



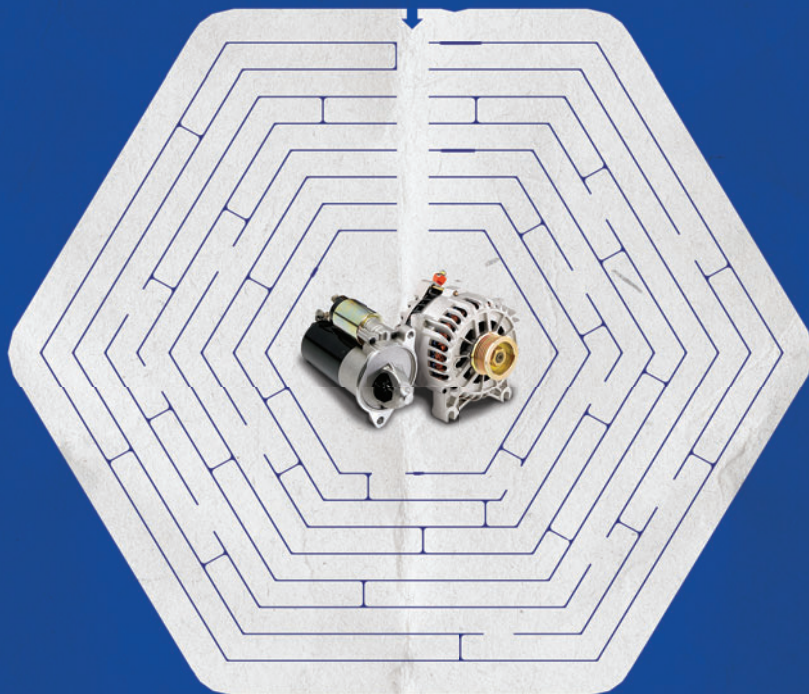
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### 22 ENHANCING YOUR IDS SKILLS

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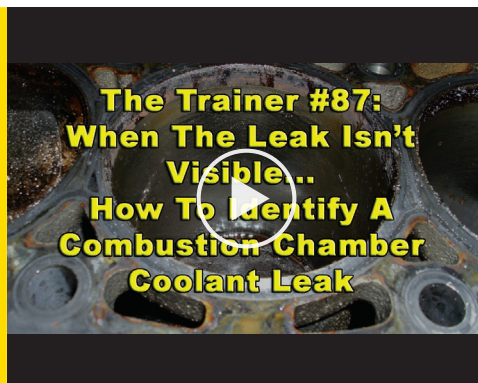
### 46 MAN-MADE PROBLEMS

When what stands between you and a  
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96

### THE TRAINER: IF THE LEAK ISN'T VISIBLE...

The Trainer #87:  
When The Leak Isn't  
Visible...  
How To Identify A  
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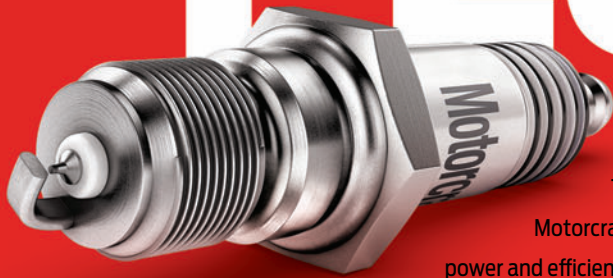
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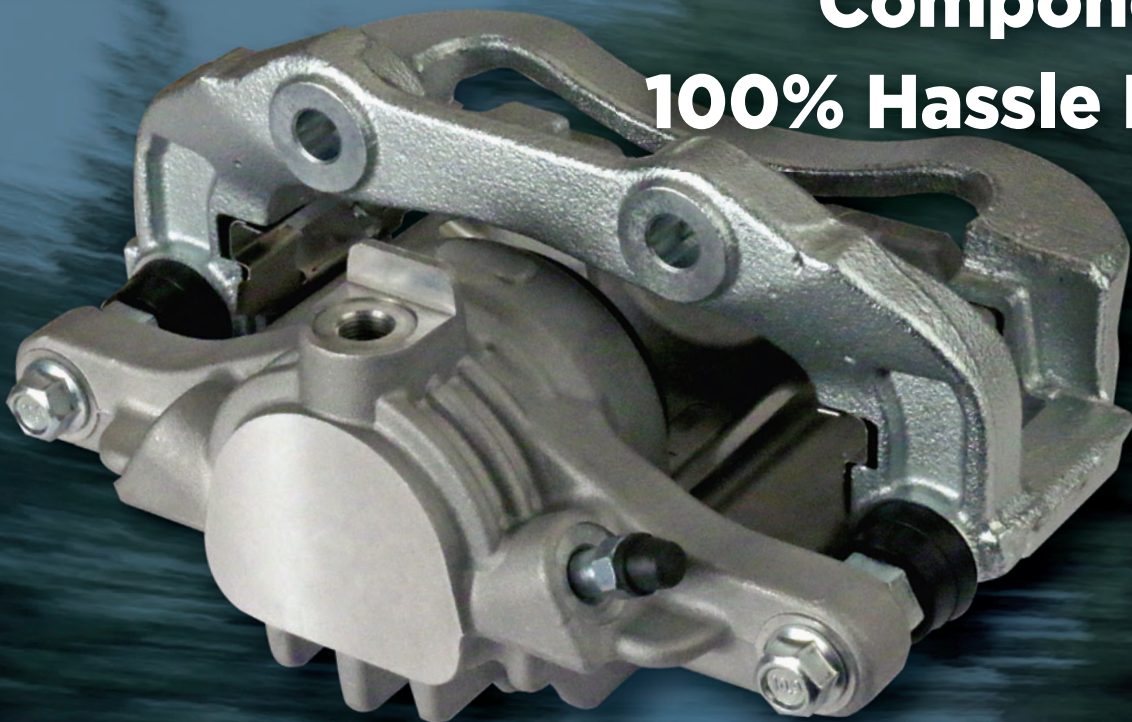
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**BREAKING NEWS**

**INDUSTRY TRAINING**

## TST 2019 BIG EVENT OFFERS EXPO, EDUCATION, PRIZES

 The 16<sup>th</sup> Annual TST Tech Training Big Event is fast approaching next month, and features training opportunities from industry experts, an expo and chances to win great tools.

Set for Saturday, March 30 at Westchester Marriott in Tarrytown, NY, the Big Event will offer a keynote speaker, three training seminars, a hot breakfast, lunch and snacks throughout the day.


Be part of the largest electronic handout automotive seminar in the country. Your registration includes a free Android tablet loaded with three full-color manuals and a newsletter. “Our goal is to keep our fellow technicians up to date with the latest technology,” said G. Jerry Truglia, TST founder. With Vin Waterhouse of the Waterhouse Group presenting the keynote, here are the training sessions:

>> CONTINUES ON PAGE 6

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## ASA'S REDDING GIVES LEGISLATIVE UPDATE FOR 2019

**KRISTA MCNAMARA //**  
Content Channel Director

 ASA's Bob Redding, the organization's Washington, D.C. representative, offered a legislative update for the beginning of 2019, discussing vehicle safety inspections, data access, OEM repair procedures and aftermarket parts.

### Safety inspections

Redding began with developments in Missouri, what he deemed the ideal “template” for other states to follow in terms of automotive programs.

“Almost every year, the Missouri Vehicle Safety Program is attacked in the state legislature. Last year, it was in the

form of House Bill 1444. Unfortunately, we've seen House Bill 451 reintroduced. We need to stop it and in working with industry partners we hope we can do that,” Redding said.

Only 15 states in the U.S. currently have state vehicle inspection programs, with as many as 30 boasting them in the past. “We think these are invaluable to protecting the motoring public. We would like to see the 15 maintained and enhanced to other states,” Redding said. And it seems a logical step, as many in legislature — particularly U.S. Senators — have raised concerns about autonomous vehicles and their safety.

“So where is the responsibility?”

>> CONTINUES ON PAGE 6

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### TRENDING

#### THREE DRIVERS FOR CORDLESS TOOLS

Cordless tools are now as powerful as air tools, says Ingersoll Rand, thanks to advancements in technology like smaller, cost-effective brushless motors and battery capacity.

[MOTORAGE.COM/NOCORD](http://MOTORAGE.COM/NOCORD)

#### DRIVE BRANDS ACQUIRES SUPER-LUBE

Take 5 Oil Change announced the acquisition of Super-Lube, a chain of quick lube and automotive service centers with 48 locations in Florida, Wisconsin, Indiana, Illinois and Alabama.

[MOTORAGE.COM/TAKES](http://MOTORAGE.COM/TAKES)

#### REPORT ADDRESSES TOOLS, EQUIPMENT PURCHASES

The Auto Care Association released the Purchasing Trends Study — Tools and Equipment 2018, which sheds light on key factors influencing shop purchasing decisions.

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#### YOUR NEW MANTRA — TEST, DON'T GUESS

Mike Alberry with Mitchell 1 leads you through processes that can be applied to your diagnostic methods for all customer vehicles. This can help techs know the right tests to use for diagnosis.

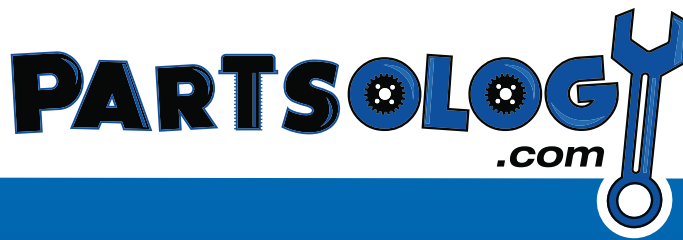
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#### TURN PRICE SHOPPERS INTO CUSTOMERS

In this Remarkable Results podcast, a panel sheds light on how to get in appointment-making mode when answering every phone call and insight into why customers ask about price.

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What professionals are looking at these vehicles to ensure they are safe?" Redding asked.

Recalls also come in to play. Many responsible independent repairers look for recalls on their customers' vehicles – without being mandated by a state program. However, these recalls would be expedited much faster with mandatory inspection programs. "This is a critical piece in consumer education. Take the Takata recall, for example. "It would have been an immense benefit to have shops engaging with consumers," Redding said.

**Data access**

In 2013, Massachusetts and six other states introduced legislation on Right To Repair, along with legislation at the federal level. Now a bill was introduced at the end of 2018 in Massachusetts with changes to the bill regarding telematics, R2R provisions and data access.

"Data access is the new service information. 'Data access' is the catch phrase you are going to see over and over in legislation and at the federal level. We need to ensure, in legislation, it does what automotive repairers need it to do," Redding said.

**OEM repair procedures**

Another top-of-mind legislative issue is ensuring OEM repair procedures are used. Stemming from concern that these procedures were being bypassed, New Hampshire has introduced a bill that will help support the use of these procedures and payment at the shop level.

"Through CIC, ASA meetings and meetings with OEs and other industry stakeholders, we have reaffirmed the importance of maintaining OE procedures in the shop. Now multiple states are drafting legislation, but this does not include parts. I look forward to more discussion about this," Redding said.

**Aftermarket parts**

What Redding deemed a battle between David and Goliath, Wyoming — out of character for a state not deemed "heavy transportation" — introduced Senate Bill 0095 that attempts to define national certification for aftermarket crash parts.

"This is legislation that has been tried with little success over the years. What state agency is equipped to evaluate the certification standard of aftermarket crash parts? Who will certify? How does this protect consumers? And the National Highway Traffic and Safety Ad-

ministration (NHTSA) has rebuked any effort to develop certification for aftermarket parts or standards," Redding said.

The legislation thus far has passed within two weeks without enough shop input. "Any discussion about automotive crash parts invokes conversation about quality issues. These are important issues that require more than a superficial review. Cheaper and quicker does not ensure a quality repair," Redding said. "ASA opposes this legislation. We are working with shops on the ground. We want more study, more review and more input from stakeholders. It provides no protections for shops in an environment where we are more concerned about litigation. And it provides no protection for consumers."

Redding concluded his update with a push for industry constituents to join ASA. "We have found there is power in numbers. We need more members and they need to speak up. We need to make sure we are at the table when decisions are made. If you aren't at the table, you are very likely to be on the menu," Redding said.

ASA will also be hosting a webinar on March 20 discussing further legislative issues. Sign up at [asashop.org/webinars](http://asashop.org/webinars). *ML*

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**TOPIC 1:** Kris Lewis, ATG, will present "Direct Injection & Systems Diagnostics." Gasoline Direct Injection (GDI) is simple in design, but difficult to diagnose. This is why ATG has adapted a "high-level indicator" approach for ruling out possible causes before parts come off. This seminar was built by analyzing actual diagnostic struggles and documenting the shortest diagnostic paths for these systems. Because of this practical approach, you won't be buried in useless engineering detail – only useful facts that you can measure

and that will help guide your diagnostic path.

Lewis brings a unique combination of experience to teaching, including "almost everything."

In addition to decades in a shop focusing on drivability and electrical, he worked with an automotive radio program and mentored many technicians through in-shop training



before transitioning into local training and a hotline service in the mid-2000s. In 2011, Lewis joined The Automotive Training Group as a part-time trainer.

Since then he has traveled the U.S. and Canada delivering ATG training seminars, focusing on practical strategies that he feels are best learned through great interaction with the audience. Lewis is the of Director of Training since 2016 and is an ASE Master L1 A9.

**TOPIC 2:** John Anello, Auto Tech on Wheels, will present “Advanced Driver-Assistance Systems (ADAS).” This seminar will familiarize you with information on current and future vehicles. It will review system information in a high-energy presentation with a detailed case study.

Anello owns Auto Tech On Wheels, and his passion for automotive vehicles has driven him to work on cars for close to 40 years. Anello’s business provides repair garages with on-site diagnostic support for problem vehicles in their shop without having to tow the vehicle to a dealership. In the last 24 years his business has grown to support 1,200-plus repair shops, 400 body shops and 50 transmission shops. He is an ASE Master L1.

**Topic 3:** John Thornton, Autotrain, Inc., will present “In Cylinder Pressure Transducer Diagnostics.” Today, in-cylinder pressure transducers are changing how technicians evaluate the mechanical condition of an engine. Thornton will discuss how to interpret cranking and running compression patterns captured by an in-cylinder pressure transducer. Both good and bad will be analyzed. Exhaust path restrictions, intake path restrictions, cam timing issues, leaking valves, broken valve springs and much more.


Thornton operates a mobile diagnostic business in the Chicagoland area. Thornton assists his repair shop customers with both engine and transmission drivability concerns, module programming, BUS communication issues and electrical

diagnosis. Thornton has over 30 years of diagnostic experience and is an ASE certified Master Technician with L1 certification.

Attendees will also have the chance to win some great tools, thanks to event sponsors. Last year, the event gave away more than \$50,000 in tools and featured more

than 30 vendors.

Register now. For TST members, the cost is \$150 and \$200 for non-TST members. Registration closes on March 18. Sign up online at [www.TSTseminars.org](http://www.TSTseminars.org) or make checks payable to TST at:

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# READY OR NOT — ADAS IS HERE!

Shops who make the proper investment to prepare for ADAS will reap the rewards

**BEN JOHNSON** // Contributing Editor

**A**dvanced Driver-Assistance Systems (ADAS) — if you haven't heard of this term yet, you will!

ADAS is an industry-invented category that includes all those things that help keep vehicles safe on the nation's highways. Blind-spot monitoring, pedestrian detection, adaptive cruise control and emergency braking are just a few features that fit into this category.

While the category may be new, the features it represents are not. Forward collision warning systems were appearing as early as 2001 as options in high-end models. By 2008, which is considered to be the older end of the "aftermarket sweet spot," ADAS-related features were found on some mainstream and luxury models from 18 manufacturers.

First, here's a little more detail about ADAS and how it all works. Depending on the feature set available on a specific vehicle, an elaborate ecosystem of cameras, radars, laser-assisted radar (LIDAR) and ultrasonic sensors (similar to SONAR) feeds information into on-board computers. These powerful computers interpret all that information and — using some artificial intelligence wizardry — enable features that fit into the ADAS category.

The array of sensors, cameras and radar/LIDAR components that supports each feature can vary. Most of the time, adaptive cruise control will be supported by a forward-facing camera as well as a radar or LIDAR system, and information from legacy inputs, such as vehicle speed. The information from these inputs is fed into an onboard computer that uses them to deliver the driver's desired speed, while watching for vehicles in front that might require a speed adjustment (up to and including an emergency braking countermeasure).

Many vehicles rely on both the radar and camera to ensure safe operation. One vehicle manufacturer explained that their forward-looking radar was very capable of identifying an object in front of the vehicle, but it was not so good at identifying what the object was. They explained, "It could be a manhole cover, or



it could be a small child." So in their model, the radar detected an object, then the forward-looking camera was responsible for validating the object was there, as well as identifying what the object actually was (and if it is safe to drive over it).

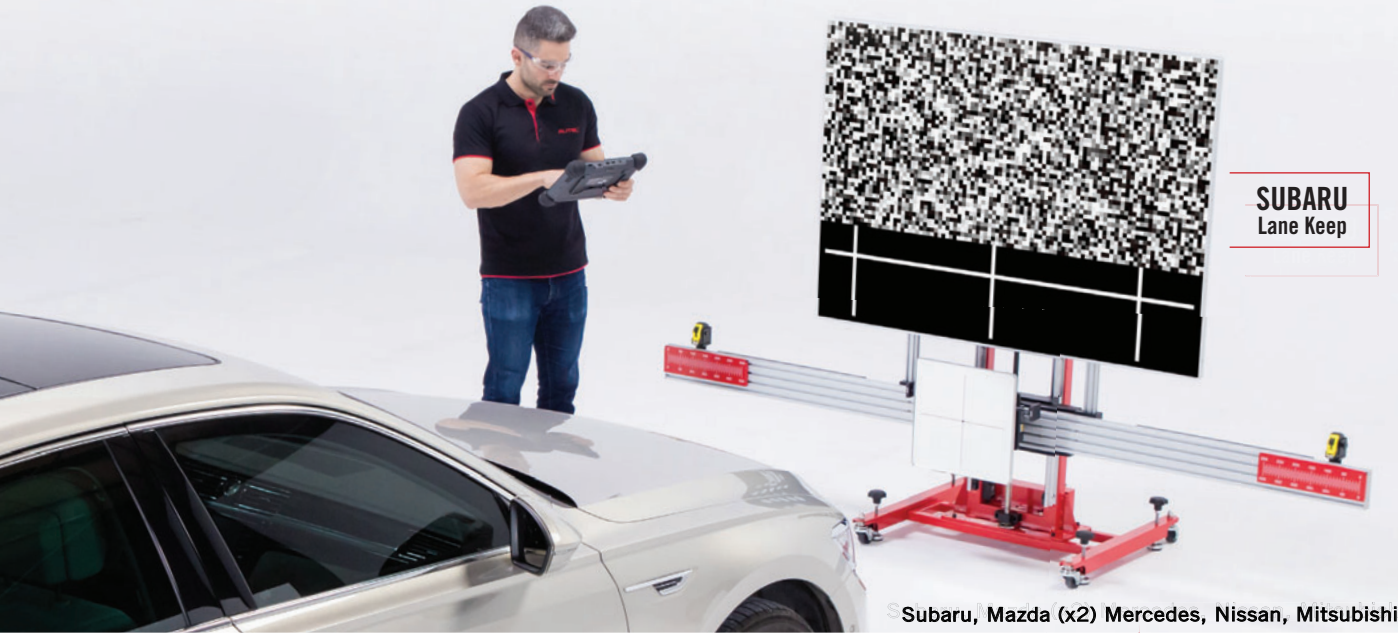
For these systems to function as intended, many of the sensors must be kept in calibration. We're used to that — if the throttle position voltage is out of whack, the powertrain controller believes the accelerator is partially down, right? The challenge with ADAS is that these sensors are all too easy to get out of calibration, and a technician may unknowingly cause that to happen.

This is a huge opportunity for shops! These features are going to carry additional cost to properly maintain the vehicle. But before you put that into your 2019 business forecast, make sure you are prepared.

First, there's an investment required to get into the game. Many of the calibration procedures require specific targeting systems. Several companies now market such kits, with good vehicle coverage. So that's a solvable problem — but as with any other shop investment, you should evaluate the opportunity to gauge the right time to purchase. Ask yourself how many vehicles you're seeing regularly that likely have ADAS features on them and if you can market the service to grow the business, etc.

# ADAS CALIBRATION **AUTEL** NEW COVERAGE

SOFTWARE / TARGETS



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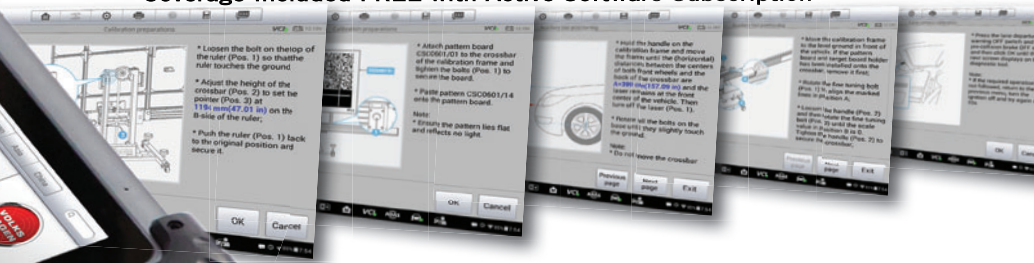
## 6 NEW LDW TARGETS

PACKAGE PART# **LDWTARGET2**



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The other issue to overcome is the problem of space. The average space required for proper calibrations is about 32 feet long by about 45 feet wide. And that means empty space; you can't have posts of lifts or other objects in that space, as during a calibration the components being calibrated could "lock on" to the wrong object, throwing off the calibration. Some vehicles with 360-degree camera systems require much larger spaces. And the calibrations typically can't be done outside, as the sunlight can adversely affect the calibration.

Even many new car dealerships are struggling to meet the space requirements. If you have the space in your shop, you can rest assured some of your competitors won't, which puts you in an enviable position to drive new revenue for your shop. "Hub and spoke" relationships are already blossoming from these needs. In these relationships, shops willing to invest the money and space to support ADAS recalibrations provide those services to nearby shops that may not have the resources or space available to do them. Collision shops are another immediate potential customer, as many of them sub-let these services and are eagerly looking for providers to perform these calibrations.

For those shops that can't — or don't want to — get into the ADAS calibration business, don't stop reading! You're still impacted. As mentioned earlier, many of those sensors, cameras and radar/lidar components need to be kept in calibration, and many of them are (or are nearly) in plain sight and get in the way of non-ADAS repairs.

