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Vol. 133, No. 7

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OF

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COMMUNITY

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A MID-YEAR UPDATE

We take a look at what's new
for the second half of 2014.

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next generation on viewing
automotive repair as a career.

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MARRIAGE
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ASA HEADS TO CAPITOL HILL

Members meet with legislators
to discuss vehicle safety.



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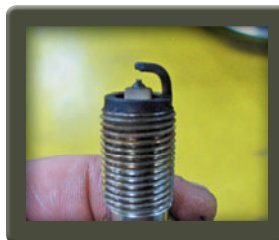
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MAKITA LAUNCHES APP

Makita U.S.A. has launched a new mobile app with a dashboard of options including tool registration, dealer locator, info on new tool releases and more.

» MOTORAGE.COM/MAKITAAPP

FRAS-LE NAMES NEW CEO

Fras-le has appointed Pedro Ferro CEO. He joined Fras-le after a career at Meritor as senior vice president and president of aftermarket and trailers.

» MOTORAGE.COM/FRASLECEO

ROTARY LIFT LEADS ALL CERTIFIED INSPECTOR CHARGE

More than 50 members of Rotary Lift's network have completed the ALI Lift Inspector Certification Program in the past nine months.

» MOTORAGE.COM/LIFTCHARGE

U.S. ECONOMY THE STRONGEST

This is both good and bad news, says Bill Strauss, senior economist and economic advisor at the Federal Reserve Bank of Chicago.

» AFTERMARKETBUSINESS.COM/ECON

REPLENISHING MILITARY PARTS

Imagine if you had to supply replacement parts for a global fleet damaged by gunfire, artillery and roadside bombs.

» AFTERMARKETBUSINESS.COM/ROLL

ALUMINUM USE GROWS

It's time to acknowledge the reality of this imminent change and get ready to tackle it as an opportunity.

» ABRN.COM/ALUMINUM

THE BENEFITS OF NITROGEN

Before you consider nitrogen in painting, this writer recommends that you create a solid baseline.

» ABRN.COM/NITROGEN



Bill Moss, AAM (left), owner of EuroService Automotive, Warrenton, Va., meets with Rep. Robert Hurt, Va.-5.

LEGISLATION

ASA hosts Capitol Hill meetings to discuss vehicle safety with leaders

On May 29, Automotive Service Association (ASA) mechanical division leaders traveled to Capitol Hill to meet with key members of Congress and their staff to discuss the importance of periodic motor vehicle inspections (PMVI). ASA's members recounted personal stories from their home states, emphasizing the value and necessity of periodic safety inspections. ASA encouraged Congress to work with the National Highway Traffic Safety Administration (NHTSA) in an effort to promote state PMVI programs.

The group also spoke briefly about telematics, requesting that Congress hold off on legislation for new vehicle technologies until the repair industry determines its legislative needs, if any. ASA leaders enjoyed a largely positive response and are looking forward to continuing to work with Congress to promote automotive safety.

Among those attending were Bill Moss, AAM, owner of EuroService Automotive, Warrenton, Va., who met with Rep. Robert Hurt, Va.-5, and Vernon and Barb Menke of Menke's Automotive Repair, Newburgh, Ind. They met with Rep. Larry Bucshon, Ind.-8.

For additional information about ASA or the Washington visit and meetings, go to www.ASAsShop.org, or visit ASA's legislative website at www.TakingTheHill.com.

BREAKING NEWS

OPERATIONS

PEP BOYS SIGNS ON WITH MITCHELL 1

Mitchell 1 has announced that The Pep Boys – Manny, Moe & Jack, a nationwide automotive aftermarket service and retail chain, has selected ProDemand™ with SureTrack™ as the source for OEM-based and expert information for its 800 locations in 35 states and Puerto Rico.

In a single lookup, ProDemand delivers complete OEM repair information along with real-world, experienced-based knowledge from SureTrack. Advanced search technology developed by Mitchell 1 integrates the data to provide comprehensive, categorized repair information in a user-friendly interface, making it easier than ever for automotive technicians to quickly find the information they need to complete repair jobs faster and with more confidence.

"Our technicians love ProDemand," said Stacey Hamilton, director of operations customer engagement for Pep Boys. "Our entire organization is happy we made the change to ProDemand for our OEM service information with real fixes. It's another way that we can help our technicians work more efficiently."

The partnership gives all Pep Boys locations access to the features in ProDemand, including best-in-class color wiring diagrams, the latest TSBs and recalls, procedures

[Mitchell 1] CONTINUES / PAGE 8

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[Mitchell 1]

CONTINUED FROM PAGE 6

and specs, integrated estimating, along with SureTrack's commonly replaced parts data, guided component tests, extensive library of wave forms, and interactive community of professional technicians. Pep Boys provides service for more than 6 million vehicles and vehicle owners each year.

