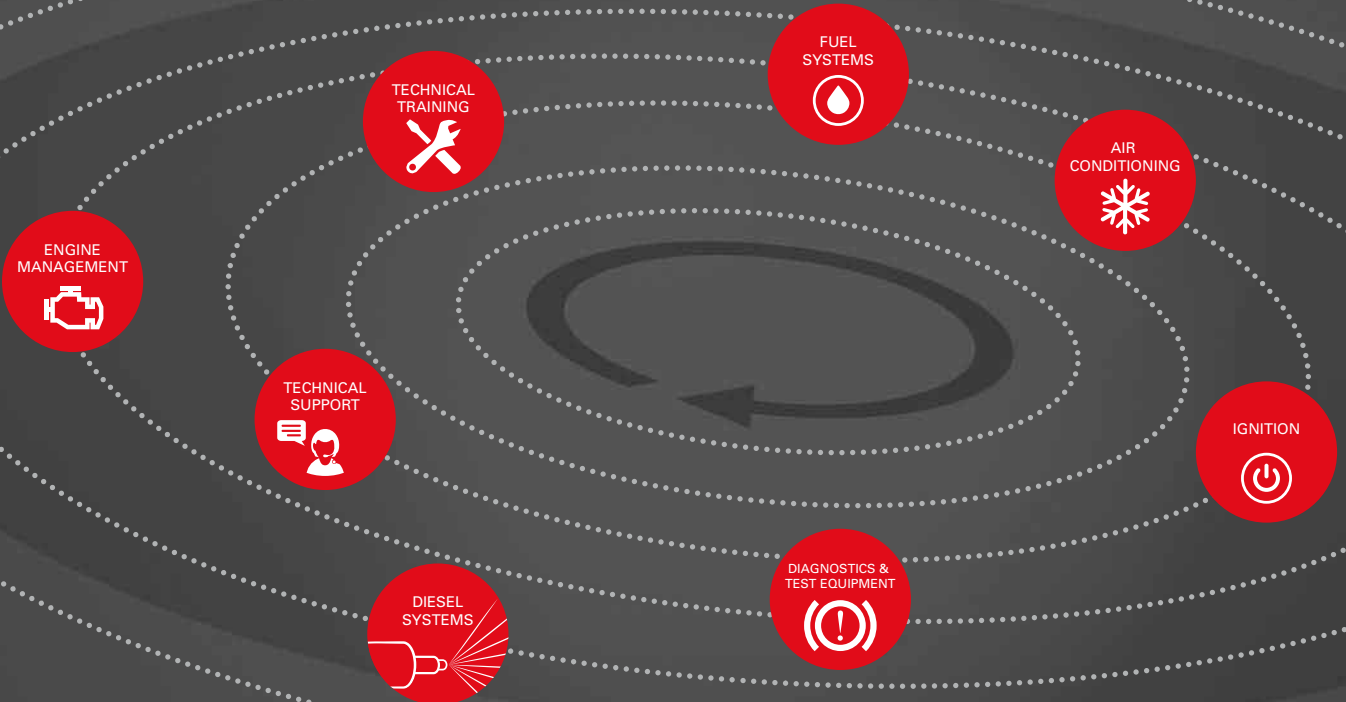


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Our aftermarket engineers work hand-in-hand with OE, to give you access to the very latest vehicle technologies. We have the aftermarket covered. Discover the full 360° value of Delphi quality at [delphiautoparts.com](http://delphiautoparts.com).

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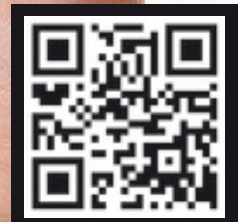
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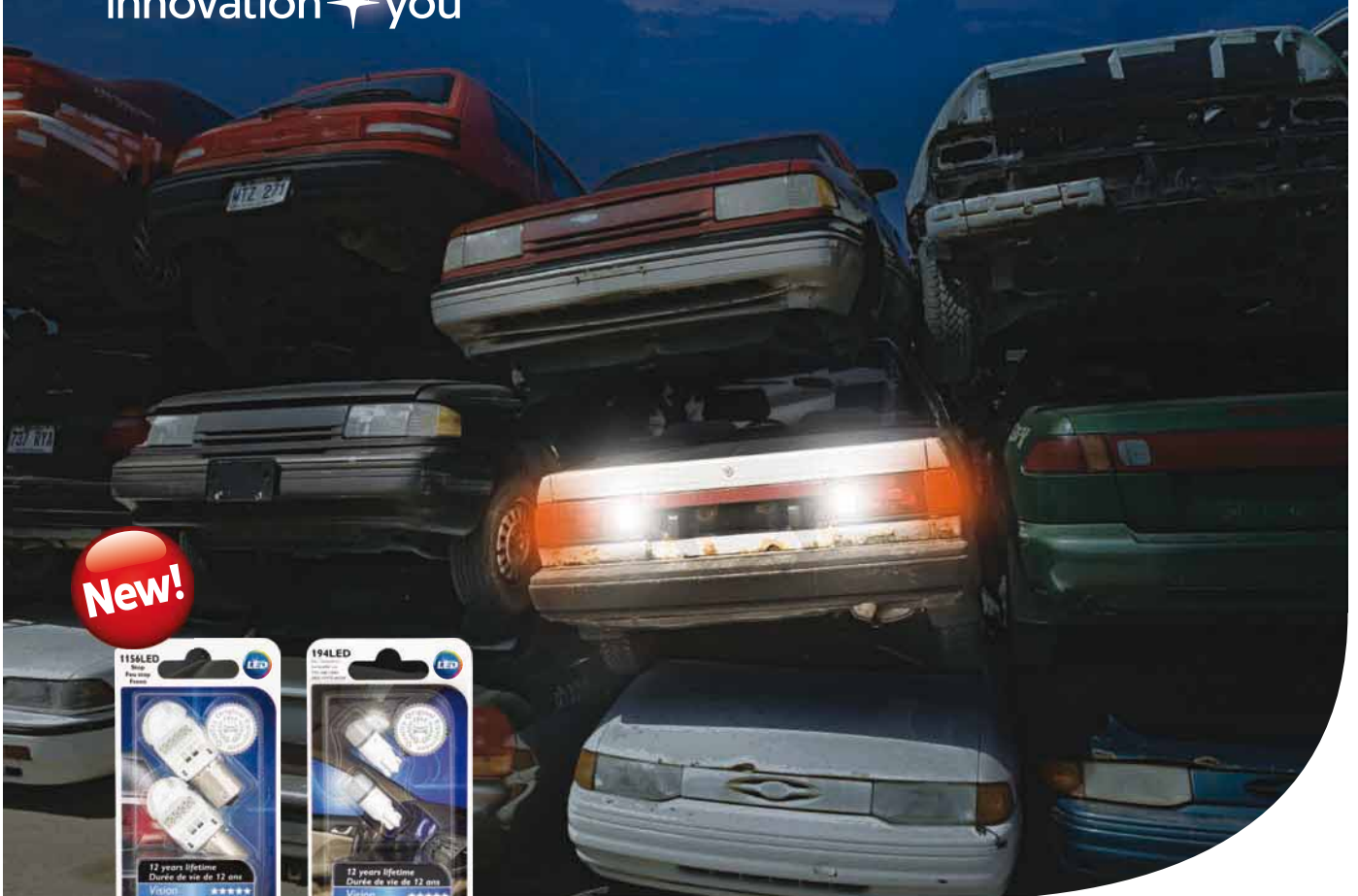
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# SHIFT TO ALL-IN-ONE

Let's get right down to it: you run an auto repair shop not a parts store. Dealing with incorrect part orders and complicated shop management programs just adds more work to your already busy day – and we're not talking about the kind of work you get paid for.

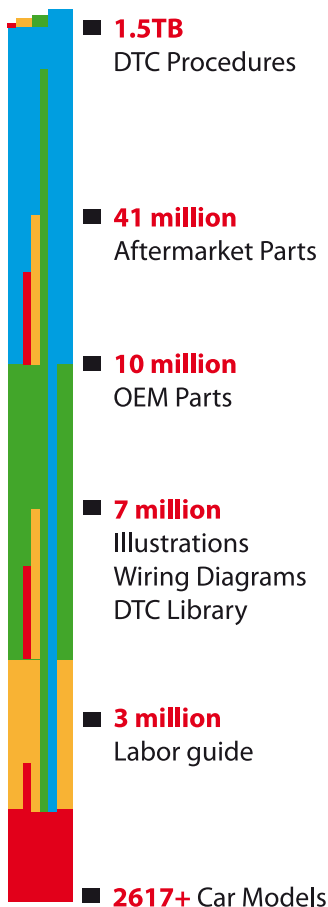
You're not alone; your customers want the same things that you do. When they pull into your bay, they want the process to be as fast and painless as possible. There's no getting around it; the longer it takes you to create an estimate, get it to the customer, and order the right parts for the job, the less time you have for actual repairs and relationship building with new customers. Here's an interesting fact: by 2015, 70% of all consumer transactions are projected to involve mobile technology. Simply put, repair shops need a comprehensive mobile solution to keep pace with innovations in the automobile industry.

SHIFTMobility ShopLite™ is an all-in-one smartphone application that helps independent auto repair shops across the nation manage their business activities, engage customers, market their services, and run more efficiently.

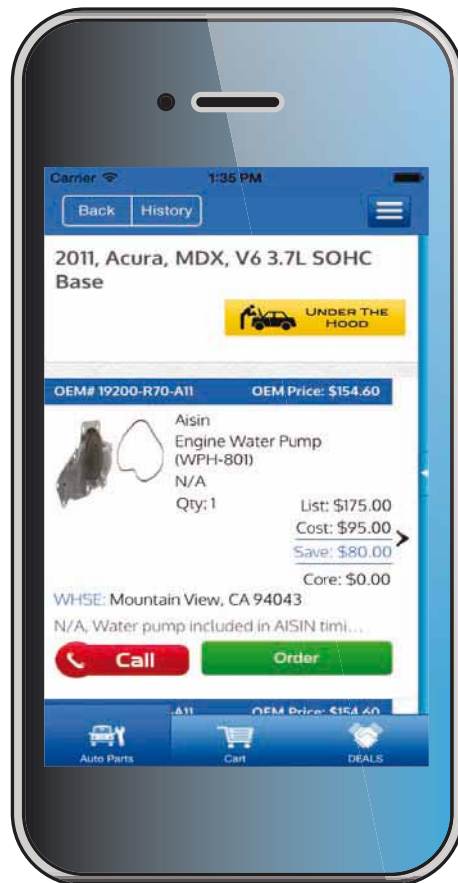
With ShopLite, shop owners can create estimates in seconds, quickly diagnose car troubles, order parts from local distributors, and print invoices from any smartphone. ShopLite also includes built-in marketing and analytics tools designed to scale with the speed of your growing business, enabling shops of any size to gain a better understanding of their customers and put this knowledge to work to attract new clients and improve customer service.