Let's say you have a 2017 Cadillac in the shop. A rock has hit the A/C condenser, and the refrigerant has leaked out. Because it's not a defect, it's not covered by warranty, so it's in your bay. You have the right parts in hand, and you're performing the R&I procedures. Referring to the manufacturer's service

information, you follow the proper steps to get at it, and then there it is — Step #7: *"Remove the forward range radar module, if equipped."*

It looks pretty straightforward. The R&I is pretty easy, especially in the context of the rest of the job on this particular car. But take a close look at the detailed instructions. The last step states, "For programming and set up, refer to Control Module References." And there are the steps to perform the recalibration when needed. You get lucky with this one — no special targets or fixtures are needed. The calibration is "dynamic," meaning it will self-learn if the calibration procedure is carried out correctly. It is kicked off using a scan tool, but then reality hits. Per the manufacturer instructions:

*"Drive the vehicle within the following conditions for 10-30 minutes or until calibration is complete. The 'Service Driver Assist' message will turn off when calibration is complete.*

- *Drive at speeds greater than 56 kph (35 mph)*
- *Minimize tight curves*
- *Avoid extreme acceleration or deceleration*
- *Follow one or multiple vehicles (Typical vehicle traffic is sufficient, but vehicles 30m - 50m (100 - 165 feet) away are most effective at decreasing the calibration time)*
- *Drive in an environment that has stationary objects on the side of the road (street signs, guard rails, mail boxes, fences, etc.)*

*Verify proper calibration by observing that the "Service Driver Assist" message turns off within 10-30 minutes of normal driving."*


While the conditions outlined likely work well in much of the country, I can think of many places where it's going to be very difficult meeting those requirements. Have you ever tried to stay above 35 mph in Los Angeles or DC — or a

number of other high-density areas in the U.S.? And, what shop has someone they can dedicate to 10-30 minutes per car to carry out the required "calibration drive?"

This is just one example of many different scenarios possible. However, ignoring the calibration step is not an option. Consequences could be disastrous — to the occupants of the vehicle, vehicles around it and ultimately to the shop that performed the last service, which could have compromised the system.

So what to do? One of the major issues in all of this is to understand what you're up against before you take on the job. Because these features and components are not standardized, they can be called any number of things — and the calibration requirements can require a bit of research to uncover.

At Mitchell 1, we've done at least part of this work for you. There is a new "Driver Assist ADAS" button in the ProDemand repair information software. Selecting it will present a table listing the different components and features that may be installed on the vehicle in your bay. It also indicates if and when those components might need calibration, and links to information about how to perform the calibration if one is needed. In addition, diagnostic, R&I procedures, wiring diagrams, etc. are all available. While it doesn't solve all the challenges, it educates technicians before they get into the job, which is important.

As for the business of calibration, it will be up to every shop to decide if they can and want to take this work on themselves, or seek out a shop that can do it for them. Either way, ADAS appears to be here to stay! 



**BEN JOHNSON** is director of product management at Mitchell 1. He serves on the Auto Care Association's Tool & Equipment and Emerging Technologies committees, the Telematics Task Force and the AASA Telematics Working Group.



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# The role of the manager in employee engagement

Technicians join companies but quit managers. Learn how to prevent disengagement.

If you have ever lost a good employee and wondered what you could have done to prevent it, I suggest you keep reading this month. There is a tremendous amount of information out there on hiring and recruiting but very little on how to hold on to them for decades. As if that wasn't bad enough, the Millennials who represent almost half of the workforce need to be treated very differently than Generation X and Y associates. This month, I'll tell you about training I had recently that I believe will help every shop owner in North America and Canada. I tried it out on my very first 20 Group I created 15 years ago, and they agreed unanimously.

## Engagement vs. disengagement

Actively engaged employees represent only 5 to 15 percent of our workforce, engaged typically run at 20 to 25 percent of employees, somewhat engaged 35 to 50 percent and actively disengaged 5 to 15 percent of your employees. The last category are the ones who have already quit, but they haven't told you yet!

Disengagement looks like no focus,

tardiness, low productivity and initiative. Engagement looks like people loving what they do and looking forward to coming to work. Highly engaged shops have 40 percent less turnover, 21 percent more profitability and average 20 percent annual revenue growth. You cannot afford to lose any of the good ones.

**MANAGERS MUST CREATE THE CONDITIONS WHERE PEOPLE WANT TO COME TO WORK BY CREATING A SAFE ENVIRONMENT TO COMMUNICATE.**

## Culture vs. engagement

Many have realized culture is a very important asset to help people want to work at your business. The problem is that your people can be culturally aligned but not engaged! Culture is how things are done around your business. Engagement is individual, between each person and the company.

Also, employee satisfaction does not necessarily mean engagement. Employee satisfaction is just an attitude, but employee engagement is a behavior!

## New models for confronting disengagement

Most management theory was developed around companies that were built and prospered in an era of labor abundance. Leadership 101, I will call it, placed emphasis on the role of the leader within a workplace hierarchy, with specific regard to rewards and punishment. Leadership 201 was more focused on relationships, but still relied on hierarchy, and the leader came across more like a disciplinarian than a trusted colleague. Leadership 301 now is more focused on the whole workplace ecosystem, including the quality of social interactions necessary to create a positive, safe and productive work environment. Does the leader do things *to* employees or *with* employees?

## The role of the manager on engagement

Owners should drive culture while the managers drive engagement. While a shop might have a great culture that owners have worked years to create, if your employees work under a manager who is not using Leadership 301 skills, your people are not going to feel the positive impact of the shop's culture. Managers must create the conditions where people want to come to work by creating a safe environment to communicate. They must give validation and recognition while listening well. They

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**ATI**  
Chris "Chubby" Frederick, CEO

**Automotive Training Institute**



need to lead by example while encouraging and mentoring others.

The ATI model is to first help you understand what employee engagement looks like. Next, you need to measure it, because if you can't measure it you can't manage it.

So start aligning your people by two-way communication, not one-way. Quite often surveys suggest employees want more communication while owners feel like they are sharing their vision and goals completely. The problem is you are not always letting your employees communicate what they want and need.


Then there is the subject of growth and development. Do your employees feel you're investing your time and money in helping them grow? Are you interested in helping them get where they want to be in their life? If you are not, there is a shop owner or manager out there willing to put forth the effort.

Are you and your manager delivering the recognition needed to continually motivate them to succeed? Recognition is much more than monthly or annual awards! It needs to occur daily when your people are doing things right and succeeding in their job.

It's time for your managers and you to build relationships with all your people and create trust so they can accomplish their goals by working for you over decades, not just a few years. I realize they are not all like us, and that makes it more challenging than befriending the

ones that are like us!

To help you along, you could follow some advice from me: "Where your mind goes your ass will follow!" I am sure I will take some heat for that famous quote; however, simply begin focusing your mind on two-way communication, growth, recognition and trust with your people.

If you would like a few sample questions to help you deliver better one-on-ones with your people that will help you deliver better employee engagement, simply go to [www.ationlinetraining.com/2019-03](http://www.ationlinetraining.com/2019-03) for a limited time. Give it a try — you'll be happy when you see 40 percent less turnover and 21 percent more profit! 



**CHRIS "CHUBBY" FREDERICK** is the CEO and founder of the Automotive Training Institute. ATI's 130 full-time associates train and coach more than 1,500

shop owners every week across North America to drive profits and dreams home to their families. Our full-time coaches have helped our members earn over 1 BILLION DOLLARS in a return on their coaching investment since ATI was founded.

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# Site efficiency measurement can identify key problems

Evaluating your team can show which processes are failing

**S**hop management can get sidetracked when they only focus on individual productivity. What about the TEAM productivity as a whole and the effect on the business?

Measuring the entire shop as a team can help direct management to certain processes that are failing. When processes fail, net income disappears. It also tells us much more. This measurement is called “site efficiency.”

Let’s look at the steps required for this measurement. Insert your own numbers and note that the longer the period of measurement to start (i.e. one full year), the more accurate the measurement will be. Once you have this “base” measurement established, then you can proceed with a weekly and monthly measurement to compare your progress.

The information you require to complete the measurement is the following:

- # of days per year the shop is actually open (Example: 243 days)
- # of days per week the average technician works (Example: 5 days)
- Average hours per week a technician works (Example: 44 hours)
- The business labor (door) rate (Example: \$125)
- The total labor sales for the year (Example: \$561,731.25)
- The equivalent number of technicians on staff (Example: 3 licensed technicians/journeymen) *Note – An A Tech or Master Tech is 1 full tech and an apprentice tech (B or C Tech) is equivalent to ½ tech for this measurement.*

**Step 1:** Take the total hours per week an individual technician works and divide it by the number of days a week worked. This equals the total average technician hours per day.

Example: 44 hours ÷ 5 = 8.8

**Step 2:** Take the average technician hours per day times the number of days per year. This equals the number of technician hours worked (paid) per year.

Example: 8.8 X 243 = 2,138.4

**Step 3:** Take the number of technician hours worked per year times the number of technicians. This equals the number of hours available per year to produce labor.

## WHEN PROCESSES FAIL, NET INCOME DISAPPEARS. IT ALSO TELLS US MUCH MORE. THIS MEASUREMENT IS CALLED “SITE EFFICIENCY.”

Example: 2138.4 X 3 = 6,415.2

**Step 4:** Total technician hours per year available to produce labor divided by 12. This equals the available hours per month for all technicians.

Example: 6415.2 ÷ 12 = 534.6

**Step 5:** Available technician hours per month times the hour labor rate. This equals the potential labor dollars available in the shop for a month.

Example: 534.6 X \$125 = \$66,825.00

**Step 6:** Actual average monthly labor of the past year divided by the potential. This equals the site efficiency of the shop.

Example: \$561,731.25 ÷ 12 = \$46,810.94.

\$46,810.94 ÷ \$66,825 = 70 percent site efficiency.

**Step 7:** The actual labor produced per month divided by the average total hours per month for all technicians equals the average labor rate achieved.

Example: \$46,810.94 ÷ 534.6 = \$87.56

The shop is charging \$125 per hour but only achieving \$87.56 per hour to pay the techs and benefits. The shop is operating at 70 percent efficiency; this number should be a minimum of 75 percent with 80 percent being goal. The only way you increase your site efficiency is by improving billed hours — complete proper, professional and accurate vehicle inspections, fully documented, coupled with proper communication between the techs, front counter and end client. Today, this entire process should be fully electronic, with each technician utilizing tablet technology through cloud computing, providing live, secure and accountable transactions.

Do the math and then follow the math. Once the self-discipline is in place to execute what the math is telling you to focus your attention on, the bottom line of the shop will grow as you have never experienced before. **TL**



**BOB GREENWOOD, AMAM**, is president and CEO of Automotive Aftermarket E-Learning Centre Ltd. (AAEC), which provides business management resources for

the automotive aftermarket. Bob has more than 36 years of business management experience and is one of 150 worldwide AMI-approved instructors.

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# Wyoming crash parts legislation stalls

Collision repairers make a difference at the State Capitol

In a classic David versus Goliath legislative struggle, collision repairers in Wyoming have said no to legislation historically promoted by some insurers, parts certification advocates and others. Sponsored by State Senator Tara Nethercott, SF0095 passed the Wyoming State Senate and was sent to the Wyoming House of Representatives for consideration.

The Senate summarizes the legislation as follows: “AN ACT relating to insurance; providing standards for the use of aftermarket parts in automobile damage repairs; requiring disclosure when any use is proposed of a non-original manufacturer part; requiring that all aftermarket parts be identified and be of the same quality as the original part; and providing for an effective date.”

The bill language is similar to that proposed in other states and considered numerous times by the National Council of Insurance Legislators (NCOIL). The legislation was introduced in mid-January and passed the Senate in just a few weeks. This did not give stakeholders enough time to mobilize and communicate with their policymakers. The Automotive Service Association (ASA) has opposed this model legislation for a number of years. Specific concerns for collision repairers include the following points:

- Who is to determine that parts meet OEM standards?
- What state agency is equipped to evaluate certification standards?
- How does this protect the consumer?

In letters to legislators, collision repairers stated: “SF0095 encourages the use of aftermarket crash parts without addressing significant issues that could impact a quality, safe vehicle repair after an accident...A cheap, quick vehicle repair does not assure quality or safety for the motoring public. This bill is harmful to Wyoming small businesses and consumers.”

Certification relative to parts is critically important. It’s a task that the National Highway Traffic Safety Administration (NHTSA) has avoided, as it relates to aftermarket crash parts.



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With this said, what state has the resources to define certification and assure that the appropriate standards are met?

Legislation with such critical safety implications deserves more than two weeks of policy debate. Legislation this important should look first to stakeholders, small businesses and consumers for input about these issues.

Fortunately, Wyoming’s collision repair community and industry partners joined together to help educate members of the Wyoming House of Representatives about SF0095 and the importance of these policy issues. Collision repairers communicated their concerns to members of the Wyoming legislature — and it appears the Wyoming House of Representatives won’t be moving forward this session with SF0095. The Wyoming legislature is scheduled to adjourn at the end of the month.

Clearly, this time-consuming exercise was burdensome to collision shop owners, but it did give them an opportunity to reach out to policymakers and help educate them about the industry. There is a remedial understanding of collision repair, at best, among policymakers. This is an example of a

crisis that also presented an opportunity. In addition, this demonstrates that small businesses speaking with one voice can make a difference even in a brief amount of time.

Legislation like SF0095 can certainly reappear in the future, but repairers will be more prepared to address their concerns at the State Capitol. Whether parts legislation removes consumer protections, eliminates notice and consent or puts collision shops at risk, policymakers should include stakeholders, consumers and repairers in the conversation. SF0095 is just one example of legislation that is harmful to the collision industry. Repairers joining together, with one voice, can make a difference. *ZZ*

**ROBERT REDDING** is the Automotive Service Association’s Washington, D.C. representative. He has served as a member of several federal and state advisory committees involved in the automotive industry. [rredding@reddingfirm.com](mailto:rredding@reddingfirm.com)

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# Building the perfect playground

Shop owner focuses on providing a fun environment driven by teamwork

**ROBERT BRAVENDER** // Contributing Editor

➔ They are definitely a photogenic bunch. Perusing the Auto Check Elite website and Facebook page, you'll see photos of staff in race crew shirts being passionate about their work at this Katy, Texas repair shop. They're also diverse — besides employees from Houston's environs, there's one from Switzerland, one from Uruguay, while their boss, Matthew Roayae (pronounced Roy-i-e), was born in England.

"My dad used to work for General Motors," Roayae reports. "He was sent to England to get training on hydraulics, (and) I was born in Wakefield." His father also instilled in him a love of cars, "so when I was about 20 years old I had the opportunity to work in a shop." Starting entry level as a janitor, he began working his way up through the ranks until he became a technician.

"When I was working as a lube tech," Roayae relates, "I got tired of waiting for the service writer to write up the ticket and go talk to the customer, so I took charge." On his own initiative he'd sell and perform tire rotations or simple installs. The resulting increase in sales got him promoted. "I had no training; everything was trial by error."

Within five years, his ambitions kicked in again; Roayae started saving money and trying to learn as much as he could about the business before buying the shop in 2005. "I had no idea what the hell I was doing," he recalls, so he relied on the same impetus he used when he was an employee. He started with a skeletal crew — himself as service writer, a 'B' tech to handle oil changes and brakes jobs, and an 'A' tech for big repairs. In about three years they went from doing about \$300,000 a year to around \$1.5 million. The team of three quickly went to 12, and the eight-bay facility was overwhelmed with work. "There was no place for me to park cars," he laughs, "I had to hire someone to valet cars across the street."

They moved to a larger shop, but Roayae didn't like the location and began looking at building a new facility from scratch. He picked his employees' brains for ideas on improving performance, and began customizing the design to better fit their needs. By 2016 the new shop was open. "In my opinion, this is as good as it gets," he proclaims. "I'm not going to open another shop. I'm DONE."



## AUTO CHECK ELITE

Katy, Texas // [autocheckelite.com](http://autocheckelite.com)

**Matthew Roayae**

Owner

**9,000**

Total square footage of shop

**1**

No. of shops

**10**

No. of bays

**13**

Years in business

**130**

No. of customer vehicles per week

**8**

No. of employees

**\$2.5 million**

Annual gross revenue

Permits, frontage location and zoning all caused the plans to be made over nearly 20 times. "But it's here," Roayae smiles. "It's in a golden spot, and I feel like everybody that works here with me is a rock star. Everybody comes to work to play; I've built them a playground."

Like air conditioning the shop against sultry Houston summers, making the doors electric to keep the cool in, even to how music is played. "I bought concert equipment — the speakers in the shop are taller than me," comments Roayae. "Nobody will spend \$6,000 just on the subwoofer. It helps in building an atmosphere, a culture (where the staff) really has a lot of fun coming to work."

Plus there are company outings to concerts, go-karting, NASCAR and Formula races. "That's my way of saying thank



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you to the guys,” explains Roayae. “I’m proud of them.” The reason why? He says their productivity is up around 130 percent to 140 percent.

“The way the parts department works, the service department works, everything is so smooth like gears in a clock,” he explains. “And when you run at 140 percent productivity, you don’t need as many people as you think.” At one time Roayae had 15 employees — team members, he prefers to call them — only now he does the same work with nine to 10. “If I have two people that do 140 percent, that’s equal to three people who do 100 percent. And those two guys are really happy because they’re getting paid 40 percent more than they’re getting paid anywhere else.”

Roayae looks at the shop’s workflow as a puzzle in which every piece has to fall exactly into place in order for it to work. “I could have a technician who can blow ours out of the water — like he can do 200 hours — but if my parts guy can’t get parts here fast enough, if my service advisor can’t deliver the car fast enough, what good is that going to do? When it works, it’s through teamwork.”

Of course, this wasn’t all discovered by trial and error. Around 2010, Roayae joined the Automotive Training Institute (ATI), “and that helped a lot,” he notes. “I got to meet a lot of good people, and learned a lot from shop owners in different states. I stayed with ATI for about four to five years.” During that period, Auto Check Elite achieved Peak Performance within two years and won a Top Shop award.

It’s through such contacts that Roayae keeps an eye on high-tech market shifts, where he’s always willing to invest in new equipment. “I will never stop investing back in the business,” he asserts. “I’m the only shop that I know of in Texas, maybe the whole U.S., that has all the targets to calibrate sensors on self-driving cars. You can buy pieces, like self-parking systems for Nissans.”

He learned that body shops were replacing the sensors for these systems; however, nobody could calibrate them outside of dealerships. “It’s a painful job that doesn’t pay as much,” Roayae notes. This calibration includes adaptive cruise control, crash avoidance, self-parking, self-driving — for which he has all the tools.

“I’m excited by this, because it’s my playground. If we get a car that needs to be calibrated, I go step by step and see how it’s done — because I get a kick out of it.” The downside? “One technician taking six classes cost \$3,600. They’re not cheap, but what’s the alternative? I’m always fixing the hard stuff so I don’t get the long-hanging fruit anymore,” he laughs. “But we fix cars nobody else can fix; that’s what we’re known for. It may shift again, but that’s where the money is now.” *ZZ*



**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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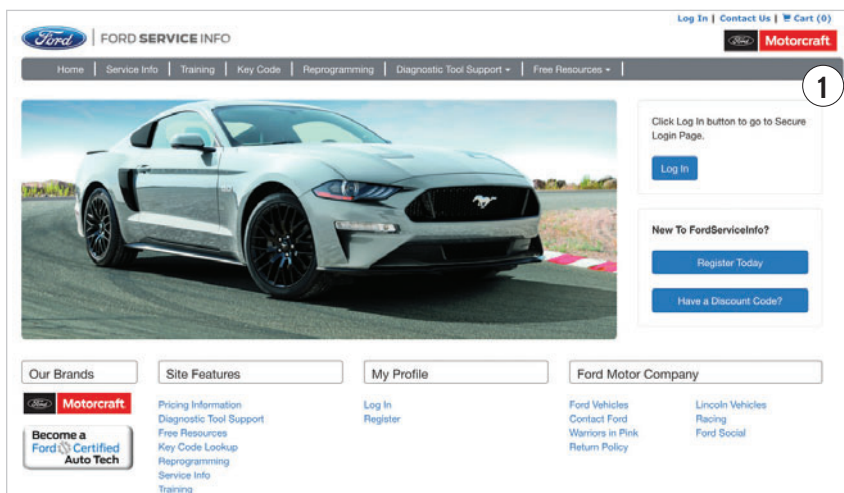
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**MARK DEKOSTER //**  
Contributing Editor

In 2015, I wrote an article (“Inside the IDS,” June) in which I detailed some of the other tests IDS can do besides pulling codes and looking at data PIDs to enhance your analysis of that Ford that is in your bay. Ford is constantly making changes in the software in their vehicles and adding tests of that software into IDS. They release how-to information on their Motorcraft/PTS website in General Service Bulletins (GSBs). In this article I’m going to tell you how to access these bulletins along with some examples of using IDS as these bulletins explain.

I have a disclaimer right up front so that we are all on the same starting point. I am going to make a few assumptions about your skills and access to information. First, I am going to describe things as if you’re familiar with the IDS and somewhat familiar with Ford’s Motorcraft — PTS (Professional Technician Society) webpage (**Figure 1**). On that page if you access service information by VIN, you get an OASIS report along with service publications; if you access by year and model, you don’t get an OASIS and you will get a message offering all TSBs and SSMs. This will also give you GSBs.

These GSBs can be downloaded as PDF files and stored on your shop’s computer system, or even printed and kept in binders at your shop for future reference.



**MOTORCRAFT – PTS LOGIN WEBPAGE**

## Let’s get started!

As we start, I have input the VIN to my 2015 Expedition and I put in a concern about the audio system, so the OASIS report comes up first and has listings for any TSBs and SSMs that may apply to my listed concern. After viewing those, I can move to the TSB/SSM/GSB tab and view all of them that are pertinent to my vehicle (**Figures 2, 7**). Let’s take a look at a few.

GSB 0000156 details Passive Anti-Theft Key Fob reprogramming. As you may know, programming Ford key fobs can be very easy, if you already have two programmed fobs. It is a challenge and you’ll want to have an IDS to program a fob when you only have one. This GSB shows the fobs and the unique methods of programming each style.

Another — GSB 0000106 — discusses accessing and using Historical

Powertrain Diagnostic Codes. These are codes that are not currently confirmed or pending, but have set since the last clearing of DTCs. OBD II regulations prohibit scan tools or disconnecting the battery, from being able to erase emission DTCs from the PCM. They can be cleared and, depending on the scan tool, not show up when scanning for codes, but regulations require the PCM to actually clear the codes. This typically takes 80 or more key cycles without a fault (**Figure 4**).