"We are delighted to partner with Pep Boys, one of the most respected brands in the car care business, to provide their affiliated service and repair

"Our ongoing goal is to help our partners and customers succeed for the long-term by providing them with solutions that make their jobs easier,"

— Dave Ellingen, Mitchell 1 president

facilities with access to ProDemand, Mitchell 1's all-in-one solution for

repair information and diagnostics," said Dave Ellingen, president of Mitchell 1. "Our ongoing goal is to help our partners and customers succeed for the long-term by providing them with solutions that make their jobs easier. With the adoption of ProDemand, Pep Boys demonstrates its commitment to providing their shops with tools that not only simplify their tasks, but also help them increase efficiency and accuracy."

To learn more about ProDemand, visit <http://www.mitchell1.com/ProDemand> or call Mitchell 1 at (888)-724-6742.

CNBC 'The Profit's' Marcus Lemonis to deliver keynote

Business turnaround king Marcus Lemonis, star of CNBC's "The Profit," will deliver the keynote address at the 2014 Mudstock Training Summit slated for Sept. 3-5, 2014.

Lemonis, CEO of Camping World, the nation's largest RV and outdoor retailer, and Good Sam, the world's largest organization of RV owners, is known as the "business turnaround king" and has turned around more than 100 companies over the past decade. At Mudstock, Lemonis will share profit and growth strategies for entrepreneurs.

Presented by Mudlick Mail, a provider of direct mail services for the automotive repair industry, Mudstock 2014 is an interactive training event designed for independent automotive shop owners and owner-operators. The event aims to help shop owners grow their businesses with practical tools and how-to knowledge to produce results.

"We are so lucky to have someone of Marcus' experience and stature at Mudstock. I have no doubt that he'll have valuable insight to share with this year's attendees," said Mudlick Mail President Tim Ross.

Lemonis will speak at 7 p.m. on Sept. 4, sharing the experience he has gained working with struggling businesses around the country. On "The Profit," he invests his own money and knowledge in failing businesses, in exchange for a piece of the business and a percentage of the profits. Prior to "The Profit," he appeared on NBC's "Celebrity Apprentice" in 2011 and 2012 and was featured on ABC television's "Secret Millionaire" in 2012.

Named Entrepreneur of the Year in 2008 by Ernst and Young, Lemonis leads nearly 6,000 employees in over 100 U.S. cities, and recorded close to \$3 billion in sales in 2013. He also owns A Better Life, a holding company offering products and services inspired by Lemonis' ongoing lifestyle goal to eat right, nourish the body, incorporate exercise into a hectic schedule, minimize stress and limit exposure to harmful toxins.

Other speakers include: Ross, a direct mail expert; Greg Sands, Mudlick's founder and CEO and auto repair operators with more than 38 shops in five states; Rissy Sutherland, COO of Honest-1 Auto Care; and digital marketing expert Todd Westerlund, CEO of Kukui Corporation, a developer of software marketing solutions for automotive repair shops.

Mudstock regularly draws more than 150 of the nation's top service center owners to the Barnsley Gardens Resort, tucked in the foothills of the Blue Ridge Mountains just north of Atlanta. Amidst this beautiful background, industry experts will provide guidance on a wide variety of topics, including capitalizing on trends in the automotive industry, hiring and training technicians and service writers, valuing your business, increasing sales and profitability and financing growth.

"This event provides a great opportunity for shop owners to exchange information and ideas while gaining expert guidance to improve their businesses," said Sands.

2014 TOP SHOPS CONTEST IS UNDERWAY

Back again, the annual *Motor Age* Top Shops contest is here for you to show off how great a shop you operate or work in.

Every year, the contest searches for the 10 best shops in the country, highlighting an overall winner and nine other quality shops. To enter, download the form at MotorAge.com/

TopShops. It outlines the rules and all of the information you need to share about your shop. The questions inquire about your shop's marketing, social media and training programs, your involvement in the industry and community and how you came to own and operate the shop. You also will need to submit photos of your shop, because a photo is worth 1,000 words, you know.

Should you have any problems downloading the information, send an email to Tschanen.Brandyberry@MotorAge.com

[Top Shops] CONTINUES / PAGE 10



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[Top Shops]

CONTINUED FROM PAGE 8

Age's managing editor. The contest runs through Aug. 29, 2014. The top 10 shops will be profiled in the December issue of *Motor Age* and featured online. Again, you can see all of the information on entering the contest at MotorAge.com/TopShops. In the meantime, check out more about our 2013 winner, Pellman's Automotive Service in Boulder, Colo. You can read about them in our official news release or in their feature story from the December 2013 issue of *Motor Age*.

Online you also can read about the 2013 top 10 top shops in the *Motor Age* contest:

- Pellman's Automotive Service, Boulder, Colo.
- Brad's Service Center, Chicopee, Mass.
- Carfix, Garner, N.C.
- CARS of America, Inc., Glenview, Ill.
- Certified Automotive Specialists, Glendora, Calif.
- Curt's Service, Oak Park, Mich.
- George's Sierra Shell, Fontana, Calif.
- Larson's Service, Inc., Peabody, Mass.
- Rad Air Complete Car Care, Westlake, Ohio
- Sun Valley Imports, Tempe, Ariz.