## Geared for You

ShopLite streamlines car diagnostics by providing technicians with detailed car inspection sheets along with an extensive



library of car repair and diagnostic manuals. Say goodbye to running back and forth to the computer in search of a specific part number. ShopLite's license and VIN scan feature ensures that you will order the right part for the right car every time. And, with SHIFTMobility's comprehensive parts procurement network, you can quickly find and buy locally sourced, high-quality OEM and aftermarket parts from all the leading manufacturers. Gone are the days of juggling each manufacturer's proprietary ordering system.



Once you have all the parts necessary to complete the job, ShopLite serves as a centralized clearinghouse for the repair instructions, diagrams, and technical data necessary to repair vehicles from every major car manufacturer. In fact, SHIFTMobility's OEM library contains information for over 30 different car manufacturers.

With ShopLite, you have the only platform you'll ever need to manage your shop and successfully engage your customers - anywhere, anytime.



# SNAP-ON TECH SERIES - BRINGING THE TECHNOLOGY AND TOOLS BEHIND RACING TO LIFE THROUGH VIDEO

Snap-on supports a wide range of professionals, including motorsports teams and drivers, working in often punishing environments and under tight turnaround times. For more than nine decades, Snap-on has been a part of racing, solving the critical...developing new solutions...making jobs easier in shops and pits for when it counts on the track.

For motorsports enthusiasts and those who make a living at it, Snap-on has introduced its "Tech Series: Nitro Edition" featuring 24 videos which show the inner workings of a nitro Funny Car and the tasks performed by the technicians that work on a 10,000 horsepower dragster. The Tech Series is designed for viewers to watch and learn more about the sport of drag racing.

Hosted by Jarod DeAnda, long-time automotive event and Formula Drift announcer, the 60-second videos feature interviews with Snap-on Funny Car driver Cruz Pedregon. Tech Series videos post to Snap-on social media and a dedicated YouTube page before each National Hot Rod Association (NHRA) race weekend. Topics range from how grip, temperature and coverage affect the setup of the car to the new evacuation system on Funny Cars to the difference between a six-stand and eight-stand clutch.

Snap-on is a long-time sponsor of Pedregon dating back to 1992 when he won his first NHRA Funny Car Championship. In 2010, just two years after Pedregon won his second NHRA Funny Car World Championship, Snap-on became his primary sponsor. Pedregon made the fastest Funny Car pass in history last season, a lofty accomplishment for a single-car team. He knows and understands tools and serves as an ambassador for the Snap-on brand in the Tech Series and during ride-alongs with franchisees to visit customers in shops.

Another Snap-on motorsports partnership is the 33-year bond



with Team Penske. Snap-on is an associate sponsor of all Team Penske cars competing in NASCAR and INDYCAR and serves as a primary sponsor of a Team Penske car in the NASCAR Xfinity Series. Snap-on recently hosted the "Snap-on Seat Swap" event, where drivers Cruz Pedregon and recent Dayton 500 winner Joey Logano swapped racing roles for an afternoon. The "Seat Swap" will be featured in a special "Tech Series" episode in May.

Whether it's the oval or dragstrip in the pits or the shop, Snap-on respects the unique challenges of racing vehicle performance...bringing the technology and tools behind it to life through "Tech Series: Nitro Edition." Check it out on Facebook, Instagram and YouTube.



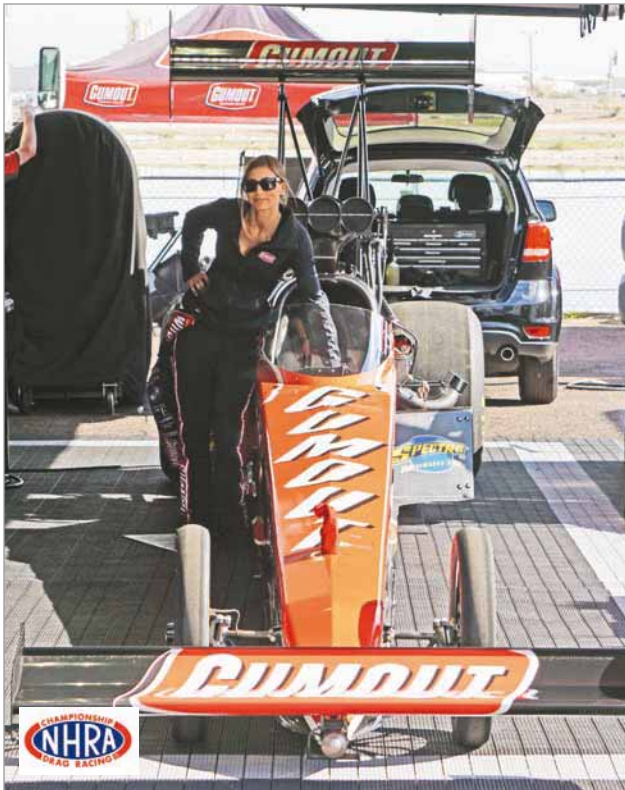
# GUMOUT SUPPORTS PROVEN PERFORMANCE

Professional race drivers don't get on the track without proven, cutting-edge technology backing them up. At Gumout, we feel the same way about what goes into our products, which is why we're proud to support both the NHRA and Formula Drift Series.

Gumout drivers Leah Pritchett (NHRA Top Fuel) and Vaughn Gittin, Jr. (Formula Drift) care about performance and what goes into their cars. In order to get the maximum performance out of their vehicles (and out of each race), Leah and Vaughn only use the highest quality components, systems and preparation procedures. They understand what goes in impacts the performance that comes out.

Performance and quality are also key elements in every Gumout product. It's why we use the most advanced cleaning and conditioning ingredients in our fuel additives. And no product goes onto the shelf without proving itself in the lab, on the track and on the street.

Our latest innovation, Multi-System Tune-Up, more than lives up to those standards. This product uniquely treats the entire fuel system with a scientifically-formulated blend of premium cleaning and conditioning agents, restoring performance and fuel economy in any engine type. While other cleaners



Leah Pritchett



Vaughn Gittin, Jr.

burn up in the intense heat of the combustion chamber, the PEA (polyether-amine) used in Gumout remains stable, removing carbon deposits that can lead to pre-ignition and reduced combustion efficiency.

But cleaning is only part of the story. Gumout Multi-System Tune-Up features a range of conditioning ingredients as well. Antioxidants help stabilize fuel and oil, particularly in engines that are used less often, to keep varnish from developing on metal parts. And corrosion inhibitors keep key engine parts from degrading, helping to extend engine life.

Gumout Multi-System Tune-Up can be used in gas, ethanol and diesel or poured into the crankcase to stabilize oil. And Gumout Multi-System Tune-Up is built to handle the requirements of modern engine technology, like GDI (gasoline direct injection), turbos and superchargers. It's also equally effective on engines without those systems, thanks to its advanced ingredients.

Performance matters, whether you're racing to the grocery store or against a top fuel dragster. So, just like Leah and Vaughn, we make sure the best technology and science goes into everything we do. To learn more about the science behind Gumout and keep up with the racing schedule, visit [www.gumout.com](http://www.gumout.com). Gumout. Science in, performance out.





# RESTORING YOUR CAR'S PERFORMANCE ISN'T ROCKET SCIENCE. IT'S ORGANIC CHEMISTRY.



Fig. 1-Piston and Connecting Rod

The heat of the combustion chamber bonds carbon deposits to piston tops, creating hot spots that can lead to pre-ignition and reduced performance.

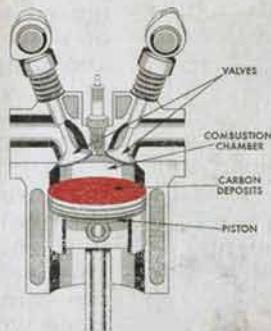


Fig. 2-Combustion Chamber

The intense 495° temperatures destroy most fuel additives before they can clean piston tops and cylinder heads. But the nitrogen-based PEA (polyether-amine) in Gumout® remains stable, easily withstanding the heat and pressure.



PEA breaks the bonds between carbon deposits and engine parts, removing them for restored horsepower and better fuel economy.



Cleaner engine parts mean better performance. Gumout cleans and conditions more engine parts than other additives— including piston tops, cylinder heads, GDI injectors and the combustion chamber.

\*Complete Fuel System Cleaner and Multi-System Tune-Up

Gumout is scientifically proven in the lab, on the track and on the street. See all the ways it can improve your performance at [gumout.com](http://gumout.com).

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## JIFFY-TITE KEEPS FLUIDS FLOWING

Jiffy-tite has been the preferred manufacturer of fluid connectors for the industrial and original equipment manufacturer sector of the automotive industry since 1963. There are over 400 million Jiffy-tite devices in service on over 20 different brands of vehicles worldwide including Chevrolet, Ford, Cadillac, Dodge, Mercedes Benz.

With a proven track record in OE and aftermarket applications, as well as years of research and development in the lab, on the track, and on the dyno; Jiffy-tite has developed a full line of motorsports quick-connect fluid fittings that are second to none and offer the quickest connection in the industry.

Designed for racers by racers, these revolutionary quick-connect fluid fittings are engineered to perform and provide unsurpassed performance under extreme racing conditions. Jiffy-tite's quick-connect fluid fittings can replace nearly any fitting in any location (ranging in sizes -3AN through -12AN.) These fittings are made of lightweight, high quality aircraft aluminum with brass valves and stainless steel ball bearings. Jiffy-tite fittings are lightweight and corrosion resistant offering a long life span. Quickly connecting and disconnecting in seconds by hand, no tools are required making them ideal for high performance applications; including



drag racing, circle track and off-road, plus many other forms of motorsports and fluid applications.

Racers rely on Jiffy-tite's quick-connect fittings for minimum flow restriction and maximum safety. With Jiffy-tite you can have the advantage of high flow, minimum restriction, easy connect and disconnect in seconds by hand, no tools needed, 100% leak proof when valved fittings are disconnected-giving that added safety feature.

New in 2015, Jiffy-tite has introduced their New Pro-Compact Series. The Pro-Compact Series offers all of the benefits of the quick-connect technology when valves are not required and they are comparable in size to most AN sized fittings on the market today (ranging from -4AN through -20AN.) The reduced size is paramount to bringing Jiffy-tite's revolutionary quick-connect technology to smaller spaces and allowing 100% flow thru.

Manufactured in Lancaster, New York, all of Jiffy-tite's fittings, including the new Pro-Compact series, are compatible with virtually any fuel, oil, water and transmission applications given the

option of Fluorocarbon (FKM), Nitrile (NBR), or Ethylene Propylene (EPDM) seals and they are available in black and gold anodized finish or all black.

Additionally, with Jiffy-tite's quick-connect fluid fittings, racers can avoid common problems associated with traditional threaded fittings such as stripping, cross-threading, over-tightening, forgetting to tighten, stripping the hex by using the incorrect tool or scratching the fitting by frequent wrenching.

For more information on Jiffy-tite's quick-connect fluid fittings for motorsports applications, visit [www.jiffy-tite-motorsports.com](http://www.jiffy-tite-motorsports.com) or call 888-605-7788.