This is a feature that can be used for concerns that are intermittent and may or may not have progressed to MIL but are not currently present. It is also not available on every Ford. There is a special icon that appears on the left side margin of the IDS screen at the conclusion of the test for PCM CMDTCs, or Continuous Memory Diagnostic Codes (**Figure 5**).

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For those of you who've read my postings, been to training classes that I've done, or have interacted with me over the past few years, you know that I maintain that there are five steps that should be done to every vehicle that comes through the door of your shop and into your bay:

1. Confirm the concern exists as described on the RO.
2. Good visual inspection
3. Check service publications and TSBs.
4. Initial non-intrusive tests
5. Network tests

Steps 4 and 5 are typically confirmed by connecting a scan tool and pulling codes. Generally speaking, if the scan tool communicates with the vehicle, you will get codes if there are network concerns along with the codes that are a result of module self-testing. When the scan tool doesn't communicate with the vehicle or you have Uxxxx codes, you may wish to use GSB 0000043.

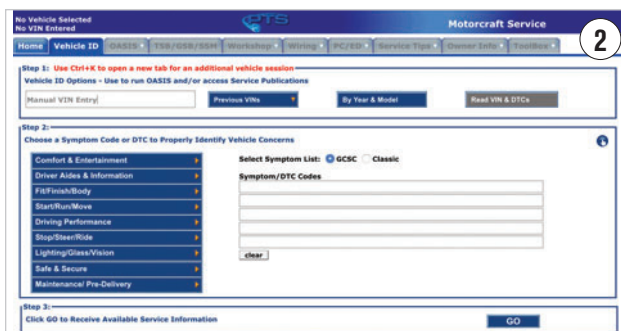
In my previous article, I spent time discussing how to use IDS and PTS together to do network testing. GSB 0000043 is the one that details how to connect to a vehicle using PTS and IDS to do a live network test on the vehicle. By connecting the IDS to the vehicle, and then logging into PTS, you can do a live network test and monitor whether or not the modules in the vehicle respond when the website pings them. You can do the Ford Wiggle test to see if modules stop or start responding on the network. It's very cool. You can read about it in more detail in my previous article and the GSB describing this (Figures 6, 7).

**Analysis best practices**

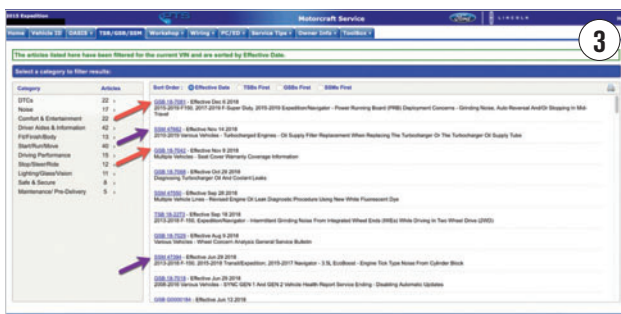
The starting point for analysis of any vehicle is service publications; I prefer OE access. Ford sells access by the year, the month, or for \$21.95 for 72 hours of access. With this access you can get to everything Ford provides their dealer techs to analyze the vehicle, including the ability to connect IDS to your vehicle via the web using Ford's servers and connecting to PTS. The other access you get is to As-Built data, which may be needed during reprogramming modules.

Some boilerplate "this is how you're expected to do things" — whenever testing, programming, reprogramming, making calibration changes, best practices are:

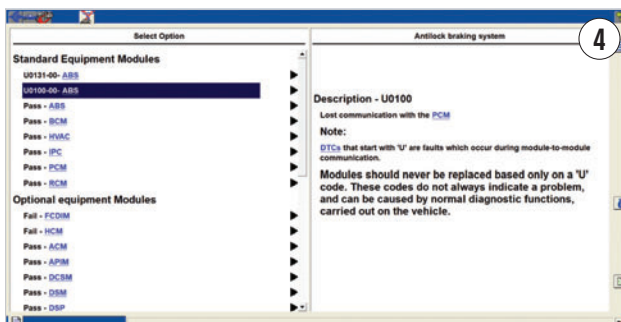
- On your IDS laptop make sure that Windows is set to never go into screen saver or to sleep or to turn off the hard drive(s). It is also a good idea to turn off Automatic Updates; you want to control when that happens.
- Set the Ford websites in Internet Explorer to trust and allow data access across domains.
- Use the USB cable to connect the VCM-VCM II to the laptop.
- Use an ethernet cable to connect the laptop to the shop's internet.
- To really be safe, have your IDS laptop connected to power.



**PTS VEHICLE IDENTIFICATION PAGE.** Use a previous VIN, by year and model, or use IDS to read VIN and DTCs.



**TSB/GSB/SSM SCREEN** showing documents that may apply to this vehicle.



**TYPICAL CMDTC TEST RESULTS SCREEN**



**IDS SESSION STARTED** by the Motorcraft/PTS website showing modules that have responded and those with DTCs in yellow.

- Connect a clean power source to the vehicle to maintain sufficient voltage to keep modules awake.
- Always run a network test to make sure modules can communicate with each other. A new module that has not been

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programmed should be able to pass a network test and communicate with IDS.

- When having problems with network communication, if it worked before and now doesn't, try disconnecting the VCM from the DLC and reconnect.

When you log into PTS and input a VIN or use the self-identity method, you will first get an OASIS report. This report details the history of the vehicle and includes warranty repairs, service actions and possible TSBs or SSMs that may apply to the vehicle based on DTCs or symptoms you have input (**Figure 8**).

As you can see in this image there are multiple articles, TSBs, SSMs and GSBs available for this Expedition. And no, I don't expect that you'll take the time to read every one of them while the customer's car is in your bay. I do expect you to review those that are listed that may be related to the customer's concern. I also expect that you will note the GSBs that you may wish to download and use.

I have input my 2015 Expedition and look at this interesting SSM that has popped up. In the most recent SYNCH update, Ford removed the ability to control the climate seats from the touchscreen. There's a change that I'm sure has caused Ford dealer techs some heartburn when dealing with customers who upgraded the systems and their control is gone. Made me wonder (**Figure 9**).

I've already mentioned a number of GSBs — let's be a little more detailed with two more GSBs today.

### GSB 0000017 2013 and newer vehicles — gasoline engine — Adaptive Fuel Viewer GSB

The first is GSB 0000017, posted in 2015, Adaptive Fuel Viewer. I was very excited when I first saw this as I'm thinking, "Wow, I can finally see LTFT in the different operating blocks without driving the car and recording them. How cool is that?" (**Figure 10**)

This GSB explains that starting with "certain" 2013 vehicles, there will be a navigation button and Datalogger screen for viewing historical LTFT. Unfortunately, the key here is the word "certain." I owned a 2013 Flex with the 3.5 Ecoboost. It didn't have the option. When I traded the Flex for a 2015 Expedition, 3.5 Ecoboost, I figured I would find it on that vehicle. No such luck. Which vehicles have this option seems to be a closely guarded secret, which may explain why it took until 2015 for Ford to produce a GSB on something that started with the 2013MY. Unfortunately, I have not been able to find a Ford with the Adaptive Fuel Viewer option for use in this article (**Figure 11**).

If you're working on a Ford that doesn't have this option, you will need to view adaptive fuel the way we've done it for the past 22 years — by doing a road test. Set IDS to take a two-minute recording and then starting from a stop, accelerate up to about a 20-30 mph cruise, then accelerate up to about 50-60 mph cruise.



**IDS SCREEN SHOWING** interactive and live module testing. Gray shows modules that may be in the vehicle and are not responding. Green shows modules that are responding when pinged.



**OASIS REPORT** that shows when using VIN or Read VIN selections



**SSM, WHICH DESCRIBES** that the climate seat function has been removed from the SYNCH touch screen



**THE ADAPTIVE FUEL VIEWER GSB LISTING**

Review LTFT in those different operating conditions.

For those of you who are not to drivability analysis using fuel trims, look up this GSB on PTS and you can read the whole article. Ford has been training their dealer techs to use adaptive fuel trims, LTFT, to search for patterns as a quick way to analyze



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the likely cause of drivability concerns for 20+ years now.

There are examples of the most common patterns for common concerns. For example, if LTFT is negative at idle, comes to a more normal reading off idle and then goes positive at cruise, we're looking at the most likely symptoms of a contaminated MAF.

### GSB 000150: Various Vehicles — Module Programming and Reprogramming Procedures

This GSB details the process for recalibrating and programming new modules. It is 21 pages long, so let me pull a couple of points that you're likely to use.

### GSB 150: Recalibration of Existing Modules: Tire size – Axle ratio

I had a 2013 Flex that was equipped with 20" factory rims. The tires that were on the car when I bought it used were great tires for dry and wet pavement but nearly worthless on snow. After some initial research, I found that most tire manufacturers don't make snow tires to fit a 20" rim. I ended up buying a second set of wheels, which were 18" diameter to fit the snow tires. This was and is the recommended practice by even the aftermarket tire sites.

This means different diameter rims, different tire diameters and of course new TPMS sensors. Twenty-plus years ago it was a swap without concern. Maybe the speedometer was a little off and TPMS didn't exist, but hey, it's just for a few months — don't worry about the speedo. In today's world how many issues might come up due to different tires? Will fuel economy be affected? How about ABS? Transmission shift patterns? Maybe no problems, maybe some?

Those of you with tire experience are already thinking that if they did it right by changing the tire profile to the new ones, everything will be pretty close, and you're right — they did. The 20" rims had a 45 profile and the 18" rims had tires with a 65 profile. However, this vehicle has the option of recalibrating for different diameter wheels and tires. I went in and changed tire size to the 18" set that I installed. When I put the 20-inch rims back on, I went back in and set it back to the 20" numbers. Let's look at a few screen shots from my Expedition on how that was done.

Once IDS is connected, go to the main menu and select MODULE PROGRAMMING. This brings the next submenu, and there are four options. To get to the tire menu you select PROGRAMMABLE PARAMETERS. This brings up the submenu with your available options. Why Tire Size – Axle Ratio is listed twice I don't know (Figures 12, 13, 14, 15).

My Flex only had the option of changing tire diameter. On my Expedition, I can set tire diameter but as you can see, I also have the option of four different axle ratios. The current



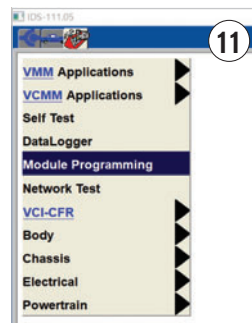
**THE ADAPTIVE FUEL GSB**

ratio has the "\*" alongside it and to change the ratio you simply highlight the new ratio, press the blue checkmark icon in the lower right, and you've changed the ratio (Figure 16). You may be asked to confirm your choice and may also be reminded to clear codes. It is typical to get multiple Uxxxx codes when recalibrating, reprogramming or replacing modules. IDS will shut the module off during reprogramming and those modules that are expecting data will not see it on the network. The result? Uxxxx codes.

### Why you want to follow best practices

While working on my Expedition for this article I ran across an interesting thing the vehicle did. Look at the screen shot and notice that I have a screen full of Uxxxx codes. As I was working on the vehicle trying to scan data (which I had done successfully), when I tried to connect to get to KOEO, as my vehicle has the push button ignition, I started getting message after message that various modules were being shut down. As they did, U codes started popping up. My best guess as to what happened is that after working on the vehicle KOEO, the system voltage dropped too low and, in an effort to maintain enough power to start the vehicle, it began to shut off modules to save energy (Figure 17).

I came to that conclusion because I forgot one of the best practice cardinal rules about working on a vehicle when doing module testing: connecting a clean power charger to the battery positive and a known-good body ground point. I did that and the modules stopped shutting down. I had many codes to clear, but after clearing and using the charger, the system worked as it is designed.



**NAVIGATION PANEL SHOWING** Module Programming access point



**MODULE PROGRAMMING SUB-MENU** to do specific tasks



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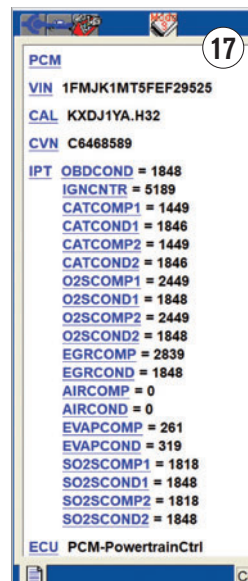
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### GSB 150: MODE \$09 to check for aftermarket programming and monitor completion

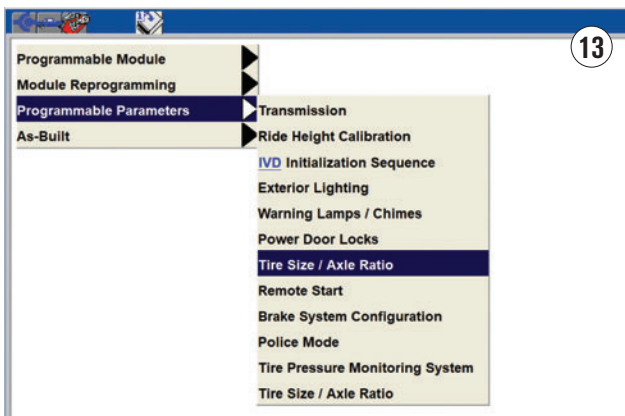
An interesting section in this GSB is the information about what is visible when checking Mode \$09. While this may be more valuable to a Ford dealer tech, this screen and information is a back door into possible tuning modifications that have been done by the vehicle owner. The PID is IGNCNTR, which is telling you how many times the ignition has been turned on since the last PCM reprogram or KAM reset (**Figure 18**). Techs can find if the vehicle had performance chips or other PCM modifications done by aftermarket shops or the own-

ers. Looking at my Expedition you can see that it has been a long time since KAM was reset, with 5,189 starts since last reset.

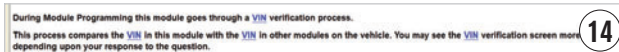
The other PIDs indicate the number of times that OBD II monitors have completed. You will notice that the numbers are different for different monitors. It is true that all monitors are enabled to complete every time you start and drive the vehicle. What is also true is enabling to run does not equal completion. For the non-continuous monitors, in addition to being enabled at engine running and temperature above 160 degrees, there are specific driving conditions that need to happen as well. I was testing that to see what qualified as an OBD II drive-cycle. I got everything ready and jumped on an expressway. I drove for an hour at 70 mph and not a single non-continuous monitor completed. I got off the expressway and drove in an urban area and all of them completed within 2 miles.



**THE MODE \$09 SCREEN** showing data PIDs with ignition counts and monitor completions since last KAM reset or PCM reprogram.



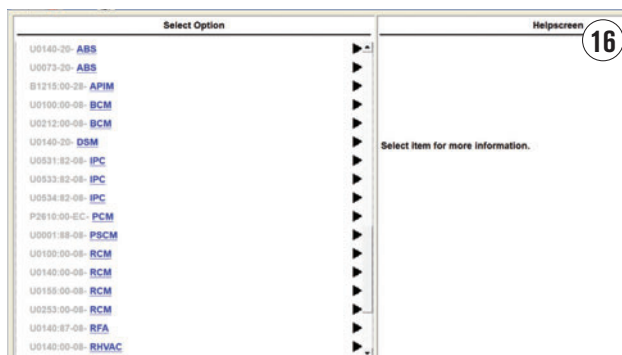
**PROGRAMMABLE PARAMETERS SELECTING** Tire Size/Axle Ratio will get you to the screen where you can reset tire size to ensure speed and other modules that use vehicle speed get accurate information.



**WARNING SCREEN** that IDS may ask questions. You may have several screens go by once you implement the changes.



**AXLE RATIO CHANGE SCREEN**



**THE RESULT OF THE VEHICLE** shutting down systems to save battery power.

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the vehicle and frees IDS to be used on other vehicles during that time (**Figure 19**).

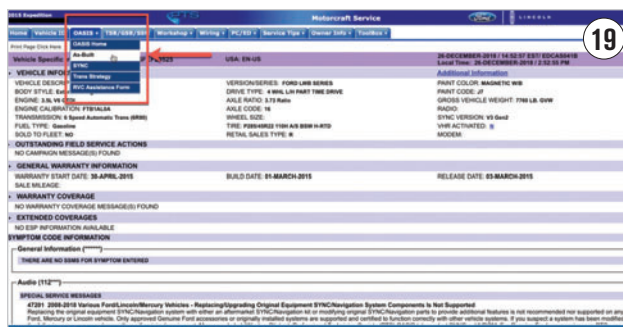
This is important for doing network and module work because what IDS did was inhale the information from the original modules and store it in memory. When you replace the module, it exhales that programming into the new module. In some cases, the software in the old module is lost or corrupt. That is when you need to use As-Built data to reprogram the module.

It has been my experience that replacing a module or flashing the PCM is a very straightforward process when using IDS and doing so with a subscription to Motorcraft-PTS. You follow the prompts on IDS and it does everything for you except clearing codes, although I have experienced

it doing that after a programming event. I did have one experience in which I was asked for As-Built data to complete replacement of a module.

- **Hold (saves recordings).**
  - **Complete (deletes recordings).**
  - **Delete (deletes session).**

**IDS SESSION LOGOUT SCREEN WITH THE CHOICES**



**AS-BUILT NAVIGATION DROP DOWN**

To get As-Built, you go back into PTS and OASIS and select As-Built data, and it will walk you through the process by either giving you a file to download and then upload into IDS, which will install it for you, or you may be asked by IDS to input the data as printed (**Figure 20, 21**).

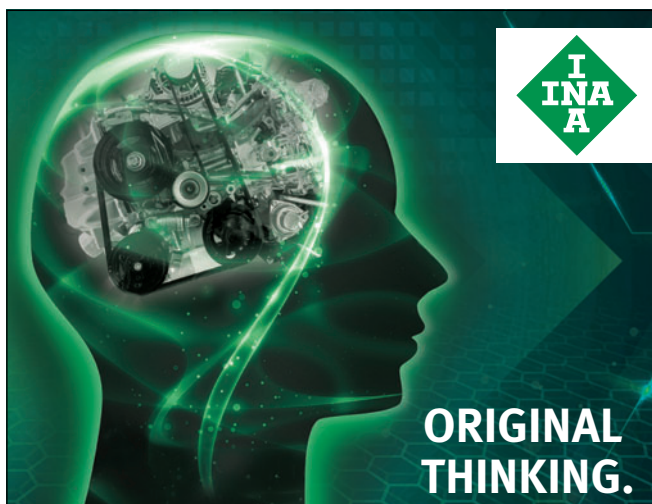
I have one more quick comment, and this is detailed in the GSB, about when flashing or programming fails. I have blown out the programming of a number of modules over the years — Ride Height on a Navigator and the ABS on a Hybrid Escape, for example. As the GSB describes and what I did in these various instances was to simply start over, make sure the vehicle had good clean power and start the process over. Often that includes removing the IDS and VCM from the vehicle and then reinstalling and reconnecting.

I am well over the expected number of words for an article, and I could still go on for several more pages. Perhaps *Motor Age* will have me do a Part Two in a coming issue. Let me wrap this up with a suggestion. The only way you become an expert at running IDS is to use it and play with it. The only way, or perhaps the best way, to find out about these GSBs is to use the Ford website and explore it.

Most of these GSBs appear on any Ford that you input into PTS, even if only by year and model. You can review them and download them for use at a later time and to use as practice guides. Find a Ford you can spend some time with, follow their instructions, and when you have a customer who needs a key programmed, an intermittent concern currently without codes, the need to replace a module, or need to change tire size when you swap snow-summer wheels and tires, you can do so quickly and you, too, will be an Enhanced IDS User. **ZZ**



**MARK DEKOSTER** has been fixing or teaching people how to fix cars for over 30 years. He has been a tech, trainer for Snap-on and Ford Motor Company, and currently is an associate professor at Ferris State University. He is the lead instructor in The Automotive Management Degree Program.  
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**JAIME LAZARUS** // Contributing Editor

**T**he scene opens with the camera fading in to reveal some of the characters. There's a young unnamed couple, it's a beauti-

ful day with plenty of sunshine. They are frolicking without a care in the world and appear to be dancing in an open field of flowers with total abandon. There's a picnic basket, a bottle of wine and two glasses, some homemade snacks and

two pairs of shoes on the edge of an unfolded sheet. By the looks of their clothing it must be taking place somewhere around the mid-1960s. The camera fades to dim as the couple runs towards a standing of trees hand-in-hand.



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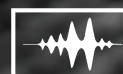
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Full vehicle systems AI inspection report		Report No. A0000014163
This report is created by <b>LAUNCH ROXIE</b>		
<b>Vehicle Information</b>		
VIN: 1FTWW31P60E01630		
Vehicle manufacturer/model: Ford/F-350		
Year of manufacture: 2005		
Mileage: 230971 KM		
<b>Inspection organization</b>		
Name: LaunchTechUSA		
Address: 1820 S Milliken Ave Ontario CA		
Contact Number: 0 5624831580		
RN: 98970001020		
Time and date of inspection: 10/09/2018 11:58:57		
Inspection Location: 9 2489 Arroyo Dr, Corona, CA 92678, USA		
<b>Inspection result</b>		
There are 2 issues for Power system:		
1. On-Board Diagnostic (OBD) Systems Readiness Test: Incomplete		
2. Too Low ICP - Engine Cranking		
There are 2 issues for Safety and Security system:		
1. CAN Communication Bus Error - Reception Error		
2. FR Wheel Speed Sensor Input Circuit Fault		
There are 7 issues for Vehicle body system:		
1. Brake On/Off Switch Circuit Fault		
2. Transfer Case 2WD (Two Wheel Drive) Solenoid Circuit Open Or Short To Ground		
3. Ignition Run/Accessory Circuit Fault		
4. Transmission Transfer Case 4WD (Four Wheel Drive) Solenoid Circuit Fault		
5. Ignition Key In Circuit Error		
6. CAN Communication Bus Error - Reception Error		
7. Ignition Switch Circuit Open		
Inspections are normal for Power system		
1. TCM (Transmission Control Module)		
Inspections are normal for Safety and Security system		
1. PAM (Parking Aid Module)		
2. TBC (Trailer Brake Control Module)		
3. PCM (Powertrain Control Module)		
4. BCM (Body Control Module)		
<b>Professional Report</b>		
GEM (Generic Electronic Module)	Abnormal	🔴
ABS (Anti-Lock Braking System)	Abnormal	🔴
IC (Instrument Cluster)	Abnormal	🔴
PAM (Parking Aid Module)	Normal	🟢
PCM (Powertrain Control Module)	Abnormal	🔴
TBC (Trailer Brake Control Module)	Normal	🟢
TCM (Transmission Control Module)	Normal	🟢
BCM (Body Control Module)	Normal	🟢
VSM (Vehicle Security Module)	Normal	🟢

**- PRE & POST REPORT -**  
**WILL AUTOMATICALLY SEND UP TO 5 EMAIL ADDRESSES**

The scene continues on a street, which looks like any typical residential neighborhood for the time period, where the newest car seen is a 1968 Ford LTD — and it is being jump-started. The camera pans to one of the other vehicles alongside the road with its hood open. Before the camera can view what’s happening, in front of that car there is a loud bang! Sparks fly and smoke billows as two young lads jump back screaming. One partially disrobes, taking his T-shirt off to try swat at the flames now erupting from an unseen location. He then uses it to insulate his hand as he grabs one of the jumper cables.