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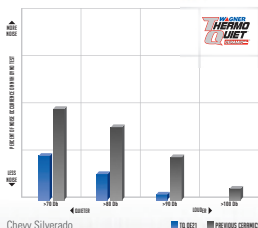
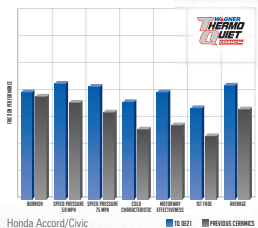
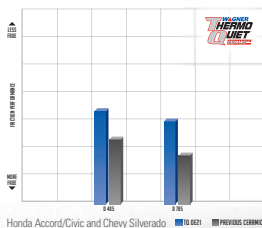
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Average age of vehicles on the road steady at 11.4 years, IHS Automotive says

The combined average age of all light vehicles on the road in the U.S. remained steady at 11.4 years, based on a snapshot of vehicles in operation taken Jan. 1 of this year, according to IHS Automotive, which incorporated Polk into its business last year.

Total light vehicles in Operation (VIO) in the U.S. also reached a record level of more than 252,700,000 -- an increase of more than 3.7 million (1.5 percent) since last year, said the IHS Automotive analysis from July 2013. In addition, new vehicle registrations outpaced scrappage by more than 24 percent for the first time in a decade, according to the analysis.

The average age is in line with the trend shift first seen in 2013, in which the combined fleet of cars and light trucks on the road is older than ever. New analysis, however, indicates the average age of light trucks has increased in the past year to the same age as passenger cars, both at 11.4 years. This milestone marks the first time this has happened since 1995, when the data was first reported.

"In our history of tracking, we have seen a gradual increase in the average age of vehicles on the road," said Mark Seng, director, aftermarket solutions and global aftermarket practice leader at IHS Automotive. "This year, we're seeing somewhat of a plateau in the

[Vehicle Age] CONTINUES / PAGE 13

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[Vehicle Age]

CONTINUED FROM PAGE 10

market, and expect it to remain over the next few years, without a major change in either direction. We attribute this to a number of factors, including the economy and the increasing quality of today's automobiles."

Looking ahead, IHS forecasts that average age of vehicles is likely to remain at 11.4 years through 2015, then rise to 11.5 years by 2017 and 11.7 years by 2019. This rate of growth is slowing as compared to the last five years due to the substantial increase in new vehicle sales.

The number of vehicles scrapped in 2013 was significantly fewer than in previous years, with just over 11.5 million vehicles scrapped during the 12-month timeframe analyzed by IHS Automotive. In comparison, a record high of more than 14 million vehicles were scrapped in 2012. This while VIO is up 1.5 percent, a rate the auto industry hasn't seen in the U.S. since 2004-2005.

With the shift in ownership comes shift in the age of vehicles within seg-

ments of the overall fleet, which is important to business planners in the aftermarket and service industries so they can manage inventories of parts required and plan for sales and service activity accordingly.

Based on the growth of new vehicle registrations in the past few years as the U.S. auto industry has rebounded, IHS Automotive forecasts that the volume of vehicles zero to 5 years old will increase by 32 percent over the next five years while vehicles in the 6-11 year old category will decline by 21 percent. Because of improved quality and consumers holding their cars and light trucks longer, vehicles 12-plus years old continue to grow and will increase by 15 percent by 2019.

The IHS Automotive aftermarket team is working with customers in all areas of the aftermarket to help them best identify opportunities and specific planning efforts that may help improve their business. Likewise, business planning opportunities are under way at the OEMs to help them identify additional sales opportunities as vehicles are taken out of service and newer vehicle are coming into the U.S. vehicle fleet.

Continental releases glossary of industry TPMS terms

Continental Commercial Vehicles & Aftermarket, one of the industry's leading manufacturers of complete OE Tire Pressure Monitoring Systems (TPMS), OE-engineered TPMS replacement parts and the maker of the VDO REDI-Sensor™ Multi-Application TPMS Sensor, has just released a valuable glossary of industry terms that was recently developed for TPMS service. The new 10-page glossary includes definitions and descriptions for over 93 industry-wide TPMS service related and parts terms.

According to Continental Product Manager, Steve Landis, the new glossary was developed to help both parts suppliers and professional technicians better communicate and understand the complexities of TPMS service and the wide variety of industry terminolo-

gies used in this rapidly expanding automotive service category.

The new glossary is available for free on the VDO REDI-Sensor website at redi-sensor.com/glossary.php and can be downloaded for easy reference as a PDF. The glossary has also been indexed by Google for easy search.

The VDO REDI-Sensor multi-application sensor program has recently added a new sensor variant to bring even greater coverage for European, domestic, and Asian vehicles. REDI-Sensor is the multi-application TPMS sensor service solution created to simplify all TPMS service needs. It now replaces over 200 OE sensors with only four sensor SKUs.

Continental is one of the industry's leading manufacturers of Tire Pressure Monitoring Systems, replacement parts and passenger and commercial vehicle tires, worldwide. All VDO TPMS replacement parts are made in ISO-certified facilities to the same quality standards as the OE parts supplied to automakers.