# OEMS PREFER Jiffy-tite

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- NO Mess
- NO Stripping
- NO Over-tightening



## THE ULTIMATE TEST: LIQUI MOLY ALSO USES MOTOR SPORTS AS TESTING GROUNDS FOR ITS OWN PRODUCTS

Naturally motor sports also attract a great deal of attention for LIQUI MOLY. The objective is ensure that spectators at race tracks and above all television viewers are familiar with our brand and will hopefully try it out some time in the future. But in addition to all the marketing aspects, LIQUI MOLY's participation in motor sports also has a technical background: This is the ultimate test for our products.

The oil in a racing engine is subject to stresses going far beyond normal operation. Extremely high temperatures, extremely high pressures, extremely high speeds. Under such circumstances weaknesses in an oil show up quickly. Here only oils with perfect performance are acceptable. Any flaw, any defect mercilessly reeks havoc with lap times and engine condition.

In everyday situations on the road, the stresses acting on the motor oil are quite different. Here the oil requires the qualities of a Marathon runner, rather than those of a sprinter on a race course. The oil change intervals are longer, making properties such as protection against corrosion and wear as well as the cleaning effect more important.

Nevertheless, these tests provide important insights as to how the oil behaves in extreme situations. The better it is in these situations, the greater its performance reserves in everyday use. And they very well may be required, whether due to ambient conditions (extreme heat, steep grades, heavy loads), or because of problems (oil loss, mechanical defects). Oils, which have proven themselves on the race track, also offer the greatest possible protection on the road.

LIQUI MOLY is involved in a variety of motor sports events.



The best known are Sandro Cortese in the Moto2 Motorcycle World Championship, the All German Motor Sports Team at the Baja 1000 and the LIQUI MOLY Engstler Team at the TCR Touring Car Racing Championship. And the outstanding factor is that LIQUI MOLY does not use motor oils developed specially for racing - the oils all originate from our standard sales line. This ensures that every car owner can profit from the experience gained in motor sports.

The Motorcycle World Championship proves just how good these high performance motor oils are. As of this year all teams in the Moto2 and Moto3 races will be using oil from LIQUI MOLY.

LIQUI MOLY offers more than just motor oil. The company has over 50 years of experience in the production of additives. These additives ensure that all engine performance reserves are utilized to the optimum. They do this by removing damaging deposits from the injection system, the combustion chambers and the oil circuit and by reducing friction in the engine.

What does this mean for workshops? With LIQUI MOLY you get a strong brand and premium quality made in Germany. Every quart is filled up in Germany. This makes LIQUI MOLY the perfect brand for all car owners who want higher performance and greater security. Because motor oil is not just motor oil, but rather a virtually integral part which must match each individual engine precisely, we provide a free oil guide at [www.liqui-moly.us](http://www.liqui-moly.us) to tell you which oil is right for which engine.





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## 5 WAYS RED KAP'S BOTTOM LINE BENEFITS PROGRAM HELPS KEEP YOUR BUSINESS IN THE BLACK

**A**s the premier automotive uniform expert, Red Kap has discovered five distinct business advantages that a solid uniform program brings to auto shops of all types. No wonder so many pros choose the Red Kap Advantage.

**1. Powerful advertising inside and outside your shop.** Sharp uniforms are an amazingly cost-effective way to create awareness of your shop. Red Kap makes clothing comfortable and good-looking enough that employees often keep their workwear on long after they clock out.

**2. Let your team look like the experts they are.** For decades, studies have consis-

tently demonstrated that men and women in uniform are perceived as strong authority figures. Even a respected expert with years of experience needs to look the part. It pays to project expertise to the public.

**3. Make a great first impression with customers.** A potential customer walks through the door and scans the room. Do they feel comfortable leaving their car? The appearance of counter staff and techs will help answer that question. And a uniform is an instant way to convey that your shop values professionalism and quality.

**4. Boost employee morale every day.** It's a proven fact – when a shop's employees are highly engaged, that shop's income

tends to go up. And one of the most powerful ways to boost morale and pride is by dressing a team in killer uniforms. Customers really do notice the difference.

**5. Free employees up to do their best work.** You've hired great people for a reason. So give them room to do what they do best. Freedom to move. Pockets designed to keep important tools close at hand. Comfortable fabrics to help keep the energy level up. A high-performing team is good for business and even better for your bottom line.

Learn how to take your shop to the next level: [redkapautomotive.com/bottomlinebenefits](http://redkapautomotive.com/bottomlinebenefits)



**BOTTOMLINE  
BENEFITS  
PROGRAM** 



## 2015 NAPA AUTO PARTS RACING PREVIEW: A NEW CHAPTER FOR CHASE ELLIOTT

If there is such a thing as fashionably late, Chase Elliott is fashionably early – early to start a professional racing career, early to win, early to become a champion, early to make NASCAR history.

Elliott, at the age of 18 years, 11 months and 18 days, became the youngest champion in any NASCAR national touring series when he won the 2014 XFINITY Series (then the Nationwide Series) title as driver of the No. 9 NAPA AUTO PARTS Chevrolet Camaro for JR Motorsports (JRM). He became the first racer in NASCAR history to win a series championship and Sunoco Rookie of the Year in the same season. He also was voted by the fans as the series' most popular driver. No driver in any of NASCAR's top divisions had ever taken all three top honors, and yet Elliott did it in his first year, part of which was spent finishing his senior year of high school.

Elliott's storybook season included three wins, two poles and 26 top-10 finishes in 33 races. He completed 99.5 percent of the 6,063 total laps run, and he clinched the championship before the season finale, becoming the first to do so since Brad Keselowski in 2010.

Elliott's first win came in the Texas 300 at Texas Motor Speedway on April 4. It was only his sixth career start, making him the second-youngest winner in XFINITY Series history behind Joey Logano. A week later Elliott won the VFW Sport Clips Help a Hero 200 at Darlington Raceway in South Carolina. He added his third victory on July 19 in the EnjoyIllinois.com 300 at Chicagoland Speedway.

As a new chapter began in 2015, a new Elliott team emerged at JRM, which would be led by veteran crew chief Ernie Cope. Big opportunities always carry heavy responsibility, and for the new-faceted No. 9 NAPA AUTO PARTS team it begins with Cope. He brought an impres-



Photo: ©2015 JR Motorsports, LLC. Photo courtesy of Harold Hinson Photography.

sive record to the No. 9 team, although this will be just the second time in his career that he will have the chance to compete for a championship. As crew chief of the part-time Nos. 5 and 88 entries, he led the teams to five wins, 17 top-five finishes, 20 top-10 finishes and one pole in 29 NXS races in 2014, his first season with JRM.

The team will also have a new look from an engineering perspective with race engineers Tristan Smith and Seth Kookier joining the NAPA force. Longtime JRM employee Christopher Allen will make his car chief debut in 2015, while Rick Pennington will be featured as the new rear-end mechanic. Brad Thompson, a Hendrick Motorsports engine tuner, joins the defending champions in their pursuit of a second consecutive title. While plenty of new faces surround Elliott, a number of familiar ones still remain on the No. 9 NAPA team. Spotter Earl Barban returns, as does race engineer Scott Radel, front-end mechanic Danny Earnhardt Jr., and tire specialist/interior mechanic Will Coats. Truck driver Chris Waddell will

again wheel the 80-foot NAPA rig across the country in 2015.

Despite a full slate of 33 XFINITY Series races for JRM in 2015 during his quest to repeat as series champion, Hendrick Motorsports' (HMS) team owner, Rick Hendrick, is giving the 19-year-old Dawsonville, Georgia, native an opportunity to pilot his No. 25 NAPA AUTO PARTS Chevrolet SS five times in the NASCAR Sprint Cup Series as well. Elliott, who became the 12th-youngest Cup Series driver to debut in the sport on Sunday, March 29, at Martinsville Speedway, will have four more opportunities this season in the NAPA AUTO PARTS sponsored Chevrolet SS (Saturday, April 25, at Richmond International Raceway; Sunday, May 24, at Charlotte Motor Speedway; Sunday, July 26, at Indianapolis Motor Speedway; and Sunday, Sept. 6, at Darlington Raceway). NAPA will continue to be the principal sponsor for Elliott's remaining 2015 Cup races at HMS before he drives full-time for Hendrick Motorsports in the No. 24 Chevy in 2016.

# ART OF FAST: NGK RACING OFF TO A GOOD START

When performance counts, the fastest teams on two wheels or four, on land or on water, choose NGK. As a proud sponsor of nearly 150 motorsports teams, including some of the most competitive teams in NHRA, IHRA, NASCAR, AMA,

USF1 Powerboat and local grassroots racing, NGK is highly engaged with the racing community. From tractor pulling to monster trucks, NGK provides each team with the products needed to ignite a successful season.

After gearing up with a busy spring schedule that included the annual

Monster Jam World Finals, presented by NGK Spark Plugs in Las Vegas, Nevada and NHRA 4-Wide Nationals in Charlotte, North Carolina, NGK is going full throttle in the coming months. Be sure to keep your eye out for NGK Spark Plugs while watching your favorite races across the country all summer long:

DATE	RACE	TRACK/LOCATION
May 2	K&N Pro Series-West	Tucson Speedway-Tucson, Ariz.
May 16	K&N Pro Series-East/West	Iowa Speedway-Newton, Iowa
May 16	NASCAR Sprint All Star Race	Charlotte Motor Speedway-Concord, N.C.
May 22-24	NHRA Kansas Nationals	Heartland Park Topeka - Topeka, Kan.
May 24	NASCAR Coca-Cola 600 Race	Charlotte Motor Speedway-Concord, N.C.
May 29-31	Maple City Grand Prix-USF1 Powerboat Tour	Stone Lake- LaPorte, Ind.
May 30	K&N Pro Series-West	Shasta Speedway-Anderson, Calif.
May 30	K&N Pro Series-East	Bowman Gray Stadium-Winston-Salem, N.C.
June 4	NHRA Toyota Summernationals	Old Bridge Township Raceway Park-Englishtown, N.J.
June 13	Monster Jam	MetLife Stadium-East Rutherford, N.J.
June 20	Monster Jam	Gillette Stadium-Foxborough, Mass.
June 20	K&N Pro Series-East	Langley Speedway-Hampton, Va.
June 24-28	Pike's Peak International Hill Climb	Pike's Peak-Colorado Springs, Colo.
June 26-28	Bay City River Roar-USF1 Powerboat Tour	Saginaw River-Bay City, Mich.
June 27	K&N Pro Series-West	Sonoma Raceway-Sonoma, Calif.

For a full list of NGK sponsored race teams, please visit <http://www.ngksparkplugs.com/racing/> and catch all the action on our Facebook page at [Facebook.com/NGKsparkplugs](https://www.facebook.com/NGKsparkplugs)





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The World Leader



## FROM A SMALL TOWN IN INDIANA, ROTARY LIFT HAS RAISED AN INDUSTRY

**R**otary Lift was born in 1925 when Peter Lunati founded a company to manufacture the automotive hydraulic lift he invented. Ninety years later, more technicians around the world rely on Rotary Lift products every day than any other lift.