It’s clearly apparent that a proper procedure was not followed! The camera fades to dim.

Fast forward. The same unnamed couple, slightly older now, is arguing. A child cries in the background. It’s clearly evident there’s trouble in paradise! Past-due bills are scattered on the dining room table. Old newspapers are laying on the living room couch and chair. One of the window blinds is cockeyed and the home appears in total disarray. The camera fades to dim.

In the next scene appears a student at a desk testing intently. He slams his book shut, hands the teacher his paper and leaves the room. The student is one of the two young men who were attempting to jumpstart that LTD many years ago. In the next scene he is shirtless on his couch with an infant on his knee that is sucking a baby’s bottle while at the same time, a technical service manual that he’s reading rests in his lap. Beside him, a half-eaten dinner sits on a plate. He decides it’s time to put the baby to sleep, go take a shower and call it a day. His dinner never gets finished. The camera fades to dim.

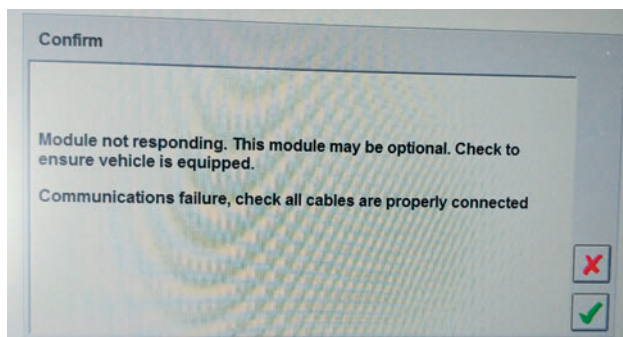
When the camera fades back in it shows us a current environment. The familiar girl, aged now, crying on the

phone. She is hysterically explaining she doesn’t “KNOW what happened” to whomever it was that was listening on the other end. The camera pans out to show knocked over furniture, a lamp lying on its side yet still

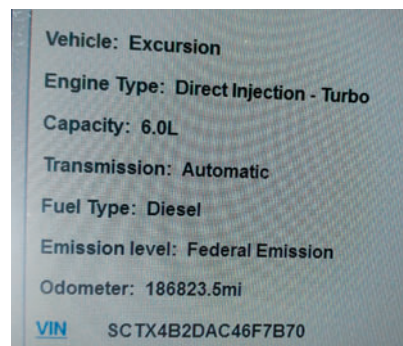
brightly lit and a smoky kitchen stove with a pot on it while unintelligible discussion takes place in the background. There are someone’s legs, attached to feet with shiny, new-looking shoes on them, visible beside the kitchen doorway but the body is lying still on the floor. Sirens wail in the background. The woman cries uncontrollably as the sounds of police vehicles gets louder. The camera fades to dim.

In the next scene appears a now well-trained mechanic who is sitting in a 2003 Ford Excursion just across the street from an unkempt yard where two police cars arrive from different directions. He looks up curiously as the police officers rush to the front door of the house, already slightly ajar. His curiosity lasts only so long and he returns his focus to the IDS software displayed on his laptop on the seat next to him. He has a job to do, he mutters to himself, thinking he doesn’t have time to satisfy his curiosity about what may be happening across the street. Thankful, he feels, that he didn’t get involved when he next looks up to see yellow “Crime Scene” police tape being attached to trees surrounding the property he can see through the windshield.

Unfortunately, he gets dragged into the criminal investigation when an observant police officer notices Jaime and comes over to chat. The officer queries the mechanic then stops abruptly after one of Jaime’s answers.



**FORD IDS SOFTWARE DOESN'T “KNOW”** whether a vehicle is fitted with a particular module.



**AFTERMARKET “TUNERS”** may write a fictitious VIN when they reprogram a module.

It wasn’t something that quite “fit” into the crime scene — and causes the officer to say “well, we didn’t know THAT before now.” Suddenly, the sound of a gunshot interrupts the impromptu interrogation...

### When customers are less than truthful

Have you ever been performing diagnostic routines that presented results inconsistent with the customer’s explanation of the events which led up to the failure? Did it make you think you were dropped into some sort of a TV Crime Drama show — the way nothing you were finding wrong with the vehicle was making any sense based on what you were initially told? Sometimes, when further queried, the customer suddenly remembers other, usually vitally important, facts and anecdotal parts of the story that were mysteriously omitted when the diagnosis first began. It can be a frus-



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trating experience, one that's shared by many of our readers every day!

This Excursion, with 186,823 miles and a direct injection Turbo 6.0L, was just that type of a "job." Knowing the shop owner, as I have had dealings with him before, I know his communications sometimes require deciphering in order to understand them. This text was no exception. The shop owner's initial complaint was stated as: "The vehicle was towed here after the batteries went dead overnight, but with anti-theft issues can you remove them." I'm already feeling like I'm in a who-dunnit.

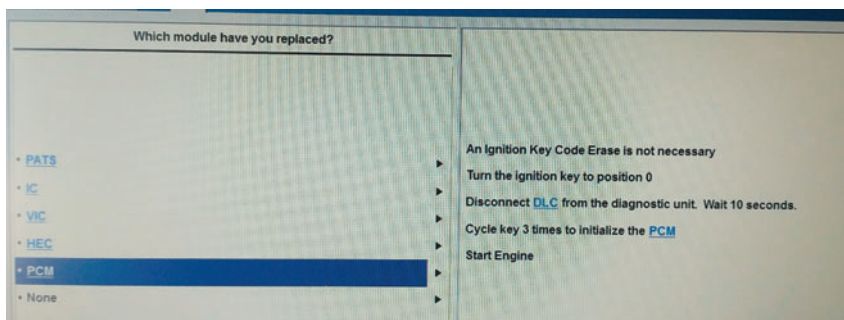
Upon arriving at the shop, I found both of the batteries (this is a diesel) were dead. Zero volts. "Oh, just wonderful," I thought. If we are to be able to accurately diagnose ANY type of electrical problem, we MUST have fully charged batteries, ones which pass a load and a conductance test. After I explained this to the shop owner we agreed he would charge the two batteries in the vehicle and I would return at the end of my day.

When I returned, I scanned the vehicle's network, found a Powertrain Control Module (PCM) without a VIN and a Generic Electronic Module (GEM) not reporting. I asked them to order one and left because it was late in the day. I was going to do some research at home, now that I have some initial tests performed and an IDS Log File with lots of information to which I can refer. They called, the dealer argued about the truck needing a GEM, and claimed the vehicle wasn't equipped with it. I did some research; IDS said it was "OPTIONAL" as did the Ford Professional Technician's Society (PTS) website. OK, no problem, I scheduled time to go back the next day.

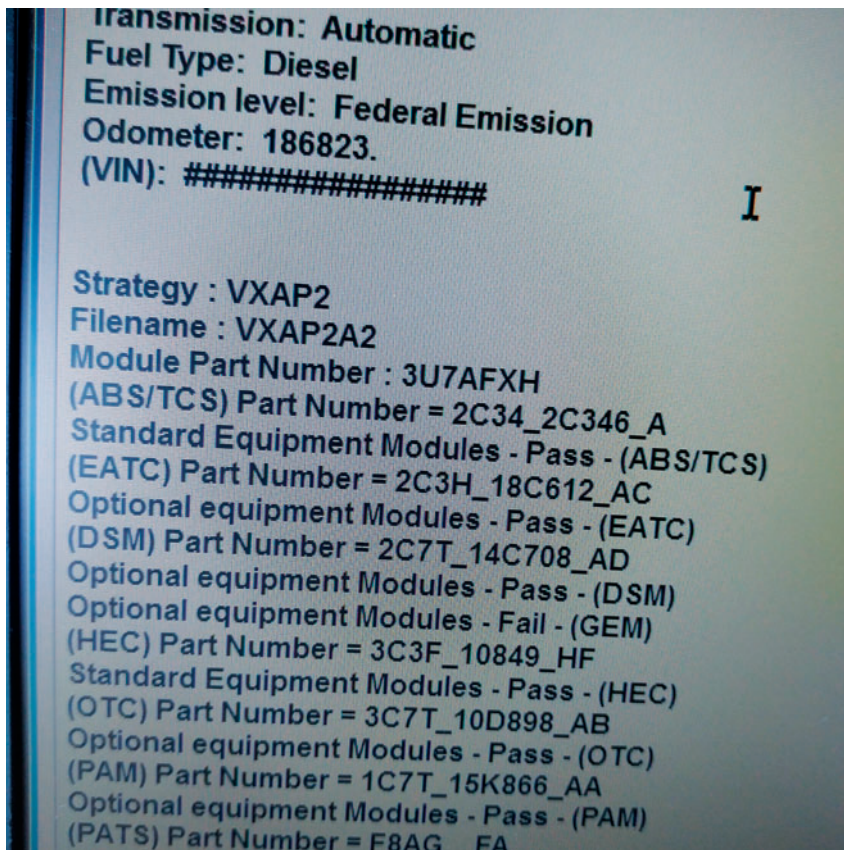
Upon arriving the next morning, you guessed it, the batteries were dead again! The shop personnel had neglected to disconnect them prior to leaving the night before. I had them

<b>L3 RETRIEVE THE PCM DTCs</b>	
<ul style="list-style-type: none"> <li>Retrieve and document continuous DTCs.</li> </ul>	
Is DTC <b>P1260</b> retrieved?	
Yes	GO to <b>L4</b>
No	VERIFY PCM power and ground. REFER to Section 3A in the Powertrain Control/Emissions Diagnosis (PC/ED) manual.
<b>L4 CHECK THE COMMUNICATION NETWORK</b>	
<ul style="list-style-type: none"> <li>Repeat Inspection and Verification steps 3 through 7. Refer to Inspection and Verification in this section.</li> <li>Ignition OFF.</li> <li>Retrieve and document continuous DTCs.</li> <li>Clear the continuous PATS DTCs.</li> <li>Carry out the PATS self-test.</li> </ul>	
Is DTC U1147 retrieved?	
Yes	INSTALL a new PATS module. REFER to <a href="#">Passive Anti-Theft System (PATS) Module</a> in this section. CLEAR the DTCs. REPEAT the self-test. If DTC U1147 is still present, INSTALL a new PCM. REFER to <a href="#">Section 303.14A</a> , <a href="#">Section 303.14B</a> or <a href="#">Section 303.14C</a> . CLEAR the DTCs. REPEAT the self-test.
No	System is OK.

**THIS ROUTINE IS A VERY SIMPLE**, two-step diagnosis. Well, it's supposed to be!



**AFTER PCM PROGRAMMING**, PATS functions must be performed before the engine will start.



**THE "VIN WRITE" FUNCTION** can be skipped during the programming process.

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install some known-good units so that I could perform testing. I focused first on the PCM. I found and removed an “Aftermarket Flash” (using owner’s equipment) then reinstalled the original flash using Ford’s As-Built Data. The IDS then found a new update for the PCM, FICM and TCM, so I performed the update to ensure all three were up to date. I was required to perform Passive Anti-Theft System (PATS) functions after programming the modules. I was allowed Parameter Reset, but it would not allow further access to perform Key Erase, etc. It seemed to be locked in some way. It would not allow the starter to crank the engine and codes were set in various modules, which helped influence the PCM’s decision to allow the engine to start. Prior to completing testing for the day, we put the shop owner’s PCM in place of this one and found the engine would crank. He ordered a PCM.

**A little homework**

I went home and researched some more that night. I found some interesting information about the systems used on this vehicle, which were unlike most others I’d worked on in the past. For instance, thinking because I had Vehicle Security Module (VSM) codes, that those Diagnostic Trouble Codes (DTCs) may be influencing the PCM. A replacement VSM was ordered before I found data indicating it is NOT responsible for anti-theft (so I didn’t open or install it). How silly of me to assume a Vehicle Security Module might control Anti-Theft functions! Am I right? In this case, the VSM is in charge of exterior lighting, some of the restraint information and other sections of the vehicle that keep its occupants safe and secure.

I also learned that a first version of Ford’s Vehicle Communication Module (VCM) must be used to access the PATS functions on this vehicle. More

KEYCODE	PATS_TYPE	PCMID	PCMVER	SERV_MODULE
3	Coded	Not Stored	No	No

**NOT THE MOST HELPFUL OF INFORMATION**, but sometimes these PIDs may assist with a no-start complaint.

2003 Excursion  
1FMNU42P33EC54414

Home Vehicle ID OASIS TSB/GSB/SSM Wor

### Module Reprogramming

VIN: 1FMNU42P33EC54414  
Tear Tag: NFW9  
Vehicle Data: 1BF3 3375 FFB5

[Click here](#) if module data required is not available

**Module Information Found**  
When prompted, be sure to save or copy the file to the  
c:\Program Files\Ford Motor Company\Calibration Files

Download File

No WABCO Data is available for this VIN.  
No Cummins Data is available for this VIN.

**WHERE YOU GET FORD’S AS-BUILT DATA** to program a module as it was originally

diagnostics led me to think the PATS module is causing the no-start, but since it doesn’t prevent the starter operation, and a replacement PCM allowed it, I knew the PATS module was simply doing its job. This logic was perplexing.

A very strange piece of evidence, a recurring DTC P1260 (Engine disabled by PATS), was setting intermittently the whole time while I was diagnosing the vehicle. If it wasn’t present (for instance, when I finished programming the PCM) then the starter would operate. As soon as the key was released, the DTC would set and the starter

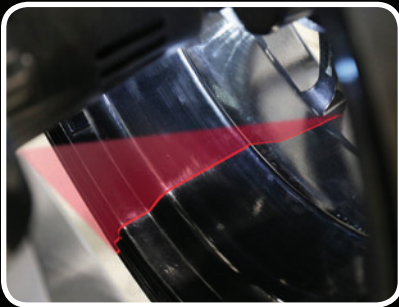
Fuel #	FU
-----	
Odometer	O
186823.50mi	Low
WATER_FUEL #	
-----	

**TO CONFIRM A PCM IS COMMUNICATING** on a network, observe a parameter that’s shared by another module (in this case, the odometer is stored in the IPC).

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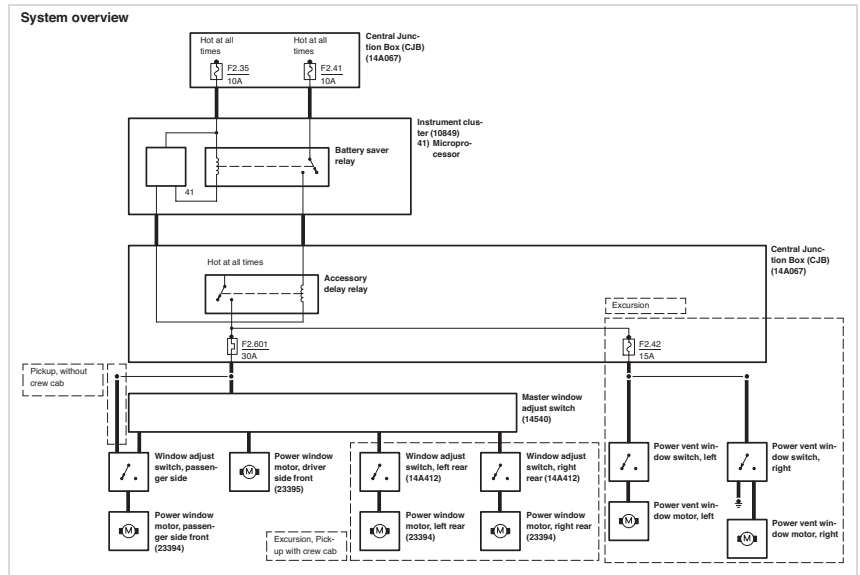
would not be commanded to operate. In addition, I found the radio and windows operated with Key OFF! I traced this phenomena to a bad Instrument Panel Cluster (IPC), which was improperly causing the Accessory Delay Relay to stay activated. I did not check to see if all of the vehicle amperage draws were gone with the IPC disconnected (and regret now not doing so). Isn't this plot thickening? See how the evidence doesn't really coincide with what the original complaints were?

Once the IPC was installed, a replacement key was obtained for one of the two provided (which was held together with tape) and programmed. A Ford remanufactured PCM was installed and programmed (an aftermarket unit failed to program to completion) and all the PATS functions had been completed, then the starter would crank the engine without a DTC P1260 setting.

However, the engine would not start. In addition, there were now only six "U" codes (Vehicle Communication Network DTCs) setting instead of 10 or more found initially — which was contributing to my jumping to the conclusion the GEM was faulty since it would usually be the module in control of such things. There were 29 DTCs found throughout the vehicle's 11 modules now reporting on the network.

**Just the facts, please!**

All these clues do not coincide with a "batteries went dead" complaint. I queried the shop owner one more time, explaining why I was perplexed and asked if he could offer any more information that could help me resolve the unusually large number of problems indicated. That's when he said he had spoken to the vehicle owner earlier that day to bring him up to date about what's been done so far. In his conversation the owner admit-



**WE NEED TO LOOK AT A WIRING DIAGRAM** to see what is most likely at fault, as was the case when the Power Windows could still be operated when the key was out of the ignition.

**Configurable Modules - Excursion**

- 4-wheel anti-lock brake (4WABS) control module (if equipped)
- Vehicle security module
- Overhead trip computer (OTC) (if equipped)
- 4-wheel drive control module
- driver seat module (DSM)
- Instrument cluster

**Programmable Parameters Index**

Module	Calibration Updatable	PMI	Programmable Parameter
Vehicle Security Module	No	Yes	<ul style="list-style-type: none"> <li>4WD ESCF</li> <li>Autolock</li> <li>Power Door Lock Inhibit</li> </ul>
Instrument Cluster	No	Yes	<ul style="list-style-type: none"> <li>Overspeed Warning</li> <li>SeatBeltIndicator</li> <li>4x4 Present</li> <li>Speedometer Bias</li> <li>EATC Present</li> </ul>
Anti-Lock Brake System (ABS) Module	No	Yes	<ul style="list-style-type: none"> <li>Tire/Wheel Size</li> </ul>
Overhead Trip Computer (OTC)	No	Yes	<ul style="list-style-type: none"> <li>EATC Present</li> </ul>
Powertrain Control Module (PCM)	Yes	Yes	<ul style="list-style-type: none"> <li>Fuel Octane</li> <li>Tire/Wheel Size</li> <li>Axle Ratio</li> <li>Transmission Type</li> <li>4x4 Present</li> <li>Manual Shift on the Fly</li> </ul>
Fuel Injection Control Module (FICM) (6.0L diesel engine only)	Yes	Yes	<ul style="list-style-type: none"> <li>None</li> </ul>

**ALTHOUGH NOT A PLACE FREQUENTLY THOUGHT** of for such things, I found on this page the Vehicle Security Module had absolutely NOTHING to do with Anti-Theft system

ted he tried to jump start the vehicle. This vehicle owner shared a story from a long time ago about how while jump starting "an old Ford" improperly he made the car battery explode! He also shared that this time he thought he was being careful when he did it to his truck but made the same mistake, reversing the polarity of the jumper cables. He knew because of the sparks and heat that formed in the clamp he was still holding, just like they did "way back then!"

It appears the ignition key must have been left in the ON position when

the attempted jump starting took place (due to the extensive damage). This last bit of information is what made all the puzzle pieces fall right into place. The feeling of being an unwilling participant in a crime drama soon left me. Thankfully. **TLZ**



**JAIME LAZARUS** has regularly presented technical seminars since 1985. He recently taught instructors at the North American Council of Automotive Teachers conference and the NASCAR Technical Institute.  
[jlazarus1@cfl.rr.com](mailto:jlazarus1@cfl.rr.com)

**TESTING GROUND AT PIN 4 OF THE DLC resulted in bright test lamp illumination.**

**1**

# MAN-MADE PROBLEMS

**WHEN THE BLOCK TO A SUCCESSFUL REPAIR IS NOT A MECHANICAL ONE**

**SCOTT SHOTTON //** Contributing Editor

**M**an-made problems can take many forms. Sometimes a man-made issue is caused by an honest mistake. Other times it can be caused by a faulty part. In some circumstances, the fault could be the result of a substandard repair that was made quite some time ago. Some may even argue that every issue with a vehicle is a man-made issue since man made the vehicle in the first place. I digress. Regardless, stepping back for a moment and re-assessing the situation is in order. Each situation will be different. These issues can be broken down into a few different categories. Let's explore them individually.

**Story #1: Insanity**

We need to remember the cliché definition of insanity: repeating the same action over and over again and expecting a different result each time. An example of this would be, "I replaced the Mass Airflow sensor three times, so maybe the fourth MAF sensor will fix the problem." I experienced this exact issue on a Mazda. A shop was on MAF sensor No. 4 in an attempt to resolve a low power issue. The fault was actually a restricted catalytic converter. Maybe, in this case, they should have stepped back and reassessed the situation. What is the likelihood of getting four faulty parts in a row? I agree that faulty "new" parts could be an issue. Technically this

was not a man-made issue initially, but needs to be recognized none the less.

Moral of the "Insanity" story: If a part does not fix the issue initially, step back and review your diagnostics. Accept the fact that you are human and you may have made an error. Learn from the mistakes and diagnose the next one more efficiently.

**Story #2: Common sense**

I was called to a shop to program a Jeep engine control module. I consulted with the shop prior to my visit and confirmed that a used JTEC (Jeep Truck Engine Controller) could be made to work on this particular vehicle. When I arrived, the technician informed me

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that they had replaced the valve body in the transmission due to a solenoid DTC. The vehicle started and drove into the shop before the repair and now the vehicle does not crank. The TCM (Transmission Control Module) no longer communicates with the scan tool, but all other modules, including the JTEC, do continue to communicate. The technician “followed the charts” and determined that the JTEC needed to be replaced. Also, poking my head under the vehicle, I noted the transmission pan was not installed.