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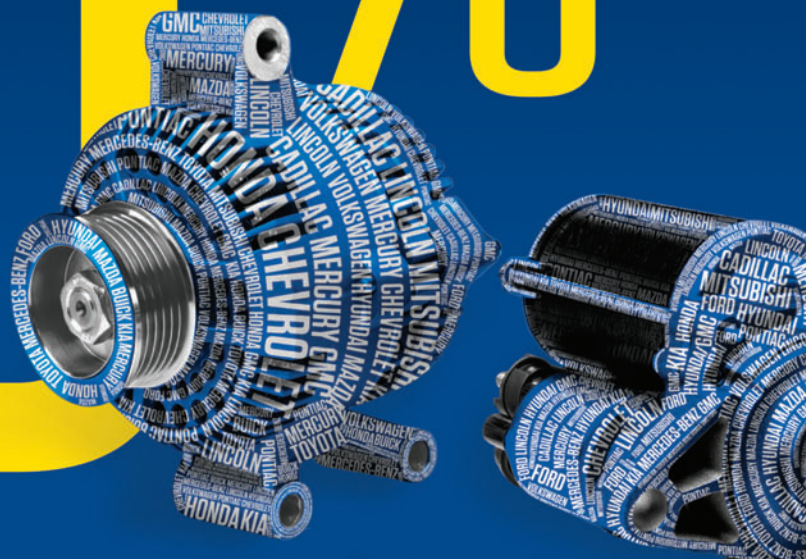
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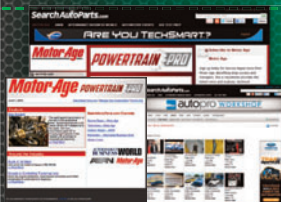
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ASE GUIDES

QUESTION OF THE MONTH



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✓ **SURVEY:** The ECM needs to receive feedback so it can determine how well an executed function has performed. Exhaust Gas Recirculation (EGR) systems may use shifts in O₂ sensor voltage or changes in short term fuel trim corrections to determine if the EGR is flowing correctly. What OEM uses a Differential Pressure Feedback (DPFE) sensor as the feedback source for some of its EGR systems?

- A. Chevrolet
- B. Ford
- C. Jeep
- D. Edsel

Go to MotorAge.com/jul14survey to answer the question and enter the monthly contest from Federated Auto Parts.



What's your corporate social responsibility?

We're all part of this world, going beyond the repair side. How do you give back?

BY LESLIE ALLEN | WORKSHOP MEMBER

Corporate Social Responsibility, CSR, has taken on with companies large and small. Auto shops have almost always recognized the need to give back to the community and participate regularly in support of sports teams, Boy and Girl Scouts, church fundraisers and causes that are directly affecting their local community.

Larger corporations most often select a few non-profits to support that would have widespread appeal or their local United Way

that will provide more integration with employees to get a full company commitment.

In the automotive aftermarket, I would like to applaud MAHLE Service Solutions, which was formerly RTI, for supporting the military with a portion of the proceeds from the sell of some of their equipment to go to the Support Our Troops — America (OSOT America) organization.

If more companies could look at their inventory as a way to share profits by choosing one or more products to share revenue, so much more can be accomplished.

MotorAge.com

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

LongIslandAutomotiveTraining / N.Y.

Smart revenue

I learned recently that manufacturers recommend the replacement of Smart Key or Smart Entry Keyless start system batteries once per year. This led me to think that this may be a new stream of revenue for independent repair shops.

Let's say on average you service 1,000 individual cars with keyless entry/start annually. If you replaced all 1,000 batteries at a profit of \$5.00 per unit, you just made an extra \$5,000 in straight profit. These battery replacements can be done in seconds at the service counter, which eliminates a cost for installation.

Why should a battery be replaced every year? Storing keys near anything with a radio frequency, such as a cell phone can cut down on the battery life. If the bat-

tery is dead, it may leave the customer stranded, and if you were the last to service the vehicle, who do you think the customer might blame? If you said they will blame you, you are probably correct.

Think about adding battery replacement to your services offered as a value added component for your customers. At the very least you will keep them happy and maybe make a few bucks at the same time.

Kukui / San Jose, Calif.

Converting leads

A new customer will almost always call you before bringing his or her car into your shop. Converting these calls into sales can be tricky, but you can increase the potential for success by establishing a game plan before the phone rings. Here is one of several strategies to consider when for-

mulating your plan.

There are tons of shops out there with employees who answer the phones sounding grumpy, disappointed or tired. You can get an edge on the competition by being friendly, which should lead the person on the other end of the phone to be friendly in return. In addition to setting a welcoming tone, your introduction should always mention the name of your shop, your name and the phrase, "How can I help you?" Remember to train your employees on this approach, so no matter who picks up the phone, the customer receives the same warm greeting.

You can read the rest of the tips on pitching and closing the deal by going to MotorAge.com/convertingleads.