Rotary Lift is based in Madison, Ind., a small town on the Ohio River. Madison is home to Rotary Lift's world headquarters and North American manufacturing and assembly plants. The company's North and South American operations, engineering, product development, R&D, customer service and support, training, and sales/marketing teams are also based in Madison.

"For 90 years, Rotary Lift vehicle lifts have set the standard for quality, ingenuity and value for every repair shop, dealership and service center that owns one. The Rotary Lift brand has earned a legendary reputation in the industry because of the skill and dedication of our people," says Matt Webster, vice president and general manager, the Americas for Rotary Lift parent company Vehicle Service Group (VSG). "We take pride in our craftsmanship, teamwork, Midwestern values and strong work ethic. We do things no other lift company does, to improve the lives of the people who rely on our products to do their jobs. Our lifts aren't just built — they're Raised in Madison."

### Industry-Building Products

With the invention of the first hydraulic automotive lift, Peter Lunati not only laid the groundwork for a new industry, he also improved the working conditions

of mechanics. His first lift was called a "rotary" because it actually rotated 360 degrees, enabling technicians to drive on and off the lift without shifting a vehicle into reverse — no easy feat in the 1920s. Using a lift also meant that technicians no longer had to work in dark, dirty pits — they could come above ground and work more ergonomically, with better access to their tools and equipment.

This focus on improving technician efficiency and productivity has led the development of hundreds of Rotary inventions over the last 90 years. Today, the company offers a full range of industry-leading true asymmetrical and symmetrical two-post lifts, four-post lifts, environmentally friendly inground lifts, mobile column lifts, drive-on hinged lifts and low-rise lifts. SmartLift®, a new concept in inground lifts when it was introduced in 1995, is the world's most popular inground lift, and the Rotary Lift SPOA10 is the world's bestselling two-post lift.

Because time is money in the service bay, Rotary Lift engineers have dedicated themselves over the last decade to developing products that save time. These include Y-Lift™, which maximizes rise speed based on the weight of the vehicle being lifted, and the world's fastest two-post, four-post and inground lifts, which are driven by Rotary Lift's patent-pending Shockwave™ technology.

Rotary Lift's global operations now extend from Madison to ISO 9001-certified plants in Europe and Asia. Its engineers draw on extensive product tests and customer input from across the globe to develop lifts that are durable, powerful, productive and environmentally friendly.



All new Rotary Lift vehicle lifts are tested to at least 20,000 cycles before being released. As a result, Rotary Lift customers receive lifts that are more efficient, require less maintenance and produce more profits for their operations.

Rotary Lift's success is also driven by its extensive network of Rotary Authorized Installers (RAIs) and distributors. These partners ensure that factory-trained service, lift inspections, and Genuine Rotary Parts are always close at hand for customers who need them. Rotary Lift also provides value-added services such as assistPRO professional facility planning assistance.

Rotary Lift is proud to be one of the original charter members of the Automotive Lift Institute (ALI), an industry trade association focused on vehicle lift safety that was established in 1945. In fact, Rotary is the only founding member still in business 70 years later.

To learn more about the full line of Rotary Lift vehicle lifts, contact your local Rotary Lift distributor, visit [www.rotarylift.com](http://www.rotarylift.com) or call (800) 640-5438.

### Rotary Lift

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Madison, IN 47250  
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# MEN OF STEEL.

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# SKF DELIVERS WINNING PERFORMANCE ON AND OFF THE TRACK: RACING A TESTING GROUND FOR AFTERMARKET

**W**ith nearly a century's worth of experience in racing – including support for Team Penske and Scuderia Ferrari teams – SKF knows what it takes to reach the winner's circle.

Consider that Team Penske is coming off a record-setting 2014 with a single-season high 11 Sprint Car Series victories (six from Brad Keselowski and five from teammate Joey Logano) and 17 NASCAR wins overall, topping off the year with a second-consecutive Xfinity Series Owners' title. Across all levels of competition, Team Penske visited victory lane 22 times, including three in the Verizon IndyCar Series.

What's SKF's role in all this?

SKF engineers offer these race teams access to a wide range of technical support.

## Testing under harsh conditions

The racing experience benefits SKF and its aftermarket customers, as its engineers observe the impact of racing's harsh conditions – often developing solutions for today's on-the-road applications as a result.

In other words, the racetrack becomes a virtual research-and-development test laboratory for products designed to work with customers such as OE manufacturers and automotive aftermarket partners. What works in racing is likely to translate into today's automotive applications.

The end result is a focus on providing premium SKF products, whether it's wheel hub bearings, wheel end seals, drivetrain kits, corrosion prevention and control, or anything in between.

## Technical training

SKF is happy to share the lessons it learns in designing for harsh conditions – and the resulting innovations – through various channels.



Pictured here, Joey Logano, 2015 Daytona 500 Champion, begins the 2015 season on a high note for SKF Racing and Team Penske!

That includes the SKF technical training trucks, which are manned by ASE master-certified technicians and offer hands-on technical training, along with information about SKF automotive services, to industry professionals.

Then there's The SKF Pole Position Program, which provides automotive technicians with the most up-to-date technical information, training literature and product knowledge needed for maintaining a profitable repair business. Technicians also receive insight into the industry's future trends and technology, giving them a leg up in preparing for future repair and maintenance scenarios.

In addition, SKF is keeping up with the ever-growing social media universe.

A new SKF YouTube channel features more than 50 short instructional videos designed to educate technicians on a variety of topics they may encounter on a regular basis. And SKF's Twitter account

regularly includes links to technical tips, as well as racing information and general company news.

## To Learn More

For more information about SKF, contact your local SKF representative, visit [www.vsm.skf.com](http://www.vsm.skf.com), call 800-882-0008 or visit the SKF e-catalog at [www.SKFPartsInfo.com](http://www.SKFPartsInfo.com). Follow SKF on Twitter @skfpartsinfo or subscribe to our YouTube channel at [www.skfpartsinfo.tv](http://www.skfpartsinfo.tv).





# Knowledge in the fast lane



## Partnering with Team Penske to take performance to the next level.

More than just a logo on the cars, SKF is a true technical sponsor to Team Penske, sharing the power of knowledge engineering to provide a competitive advantage to Brad Keselowski, Joey Logano, Ryan Blaney and Helio Castroneves. We're committed to helping Team Penske get to Victory Lane, and to applying lessons learned on the track to the products SKF brings to the automotive aftermarket.

YouTube [www.skfpartsinfo.tv](http://www.skfpartsinfo.tv) [@skfpartsinfo](https://twitter.com/skfpartsinfo)

The Power of Knowledge Engineering

# SKF®

# GARAGE GURUS. THE SUPPORT YOU'VE BEEN LOOKING FOR, WHEN AND WHERE YOU NEED IT

**Y**ou've got a hard job. And what you do has never been more important. But thanks to Garage Gurus, the new nationwide "Tech First" initiative from Federal-Mogul Motorparts, you can count on the training and other critical support you need to advance your career and your business. And it's all available onsite, online and on-demand, exclusively for professionals like you.

Impressive new Garage Gurus training centers are already open in Chicago, Los Angeles and New York City, and 12 more are coming throughout 2015. Additionally, our fleet of Web-connected "Gurus-On-The-Go" product technology vans continues to grow, with ASE-certified technical specialists providing valuable training and product tips to professionals in service bays throughout the U.S. And regardless of where you are, you can also take advantage of the extensive new Gurus Online eLearning curriculum by visiting [www.FMgaragegurus.com](http://www.FMgaragegurus.com).

"Garage Gurus is our investment in the future of the thousands of local shops and talented, hardworking professionals who maintain and repair today's passenger vehicles," said Dan Ninivaggi, CEO, Federal-Mogul Motorparts. "They have difficult but extremely important and rewarding jobs, and we are committed to providing the information and support they need to continue to be successful."

## More Than 100 Courses and Growing

Garage Gurus offers a comprehensive curriculum of training workshops, eLearning courses, Webinars, and field clinics covering brake service, steering and suspension, ignition, engine and sealing, electrical and drivability topics. Each course, available in English and Spanish, is taught by one of our more than 100 ASE-certified Gurus.



## Gurus On-Demand App

You can rely on Garage Gurus on an on-demand basis, too, through a powerful new mobile app available for iOS and Android devices. Whether you're in the repair bay, machine shop or behind the service counter, you can access the latest information on any Federal-Mogul Motorparts product and take advantage of our email-able job estimating templates and other tools that make spec'ing, quoting and completing jobs easier than ever.

## Join the Evolution

Automotive technology is evolving faster than ever. Garage Gurus is the first comprehensive technical education network designed to help keep you and your shop on the leading edge of each new technology so you can deliver superior quality, safety and performance — with the best parts — in every repair. Join the evolution today by contacting Garage Gurus toll-free at 888-771-6005 or visiting [www.FMgaragegurus.com](http://www.FMgaragegurus.com).



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# ONSITE. ONLINE. ON-DEMAND.

Garage Gurus is a new "Tech First" initiative from Federal-Mogul Motorparts that provides the most comprehensive program of support tools in the industry. Garage Gurus is committed to arming techs with the latest tools and information so they can keep pace with emerging vehicle technologies.

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**Gurus Tech Hotline: 800-325-8886  
Training Registration: 888-771-6005**



# 6 WAYS TO SAVE TIME ON REPAIRS

**Y**ou don't have time to waste. In the repair business, that old familiar saying that "time is money" really is true. So it's important to have diagnostic and repair information tools close at hand to get a quick start on the correct diagnosis and repair.

As OEMs introduce ever-changing technologies to the market, repair technologies are also evolving to keep pace. Staying current with everything can be a big challenge, especially when coupled with the need to work as efficiently as possible to stay profitable.

One of the best ways to accomplish faster, more accurate repairs is by having complete OEM data combined with real-world information from the industry, accessible together in single application. ProDemand® from Mitchell 1 does just that, delivering OEM procedures, TSBs and scalable wiring diagrams, along with real-world insights with each lookup.

Here are six of the newest features in ProDemand that help save time (that you might not know about):

**1. Real Fixes** – SureTrack™, the diagnostic module in ProDemand, is

powered by millions of actual repair orders and feedback from an exclusive community of professional technicians that add valuable real-world insight to the diagnostic process. Real Fixes quickly give techs a full picture of the most likely vehicle issues to help them complete the repair more efficiently.

**2. Top 10 Repair List** – With every vehicle search in ProDemand, techs get a jumpstart toward the correct diagnosis and repair with detailed information about the top 10 most common component failures, diagnostic trouble codes (DTCs), symptoms and lookups for the vehicle selected.

**3. Quick Links** – This is the fastest route to the most commonly accessed information in ProDemand: technical bulletins, common specifications and procedures, a DTC index, electrical component locations, fluid capacities, tire fitment and wiring diagrams.

**4. Smarter Searches** – Type in a symptom, trouble code or component and ProDemand's iSearch™ feature delivers a list of verified fixes that have resolved the same symptom for other technicians. It's an excellent starting

point to direct techs quickly to an accurate diagnosis and repair.