Does this scenario raise some questions? The vehicle cranked and started before the repair so what changed? The scan tool communicated with the TCM prior to the repair but now does not. What changed? The kicker? The TCM does not communicate but the JTEC does...so let’s replace the JTEC? I am not quite sure why the technician came to such a conclusion.

The diagnosis was actually quite easy. Maybe it was because I showed up with “a fresh set of eyes.” Maybe it was just common sense. My approach was to attack the “new” no-crank issue. Connecting a scan tool confirmed that the TCM did not communicate. The JTEC did communicate and the gear selector PID indicated DRIVE. It is a pretty safe bet that this is why the JTEC is not commanding engine cranking. Since the valve body had just been replaced, I chose to disconnect the connector at the transmission valve body. Lo and behold, I regained communication with the TCM. The customer was informed that either the valve body had an electrical issue or improper installation had occurred. The valve body was replaced with another unit, and the issue was resolved.

Here are a few common sense questions we should ask ourselves: Why would replacing a valve body cause a JTEC to fail? Why would replacing



**PIN 5 OF THE DLC** has a voltage drop that can be seen due to the lack of test lamp intensity.



**A JUMPER WIRE** was used to provide a good ground to pin 5 of the DLC.

a JTEC solve a communication issue with a TCM? Why did the vehicle start and drive into the shop and now it does not start after a transmission repair? Most importantly, why did this technician go down the proverbial rabbit hole? We have all gone down this path at some point in our careers. In hindsight, I think we can all agree that the heat of the moment clouded our common sense. When confronted with “the hole,” step back and gather your thoughts.

Moral of the “Common Sense” story: If things do not make sense, STOP.

Step back for a moment and reset your thought process to avoid the rabbit hole. If it seems like something does not make sense, then it probably doesn’t.

**Story #3: Do not be a slacker**

Quality repairs do many things: fix the vehicle permanently, please the customer, please the boss, improve shop profitability and more. However, cutting corners on a repair might be sufficient (not acceptable) in the short term, yet catastrophic in the long term. Piercing a wire, for example, could cause corrosion issues in the future. I constantly pierce wires for test-

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- 8 Videos**  
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- 9 Documentation**  
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**10 PicoScope Automotive**  
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ing purposes, but I always make sure to repair the wire I pierced with some acceptable type of sealant or wiring repair. My point: make a **QUALITY** repair to avoid future issues and comebacks.

Here is an example of a substandard repair that caused the customer to spend lots of time and money when they should not have had to. In addition, a logical diagnostic process led to an accurate diagnosis in the end. The vehicle in question is a 2001 Dodge Ram 1500 with a 5.9 liter engine. The vehicle would crank and not start. Also, a “no bus” message was displayed in the odometer. The customer replaced the engine control module with a used unit and was requesting programming.

Initial inspection confirmed that the MIL did illuminate and the vehicle was cranking and not starting. A scan tool was connected and communication was attempted. Ironically, the engine started when cranked. Disconnecting the scan tool caused the vehicle to stall. Reconnecting the scan tool allowed the vehicle to start again and disconnecting it yielded the same stalling result.

Knowing that there is one power pin, located in cavity 16 of the DLC, and two ground pins, located in cavities 4 and 5, got me to thinking. Could the scan tool be providing a missing ground between pins 4 and 5? A DLC breakout box was then



**TOUCHING THE GROUND WIRE** caused the substandard repair to fall apart.

connected in order to test the ground circuits. First, pin 4 was tested with a test lamp (**Figure 1**) and it illuminated brightly. Next, pin 5 was checked (**Figure 2**) and the same result was not achieved. The test lamp did illuminate but with much less intensity. The next step was to confirm our suspicion of the scan tool providing a ground for the vehicle. A jumper wire was installed between pins 4 and 5 (**Figure 3**). As suspected, the truck started and ran. Disconnecting the jumper, no surprise, again resulted in a stalling situation. Time to trace some wiring diagrams. Following the wiring diagrams backwards from the DLC leads to ground G105. This ground is shared by the DLC, PCM and many other components. Could this ground be the cause of all of our issues? Further research leads us to the ground location on the left front of the engine. It was obvious, when inspecting the ground, that a repair had been made. Touching the wire caused the replacement connector end and the ground wire to separate (**Figure 4**).

In this case, a shoddy wiring repair may have worked initially but failed further down the road. In **Figure 5** it looks like the connector end that was chosen for the previous repair was too small for the copper wiring involved. Instead of choosing the appropriate connector, the small connector was “modified” to fit. I’m not sure, but it looks like no solder or crimping was used, and the plastic heat shrink of the replacement connector was relied on to hold the wire in place and maintain good electrical contact. This fault, and subsequent unnecessary PCM replacement, could have been easily avoided by performing a professional quality repair the first time around.

Moral of the “Don’t Be a Slacker” story: Do not cut corners on a repair. We are professionals, so let’s make sure our repairs reflect professional quality. Otherwise, we risk inventing new problems later on down the road.

**Story #4: Not much you can do about it**

The toughest man-made issues to diagnose are the odd ones



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that occur after a part is replaced and a new issue arises. This may sound similar to the valve body story from earlier in this article. The no-crank issue from that story could have probably been easily found if the appropriate OE charts had been followed. What I am referring to now are issues where the OE charts would leave you hanging. Or even worse: “install a known-good module and retest.”

These types of issues often require a creative way, using our knowledge and tools available, to design a test to prove what we want to know. For this example, we will use a Durango — sorry it is another Chrysler product.

The subject vehicle is a 2002 Dodge Durango with a 4.7 liter engine. The vehicle was purchased at auction and, upon arrival at the shop, was determined to have a bad engine. A salvage yard engine was installed. The vehicle started and ran but, I was told, had mechanical issues. A second salvage yard engine was installed and now the vehicle cranks and does not start. The technician installed a spark tester and observed strong spark from the ignition coils. The engine did try to “fire” occasionally but never really started. It was probably a safe bet that fuel is getting to the engine due to the occasional firing, but to be sure the technician installed a fuel pressure gauge and the results were within specification. As a last-ditch effort, the technician used starting fluid to no avail. At this point, I got the call.

My first step was to plug in a scan tool. Of course, the auction vehicle had a dead battery and, as a result, no DTCs were stored. A charged battery was installed and testing resumed. Cranking the engine did show engine RPM on the data list and no other data PIDs appeared to be out of whack. Given the situation, I had a few questions. What was the mechanical condition of the used engine? We had some spark, but was it occurring at the appropriate time?

The next step was to perform a relative compression test to determine if the engine had equal compression across all cylinders and to get a rough idea of spark timing. A scope capture was obtained (**Figure 6**) and something definitely did not look right.

If each current peak in the capture resembles a compression stroke, then why are there around 30 compression events on this 8-cylinder engine between firing events? The engine appears to have some mechanical integrity, so ignition timing will be investigated next. Ignition timing, on most modern vehicles, is based off of the crankshaft position sensor signal. The decision is made to scope the crankshaft and camshaft sensors and move forward from there.

Consulting wiring diagrams in service information revealed that this vehicle had two possible engine



**THIS CONNECTER** was not even crimped or soldered together.

control diagrams. One is for a 4.7 liter engine equipped with a JTEC engine controller and the other is for a 4.7 liter engine with an NGC (Next Generation Controller.) The two options were easy to distinguish from one another because a JTEC has three connectors while an NGC sports four connectors.



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This Durango was equipped with a JTEC and the appropriate scope connections were made. A scope capture (Figure 7) was obtained and compared to a known-good capture.

The scope capture that was obtained looked great if the Durango had an NGC. However, this vehicle's JTEC is expecting a completely different pulse train from both the CKP and CMP. Both the crankshaft and camshaft reluctors were wrong for the vehicle.

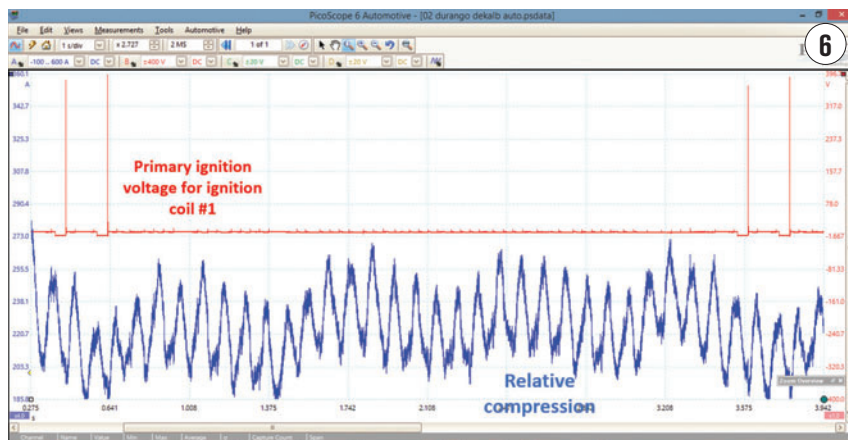
This vehicle had the wrong engine installed and needed to be replaced for a third time to resolve the issue. This can be a problem when salvage yard parts are used and is more common than one might think.

**Story #5: Not much you can do about it – Part II**

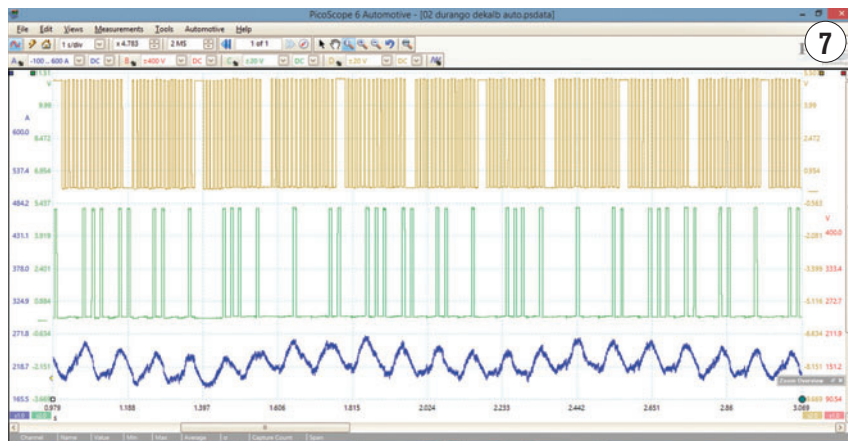
This last vehicle was a Mazda 3 that had a used engine installed just like the previous Durango example. Only because it is important for the diagnosis, I would like to point out that this vehicle was in the Chicago, Ill. area. The Mazda ran and drove fine after the engine was replaced with the exception of MIL illumination for a P0171 Lean Exhaust Bank 1 DTC.

This vehicle landed in the bay of a second shop when the first shop threw up their hands. The shop consulted with me on the phone and relayed fuel trim data to me. The fuel trim numbers were equally positive under all conditions, which suggests that the existence of too much Ethanol in the tank of this non-flex fuel vehicle was a strong possibility. An Ethanol test was performed and the fuel was well under the 10 percent mark.

When I visited the shop, and connected the Mazda IDS, I noticed on the vehicle ID screen that the vehicle conformed to California emissions requirements. What do you think the chance of finding a California emissions engine in a Chicago-area salvage yard is? Further research confirmed that the fuel



**A RELATIVE COMPRESSION TEST SHOWS** two ignition firing events and then about eight crankshaft revolutions before firing again.



**THE CAPTURE OBTAINED** from the Durango is for an NGC controller, not for the JTEC with which it is equipped.

injectors for a California emissions application had a higher flow rate than the non-California counterpart. If the injectors now have a lower flow rate than the injectors the PCM thinks it is driving, the engine will indeed run lean. A set of California fuel injectors was ordered, installed and the fuel trim numbers came right back in line.

Moral of the “Not Much You Can Do About It” stories: Salvage yard parts are not always a bad choice, but occasionally an unforeseen issue can blindside you. When this happens, a creative approach to diagnostics, observation of even the smallest details and additional research will help one find the resolution to the issue.

In summary, man-made issues are unavoidable. Whether it is your fault or not, the vehicle still needs to be fixed. Professional repair techniques will help avoid some of these issues. Common sense diagnostics will help avoid some of the rabbit holes. Observation, research and creative thinking should help resolve the rest. *TL*



**SCOTT SHOTTON** is owner of The Driveability Guys, and he performs mobile diagnostics, reprogramming, industry training and has been a college instructor

for the past 14 years. With a degree in Automotive Service Technology, Scott holds more than 21 ASE certifications.

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## 2014 F-350 WITH 6.7 DIESEL POWER

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# A FORD 6.7 THAT WON'T GO

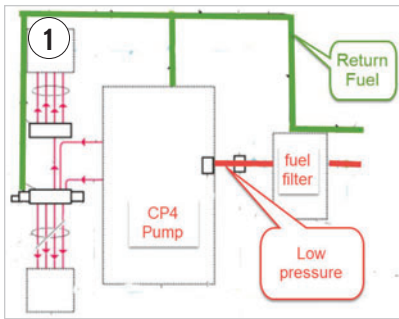
## DIAGNOSING DIESEL ISSUES RIGHT THE FIRST TIME!

ALBIN MOORE // Contributing Editor

**T**he vehicle at the shop is a 2014 Ford F-350. The truck is powered with the 6.7 Powerstroke diesel engine and has an automatic transmission. In the last 250 miles, the engine has run poorly and lacked power. It was taken to a diesel shop, where the shop put an EGR delete kit on and removed the exhaust after treatment. This did not fix the problem. The fuel filters were replaced then replaced again, which did not fix the problem either. With the second set of filters installed, the engine would not start and at that point, it was towed to my shop. The next morning, I went to check for any stored DTCs that might be of interest and found that both of the batteries were dead (5.25 volts).

With the batteries recharged and the scan tool hooked up, I found four diagnostic trouble codes that would give a diagnostic direction. All four pointed to either a lack of fuel being supplied to the engine or a leak in the high-pressure fuel system. The four DTCs were P0087 (fuel rail pressure too low), P008A (low side fuel pressure too low), P0093 (fuel system large leak) and P2291 (low fuel pressure during cranking).

A scan tool can be used to monitor the fuel rail pressure PID, along with the fuel delivery pressure switch PID (pressure switch in the low fuel supply) to get a direction before the hood is even opened. I selected these two PIDs because they will tell me if the proper amount of fuel is being supplied

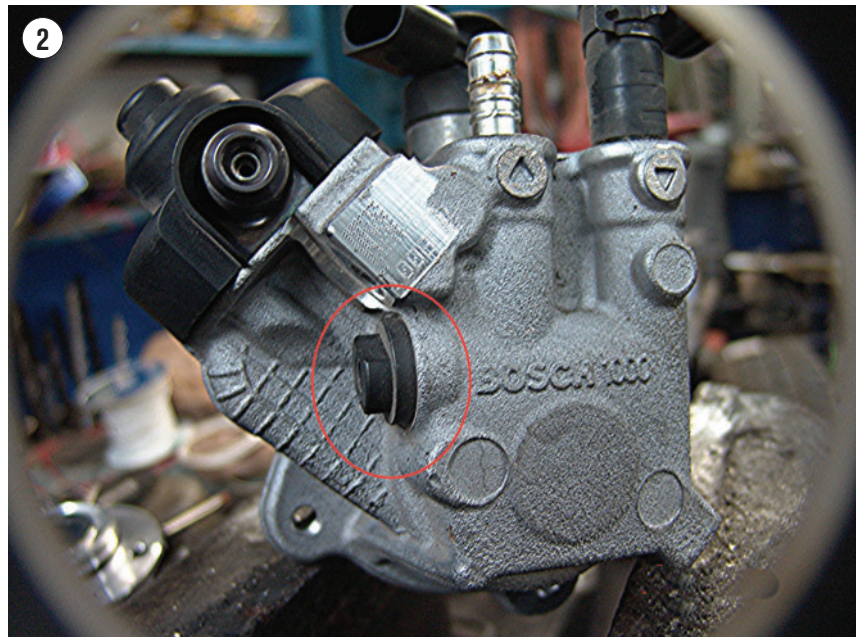


**THIS IS A SCHEMATIC OF THE BASIC FUEL SYSTEM.** Highlighted in red is the low-pressure fuel supply and in green is the fuel return. There are only two places the fuel can be dumped back to the tank — either through the CP4 high-pressure fuel pump, or the fuel pressure control valve that is located in the rear of the left fuel rail.

to the engine and if the CP4 pump is trying to build pressure in the fuel rails.

Please keep in mind, on this engine everything is hard to access except the secondary fuel filter and the air filter. The engine is NOT mechanic friendly, so plan out your next move carefully. The IDS scan tool was used to monitor the fuel rail pressure, engine RPM and fuel delivery pressure switch status, and the engine was cranked for a few seconds while recording the data. The only change in data was the engine RPM. At this point, I need to start back at the beginning, the P008A DTC, which is for the low side fuel pressure being too low.

Before we move on, the P008A DTC is stored when the fuel delivery pressure switch doesn't change from its normally closed state to open when the engine is cranked. The fuel delivery pressure switch opens when the fuel system pressure reaches 365 kPa (53 psi) or above. If the fuel delivery system pressure drops below 365 kPa (53 psi) the switch closes, and if the fuel delivery pressure switch remains closed for more than 60 seconds, the PCM notifies the driver by displaying a low fuel pressure warning in the message center, and an engine derate occurs. The



**THIS IS THE REAR OF A CP4 PUMP.** This pump is from a 2.0L VW, the only difference between the VW and the 6.7 Ford is that the Ford pump uses two pump pistons, and the VW only uses one. The "overflow valve" is circled in red.

fuel delivery pressure switch is located at the top left of the engine in the fuel injection pump supply tube, forward of the secondary fuel filter (**Figure 4**). Before you grab your favorite fuel pressure gauge to test the fuel pressure, stop and consider where you are going to hook it up. There is no pressure test port. If you really want to test the pressure, you can remove the fuel delivery pressure switch and screw a gauge into the fitting. This takes time to do, so I will be satisfied with using the scan tool and let it tell me if the pressure is high enough or not.

Before we delve into any testing, stop and consider the hydraulic principle. Basically, we are working on a hydraulic system and if a hydraulic system is going to produce any pressure, it first must have a pump that is capable of pumping volume and pressure. It also needs a restriction to push against. I opted to start with the electric pump (fuel conditioning module) and work from there. I unhooked the fuel discharge line from the second-

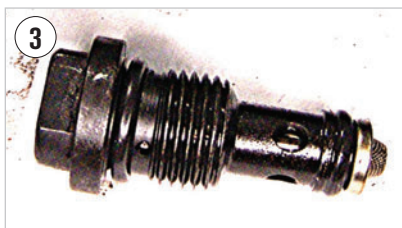
ary fuel filter and attached a hose so I could take a fuel sample. I also used my scan tool to turn the fuel pump on and off, although this can be done by just cycling the key. The electric fuel pump will run for 30 seconds each time the key is turned to the "on" position.

### On to the first test

In taking the fuel sample, I want to test three things: fuel quality, fuel volume and check for any air in the fuel system. In this case, the fuel had lots and lots of air in it, and it took about one minute to pump a quart jar full with fuel. The fuel smelled OK and was nice and clean. At this point, the primary fuel system has two strikes against it: low fuel volume and air. Will a new fuel pump get the engine to start? The only way I know to find this out is to install a new frame-mounted "fuel conditioning module" and see what happens.

With the new fuel conditioning module mounted to the vehicle, the fuel system was primed and tested. The new pump will pump the quart jar

full in about 15 seconds, and the fuel has no air in it. With the new electric pump hooked up and cranking the engine, the engine did not start. In fact, the recorded scan data did not change



**THE OVERFLOW VALVE IS REMOVED FROM THE CP4 PUMP.**

This valve is nothing more than a spring-loaded pressure relief valve. Notice the screen on the end of the valve. This screen will catch metal trash if anything starts to come apart inside of the CP4 pump.

at all from the initial test. At this point, we need to move on to the other three DTCs.

The three DTCs in question are the P0087, P2291 and P0093. Before I start taking parts off this engine, I want to do a little research to see what causes these codes to set.

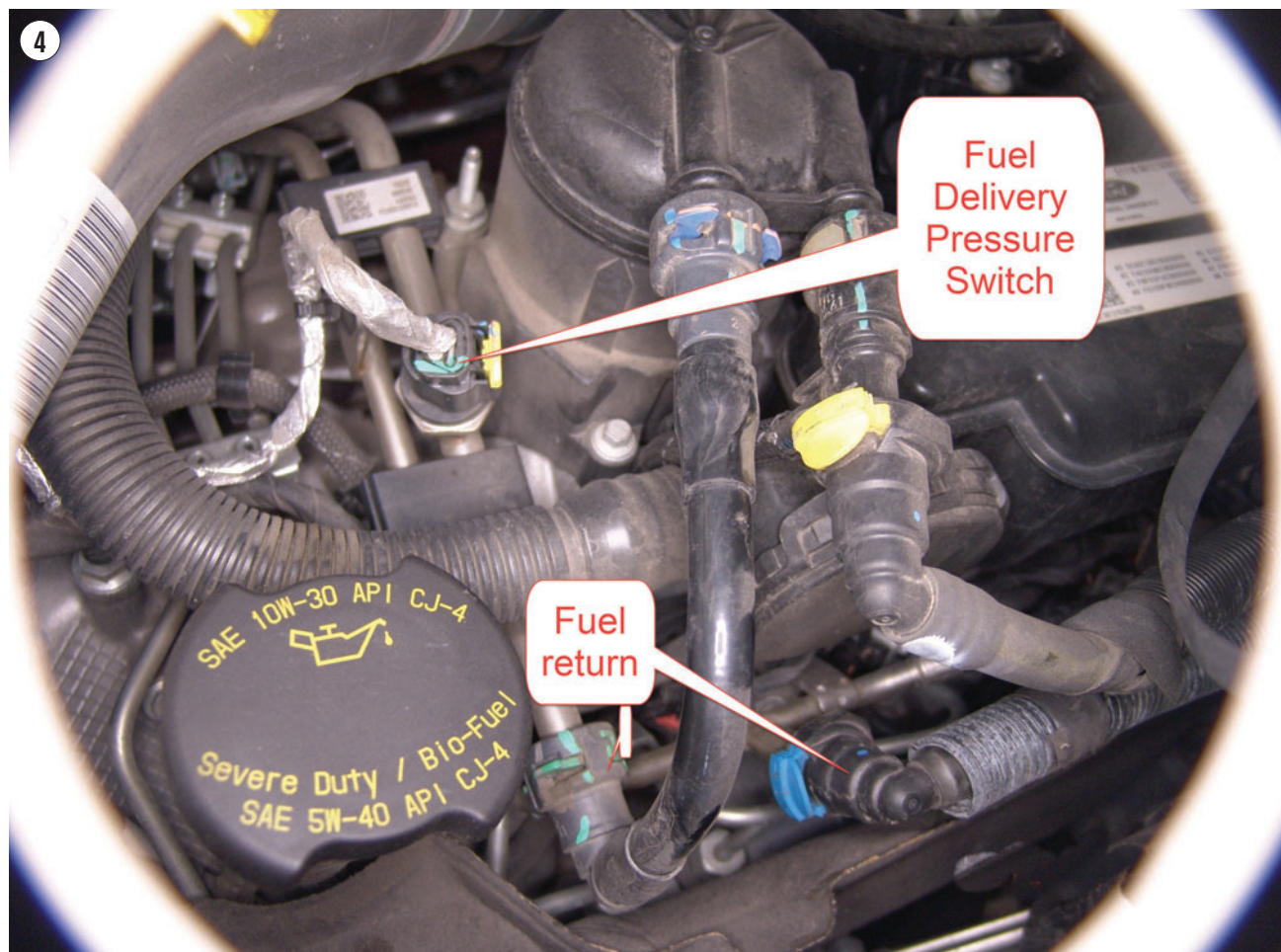
The P0087 DTC (Fuel rail pressure too low) sets when “the PCM regulates the fuel rail pressure by controlling the fuel volume control valve and fuel pressure control valve. This DTC sets when the PCM is no longer capable of maintaining the fuel pressure.” In a nutshell, it sets when the fuel volume control valve has been opened as far as it can open and the required system pressure

cannot be maintained.