Aug. 21
@ 8:00 PM**Ignition Testing**Learn the ins and outs of ignition system diagnosis in this *Motor Age*/TST webinar, sponsored by Champion.

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MEETING WITH
LEGISLATORS

ASA FLY-IN

Views on vehicle safety shared in D.C.

PAGE

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Q+A WITH
TODD WUSTERLAND

KUKUI U.S. OPERATIONS PRESIDENT

Marketing with an enlightened approach.

PAGE

104

THE
TRAINER VIDEO

PETE MEIER

When swapping plugs doesn't work.

Investigate how your company can give back to the community. The goodwill of participating in a program that is leveraged through public relations and marketing will help create loyal customers that will appreciate

how your company stands apart from the competition.

I would love to hear how your company is giving back. Please share your stories by sending an email to lallen@themarxgrp.com.

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JULY 10

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AUG. 21 @ 8 P.M. ET

Ignition System TestingPresented by *Motor Age* Technical Editor Peter Meier and G. Truglia of TST, and sponsored by Federal Mogul.

SEPTEMBER

Understanding Hydraulics

Presented in partnership with ATSG.

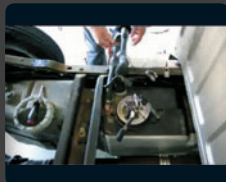
NOV. 20 @ 8 P.M. ET

Mastering Voltage Drop TestingPresented by *Motor Age* Technical Editor Peter Meier and G. Truglia of TST

2014 WEBCAST SCHEDULE

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MotorAge.com/rightload**Who is 'The Industry?'**

Pete Meier moderates a panel discussion on the challenges facing us as an industry and what we can do to solve them.

MotorAge.com/theindustry**MotoLOGIC overview**

Scott Avellino, MOTOSHOP's marketing manager, brings us up to speed on MotoLOGIC, how it works and more.

MotorAge.com/overview**Reading spark plugs**

"Reading" spark plugs is an art that seems to be loosing some favor, but still has a part to play.

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craigscarce:

As a consumer I will spend more for the relevant value as opposed to just buying cheap.

signal:

The challenge in our industry is that the vast majority of shop owners including all the chain stores and most dealerships is that they don't charge enough (for parts and labor), and therefore they can't afford to pay enough, causing a down spiral and turning good people to other industries.

Bolt On Technology:

There are automotive software solutions available that have also been proven to help increase shop efficiency, as well as technician productivity. Various features, including VIN scanning and license plate decoding, digital multi-point inspections and shop management system integration ... make it unnecessary for techs to handwrite customer information.

loosennutjust:

As a teacher I see the following happening: The most talented and

ambitious young students have more opportunities than ever. If they have the skills that will make them good technicians, they will probably be good at just about anything they decide to do. They will have many opportunities, and they are not dumb. They will choose the jobs that have the most to offer them.

AVHS2934:

Always remember that if a doctor's office ran like an auto shop, the receptionist would be making more money than the doctor.



STREAMING PROGRAMS

3M thanks military spouses

As part of their ongoing support of the military, the 3M Hire Our Heroes Program took a road trip to Fort Bragg in Fayetteville, N.C., to perform free vehicle detailing for spouses of deployed and fallen soldiers - restoring some 25 vehicles with services valued at nearly \$10,000.

AutoVitals Shop Flow

Have you checked out this system? See a demo and share your thoughts after this informative video.

Automechanika Chicago press conferenceReserve the dates today! *Motor Age* is proud to announce our partnership with Messe Frankfurt to bring Automechanika to Chicago, April 24-26, 2015.

JULY 30-AUG. 2

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2014 INDUSTRY CALENDAR

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Q+A WITH TODD WUSTERLAND

U.S. OPERATIONS PRESIDENT, KUKUI



MORE THAN A SOFTWARE COMPANY, KUKUI TAKES AN ENLIGHTENED APPROACH TO PUT YOUR SHOP OUT THERE.

BY TSCHANEN BRANDYBERRY | MANAGING EDITOR

Combining technology and marketing brings an enlightened look at getting information on today's repair shops to the general public.

And that's the goal of Kukui, a software company with a focus on marketing, says Todd Wusterland, president of U.S. operations. He adds the name actually means enlightenment in Hawaii, where the company started.

MA: What do you offer today's shops?

TW: What's different about us is that it's a revolutionary marketing platform. It combines all of the technologies that relate to your marketing strategy. We combine that in a very innovative way so the shop owner can see everything right there, real simple, all in one place.

One of the taglines we use is, 'Why write five checks when you can write one?' So when I say a platform, there's a lot of companies out there that do email marketing, postcard marketing, website marketing, review marketing, so we do all of those things. When somebody comes on board with us, they usually cancel the other four different companies.

MA: People for years have heard about SEO, but why are analytics

just as important for today's shops?

TW: It's really kind of a groundbreaking change that's happening out there. There are a couple of key elements that a website has to have. The big terminology we're looking at right now is called conversion rate. In the past, we really focused on things like, What's your click-through rate? How many impressions are you getting? How long do people stay on the website?