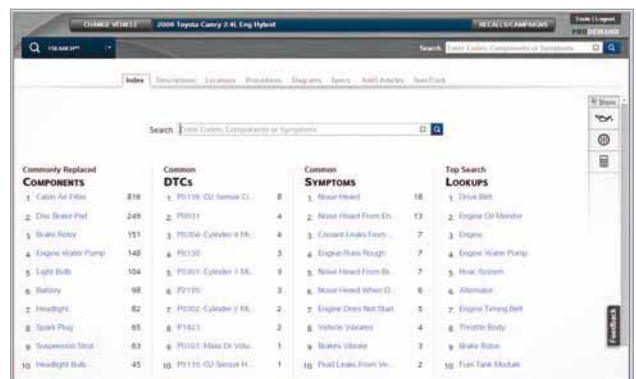
**5. ProView** – Once a code or symptom is selected in ProDemand, the ProView feature provides all of the known fixed components for that code or symptom, or multiple codes and symptoms, based on real-world content. This allows technicians to quickly see the most commonly repaired components and plan a diagnosis strategy to resolve the problem.

**6. Mobile Friendly** – ProDemand is now optimized for tablets, making it easy to retrieve the repair, diagnostic and maintenance information and Real Fixes right at the vehicle. It's another way to improve efficiency in the busy shop environment.

Being prepared for the next tricky job is crucial to keep vehicles rolling through your bays and maximizing efficiency. Advanced vehicle technology can be a challenge, but saving time and completing accurate repairs doesn't have to be. With the right information tools, you can find answers quickly, increase technician proficiency and improve overall shop productivity.



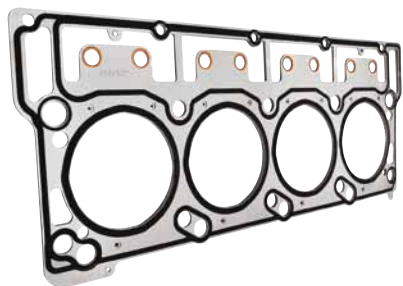
SureTrack Real Fixes provide common replaced parts information and real-world solutions in a Complaint-Cause-Correction format.



The Top 10 Repair list presents the most common issues that other techs have encountered with the selected vehicle.

**Mitchell1**  
In your shop, at your side





### HEAD GASKETS

The Fel-Pro Gaskets brand has introduced two innovative Fel-Pro PermaTorque MLS multi-layer-steel head gaskets that address a common combustion sealing issue encountered in 6.0L diesel engines used in more than 700,000 trucks manufactured between 2003 and 2010. The patent-pending PermaTorque MLS head gaskets (No. 26374PT – 18mm dowel applications; 26375PT – 20mm dowel applications) are now available through Fel-Pro distributors. Many owners of trucks equipped with Powerstroke 6.0L diesel engines have encountered premature head gasket failures and resulting engine damage caused by leakage of combustion gasses into the cooling system. The engines, originally equipped with multi-layer-steel head gaskets, have been known to experience combustion leakage at as early as 50,000 miles of service under heavy loads, the company reports.

For more information, visit [www.federalmogul.com](http://www.federalmogul.com) Federal-Mogul Motorparts

### ENGINE AIR FILTERS

Robert Bosch LLC has added engine air filters to its Workshop Filters portfolio. With this new addition, Bosch is now able to offer a complete line of Workshop Filters — air, oil, fuel and cabin air filters — to automotive service technicians through their local Bosch jobbers and warehouse distributors (WDs) in the United States and Canada. The latest addition to the Workshop Filters line, completing the Bosch portfolio of filters, the engine air filter is just as important to the longevity and performance of a vehicle's engine as are oil and fuel filters, the company says. Bosch Workshop Engine Air Filters are 98 percent efficient and their exclusive filtration media prevents contaminants from entering the engine, thereby helping to extend engine performance and life.



For more information, visit [www.boschusa.com](http://www.boschusa.com). Bosch



### AIR INTAKES

CORSA Performance has extended its line of air intakes to include Chrysler 300 and Dodge Challenger, Charger and Magnum vehicles. The air intake increases engine function and performance for a boost in horsepower. New applications include: 300 models - 2012-2013 6.4L, 2011-2014 5.7L and 2004-2010 6.1L SRT8 (part Nos. 468646, 463576 and 46861; Challenger models - 2011-2013 6.4L and 2011-2014 5.7L, and 2008-2010 5.7L (part Nos. 468646, 462576 and 46857154); Charger models - 2012-2013 6.4L, 2011-2014 5.7L and 2005-2010 6.1L SRT8 (part Nos. 468646, 463576 and 46861); and Magnum models - 2005-2008 6.1L SRT8 (part No. 46861) CORSA's air intake systems feature either high-efficiency Pro 5 filters or cutting-edge Donaldson® PowerCore® filtration technology. The Donaldson PowerCore filter is a 100,000-

mile no-maintenance filter that maximizes air flow, removes submicron particulates and outlasts conventional media filters. It directs air through channels that allow clean air to efficiently enter the engine, while trapping particulates in adjacent channels that do not impede airflow. The closed box design of the air intake creates a barrier to engine heat, moisture, dust and debris to improve performance and enhance the life of the filter, according to the manufacturer.

For more information, visit [www.corsaperformance.com](http://www.corsaperformance.com). Corsa Performance

### DIGITAL TORQUE WRENCHES

K-Tool International (KTI) offers three new digital torque wrenches and a 1/2-inch drive digital torque adaptor to their Tire & Wheel product line. There is one 3/8-inch drive and two 1/2-inch drive torque wrenches with 72 teeth gear ratchets. The digital torque adaptor (KTI72138) works with a 1/2-inch drive ratchet, has a torque range of 29.5 to 147.5 foot-pounds, operates in clockwise and counter-clockwise directions and offers three standard functions: torque, measurement and mode setting, K-Tool reports.



For more information, visit [www.ktoolinternational.com](http://www.ktoolinternational.com). K-Tool International

## MASS AIRFLOW SENSORS

Delphi Product & Service Solutions has added 20 Mass Airflow Sensors to its engine management portfolio covering more than 10.2 million vehicles built from 1990 to 2013.

Applications cover Audi, BMW, Chevrolet, Hyundai, Kia, Lexus, Mazda, Nissan and Toyota. Part numbers include AF10159, AF10162, AF10164, AF10168, AF10176, AF10184, AF10185, AF10205, AF10206, AF10207, AF10208, AF10210, AF10211, AF10212, AF10213, AF10215, AF10216, AF10217, AF10219 and AF10220.

[www.delphi.com](http://www.delphi.com)  
Delphi Corp.



## OIL INJECTION KIT

Tracer Products' TP-9772 BigEZ Hybrid/Ester Oil Injection Kit makes adding lubricating oil to a hybrid A/C system a time-saving, uncomplicated process. At the heart of the kit is the BigEZ injector

assembly, an easy and accurate way to add oil to hybrid A/C systems. Also included is a solid-brass R-134a hybrid coupler with a check valve and purge fitting. Unlike a hose, the all-metal coupler is non-permeable and allows easy connection to the low-side service port. Rounding out the TP-9772 kit is a 4 oz. (118 ml) hybrid/ester oil cartridge filled with a unique lubricating oil that is specially formulated for use in all hybrid vehicles. This OEM-based ester oil provides excellent lubricity and compressor protection, while its high dielectric properties help reduce the risk of shock hazard to technicians, according to the company. The oil cartridge comes in a moisture-resistant foil pouch with a desiccant bag.

[www.tracerline.com](http://www.tracerline.com)  
Tracer Products



## A/C SERVICE EQUIPMENT



**MAHLE**  
Service Solutions

MAHLE Service Solutions has released its ACX, its new line of ArcticPRO A/C service equipment. The ACX1280 series is designed to competently, efficiently and safely service the new R1234yf refrigerant worldwide. The ACX1180 series is specifically

designed to handle R134a refrigerant. The ACX1280 is certified to meet all applicable performance and safety standards in the stringent SAE J2843 standard. The ACX1280 features fully automatic servicing to ensure easy, time-saving and precise service on R1234yf air conditioning systems in vehicles. The ACX1180 series for R134a is a flexible machine that easily can be customized to meet the exact needs of technicians, MAHLE states. It features the ability to add a printer, a refrigerant identifier and TechALERT, MAHLE Service Solutions' patented remote paging device. TechALERT allows one technician to monitor as many as four machines while performing a separate service elsewhere in the shop. The ACX1180 provides higher service accuracy than competitors with an easy-to-use control panel with large pressure face gauges. It meets the SAE J2788 standard for certified performance and accuracy. The ACX1180H is available for servicing hybrid vehicles.

[www.mahleclivite.com](http://www.mahleclivite.com)  
MAHLE Service Solutions

## HEADLIGHTS

Philips Automotive North America has introduced Philips Vision LEDs as direct replacements for interior and exterior vehicle lighting. These new innovative

LEDs are backed by a 12-year limited warranty. The LEDs feature an advanced design that not only provides a bright, well-focused beam on the road, but also robust enough to handle extreme heat and high vibrations, the company says. The new Philips Vision LED offering includes both interior and exterior applications, and the lights are available to replace brake and taillights, back-up, dome and glove compartment, side markers, trunk, and license plate lights.

[www.usa.lighting.philips.com](http://www.usa.lighting.philips.com)  
Philips Automotive North America



## EXHAUST GAS DIAGNOSTICS KIT

ANSED's Exhaust Gas Diagnostics Kit combines a portable and easy-to-use 5-gas analyzer with exclusive diagnostic software into a single package. For diagnosing performance, drivability and catalytic converter issues, exhaust gas diagnostics completes the process. Handheld and with Bluetooth connectivity the gas analyzer is battery operated and provides accurate readings all day on a single charge. Software analyzes the multiple gases, identifies potential problems, and delivers a top-down list of potential solutions and easy-to-understand reports for both technicians and vehicle owners, the company states.

[www.anseddiagnostics.com/products](http://www.anseddiagnostics.com/products)  
ANSED





## 14-INCH PLIERS

IPA releases its latest innovation, the 14-inch Long MANTUS Tight Access Tool. The MANTUS features a slim, low-profile design that surpasses the reach of the industry's longest available needle nose pliers. Unlike traditional pliers, the handles flex as pressure is applied, ensuring a strong and consistent grip on the object being retrieved. At the end of the tool's 14-inch reach, the MANTUS features 30 interlocking teeth that the company notes are ideal for grabbing a variety of objects including fuses, wires, hoses, gaskets, O-rings, hardware and more.