DTC P2291 will set when “the PCM monitors the fuel rail pressure (FRP) during the engine cranking. This DTC sets when the FRP does not increase to the calibrated threshold while the engine is cranked.” This is a symptom DTC, which is caused by something else.

DTC P0093 (Fuel system large leak) is the place to start. “This DTC sets when the requested fuel volume control value exceeds a calibrated threshold indicating a large fuel system leak.”

With this information, I can see the low fuel pressure problem is not caused by the electric pump not being up to its task, but because there is an internal leak in the high-pressure system. With



**THIS IS THE LEFT SIDE OF THE ENGINE.** Here you can see the fuel filter, the fuel return line and the fuel delivery pressure switch. These are about the only things that are easy to access on this engine. The fuel return line can be removed easily and a 1/2" hose slipped on the nipple. That will allow you to test the fuel return flow.



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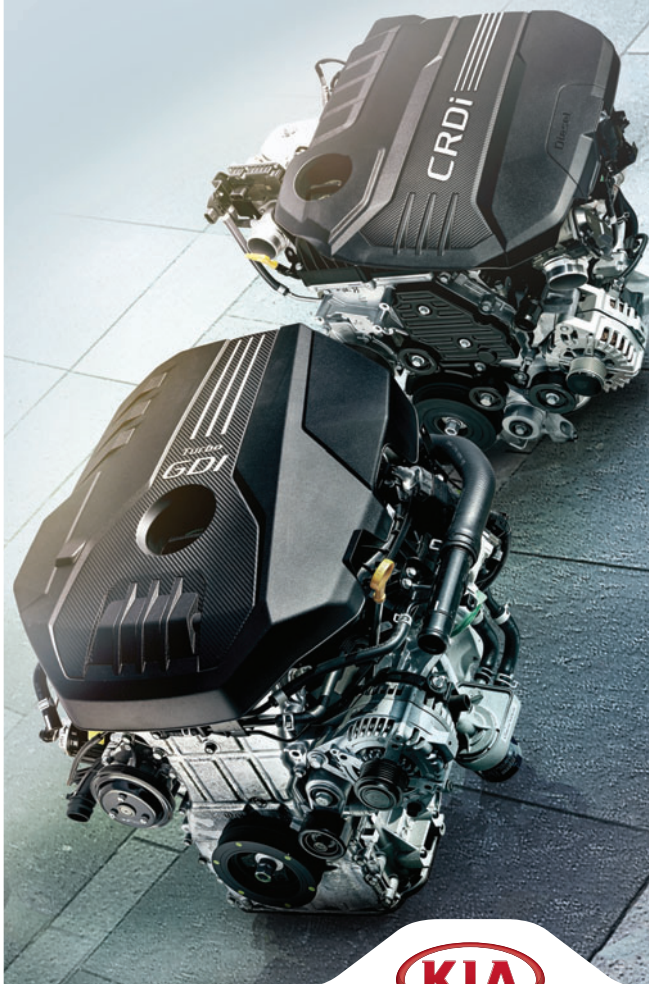
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this leak, the electric pump has nothing to push against, thus no low fuel pressure in the CP4 pump can be built.

### Where is the fuel pressure regulator?

The question at hand is "where is the restriction to the fuel flow located in this injection system?" In this case, this restriction is missing. In all fuel systems I have ever worked on, there is some sort of a fuel pressure regulator or fuel restrictor in all fuel injection systems. Let me start out with a schematic of the fuel system pressure and return circuits. **Figure 1** shows the low pressure fuel in red and the return fuel in green. The schematic shows there are only two places for the low pressure fuel to return to the fuel tank — either through the CP4 pump or through the fuel pressure regulator valve that is housed in the rear of the right-hand fuel rail.

By doing a little research about the CP4 pump, I found the restriction. The fuel pressure regulator is called an "overflow valve." This valve is housed in the back side of the CP4 pump, as seen in **Figure 2**. I have circled the overflow valve in red. Knowing this, the diagnostic process can be simplified. **Figure 3** shows the valve with it removed from its bore. The valve is nothing more than a spring-loaded pressure relief valve. This valve regulates the low pressure fuel to 55 PSI.

On this engine, there is no access to the CP4 pump without removing most of the air intake system. The only easy access to the fuel return is on the left side of the engine (**Figure 4**) where the fuel return line is attached. The fuel return hose can be removed, a short piece of hose attached to the exposed nipple, which will allow you to catch the fuel in a container. Now turn on the electric fuel pump and see how much fuel flows from the CP4 pump. In this case, a large amount of fuel flowed from the CP4 pump. I found if I put a restriction in my fuel hose, I could raise the low-side fuel pressure to the 55 PSI that was required to open the contacts on the fuel delivery pressure switch, but the engine would not start.

### Getting closer!

At this point, the fuel pressure issue has been found: the system has a huge internal leak and the next step is to verify the integrity of the CP4 pump. To gain access to the CP4 pump, several of the air intake pieces must be removed. Once they are removed, you will see the FVCV (fuel volume control valve) mounted on top of the CP4 pump. This valve is held to the pump by two screws. Remove those screws and wiggle the FVCV out of its bore and take a look at the screen. If perchance you see something like is seen in **Figure 5**, your problem analysis is finished, since the whole fuel system will be infiltrated with metal trash, and the complete fuel injection system will need to be replaced. In the case of this F-350, the FVCV screen was clean.



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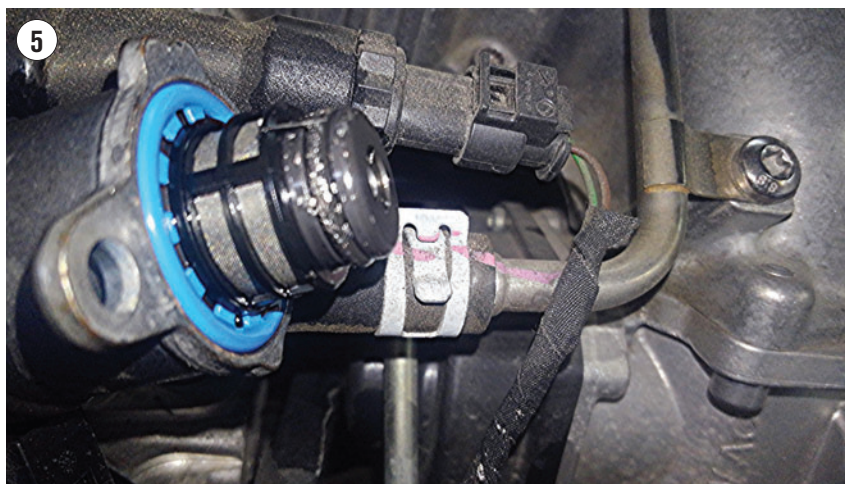
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You can also remove the overflow valve from its bore and inspect it. Inspect the screen that is on the end of the valve for trash and anything that might be out of order. There are two more places to look for trash: the primary and secondary fuel filters. This fuel system returns its fuel to the fuel conditioning module (frame-mounted fuel pump) so most of the metal trash will be collected there, but like I have already mentioned, once metal trash gets into this system, it goes everywhere — the fuel tank, filters, fuel rails and the fuel injectors. Metal trash is the death wish on the fuel system. In the case of this truck, the screen on the FVCV was clean and both filters had been replaced in an attempt to get the engine to run again, so cutting them apart did not find any trash. I do not see any evidence of metal trash in this system, so I am good with not having to replace any of the injectors.

With the problems I have found so far, I came to the



**THE FUEL VOLUME CONTROL VALVE IS REMOVED FROM THE CP4 PUMP.** If you see any trash like this on the screen, the whole fuel system will need to be replaced, which includes washing out the fuel tank.

conclusion that this truck needed to have the CP4 pump replaced. A rebuilt CP4 pump was fit on the engine, and the engine started on the first try. Test driving the vehicle, I found it had good power and ran as it should. The problem is fixed and it's time to collect my money and move on to the next Ford Powerstroke problem. I did not take this CP4 pump apart, but I would imagine there was a piece of steel that broke loose inside the pump and got lodged in the overflow valve, which is holding the valve open and letting the fuel bypass back to the fuel tank.

### How important is fuel quality

Thinking back many years to the mid '50s, the first diesel-powered machine I can remember being around was a Caterpillar D6. The fuel cap was a large aluminum screw-on cap, and molded into the cap were the words "buy clean fuel, keep it clean." When working with diesel fuel systems, these words are words to live by. Any dirt or water getting into the fuel can and will work its way into the pumps and injectors and will just plain ruin the fuel system.

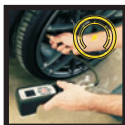
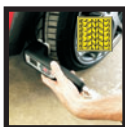
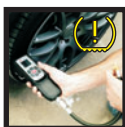
Diesel fuel has four jobs in the engine. It is used to lubricate the internals of the fuel injection system; it also is used to seal the inside of the injection system as well as cool the injection system. Last but not least, it is used to power the engine. Don't diminish the importance of the diesel fuel that is running through the fuel injection system. **LM**



**ALBIN MOORE** spent 21 years in logging before opening a shop in 1992 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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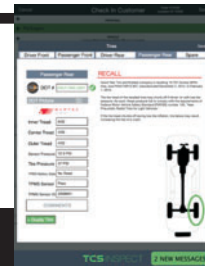
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# THINKING OUTSIDE THE BOX

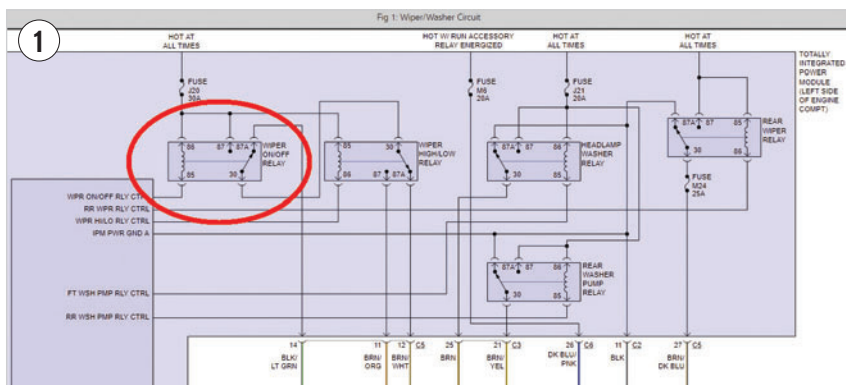
WHEN YOU'RE THE MECHANIC IN THE FAMILY...

**ERIC OBROCHTA** // Contributing Editor

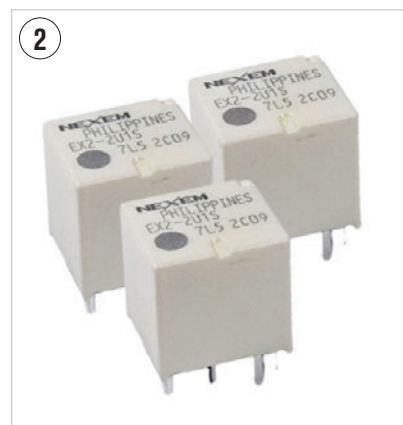
I think we have all been in the situation as a shop owner, mechanic, technician, handy man or whatever you like to be called where we are approached by a family member or a close friend because they know one thing — they know you can “fix things.” Ninety-nine percent of the time we are more than willing to lend a hand, or at least I am, and especially in this case. It was my one and only sister who called me. Mind you all three of her brothers are mechanics as well as her dad and we all own shops, but it was my turn this time. Either they copped out or I was just the first one who answered her call.

She called to let me know that the front wipers on her 2014 Dodge Grand Caravan with 71,870 miles on the odometer had stopped working and wondered if I could take a look at it for her. She goes on to tell me she already spoke with dad and one of my brothers, who both referred her to me. So there — I got my answer as to where I fall on the call list and was voted the best “family mechanic” for the job, apparently.

That day she swung by the shop and explained — or I suppose the better word would be hoped — it was “just a fuse.” Because we all know fuses are cheap! Knowing the problem that seems to follow Chrysler around since the invention of infamous TIPM, I was pretty sure we were not going to find a “bad fuse.”



I pulled up a diagram (Figure 1) and grabbed a scan tool so I could see wiper inputs into the TIPM. After releasing a few fasteners on the cowl so I could gain access to the wiper motor plug, I was ready for some testing. Looking back at the diagram it is a relatively simple layout. One fuse (that was not blown), two relays and some logic to control it all. I wasn't too concerned at the moment how the input from the wiper switch made it to the TIPM and how many modules it ran through to get there, but I could see on scan data that it did make it there. Every selection on the wiper stalk was being displayed in the live data. The next obvious step was seeing if the power was being sent through the relays and up to the wiper motor. I quickly discovered at this point it was not! The wiper on/off relay appeared to be permanently latched to pin 87a, which leads straight to a ground. Knowing the inputs were good, the testing was good and 100 per-



cent definitive, I gave her the bad news.

## It's going to cost HOW much?

We can all assume what happened next when I revealed the cost of the new TIPM plus the cost of the two-day subscription to Tech Authority so that we could program and restore vehicle configuration to finish the repair. I think some call it puppy dog eyes, sob story or crying the blues. In any case, I saw this as an opportunity to try to repair the

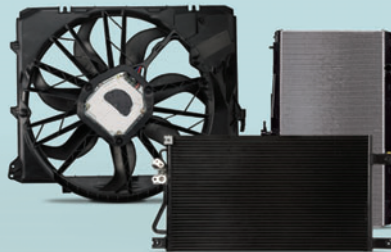


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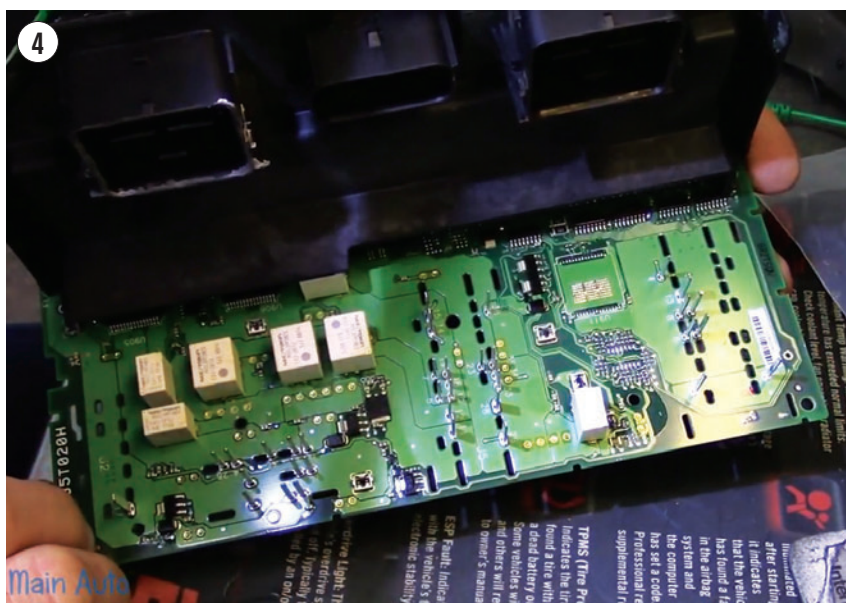
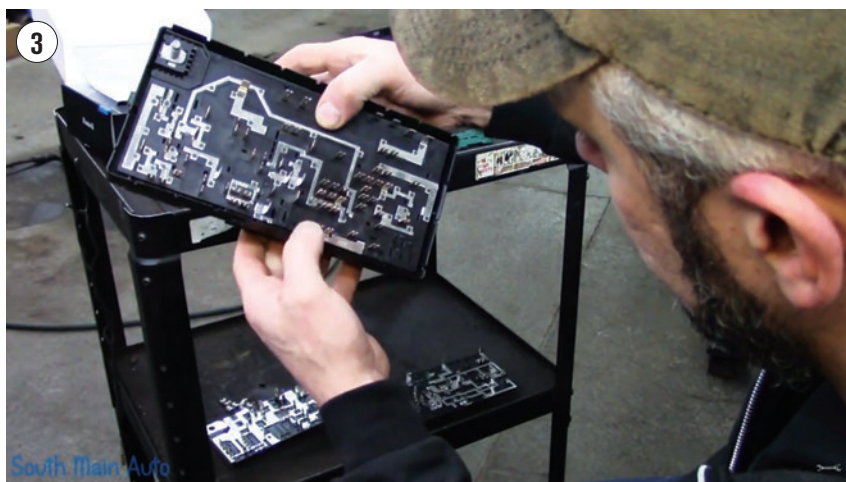
Your gift can save lives, bring hope, and build a future for a world in need. Go to [NovitasFoundation.org](http://NovitasFoundation.org).

failed relay on the board with nothing to lose. Besides, it was my sister, not a “real” customer, right? I told her the risk involved and also exposed the fact that I have little to no experience with printed circuit board repair. We agreed on the \$15 fix and I ordered a new relay (**Figure 2**).

What did I get myself into?! The TIPM comes out of the vehicle in about five minutes; however, I wasted the better part of 45 minutes trying to get it apart to get to the good stuff (**Figure 3**). My smart phone came in handy, as every fuse and relay had to be removed. There were four stacked circuit boards that were pretty resilient and eventually I was able to get down to the green printed circuit board that had the relays soldered to it (**Figure 4**). The only downside was there were about six relays on the board, and I had no idea which one of the 10-pin double relays was at fault.

Not knowing any better way, I decided to energize the control side of each relay and determine which one did not work. I was later told by several people that this was not a good idea and could have caused some damage. Either way, I was quickly able to determine the one at fault (**Figure 5**).

Now came the fun part. Trying to de-solder the old relay. I bought some fancy magnifying glasses that helped tremendously; I also bought a solder sucker and some solder wick. I failed miserably at both to say the least. Twenty minutes into it, I started to wonder how much heat and fiddling one of these boards could take (**Figure 6**). The answer to that question is a lot! At least it was in my case. Trial and error eventually got the old relay removed from the board. I can say I was relieved to see when I took it apart that the contact was clearly fused together (**Figure 7**). At the same time, I wondered if this whole mess was going to work once it was put back together.





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Finally, the EASY part. Soldering the new 10-pin relay in was a breeze. Rest assured, snapping all of the plastic bits together is way easier than taking them all apart. It was a little tedious with sausage shaped fingers full of arthritis to do the job,

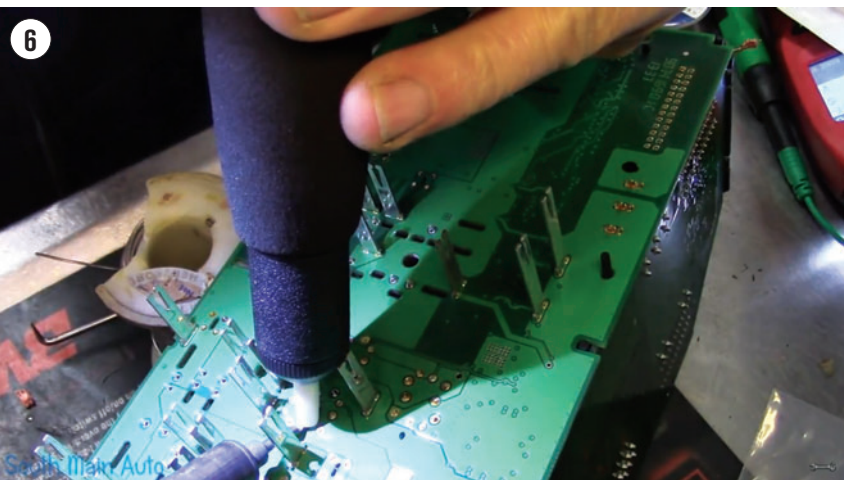
but it was very satisfying to see the finished product (**Figure 8**).

### But will it work?

Now for the moment of truth. I installed the TIPM in the vehicle, cleared the codes, pulled up some data, said a little

prayer and turned on the ignition. Palms sweating, I flicked on the wipers and they WORKED! High, low and intermittent. I actually did it! I know to many of you it may not sound like a big accomplishment, but honestly it felt good to carry out a repair I would have never thought of doing in the shop for a customer. Sell a TIPM? Sure, we do that on a regular basis. Tear one apart and do a repair? No way! As a shop owner I can't be married to a vehicle for an experimental repair that could quickly go south. On my sister's car, well, that is a different story. My dad always called it government work when we had to work on family cars. I never really knew what it meant, but it sounded good. In this case it has a happy ending. She had her van fixed on the cheap, and I looked like a hero. Although truth be told, I think I had a little luck on my side that day.

As a side note, I posted this repair on my YouTube channel and reaped some of the many benefits of having one, and that benefit is community. I received thousands of comments full of tips and tricks for removing soldered pins as well as the correct types of tools that should have been used. In my opinion, that was the biggest benefit I received and continually receive from my channel. There are a lot of folks out there from a lot of different corners of the world willing to share their knowledge and expertise on subjects that are way outside of my wheelhouse. *ZZ*



**ERIC OBROCHTA** is the owner of South Main Auto Repair LLC, a Napa Auto Care Center, in Avoca, NY since 2005. In

addition to taking care of customer cars, Eric also provides mobile diagnostics and programming to other area shops. Born to shop-owning parents in 1980, Eric now shares his experiences with others as the owner of the popular South Main Auto YouTube channel.