Really at the end of the day, that's great if I put together a nice shiny report for you and look at that and have a nice little chat about that. What you're going to hold me accountable for is does the phone ring and do people come in and spend money? We track all that stuff, but we hold ourselves accountable. Did the phone ring and did they come in? A shop isn't too excited about people going on their site and staying there a long time. That really doesn't do anything for them. They'd really like to get calls.

There are three that go along with that that we always have fundamentally built into every website, including relevancy. We remove everything. If you take a look at all the companies we work with, we really remove a lot of stuff and keep it very simple and keep it very relevant.



MA: Why should owners lay out a marketing plan for the entire year, keeping in mind it can be flexible?

TW: What we're looking at historically is a business plan. You want to have data to make the business year, but to also stop things that aren't working....

My statement on a plan is always the same. If you think of a ship leaving the harbor, if you don't have a plan, it starts wandering aimlessly. "We're heading kind of in the direction toward the United States." If you have a plan, it really is like the GPS. You can get where you need to go directly.

They really do need to have a plan month by month. What are we doing in February, say for Valentine's Day? What are we doing in April for Easter? What are we doing in July for Fourth of July? All of these things need to be planned out. **TW**

Photos: Todd Wusterland

OPERATIONS

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MANAGEMENT



IN THIS SECTION

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- 28** Financial Figures
- 30** Shop Profile

read it on **MotorAge.com**

LEAD, FOLLOW OR BLAME

Check out this list of 14 leadership traits all owners need.

[/leadfollowblame](#)

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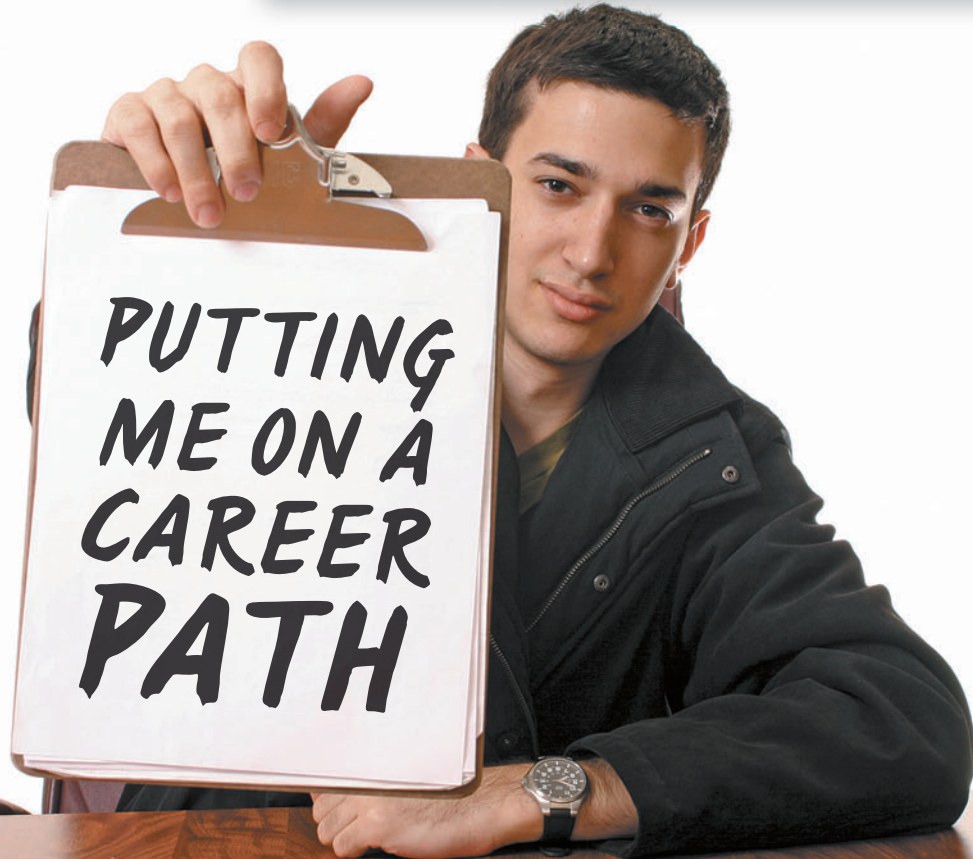
A text to a client might be the best way to convey what needs done.

[/textefficiency](#)

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Dayco is providing information for the videos played in shop lobbies.

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IT IS WORTH YOUR TIME TO TRAIN THE NEXT GENERATION ON VIEWING AUTOMOTIVE REPAIR AS A CAREER.

BY **BRIAN CANNING** | CONTRIBUTING EDITOR

ONE OF the most consistent and pervasive challenges facing repair shop owners and service managers is keeping their shops fully staffed with technicians who are up to date on their training and capable of working on late model vehicles. Finding a technician at all can be a challenge in many parts of the country, but finding capable, productive, quality technicians in many cases is a near impossibility.