[www.ipatools.com](http://www.ipatools.com)

Innovative Products of America/IPA

## WIPER BLADES

Robert Bosch LLC has launched a new look for its line of Bosch Evolution Wiper Blades and added two new blade lengths – 13-inch and 15-inch – to the program. Attractive and eye-catching, the new Evolution packaging design has been especially created to capture consumer attention through the use of bright color and dramatic imagery, the maker states. Beam or “bracketless” blades, as they are sometimes called, are designed without the metal brackets, joints or hinges found on conventional wiper blades. This design affords improved winter wiping performance as there is no place for ice and snow to build up. Beam technology applies uniform wiper arm pressure along the entire length of the blade that results in consistently clean and quiet performance in all weather conditions. An integrated, symmetrical wind spoiler helps hold the blade to the windshield to resist lift-off at high speeds.



[www.boschusa.com](http://www.boschusa.com)

Bosch

## TITANIUM PROTECT-A-WIRE KIT

For V8 ignition wires exposed to extreme heat from exhaust manifolds and headers, DEI's new Titanium Protect-A-Wire Kit provides advanced heat protection. Developed with Titanium LR fiber technology, the same material as DEI's Titanium exhaust wrap and plug boots, this Titanium color sleeving material withstands temperatures up to 1,800°F direct heat, or 2,500°F radiant. DEI's new Titanium V8 Protect-A-Wire kit includes 25 feet of 1/2-inch ID Titanium sleeving, 8 qty. DEI is branded high heat shrink tube ends, and 16 qty. high temp shrink tube ends numbered one through eight (two of each) to ensure plug wires are connected to the correct cylinder.



[www.designengineering.com](http://www.designengineering.com)

Design Engineering Inc./DEI

## MODULAR FLEXPLATE

QuickTime launched its all-new Modular Flexplate for a wide variety of engines, including small and big-block Chevrolet and Ford. Each application is designed to handle the stresses of high horsepower, high rpm engines. QuickTime's new Modular Flexplate features full 4130 chromoly steel construction that's twice as strong, 10-percent lighter and better balanced than OEM-style flexplates. Engineered for unsurpassed strength, accuracy and performance, the Modular Flexplate brings an age-old product into the 21st Century, according to the company. Since the 1920s, nearly all flexplates have been manufactured using the same method; a high carbon steel ring gear is MIG welded to a low carbon stamped steel center section. This process poses a number of problems, including weak weld joints, warping and metal crystallization, which negatively affects both durability and accuracy. In addition, all ring gears are now coming from off-shore. QuickTime takes a whole new approach to flexplates by using a laser cut 4130 chromoly steel center section that is joined to 4130 chromoly steel ring gear segments using (18) separate 4130 pins, which are pressed as well as laser welded. This approach results in a SFI 29.1 certified flexplate that is both 10-percent lighter than and twice as strong as OE-style flexplates. In addition, the Modular Flexplates are accurate in every dimension: circumference within .002, Rollout within .010, and balance within 1 gram.



[www.quicktimeperformance.com](http://www.quicktimeperformance.com)

Quick Time Performance/QTP

## BATTERY CHARGER/MAINTAINER

Clore Automotive introduces Model No. PL2140, a 4 Amp 6/12 Volt battery charger/maintainer, from SOLAR. Combining fully automatic operation and the ability to properly maintain the different batteries found in almost any car, truck, SUV, ATV, motorcycle, boat or personal watercraft application, the PL2140 is the perfect charger/maintainer for busy shops and enthusiasts alike, Clore states. The PRO-LOGIX PL2140 utilizes advanced microprocessor-controlled logic to deliver a fully automatic, precisely controlled charging routine to optimally charge and maintain each battery serviced. Plus, it has the ability to properly charge virtually any lead acid battery type, including conventional, AGM, gel cell, spiral wound, deep cycle and marine batteries.



[www.cloreautomotive.com](http://www.cloreautomotive.com)

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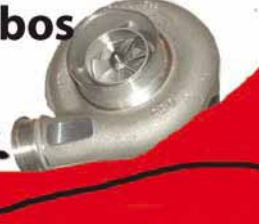
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## NEW BENDPAK LOW-RISE LIFT PICKS UP WHERE OTHERS LEAVE OFF

BendPak recently unveiled their new LR-5T — a 10,000-pound capacity low-rise lift that accommodates passenger cars and trucks thanks to a newly designed lift platform, specialty adapters, wider drive-over capability and increased lifting capacity. Convenient built-in storage trays means lug nuts and other small parts are always within reach. A small footprint, easy installation and adaptable 110V/220V power-unit make the LR-5T the perfect lift for any shop



BendPak

## HITACHI NOW OFFERS SHOCK ABSORBERS

For the first time, Hitachi Automotive Systems Americas, Inc. will offer Tokico brand shock absorbers to the North American Aftermarket. As the original developer of twin-tube low-pressure gas shock technology, customers can count on a high quality product for the more than 57,197,570 import and domestic applications covered.



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## MAXIDAS DS708 AUTOMOTIVE DIAGNOSTIC SYSTEM

The Autel MaxiDAS® DS708 Automotive Diagnostic System, available from Advance Professional Driven by Carquest, is a dealer-level scan tool with coverage for all makes, models and available modules. The DS708 offers complete functional capability on body, chassis, powertrain and information communication modules. In addition, the DS708 features sensor initializations, ECU adaptations, TPMS reprogramming, immobilizers, key coding and component activation testing. For more information on quality Autel products, call your local Advance delivery location.



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NAPA

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WORLD BRAKE RESOURCES (WBR) is a complete braking solution for Asian, domestic and European vehicles. Products include WBR brake rotors with Run True™ Technology, WBR Dual-Technology brake pads, WBR Premium and Premium OptiSelect calipers, WBR Quiet-Clip Technology hardware kits and WBR brake shoes. All WBR products offer professional quality with proven performance and are available exclusively at WORLDPAAC.



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## POWERFUL ENHANCEMENTS TO HUNTER'S POPULAR TC3700 TIRE CHANGER

Hunter's new generation TC3700 tire changer now features a polymer mount/demount head that resists damage to rims. The new mount/demount head also locks vertically for increased wheel face protection. The TC3700 features an exclusive bead roller system that performs all bead loosening from an upright position. The enhanced TC3700 is great for wide and heavy tires, and improves performance on plastic clad and raised spoke wheels.



Hunter Engineering

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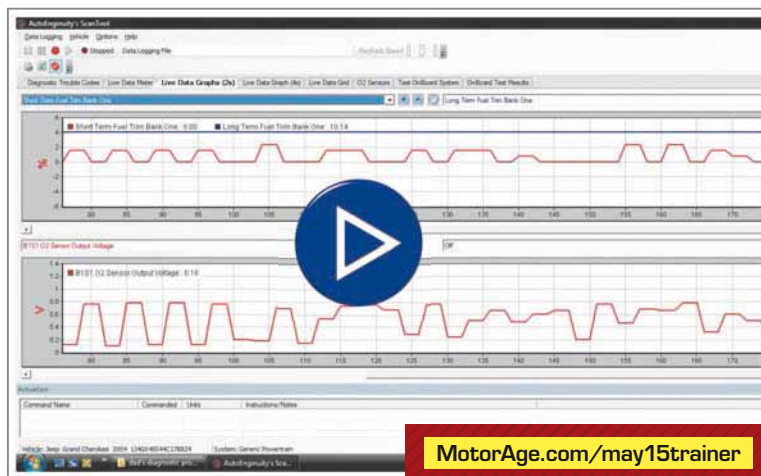
# THE LONG AND SHORT OF FUEL TRIMS

UNDERSTANDING WHAT THE LTFT AND STFT DATA PIDS MEAN.

BY **PETE MEIER**  
**Technical Editor**

Long term fuel trim (LTFT) and short term fuel trim (STFT) are such important Parameter Identifier (PID) data that it is among the choice few included in the standardized Global OBDII scan tool mode. It can provide you with direction when you're attempting to solve a variety of drivability concerns, above and beyond the P0171/174 (System lean, bank 1 or 2) and P0172/175 (System rich, bank 1 or 2) Diagnostic Trouble Codes (DTCs) that immediately might come to mind.

To take advantage of all these two (or four) data PIDs can relay, though, you need to understand what they are and what they mean in terms of engine management. The first rule to remember is that the primary reason we have computer engine controls in the first place is to regulate emissions from the tailpipe. The catalytic converter is not the primary player in cleaning up exhaust emissions. In fact, it relies on a steady diet of near perfect (read stoichiometric) feed gasses or else it hurts itself. Too much air in and the converter can overheat and meltdown, too much



fuel and the converter can overheat and meltdown. The Engine Control Module (ECM) has to keep the air/fuel mixture just right at all times to avoid either extreme. It does so through a feedback system operating in a closed loop.

Know what that last sentence means?

If you aren't 100 percent sure of how the engine management system controls those feed gasses, what the LTFT and STFT numbers are trying to tell you or what RTFT or TFT mean, this month's edition of The Trainer is for you. **TLZ**

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## [VIDEOS]



When the compressor won't compress

[MotorAge.com/apr15trainer](http://MotorAge.com/apr15trainer)



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# Quality Connection

Dedicated to Quality Kia Vehicle Repairs

SPRING 2015 VOL. 10 | NO. 1

2015 SOUL

[Models may vary.]

[www.kia.com](http://www.kia.com)

## CROWNING ACHIEVEMENT(S)

The new K900 challenges the industry's status quo

## "ONE-TOUCH" SUN OR SHADE

Replacement motors assure smooth operation

## LOWERING THE BOOM ON NOISE

Follow this simple procedure to quiet the cabin



Genuine Parts

# Our Crowning Achievement(s)

## The new K900 challenges the industry's status quo

**W**hat would a king drive? Or a better question is: What *does* a king drive? Well, among several other exotic automobiles, he drives Kia's new luxury K900. The royalty we're referring to, of course, is LeBron James, king of the basketball court. The ten-time NBA All-Star, who also is a philanthropist, businessman and trendsetter, has partnered with Kia to be the "K900 Luxury Ambassador." But it's not just a run-of-the-mill endorsement. Rather, the partnership was formed out of mutual admiration when James reached out to Kia, the Official Automotive Partner of the NBA.

"I was a Kia K900 driver and fan before we decided to become partners, so I'm really excited to be Kia's first-ever luxury ambassador," says James. "This partnership is about the power of great style and performance. Kia and the K900 are out to challenge conventional wisdom and show people how to think differently, and I can relate to that. For me, a partnership has to be authentic and real to who I am, and that's what makes this one so special."



Kia's K900 Luxury Ambassador LeBron James

Like James, most people are thinking differently about Kia. Motorists watched Kia fight its way from being labeled a "budget brand" to a "value brand," meaning that Kia consistently exceeds expectations and delivers a lot of car for the money whether you're talking about a Soul or a K900. Proof of this can be found in some of the accolades and awards Kia has received, including Kelley Blue Book's Brand Image Award for "Best Brand Value" in 2014 and a No. 4 ranking in Consumer Reports' 2014 Car-Brand Perception Survey.

Even so, there are naysayers who overlook Kia's achievements and doubt

that the K900 can compete effectively in the luxury vehicle market. Apparently, this thinking is based on the notion that no car company has been able to make such a leap in such a short time. Somehow they haven't recognized the difference between a company that follows the status quo and one that challenges it.