[ericobrochta@hotmail.com](mailto:ericobrochta@hotmail.com)



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# ISN'T MODERN TECHNOLOGY GREAT?

**IF THE COMPLEX SYSTEMS OF TODAY'S VEHICLES ARE A CHALLENGE FOR US, THINK WHAT IT MEANS FOR YOUR CUSTOMER!**

**PETE MEIER** // TECHNICAL EDITOR

**E**very now and then, my wife and I look forward to loading up the little RV we own and getting a weekend away to decompress. The last such weekend was near the end of January. While my wife was finishing up her workday, I filled up our 2013 Ram pickup with fuel and hooked it up to the trailer. In just a few hours, my wife would be home and we'd be on our way.

Now, to put this into some additional perspective, the RV presented me with some real challenges over the last six months of 2018. I had to rip out a large part of the flooring to repair water damage caused by miscellaneous leaks and most recently, had to have the rear ramp of this "toy hauler" rebuilt due to water damage to its base. The last time we had a chance to really enjoy it was late last summer. So you can imagine how much the two of us were looking forward to this trip.

My wife gets home and after an hour or so of final prep, it's time to hit the road. I put the key in the ignition and — NOTHING! There's only an error message in the instrument panel display that's telling me that I'm using the "wrong key fob." I drove this truck not three hours prior to this!

It didn't take too long to figure out that we were going nowhere until the



**HOW CAN IT BE THE "WRONG KEY FOB"** when it's the same key I just used three hours ago? That's what your customer is asking themselves.

key was replaced and programmed to the truck. I couldn't even put the vehicle in neutral to move it away from the RV. With a little help from my youngest son, we disconnected the Ram's driveshaft and used his Ford F-250 to tug it out of the way. And with the help of another youngster I've known since his high school days, we hooked up to a substitute tow vehicle and still made it to our final destination before midnight.

As we drove down the driveway, I could only think to myself, "What if this happened AFTER we got to the campground?"

## **Understanding your customers' frustrations**

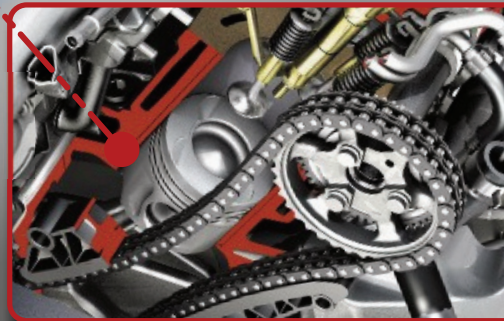
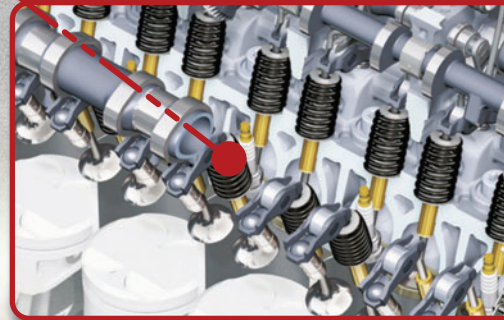
I think you know how frustrated I was when the truck failed to start. And you

can probably understand how even more frustrated I was when faced with a problem I couldn't fix. My wife sat patiently in the front seat of the Ram as I tried several times to start the truck, only to get the same error message. She offered suggestions similar to what I'm sure any helpful wife would offer their husband when faced with this situation: "Try wiggling the key, honey. Are you sure you're using the right key?"

After we had settled in at the campground, I had a chance to consider "How would a consumer with no knowledge of this system's function feel in this same situation?" A couple had planned their weekend getaway weeks in advance, made the necessary reservations, packed carefully to make sure nothing needed would be left behind.



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Anticipation is high and then the balloon bursts as a vehicle failure puts an abrupt end to everything.

It's easy when we sit on the other side of the service counter. "I didn't design it, I didn't build it, and I didn't break it — but I can fix it for a fee." But to the consumer who is standing there across from us, the failure he's bringing in to you for help represents more than just a minor inconvenience. It means missing that weekend away with his wife, his son's championship game, his daughter's first dance recital. Our society is built on the automobile as a personal conveyance and when something happens to it, our world comes to a sudden halt.

So when your customer, whether he's on the phone or at your counter, is upset and short with you — remember, it's not personal. He's upset because something he's come to depend upon has failed him and he doesn't know what to expect next. Keep a smile on your face and compassion in your heart and help him get that lost moment back.

### Avoiding your own frustration

Many of you are probably getting tired of me repeating a common message of mine, but there has never been a time in automotive history where staying up to date has been so important. And, in my personal opinion, it has never been easier to do so.

Just this month alone, there are four opportunities to attend live events around the country. By the time you read this, one or two may have been held already, though you could certainly mark the dates on your calendar for next year.

The first March opportunity is one you must attend at least once in your career, and that's the VISION HiTech Training Event and Expo. It is held in Overland Park, Kan., and always has a "Who's Who" list of trainers to choose



**THE VEHICLE FAILURE** isn't just an inconvenience. It's a missed trip with loved ones or dance recital with a daughter.

from. Following VISION is the Automotive Training Expo (ATE), held by ASA Northeast in Seattle and the AVI Training Conference held in Fort Myers, Fla. Both offer excellent training opportunities to techs and shop owners alike. And bringing up the end of March is the TST "Big Event," a unique single-day training event hosted in Tarrytown, New York by the same team that helps me bring you our quarterly webinars.

No matter where you live in the country, there is an event near you.

And if you can't take the time to attend one of these national events, talk to your parts suppliers. Nearly every major aftermarket supplier has increased their training efforts. Federal-Mogul is just one that comes to mind, building new training centers around the country and hosting more localized training opportunities. And they are not alone. NAPA, Standard Motor Products, WORLDPAC, CarQuest and so many others are hiring staff and increasing their training capabilities.

Why? A few reasons, I think. One, more and more of you are "seeing the light" and seeking out these training opportunities. Two, publications like

ours are doing more to bring these resources to the attention of you, who've looked long and hard for them. Third, it's no longer a matter of "do you want to learn more?" It's becoming a matter of "you HAVE to learn more" if you want to stay successful in this business. We simply can't approach our repair processes the same way we have in the past.

Yes, it's not getting any easier to service and repair the products the global OEMs are producing. But rest assured that your team at *Motor Age* will do all we can to help you rise to the challenge. As our cover of every issue says, "Advancing the automotive service professional since 1899." **TM**



**PETE MEIER** is an ASE certified Master Technician with over 35 years of practical experience as a technician and educator,

covering a wide variety of makes and models. He began writing for *Motor Age* as a contributor in 2006 and joined the magazine fulltime as Technical Editor in 2010. Pete believes in the mission of the magazine to "advance the automotive professional" and provides resources to working techs around the country through print, social media and YouTube.

[pete.meier@ubm.com](mailto:pete.meier@ubm.com)

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Report No.: A0000014193

**Full vehicle systems AI inspection report**  
This report is created by  
**LAUNCH ROXIE**

---

**Vehicle Information**

VIN: 1FTWW01P0E001636  
 Vehicle manufacturer/model: FordF-350  
 Year of manufacture: 2009  
 Mileage: 239371 KM

---

**Inspection organization**

Name: LaunchTechUSA  
 Address: 1820 S Milliken Ave Ontario CA  
 Contact Number: 5624831580  
 SW: 98970001023  
 Time and date of inspection: 10/09/2018 11:58:57  
 Inspection Location: 92499 Arsenio Dr, Covina, CA 92979, USA

---

**Inspection result**

There are 2 issues for Power system:

- 1. On-board Diagnostic (OBD) Systems Readiness Test Incomplete
- 2. Too Low ICP - Engine Cranking

There are 2 issues for Safety and Security system:

- 1. CAN Communication Bus Error - Reception Error
- 2. FR Wheel Speed Sensor Input Circuit Fault

There are 7 issues for Vehicle body system:

- 1. Brake On/Off Switch Circuit Fault
- 2. Transfer Case 2WD (Two Wheel Drive) Solenoid Circuit Open Or Short To Ground
- 3. Ignition Run/Accessory Circuit Fault
- 4. Transmission Transfer Case 4WD (Four Wheel Drive) Solenoid Circuit Fault
- 5. Ignition Key In Circuit Error
- 6. CAN Communication Bus Error - Reception Error
- 7. Ignition Switch Circuit Open

Inspections are normal for Power system

- 1. TCM (Transmission Control Module)

Inspections are normal for Safety and Security system

- 1. PAM (Parking Aid Module)
- 2. TBC (Trailer Brake Control Module)
- 3. RCM (Restraint Control Module)
- 4. VSM (Vehicle Security Module)

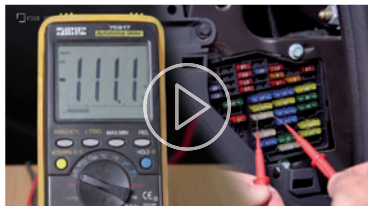
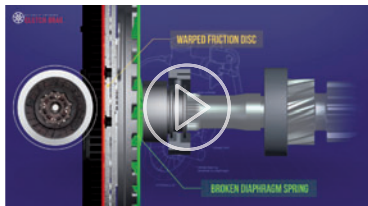
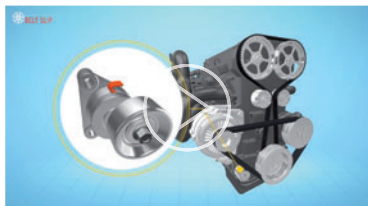
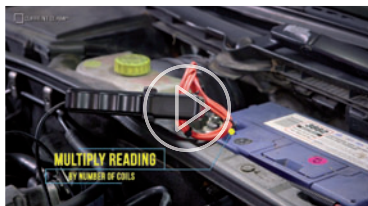
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**Professional Report**

Module	Status
GEM (Generic Electronic Module)	Abnormal
ABS (Anti-Lock Braking System)	Abnormal
IC (Instrument Cluster)	Abnormal
PAM (Parking Aid Module)	Normal
PCM (Powertrain Control Module)	Abnormal
TBC (Trailer Brake Control Module)	Normal
TCM (Transmission Control Module)	Normal
RCM (Restraint Control Module)	Normal
VSM (Vehicle Security Module)	Normal

**- PRE & POST REPORT -  
WILL AUTOMATICALLY SEND UP TO 5 EMAIL ADDRESSES**

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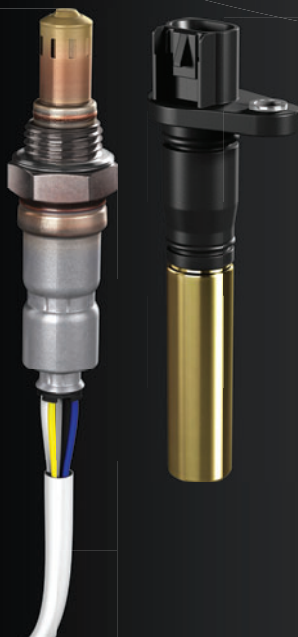


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# Autel diagnostic automotive intelligence



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## Complete diagnostic system

Autel tools provide today's technicians with tomorrow's technology. Autel offers the most comprehensive industry coverage with the advanced MaxiSYS diagnostic scan tools. One year of free software updates and one-year warranty are included with a new MaxiSYS purchase. After the initial year, extend tool coverage with a Total Care Program

(TCP) to ensure software coverage. TCP subscriptions can now be purchased digitally from local tool dealers for same-day tool activation.

## Complete TPMS solution

Autel is the ONLY manufacturer to offer a complete TPMS solution by producing both powerful scan tools and high quality sensors to provide the most vehicle coverage, easy to use tool navigation and best tool and sensor compatibility. The new MX-Sensor 1-Sensor combines both 315MHz and 433MHz frequencies for a 1-SKU sensor inventory. Together with quicker press release valve stems for interchangeable metal and rubber valves, this programmable universal MX-Sensor saves installation time. Both the TS508 and TS608 feature the exclusive TPMS Status Screen. It features a single screen full system status check to help technicians easily view sensor feedback then quickly pinpoint faults to instantly determine repair procedures.

## ADAS calibration package

The Autel MaxiSYS ADAS Calibration Tool Package provides advanced components and accurate repair procedures for camera, radar, lidar and night vision driver-assisted systems. It comes equipped with an easily adjustable calibration frame and interchangeable targets, ideal for collision repair, wheel alignment, glass replacement and specialty repair shops. Advanced MaxiSYS software provides detailed graphic instructions and precise measurements for setup and calibration procedures.

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# What drives you?

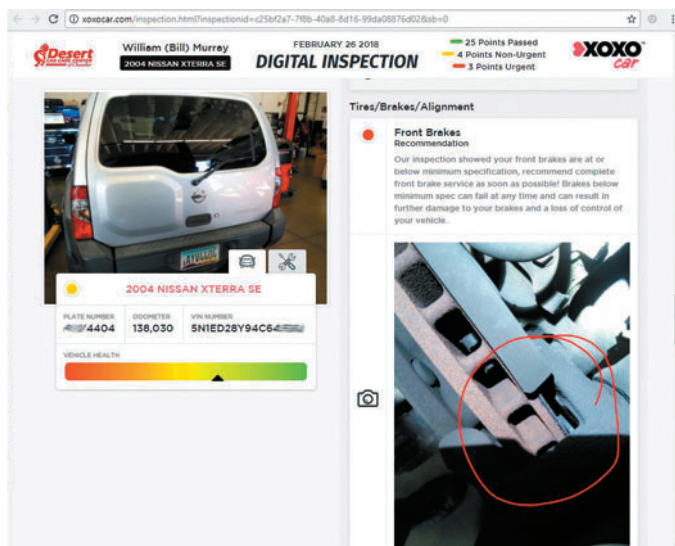
If you are driven by a passion to succeed, BOLT ON is your fuel. Our innovative software helps increase AROs, streamlines processes, provides a greater display of professionalism, and improves repeat business by delivering full transparency to customers.

Transparency is directly connected to communication. However, communicating with customers in the automotive repair industry can be a challenge. How many times have you been unable to reach customer by phone or had a hard time explaining an issue in a way they'll understand?

With BOLT ON's powerful digital vehicle inspection software that texts pictures and videos along with color-coded ratings, you can alleviate that struggle and make an undeniable, outstanding difference in customer relations, vehicle inspections, and countless other aspects within your shop.

"The response I get back from people is unbelievable. They can see what we're seeing. A picture is worth a thousand words. Even if they're not buying everything, they can see it for themselves," explains Mike Chase, Service Manager, Holt Auto Service and Machine Shop.

If you want to improve your shop and see how BOLT ON TECHNOLOGY is revolutionizing the automotive world, contact us at [www.boltontechnology.com](http://www.boltontechnology.com) or visit us at booths 733 - 741 & 832 - 840 during the 2019 Vision Expo.



# Be ready for 1234YF this year

**W**arm weather brings the need for updated air conditioning service for vehicles. With the increasing use of R-1234yf refrigerant, there are changes to the recovery, recycle and recharge process. Technicians are now required by SAE Standard J2845 to be trained to recognize which refrigerant is being handled and how to handle it safely, while being equipped with the essential information, proper equipment and tools that are unique to these refrigerants.

Starting in 2012 with 2013 model year vehicles, vehicle manufacturers began introducing vehicles that used R-1234yf. This new refrigerant is different from R134a and new service equipment requirements were created to ensure the refrigerant is handled properly and service is performed correctly. New A/C machines were introduced to work on these new vehicles with unique couplers that only allow a connection to an R-1234yf system. One of the requirements for R-1234yf service equipment is refrigerant identification anytime refrigerant is brought into the A/C machine.

The refrigerant is continuing to become more and more common and technicians will continue to see more vehicles using it. Automakers receive emissions credits for using environmentally friendly refrigerants such as R-1234yf, acting as a further motivation to comply with new standards. While not required, it is recommended that technicians retake the EPA-approved Section 609 certification course to learn about the new refrigerant recovery, recycling and charging equipment and procedures in accordance with SAE

Standards and regulatory requirements.

In response to the introduction of this new line of vehicles that are using the new refrigerant, new equipment had to be designed to service the systems. The Robinair AC1234-4 is a premier R-1234yf recover, recycle and recharge fully automatic ACS machine that meets or exceeds SAE J2927 and J2843 standards for 1234yf recovery. The AC1234-4 machine comes with a built-in internal refrigerant identifier that samples refrigerant prior to recovery to ensure the refrigerant is good before it is brought into the A/C machine. AC1234-4 is a highly accurate and reliable machine capable of servicing both standard and high-voltage vehicle A/C systems.

To further aid technicians, the machine is fully automatic, which allows it to be programmed for service, returning when the job is complete. The programmable vacuum function helps to get the necessary vacuum level in any condition quickly. The machine includes an automatic internal tank refill so there is no stopping to fill it during or before service. Refrigerant must be at least 98% pure prior to recovery and recharging. Servicing R-1234yf systems also requires technicians to manually inject oil into the system. Before injecting oil into the system, technicians should review OEM requirements and use the

manufacturer-recommended oil.

Robinair is driven by innovation and continues to be at the forefront of mobile A/C recovery. For more information on A/C recovery machines, tools, equipment and accessories, visit [www.Robinair.com](http://www.Robinair.com)



# ROBINAIR

# How to make TPMS easier, more profitable

**T**PMS is a very simple system with real time safety and economic benefits for your customers. It monitors the air pressure in a tire and alerts the driver when the air pressure falls below a set limit. However, despite its simplicity, servicing this technology can be frustrating and eat up some of your profits. This is largely due to the many variables that come with TPMS, such as the wide variety of sensors on the market, vehicle specific application criteria, and a host of different relearn procedures.

## TPMS education is key

Good education and training are essential to successful TPMS service. Because, whether you're rotating a tire, fixing a flat, or popping on a new set of treads, this federally-mandated safety system will come into play, and you'll need to know how to handle it. Install the wrong sensor, import an incorrect model year, use an out of date scan tool, or skip the relearn, and you are asking for trouble. The worst part is that you won't know it until you're done or the customer comes back with the flashing light on the dash. TPMS service isn't rocket science, but to do it properly, you have to follow the right steps in order to ensure success.

## Hands-on TPMS training and resources

Continental, one of the industry's leading manufacturers of TPMS, is dedicated to training and offers a wide range of educational options and resources. For starters, Continental has an expert team of TPMS Training Specialists that is constantly on the go across the country, instructing technicians on the latest TPMS service updates and techniques at shops, trade shows, and industry events. Continental also maintains a comprehensive library of installation instructions, relearn procedures, web-based training videos, service tips, and a glossary of TPMS terms.



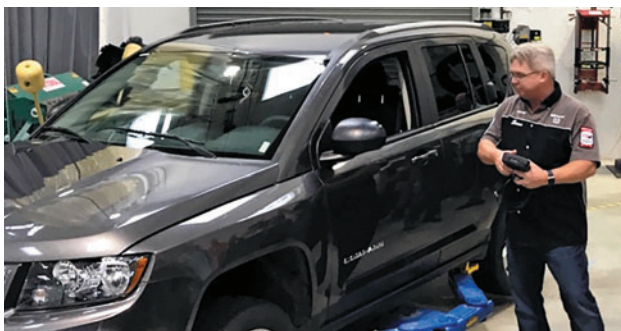
The back of every VDO REDI-Sensor package displays the free tech support hot line, which technicians are encouraged to call.

## Free tech support

Continental's free tech support hot line at 800-265-1818 gets you quick, expert help whenever you



Continental training video shows how to successfully navigate tricky Toyota TPMS relearns.



Continental Sales Technical Training Specialist, Sean Lannoo, has teamed up with his TPMS Training Team of 10 instructors and visited over 2,500 shops in the last six months.

need it. Continental will also come to your area and coordinate a TPMS training session.

As part of its national training efforts, Continental is sponsoring the Tire Industry Association's (TIA) Certified Automotive Tire Service (ATS) Course, a 300- and 400-level certification program for the professional passenger and light truck tire technicians.

Continental's 12 online instructional videos can be viewed on the REDI-Sensor website, [www.redi-sensor.com](http://www.redi-sensor.com) and YouTube. The TPMS glossary can be downloaded at [redi-sensor.com/glossary.php](http://redi-sensor.com/glossary.php). TPMS sensor applications can be found at <https://us.continental-aftermarket.com/>



# FVP Stay Tuned Multi-System Additive

**K**eep your engine clean and save money on fuel with FVP Stay Tuned Multi-System Additive. With more active ingredients than other leading brands, our formula can improve fuel economy and stabilizes your fuel system. Like other FVP products, it is trusted and verified by auto professionals, FVP Stay Tuned:

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- keeps engines clean
- stabilizes fuel
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Built on a commitment to OE quality, the FVP brand provides confident solutions for all your automotive needs. Learn more about FVP products and our

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FVP products are distributed by Factory Motor Parts, a family-owned business, for over 73 years. Visit [www.factorymotorparts.com](http://www.factorymotorparts.com) for more information.



# Don't neglect servicing the fuel filter

By **LARRY HAMMER**, Technical Services, Mighty Distributing System

**L**ittle attention is often given to the fuel filter until an engine performance issue occurs. Neglecting the fuel filter can result in damage to some expensive components such as an electric fuel pump or some costly fuel injectors.

## Identifying a defective fuel pump

Make certain that available current is getting to the pump. This should include checking relays, pressure sensors, inertia switches and in some cases the security system, which can prevent fuel pump operation. Some pumps fail due to a worn commutator bar on the armature. Tapping the fuel tank with a rubber mallet may move the armature enough to allow electrical contact, promoting fuel pump operation. This is a temporary solution.

**Pressure and Volume** — Don't be fooled by a fuel pump providing sufficient pressure but low volume. Low fuel pressure or insufficient volume will affect engine performance and may set a diagnostic code due to lean fuel conditions. Most fuel pumps will pump one pint of fuel in 30 seconds. Follow the manufacturer's guidelines for pressure and volume testing.

## Leading causes of fuel pump failure

1) The fuel is the coolant and lubricant for the fuel pump. Never allow the fuel level to get below ¼ tank to prevent overheating of the fuel pump. Running a vehicle out of fuel can cause permanent damage.

2) Water in the fuel promotes corro-



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sion, especially on vehicles stored for a long period. A low fuel level during cool or humid weather can promote condensation and corrosion. Ethanol can further aggravate the condition. Take a fuel sample in a glass container, and if the fuel is discolored or reveals the presence of water, replace the fuel.