If we do not put automotive repair out there as a viable career option early, making training opportunities highly visible, attractive and available to young people graduating from high school today, we might find ourselves in an ever tightening staffing crunch that will begin to impact our

business and our ability to compete or even survive. Come to think of it, this kind of sounds like where we are today.

Cars today are very complicated, with systems and sub-systems that require in-depth training, special equipment and skills. The good news is cars are more reliable than ever. The bad news is that when they break, you have to have spe-



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“GET ON (A SCHOOL’S) INDUSTRY ADVISORY BOARD, DONATE SOME OF YOUR TIME OR BUY THEM A PIECE OF EQUIPMENT AND TAKE THE TIME TO MEET SOME OF THE STUDENTS. ALL OF THIS IS AN INVESTMENT IN YOUR FUTURE,”

BRIAN CANNING [CONTRIBUTOR]

cialized knowledge, skill and experience to fix them.

New car dealers have long faced the challenge of staffing their service departments. Unlike the aftermarket, which can refer a customer back to the dealer, dealerships have to be ready to handle whatever shows up at their doors. They have long aligned themselves with high school, technical school and community college automotive technology programs and long have had the benefit of well-trained technicians graduating with career paths laid out.

There are automotive technology programs across the country that are dying for sponsors, and though forming partnerships can be time consuming, we are talking about our viability and survival, both something worth exploring. Being a sponsor is not a marriage or financial obligation, but it is getting involved in the direction the automotive repair industry goes and doing something very constructive in shaping what that future industry would look like. That you would have access to an emerging generation of technicians in this effort would seem a great side benefit to your sacrificing a few hours of your time each month.

Making Your Mark

I think all of us dream about that perfect tech, with that perfect combination of knowledge, skill and experience walking in off the street and rescuing our service operation. But while you wait for that unlikely event to occur, contact an appropriate high school, technical school or community college in your area and see what they might have to offer. Get on their industry advisory board, donate your time or buy them a piece of equipment and take the time to meet some of the students. All of this is an investment in your future.



Looking for ways to make Gen Y employees more successful? Try these tips.
MotorAge.com/genysuccess

Even though we still can hope and pray that perfect tech walks in and saves us somewhere along the way, beginning to partner with a local school gives us the opportunity to engage and interact with both students and teachers and gives us the very real opportunity to use that real world experience we have gained all these years and advise on curriculum and training priorities.

Most important of all, we get to engage and interact with the technicians of tomorrow and get first crack at the training, knowledge and experience they represent. Identify promising students and set up internships for them, get to know them, while they get to know you. Give them a career path while investing in your tomorrow.

Who's Available to Hire?

Before I go too much further, I want to talk to you about who we are hiring out there and why old strategies for recruiting and retaining this generation of workers might not work and why we need to be aware of who we are talking to if you want to make this work for us and make this work for them.


Generation Y, or millennials, is the newest generation to enter the workforce. A great many of us are challenged by them, but that is often our treating them like other generations and making little or no effort to understand them. Rather than waiting for them to blindly follow us, we need to find ways to effectively engage and lead them, and in this, to understand what makes them tick.

Millennials have been praised and rewarded for creativity, innovation and thinking outside the box since they were potty trained. They are comfortable with and even look forward to change, have less appreciation for something that is static or lasts than for something that changes or is upgradeable. They were

playing video games by the time they were 7 or 8. Millennials do not believe in “no pain, no gain” and cannot relate to “I have paid my dues, so should you.”

Millennials want to be on a team and believe everyone can and should contribute. They grew up in the era where everyone got equal time and opportunity to play. Millennials were raised to be assertive. They were told and reminded that their opinions and ideas were important. They are not afraid to ask questions, and they want answers. Millennials strongly believe in working smarter not harder. They are always looking for shortcuts and simplified ways to do things; not because they are lazy, because they want to be efficient.


Within 20 miles of my door are three quality automotive technology programs packed to the gills with young, highly motivated students who are learning the latest trends in automotive repair and technology but need the time and opportunity to gain experience. Each program reaches out to high schools and has at least one car manufacturer and several new car dealers listed among their sponsors.

What do dealers know that we don't? That young man or young woman looking for a career may have heard things about life as a technician in the automotive repair industry but they will not be working for the industry, they will be working for you. What view of the industry are you giving them? Maybe it's time to think about our future, our industry and became a sponsor. 



BRIAN CANNING
CONTRIBUTOR

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

 Email Brian at brimarc@hotmail.com

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WHAT THEY
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THAN YOU
THINK

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'TIL DEATH DO US PART

YOUR RELATIONSHIP WITH YOUR EMPLOYEES MEANS YOU'RE INVOLVED IN A NUMBER OF MARRIAGES WITHIN YOUR SHOP.

BY **CHRIS "CHUBBY" FREDERICK** | CONTRIBUTOR

UNTIL death do us part. That sounds kind of scary, but we all have heard that expression before. Most of the time, it refers to marriage. Marriage is defined as a formal union, a combina-

tion of two or more elements, a state of being united. Some of the things you need for a successful marriage are commitment, humility, patience, forgiveness, trust, communication, clear boundaries and respect. When you get

right down to it, you need those same things for any successful relationship.