Just two years ago, we launched the Kia Cadenza, which J.D. Power recognized as the "Highest Ranked Large Car in Initial Quality in the U.S. in 2014." The K900 is our encore and crowning achievement. But the other great achievement we seek is your endorsement as the manufacturer of vehicles that are well engineered, and as such, are easy and fun to maintain and repair. LeBron may be the king on the court, but we want you to feel like the king in the bay and a partner of Kia.

### Kia Motors America, Inc.

*2015 K900 V8 available in select markets with limited availability. All trademarks and tradenames are the property of their respective owners.*

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### Genuine Kia Reman Parts

Look for the label to ensure quality and confidence

*Kia Motors America makes no warranties/guarantees regarding the instructions represented in this publication. Do not attempt without the proper skills, training, or tools.*



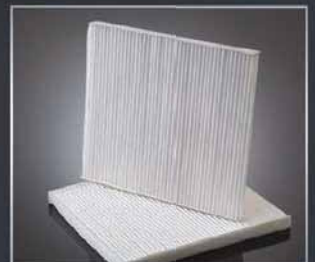
# Genuine Kia Parts.

Expect nothing less.

2015 Soul!

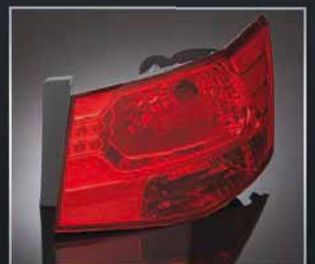
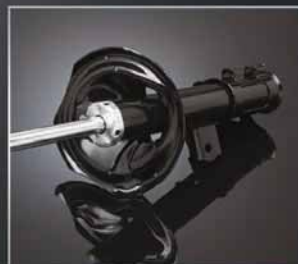


2015 Cadenza Limited



Kia vehicles are at the forefront of today's technological engineering. Unique components in our Kia vehicles demand precise engineering and fit. Kia customers deserve Genuine Kia replacement parts to keep them satisfied for years to come. Our brand's popularity continues to grow meaning more Kia customers for your shop. Always specify Genuine Kia Parts for the highest level of fit, function and quality.

Contact your local Kia dealer today for assistance and delivery of your parts.



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# Lowering the Boom on Noise

MODEL FEATURED:  
2009 Borrego  
(HM)

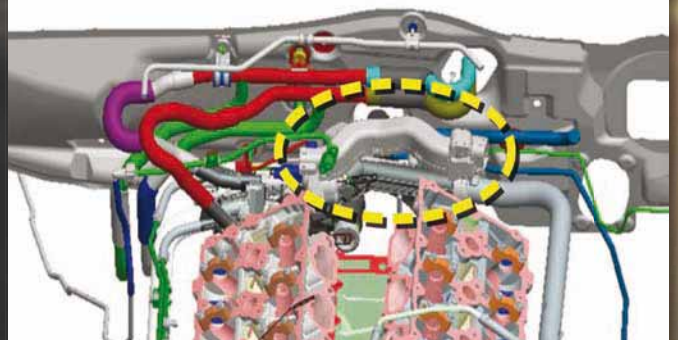
Follow this simple procedure to quiet the cabin

» **WARNING:** Do not attempt without the proper skills, training, or tools. Vehicle servicing performed by untrained persons could result in injury to those persons, to others, or to the vehicle.

» This and other technical information is available at [www.Kiatechinfo.com](http://www.Kiatechinfo.com).

» All images are for illustration purposes only.

Thermostat housing assembly located in the rear



## REQUIRED PARTS

Part Name	Part No.	Qty. Required
WTC Wiring Assembly Kit	91403 2J010FFF	1
Thermostat Housing Assembly	25600 3C502	1
Wire Harness Connector Bracket	39211 3C700	1
Connector Bracket Mounting Bolt	11403 06126K	1
Gasket LH	25614 3C100	1
Gasket RH	25614 3C200	1
Condenser	27325 37400	1





**T**o alleviate a booming noise from inside some Borrego (HM) vehicles equipped with 3.8L engines, which were produced between May 20, 2008 and October 8, 2008, follow the procedure outlined in this article. Affected vehicles may experience this noise while being driven at around 2000 rpm. The internal noise is transmitted via the heater pipes and thermostat housing.

**1** Remove the intake manifold using the electronic service information; drain coolant as required.

**2** Cover the air inlets to prevent foreign materials from entering the lower intake manifold. Disconnect fuel line and reposition out of the way.

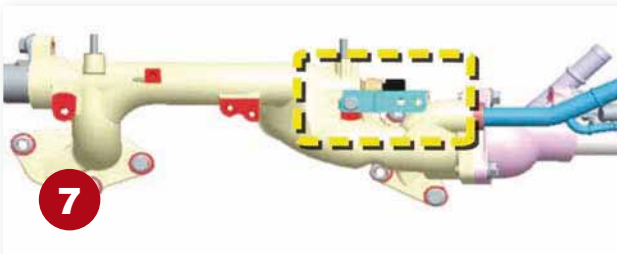
*Notice: Take care to avoid foreign materials from entering the engine during work procedure.*

**3** Disconnect heater hoses from heater pipes and nipples of the thermostat housing assembly.

**4** Remove bolt for the auto transaxle oil level dipstick tube if necessary. Remove the engine coolant pipe from the thermostat housing.

**5** Partially remove the wiring harness for clearance which passes over the thermostat housing assembly.





**6** Remove the six thermostat housing assembly mounting bolts from the engine. Remove the thermostat housing assembly from the vehicle.

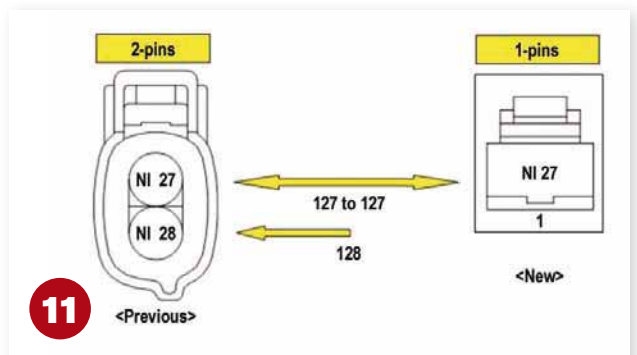
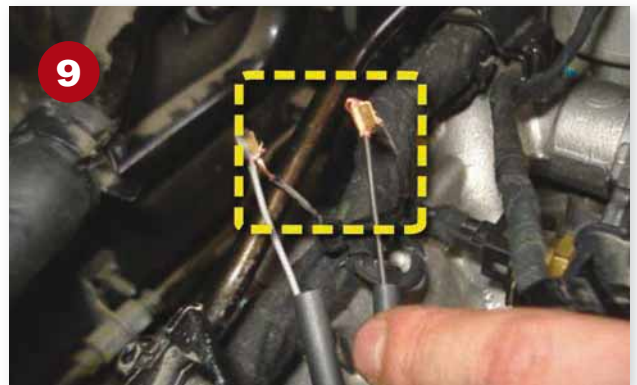
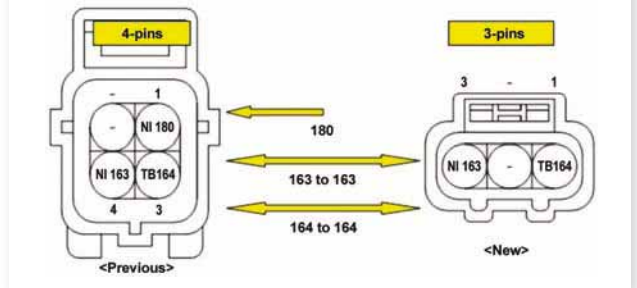
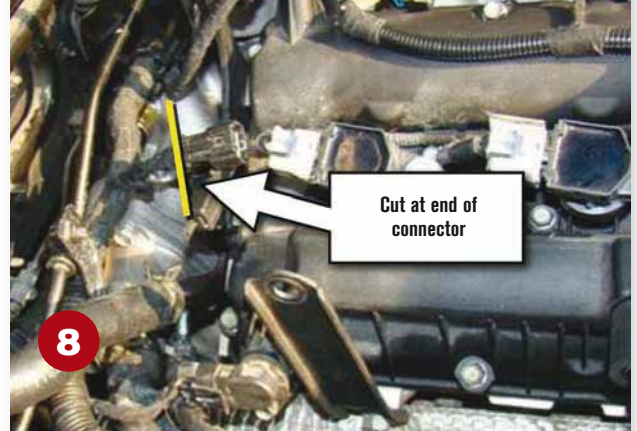
**7** Install the new wiring harness connector bracket to the new thermostat housing assembly. Then, install the new thermostat housing assembly and gaskets to the vehicle in reverse order of removal. Torque the six fasteners to 14~17 ft. lbs. (19~23 Nm).

**8** Cut off and discard the WTS (Water Temperature Sensor) wiring harness side connector to replace the 4-pin connector with the 3-pin connector. Cut the wire at the end of the connector. Connect wires in the same color. For pin 180, cut wire, then seal the cut end by using a heat shrink tube supplied in the kit. Pin 180 is not being used.

**9** Twist and join the wires of current and new WTS wiring harness connector and splice terminals supplied in the kit, then solder the connections.

**10** Cover the wire joints with heat shrink tubes and subject heat shrink tubes to heat. Tape the wires with electrical tape as required.

**11** Replace the noise condenser wiring harness side connector with new one supplied in the kit. Connect 127 to 127. Terminate 128, then cut and seal exposed wire end. Install all the removed components in reverse order of removal. Road test the vehicle to ensure proper operation. **KIA**





# GENUINE KIA PARTS

Expect Nothing Less.



2015 K900 Luxury V8  
with VIP Package shown.



ALWAYS SPECIFY GENUINE KIA PARTS FOR THE HIGHEST LEVEL  
OF FIT, FINISH & QUALITY.

Kia vehicles are at the forefront of today's automotive design. Unique details in our Kia vehicles demand precise engineering and fit. Kia customers deserve Genuine Kia collision replacement parts to keep them satisfied for years to come. Our brand's popularity continues to grow meaning more Kia customers for your shop.

**Contact your local Kia dealer today for assistance and delivery of your parts.**



Genuine Parts

# “One-touch” sun or shade

## Replacement motors assure smooth operations

This article provides the procedure to replace the panorama sunroof and sunshade motors on some 2012-2013 Optima vehicles, produced from August 9, 2011 to August 14, 2013, which may exhibit a loss of the “one-touch” open/close feature of the sunshade and/or panorama roof. This condition may be attributed to the exposure of the ECU in each motor to static electricity, causing a loss of initialization memory. To correct this concern, install the new sunroof and sunshade motors by following the procedure outlined here.

*Refer to the table at right to differentiate between the sunroof and sunshade motors.*

» **WARNING:** Do not attempt without the proper skills, training, or tools. Vehicle servicing performed by untrained persons could result in injury to those persons, to others, or to the vehicle.

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» All images are for illustration purposes only.