3) Sediments in the fuel tank can clog the strainer, promoting overheating and premature fuel pump failure. Clean the tank before replacing the fuel pump.

4) Fuel tank oxidation, promoting the formation of deposits.

5) When replacing the fuel pump always replace the strainer. The strainer can catch contaminants larger than 70 microns, however contaminants as small as 30 microns can pass through the strainer, causing permanent damage to the fuel pump.

6) The fuel filter does not directly protect the fuel pump as contaminated fuel passes through the fuel pump before it gets to the filter, with the exception of applica-

tions that have an in-tank fuel filter. The pump may overheat and fail while trying to pass fuel through a restricted filter.

7) On vehicles equipped with a fuel pump module, heavy concentrations of rust deposits may require replacement of the fuel lines, especially when the contamination is minimal in the fuel tank but heavy deposits are located in the module.

8) Purchasing fuel when a tanker is re-supplying a fuel distributor is not recommended, as many deposits are being dislodged in the storage tank.

9) Contaminates that pass through the pump can cause pump seizure, resulting in increased amperage flow necessary to overcome the resistance, causing overheating of the wiring and related connectors. A restricted fuel filter can promote the same type of electrical failure.

10) Special metals and coatings in the fuel system components are necessary for vehicles rated to burn E85 fuel to prevent fuel system corrosion.

Replacing the fuel filter is the best preventive maintenance that you can give the fuel pump.



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# Use TSBs to boost efficiency

**D**id you know TSBs can be your golden ticket to a quick and accurate fix?

With the complexity of today's vehicles, TSBs are a big deal. Technicians must know where to look, what to look for and how to determine if the TSB is applicable. Also, as more TSBs are issued, it's important to be sure you have access to the very latest ones to ensure the most accurate repair.

Let's start at the beginning with what TSBs actually are and why they are issued by the original equipment manufacturer (OEM).

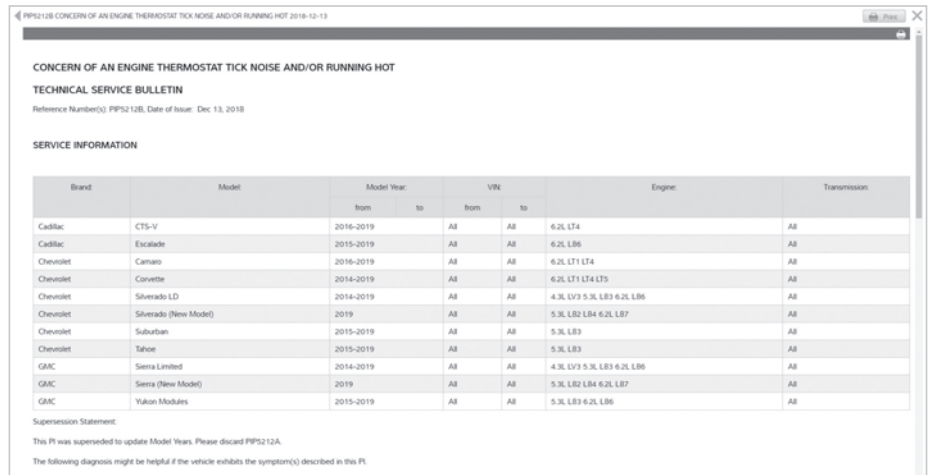
A TSB — Technical Service Bulletin — is a type of service information released by the OEM based on service issues they are seeing in the field. There are several possibilities why a manufacturer would release a TSB, including:

- The OEM could have noticed a pattern failure as the vehicle is driven by consumers. The TSB is written to alert the service technician of the proper way to service/repair the vehicle.
- The OEM could have erroneous data in their service manual. They then release a TSB to overwrite or replace that incorrect data.
- The OEM could have switched parts for the vehicle during the production run, therefore requiring that they update information via TSB.
- The OEM also could have developed a special tool to help the technician more efficiently service the vehicle.

## TSBs, recalls & campaigns

In addition to TSBs, techs should also pay attention to recalls and campaigns from the OEMs, as they also contain post-production information based on lessons learned about using and servicing the vehicle. A recall is released by the National Highway and Traffic Safety Association (NHTSA) when there is a potential transportation safety issue. Typically with a recall, the consumer is able to return to a licensed dealership to have their vehicle or equipment serviced for free.

Campaigns are similar to recalls in that the consumer is notified about a problem with their vehicle. But campaigns do not involve a safety issue and, therefore, are sent out by the



OEM (not by NHTSA). The repair cost for a campaign may or may not be covered by the manufacturer.

## So, why are these bulletins important?

OEMs release TSBs based on seeing pattern failures for their vehicles. Not only will an independent repair shop benefit because the OEM has already identified the problem, but they'll also give technicians the step-by-step correction procedure.

Generally, recalls and campaigns should be looked for when the tech first identifies the vehicle. If there is an open recall on the vehicle, the OEM dealership will service that recall for free (for campaigns it depends on the situation). Aftermarket shops want to catch these prior to starting the job to avoid having to explain to the customer why you charged them for something they could have had for free.

TSBs should be the first information you look up as part of a diagnosis. Your online auto repair information source can help. For example, ProDemand from Mitchell 1 is aligned with the technician's proper workflow, putting a "Recalls/Campaigns" button in a prominent position on the home screen. TSBs are also easily accessed in their own Quick Link on the home screen or as part of a diagnostic lookup.

With TSBs, the OEM has already done all the hard work by identifying the symptoms, diagnosing the issue and providing the corrective procedure. As a technician, you just have to follow the instructions.



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# Enhance your employees' Know How with NAPA Autotech

**V**ehicles are becoming more technologically advanced. What used to be an easy repair has suddenly gotten a little more complicated. As a shop owner you are going to need your technicians to be up to date with the latest automotive advancements. To help you accomplish this NAPA Autotech offers the the latest high-tech training. Not only are each three to four-hour class held in the evening, but they cover topics important to your business, such as hybrid maintenance, no code diagnostics, diesel issues, scan tool dynamics, electronic circuit testing and more.

## Learn from the best

All NAPA Autotech classes are led by experienced trainers who are certified technicians. They will use their work experience with the latest technologies to provide your technicians with the best training currently available. Their instruction will enhance your technicians' understanding of vehicle systems and increase first-time repair capability, which leads to increased customer satisfaction.

## With ClassPass, training doesn't end when class does

NAPA Autotech wants you to have continuing education at your fingertips 24/7. So, after you've completed a course you can access additional information online with ClassPass. When questions come up, just go to [napa-autotech.com](http://napa-autotech.com). There your employees



simply enter their ClassPass ID and have unlimited access to supplemental materials, such as slides and notes, step-by-step procedures and common fixes for repair situations.

## Autotech helps improve the bottom line

There are a lot of reasons for your employees to go through NAPA Autotech training, but the most important is that it can help make your shop more successful. Shop owners who previously attended classes boasted that it helped their technicians speed up diagnostics testing times and increased employee

productivity, which can help improve your operation's bottom line.

## Sign up for a class

NAPA Autotech wants to help keep your employees up to date with the latest automotive advancements. To find out more about the classes being offered, go to [napaautotech.com](http://napaautotech.com) and search for classes in and around your ZIP code. Keep your business running longer, stronger with NAPA KNOW HOW.

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# Corrosion-resistant coils from NGK — The Ignition Specialist™

**M**any Chrysler, Dodge and Jeep original equipment ignition coils are made with zinc-plated steel secondary winding terminal connections that can be prone to corrosion. These corroded coils can reduce engine performance and fuel economy. That's why NGK manufactures ignition coils for these applications with brass secondary winding terminal connections. And with an added insulating dielectric grease, NGK's coils better resist corrosion, optimizing engine performance and improving fuel efficiency.

NGK coils are engineered to function seamlessly within vehicle ignition systems with failure prevention, optimal performance and easy installation in mind. To better prevent part failure, the coils feature vacuum-sealed epoxy resin for longer part life, a shellac winding coating to resist voltage arcs and high-grade dielectric thermal plastic that is resistant to extreme temperature variations. Designed for maximum efficiency, NGK coils are manufactured with high-quality laminated electrical steel coils to produce the best spark possible. The custom NGK application-specific integrated circuit (ASIC) chipset also aids in performance by preventing component damage and optimizing efficiency in complex engines. And for easier installation, NGK coils include ignition control modules, coil boots and jumper harnesses as required for certain applications. These innovations, in con-



junction with numerous application-specific product enhancements, like the brass secondary winding terminal connections, make for one of the highest performing, most durable ignition coils on the market today.

NGK coils are manufactured to OE standards for durability and operational performance. Developed in an ISO 17025 accredited lab, all NGK ignition coils must pass extensive testing and quality checks throughout the manufacturing process. Each coil undergoes mechanical vibration testing, thermal-shock testing to -40°F, electromagnetic interference testing to ensure the part will not interfere with other components, and accelerated life testing at high voltages and frequencies to help identify and correct potential failure points.

From rail to pencil-style coils, NGK offers more than 490 ignition coil part numbers for a variety of brand names and applications, covering over 96%

of vehicles on the road today. NGK is the largest supplier and manufacturer of spark plugs, coils and other ignition products for domestic and import vehicles in North America. With over 50 years of automotive expertise, NGK's family of automotive products, including NTK sensors and WVE vehicle electronics, is driven by extreme dedication to innovation, performance and quality.

To learn more about NGK ignition products, visit [ngksparkplugs.com](http://ngksparkplugs.com).



**NGK SPARK PLUGS (U.S.A.), INC.**

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# Raybestos offers technical training clinics

**R**aybestos® offers technical training clinics where attendees learn from ASE Certified instructors. Brake clinics can be conducted in a classroom and/or in shop training at the customer's location, or onsite at the Brake Parts Inc (BPI) headquarters in McHenry, Illinois.

Scheduling a Raybestos training clinic has many benefits, including:

- Higher customer satisfaction
- Increases component knowledge; demonstrates the importance of quality products
- Increases technical knowledge
- Increases sales and profits
- Reduces warranty claims
- Builds relationships and credibility
- Priority access to technical hotline and catalog assistance

There are two field clinic options available. Each runs approximately three hours. Certificates of completion are provided.

## Brake System and Repair – Module 1

This seminar is designed for technicians, counter and sales personnel. It covers the most up-to-date information available from both OE and the aftermarket in regards to practical braking application of hydraulic theory and diagnostic procedures. There will be a comprehensive explanation of braking principles, master cylinders use and operation, power-assist devices as well as rotor/drum machining techniques and lathe verification procedures. The proper use of friction materials will be discussed, along with using friction wear patterns to diagnose



and explain why a complete brake job is necessary. Attendees will learn how to eliminate brake noise and brake pedal pulsation. This class will also provide the knowledge to explain the cause of brake noise and provide the procedure for servicing calipers and wheel cylinders.

## Interactive Brake Systems – Module II

This seminar explains how brakes on today's vehicles not only stop us, but also keep us on the road. It covers the most up-to-date information available from both OE and aftermarket suppliers. Electronic stability control (ESC) can apply a single brake to prevent over or under steer without driver intervention. Active cruise control and collision-avoidance systems can apply full braking without driver input. ABS is an integral part of the brake system and has to be serviced accordingly. Attendees will also learn about electronic parking brakes and

how these systems operate, the problems they create and how to service them correctly. Common brake issues typically seen at the shop such as pedal pulsation, noise and pulling problems will also be discussed.

Please reach out to your local Raybestos distributor for more information on the availability of training clinics in your area.

Raybestos has been known as the best in brakes for over 100 years. With a demonstrated commitment to research, development and testing, Raybestos is widely recognized for quality brake components, including friction, rotors, drums, calipers and hydraulic products. To learn more, visit [www.raybestos.com](http://www.raybestos.com).

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# SKF – A hub of innovation

**W**ith the continued demand to create safer and more reliable vehicles, manufacturers are looking for any edge that can strengthen components and how they perform. SKF continues to build on its history as a pioneer in the development of the first, second, third and fourth generation wheel end hub bearing units.

Today, SKF continues its ongoing partnerships with original equipment manufacturers to develop a new level of performance, reliability, safety and comfort for today's vehicles.

## The next generation of wheel end technology

SKF's X-Tracker hub bearing unit provides precision handling and braking characteristics, ultimately delivering improved handling and comfort. The SKF X-Tracker Hybrid hub bearing unit is designed to provide increased performance to pickup truck and SUV applications. Combining the strengths of the ball and tapered roller hub units, the hybrid hub bearing unit offers less rotor and flange deflection which helps withstand harsh off-road environments.

## SKF hub bearing kits – everything you need in one box

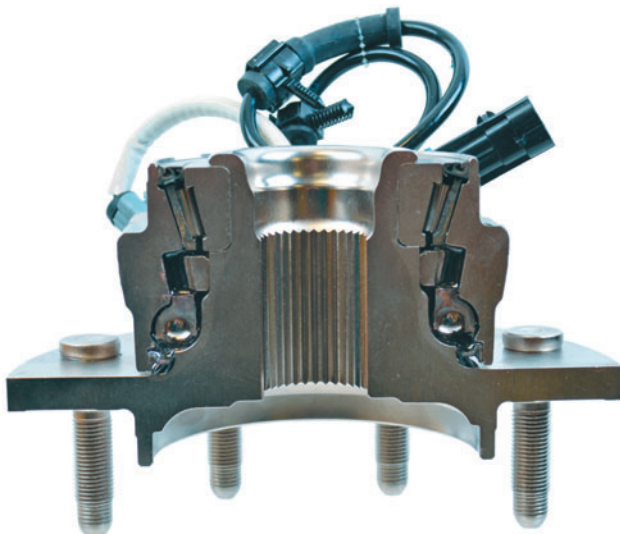
SKF's hub bearing kit is designed to save time by providing everything an automotive technician needs to replace a press-in style hub bearing, including a cartridge-style wheel bearing,



C-clip, axle nut, seals and the only premium hub flange in the aftermarket that meets 100 percent OE Specification. SKF's hub bearing kit reduces the chance of customer returns by providing quality parts designed to fit and work properly together, eliminating the hassle of sourcing separate parts, sometimes from separate suppliers.

## SKF Parts Xperience – a training and rewards program

The SKF Parts Xperience training and rewards program provides automotive and truck technicians with the latest technical information, training materials, and product knowledge to help them be more productive and keep pace with ever-changing vehicle technologies. This web-based program features interactive training modules, links to SKF product and technical information, and an extensive rewards catalog. By completing the interactive training courses and installing SKF products, participants earn points that can be redeemed for various premiums. Technicians can sign up today at [www.skfpartsxperience.com](http://www.skfpartsxperience.com).



## SKF

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# Dan-Am Air<sup>®</sup> aluminum air piping system

**C**lean air requirements are more critical than ever. Air tools, blow driers, HVLP spray guns, and supplied air respirators may require more air volume and better air quality than in the past. Not only does clean air effect equipment performance, but it is also critical for paint coatings performance. Dan-Am Air's aluminum airlines along with SATA's filtration system can solve all of these issues.

The Dan-Am Air system is reusable and easily adaptable to any space, not only ensuring safe, clean air for your team, but also increasing your shop's efficiency and improving your bottom line.

## Three-stage filtration

SATA filtration is available in two sizes, which can flow up to 129 cfm at 90psi—an exceptional amount of air for a single filtration unit, Gravenhof says, “if your shop is equipped with multiple booths, you have the option of a single SATA filter to maintain, as opposed to a filtration unit at each booth. Fewer filter cartridges to maintain equals fewer dollars spent.”

The SATA three-stage filtration system is simple: The first stage is the water separator, removing the larger moisture droplets and particles down to 5 microns from the air; next is the fine filter which removes particles down to 0.01 micron; and, finally, there is the activated charcoal filter stage removing hydrocarbons, oil vapors and odors to give you perfectly clean air for breathing and spraying.

## High-quality materials

The system's airlines are made of powder-coated, aircraft-grade, extruded aluminum.



Aluminum's biggest advantage? Easy to install, modular and reusable, lightweight, corrosion resistant, and guaranteed not to leak. Dan-Am Air fittings are constructed of a reinforced Nylon composite material, with a double Nitrile

seal. The manifolds and ball valves are nickel plated solid brass, and all threaded connectors are high grade steel. Dan-Am Air can be easily adapted to your current system with the variety of threaded connection options available.

## Modular design

“Compared to a more typical airlines system, ours is reusable,” Gravenhof says. “You can put a system up, and take it down and put it back together very easily. It's modular, and can be easily added on to or changed if need be.”

Designed with simplicity in mind, DAA allows you to do-it-yourself. Measure, cut, de-burr, then simply “Press-to-Connect”. The direct result being lower installation times and costs.

The “Press-to-Connect” subject tends to be the most misunderstood instruction in the DAA system. We have all been taught since we were young to first loosen a given item, put it together, and then tighten it. That is NOT the recommended installation procedure for DAA fittings. DO NOT loosen fitting caps before installation. It's as simple as pushing the fitting onto the pipe until it is fully inserted.

## Creating efficiency, saving money

With high air volume demands and efficiency requirements, many of the major paint company training centers across the U.S. utilize the benefits of DanAm Air and SATA Filtration in their facilities.

“The cost of a reusable and versatile system like Dan-Am Air can pay off quickly,” Gravenhof says. “It's a simple, effective system, with a do-it-yourself installation option. It saves time. It saves energy. It ultimately saves money.”



# Recharge your CVT service plan

**W**ith LUBEGARD's recent in-house technological advances and improved testing machinery, our molecularly advanced driven products are quickly becoming the solution for many transmission fluid related problems.

The current fluid proliferation combined with an incomprehension about what they are and what they do has driven many service technicians and shop owners to take the OEM's advice on fluid specs and service intervals. This is one of the costlier mistakes mechanics and technicians make when confronted with picking service fluids and advising customers when to service a transmission. The OE mantra "use my fluid or your transmission will fail" is almost as bad a notion as "fill for life." Both policies are designed to serve the OE, not the consumer or mechanic who maintains the vehicle.

There is a growing movement in the aftermarket to educate the service industry on what constitutes good advice and proper products that extend the life of the transmission, basing service on real-world factors, not time or miles alone. The vehicle's daily use is critical in determining the frequency of service where certain types of transmissions are concerned, like the CVT transmissions commonly found in smaller cars and vehicles used for urban delivery and transportation.

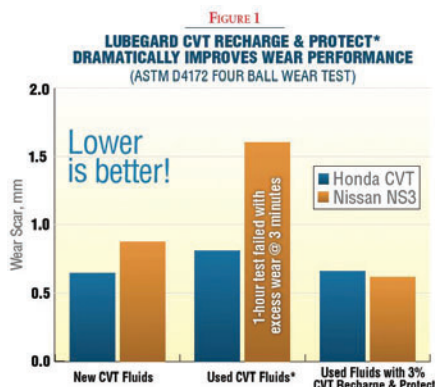
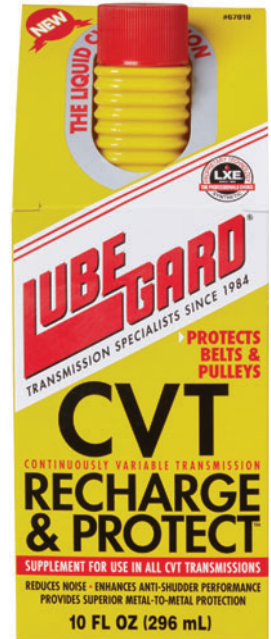
CVT transmissions that initially proved to be problematic with newer units are much more robust and reliable, but all CVTs, regardless of who the manufacturer is, have lubrication issues unique to the CVT design and are influenced dramatically by variables such as driving style and the fluid level at operating

temperature. Too much fluid and the transmission fluid foams; too little fluid, which can be a problem in cold weather before thermal expansion occurs, and the fluid foams. Foamed fluid on the sheaves and

belt/chain will cause reduced pressure that also leads to belt wear and slipping, resulting in the fluid quickly being depleted of its anti-wear and extreme pressure additives. Even when fluid levels are set correctly the problem of additive depletion on CVT fluids can cause belts, bearings and bushings to wear out prematurely and fail when the driving habits or daily use (severe service) uses up the additive package of the fluid before scheduled OE recommended service occurs.

Because so many problems in CVT transmissions relate to fluid, you would think the OEs would be all over the problem, but that is not what has occurred. LUBEGARD is proud to announce a new solution to the additive depletion problem currently affecting CVT transmissions. This new product is called CVT Recharge and Protect and has been proven to restore anti-wear protection and reduce foaming in used CVT fluids, which in many cases is the specific solution to wear and performance problems.

The unfortunate reality is that the OEs that sell the transmission did not engineer it or design the fluid it uses. They rely on aftermarket suppliers to provide the solutions and in the end take credit for the hard work and technology of supplier companies. This is certainly not a new problem. The automotive aftermarket has been amazingly resilient and is finally starting to get the credit for problem solving and engineering excellence by solving mechanical and fluid problems eluded by OEs. The OEs do not have the in-house talent to do so in the new "lean" outsourcing corporate world of U.S. automakers. LUBEGARD, a world leader in research, development, and manufacturing of high-performance lubricants, does, which is why we have the solutions you are looking for.



\*Nissan NS3 Used Fluid had 224,069 miles on the original factory-fill fluid extracted from 2014 NV200. Honda HCF-2 Used Fluid had 27,322 miles on the original factory-fill fluid extracted from 2013 Honda Accord

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## IF THE LEAK ISN'T VISIBLE...

THE COOLANT RESERVOIR IS LOW, BUT EVERYWHERE YOU LOOK, IT'S DRY. IF IT ISN'T LEAKING ON THE OUTSIDE, IT MUST BE LEAKING ON THE INSIDE!

PETE MEIER // Technical Editor

Your customer brought in the family people-mover for a routine service. There are no complaints — in fact, they shared that the car is running beautifully, thanks to you!

As you perform your routine underhood checks, you notice that the coolant in the reservoir is lower than it should be. You look around the engine compartment, paying special attention to the cooling and heating system components, but see no visible signs of a leak. Later in your service, you remove the radiator cap and note that the radiator level is also a bit lower than it should be. You grab your radiator pressure tester and pump up the system to 15 pounds or so, but the pressure holds. Shaking your head, wondering why the coolant level was low, you top off the radiator and reservoir and send your customer down the road.

So, where did the coolant go? Odds are there is an internal leak — most likely, into the combustion chamber. According to many coolant manufac-



turers, internal coolant leaks are more common than we think. The loss of coolant may be slow, but the impact on the engine can be huge over time.

In this month's "The Trainer," I will share a few techniques on locating even small coolant losses due to combustion chamber loss. *ZZ*

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