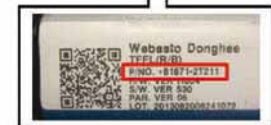
### MOTOR DIFFERENTIATION



Sunroof Motor  
P/N 81671 2T210



Sunshade Motor  
P/N 81671 2T211



**Notice:** VINs which start with KNA are designated Optima (TF/TF HEV) and built in South Korea. VINs that start with 5XX are designated Optima (QF) and built in the United States. This TSB applies to Optima (QF) only. After replacing the panorama sunroof and sunshade motors, perform the panorama sunroof motor initialization.





**Service Procedure:**

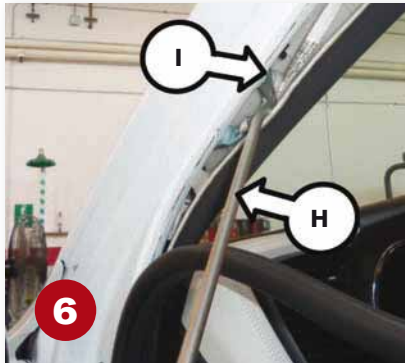
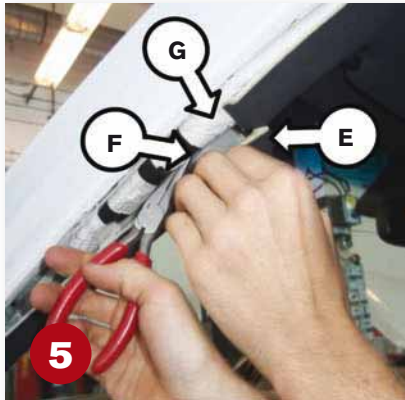
**1** Remove the weather-stripping (A) from the front and rear doors.

**Caution:** Wear disposable gloves to avoid damaging the headliner.

**2** Remove two screws securing the grab handles (B). Make sure to remove all four grab handles.

**3** Use a plastic prying tool to remove the lenses from the rear dome light (C). Remove two screws securing the rear dome light body and disconnect the electrical connector.

**4** Open the sunglasses holder and remove two screws securing the front dome light (D). Gently pull down on the front of the dome light to release the mounting clips, disconnect the electrical connector and carefully remove the dome light from the headliner.

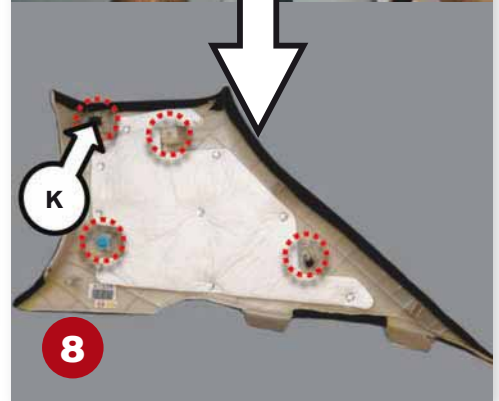
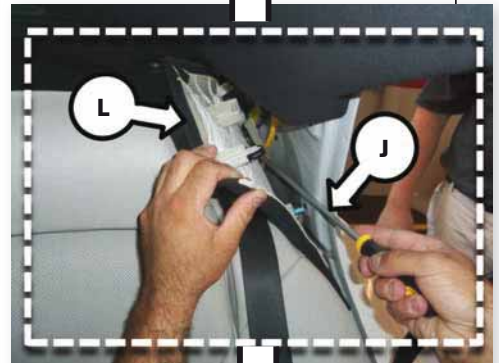
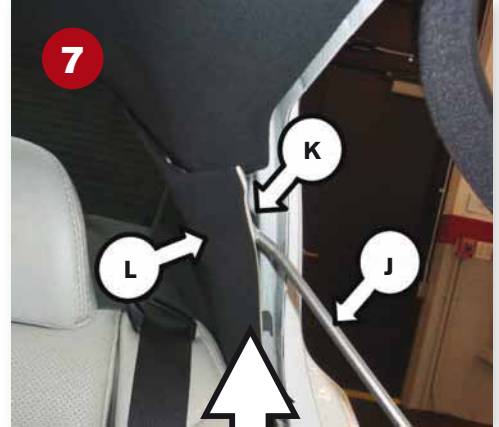


**5** Partially detach the A-pillar trim panel (E) using both hands, then use a pair of needle nose pliers to rotate and detach the mounting clip (F), as shown.

**Caution:** Avoid damaging the side curtain airbag (G) while removing the A-pillar trim panel.

**6** Use a panel remover (H) to gently detach the lower attachment point (I) for the A-pillar trim panel.

**Notice:** Make sure to replace any broken clips before reinstalling the A-pillar trim panel.  
P/N: 82315 33020  
Description: Fastener-DR Trim

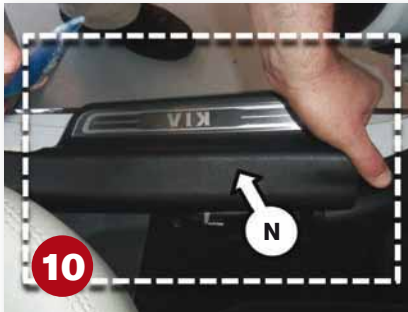


**7** Use a trim panel remover (J) with a long shaft to pry-off the upper attachment point (K) for the C-pillar trim panel (L), as shown.

**8** Continue using the panel remover (J) to gently detach all other mounting locations for the C-pillar trim panel (L).

**Notice:** Make sure to replace any broken clips before reinstalling the C-pillar trim panel.  
P/N: 82315 33020  
Description: Fastener-DR Trim

**Notice:** Examine all mounting clip locations for the C-pillar panel.



**9** Move the front seat as far forward as possible and use a plastic prying tool to remove the front door threshold panel (M).

*Notice:* Make sure to reinstall any clips that may fall off the panel following removal.

**10** Use a plastic prying tool to remove the rear door threshold panel (N).

*Notice:* Make sure to reinstall any clips that may fall off the panel following removal.

**11** Lower the safety belt to its lowest setting and use a trim panel remover to detach all mounting locations for the upper (O) and lower (P) B-pillar trim panels.

*Notice:* Make sure to replace any broken clips before reinstalling the B-pillar trim panels.

P/N: 82315 33020

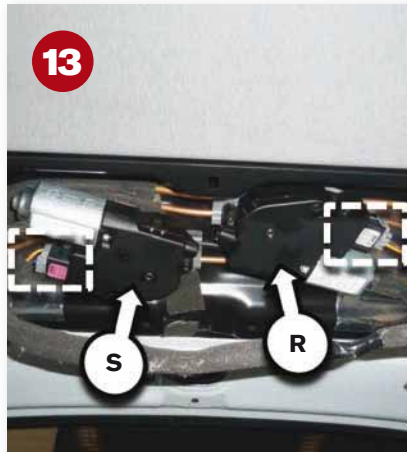
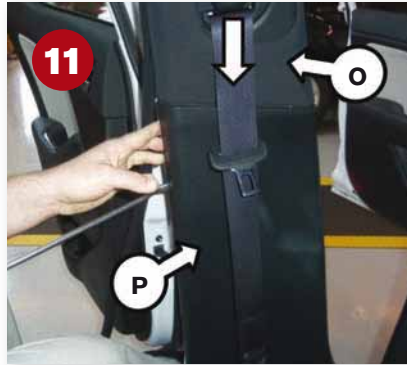
Description: Fastener-DR Trim

**12** Gently apply downward pressure to the headliner (Q) to create an access gap to the sunshade and the sunroof glass motors.

*Notice:* Make sure to replace any broken clips before reinstalling the headliner.

P/N: 85849 1M000AS

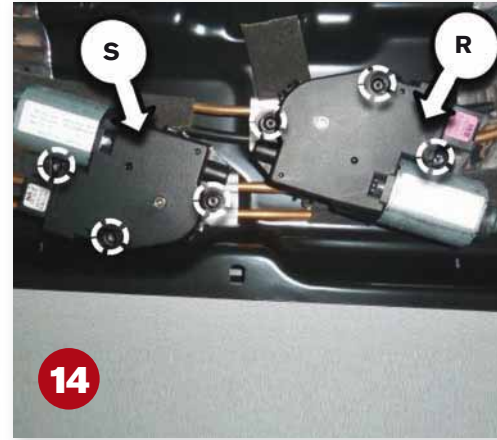
Description: Clip-Trim MTG



**13** Disconnect the power connectors from the sunshade (R) and sunroof (S) motors.

**14** Remove three T20 Torx® head screws securing the sunshade motor (R) and three T20 Torx® head screws securing the sunroof motor (S).

**15** Install the new sunshade motor (R) and sunroof motor (S) using the original T20 Torx® head screws and reconnect the electrical connectors. T20 Torx® Screw Tightening Torque: 2.8 lb-ft (3.8 Nm)



**Complete and initialize**

Install all other removed components by reversing the order of removal.

Perform the panorama sunroof initialization procedure as follows:

- Turn the ignition switch to the ON position and close the sun roof completely.
- Release the control lever.
- Push and hold the control lever forward (for more than 10 seconds) until the sunroof tilts and slightly moves. Then, release the lever.
- Push the sunroof control lever forward in the direction of close until the sunroof operates as follows:

SUNSHADE OPEN → TILT OPEN → SLIDE OPEN → SLIDE CLOSE → SUNSHADE CLOSE → Then, release the control lever.

When this is complete, the sunroof system is reset. **KIA**



# Kia Genuine Parts Are Closer Than They Appear



**DO NOT LET QUALITY PASS YOU BY.**

Your reputation depends on repairs done right – the first time. Kia Genuine Parts are manufactured to the same exacting standards as original equipment. Don't take chances by using after-market parts. Are you willing to risk your reputation and customer satisfaction? A happy customer is your best advertisement. Protect your customer, Protect your business – Insist on Kia Genuine Parts.

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Genuine Parts

# How do you tell a new Genuine Kia A/C compressor from a remanufactured Genuine Kia A/C compressor?

Answer: **The label.**

Otherwise, you can't tell the difference. That's because the reman part looks the same as a new part, fits the same as a new part, performs the same as a new part and has the same warranty as a new part. In other words, a Genuine Kia part is a Genuine Kia part, whether it is new or reman.

How is this possible? We have an extensive reengineering process that assesses cores individually — by closely inspecting, cleaning, dismantling, and checking and evaluating them for defects. Then they are brought back to OE spec with new and updated components. In effect, what was used is new again.

You can install this Genuine Kia reman A/C compressor — or any Genuine Kia reman part — with complete confidence that it will work like a new part. That's peace of mind for you and your customer. And all at a reduced cost to the customer which builds confidence in you.

**Genuine Kia Reman parts — every bit as Genuine as new Genuine Kia parts.**



**Genuine Parts**

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Kia Genuine remanufactured parts sold by Authorized Kia Dealer under warranty are covered for the greater of (1) the duration of the New Vehicle Limited Warranty or (2) the first 12 months from the date of installation or 12,000 miles. Labor charges not included when not installed by an Authorized Kia Dealer. Warranty is limited. See retailer for details.