Make no mistake, you need to have that with all your employees. How successful those relationships are is entirely up to you, and just like marriage, you have to work at it. This month I want you to listen to Kim Hickey, an ATI coach and former shop owner from Arizona, explain how she has helped hundreds of shop owners hold on to their valuable employees.

Maybe you're not that kind of person who gets all touchy feely with others. Well, it's in your best interest to foster and nurture these working relationships. The costs of losing and replacing an employee can be astronomical: vacation and severance pay, unemployment wages, possible increases in your unemployment rate, advertisements for the open position, drug testing, background checks and motor vehicle reports, just to name a few.

The Cost of Death

The man-hours or wages paid to the person writing ads, interviewing, performing reference checks, drafting employee offers, setting up security passwords and alarm codes, email accounts, etc. — this part of the process alone can take a minimum of 30 hours up to more than 100 hours per appli-



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“SHOULD I TRY TO HELP MY EMPLOYEES WITH THEIR PERSONAL DREAMS AND GOALS? IF YOU DON'T, MANY OF YOUR COMPETITORS ARE MORE THAN WILLING TO DO SO.”

CHRIS “CHUBBY” FREDERICK [ATI CEO]

cant. While you are mentally adding up the possible cost of this, don't forget about set-up costs for uniforms, business cards, internal training, external training and certifications.

Just when you think your list is done, think again! How much does it cost to replace the loss of knowledge, skills, contacts and relationships your terminated employee takes with them? Can you put a dollar amount on the loss of possible revenue from your customers that your terminated employee could take with them? The last part of this equation is factoring in productivity loss during recruiting and training, lost work while the position is vacant and high potential for mistakes until your new employee achieves the same level of skill as their predecessor. Is your head swimming yet? It should be!

None of this even takes into consideration the difficulty of finding qualified candidates. The nation's demand for technicians is expected to grow by 17 percent by 2020. This will add 124,800 jobs needing to be filled. If you follow ATI's business model of three techs per service advisor, that would mean at least 41,600 service advisor jobs also will need to be filled by 2020.

Further studies have been done on actual costs to replace employees. The Center for American Progress published a study that found businesses spend about one-fifth of an employee's annual salary to replace him or her. According to Dun and Bradstreet, replacing someone in a management position could cost as much as 150 percent of that employee's salary. Even more eye-opening was data collected by the Sasha Corporation, which determined the average cost of replacing an \$8-an-hour employee to be \$9,444.47. Sounds crazy but this is real dollars, your profit that we're talking about.

Keep Your People for Life

I hope by now you are asking yourself what you can do to keep your employees married to you for life. You can start by asking yourself if you are ready to accept the role of a true leader. Having the title of owner does not



guarantee that you have leadership abilities. It doesn't ensure that your employees will do their best for you, be inspired by you or want to help you build your business.

A good leader ensures that he or she does everything in their power to set their employees up for success. They provide their employees with a professional environment. They certainly don't run around yelling, threatening to fire everyone or rule with the iron-fisted and antiquated “It's my way or the highway” attitude. Just as in any successful relationship or marriage, both parties have to have an understanding of what the other person's expectations are. Those expectations must be clearly defined, leaving nothing open to interpretation.

“If you find out what your employees' dreams are, you can use that information to motivate them. All of you have a great wealth of resources at your fingertips.”

A great place to start is with a detailed written job description. Upon completion of the description, have a one-on-one with your employee. Make sure they understand exactly what it is that you expect from them. Explain what type of growth or advancement potential they have. If there is no potential for growth or advancement, be honest and up front with them. Before you conclude the meeting and have your employee sign off that they understand what is expected of them, ask what tools you can provide for them. If an

employee doesn't work out, you need to ask yourself whether you did everything possible to mentor them and help them reach their full potential — or did you set them up for failure?

Find Out What They Want

You need to find out what your employees want. It's as simple as asking them or giving them an anonymous survey. We surveyed all the service advisors who came through our classes during the past six months. What surprised me was that even though we provide four levels of classes for our service advisors, their answers were the same regardless of their level of experience.

The good news is, today's employees are not looking for money and benefits as a requirement for job loyalty or satisfaction. The bad news is, what they want might be something that you have not been prepared to provide. You have to remember that your future staff member might have been raised with a different standard of performance and a very different way of measuring success. They have been raised receiving trophies for just showing up. They've been raised with the constant reassurance that everyone is equal and should be treated equal regardless of performance, effort or results. Remember no child left behind?

Today's recruits are all about themselves and what we as owners can do for them. When we read the answers to the survey questions, over and over we saw the same thing, survey after survey. They want to feel proud, they want to be heard and they want to see co-workers that don't perform be removed. Don't forget daycare, recognition for efforts, more responsibility, more thorough training and your promises have to be kept. They want you to help them improve personally, not just be concerned with improving the company.

Other responses were they don't want to be threatened all the time that they will be fired “if...” Some of the employees we surveyed not only wanted, but expected, you to sell your

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business to them. They also want you to make them feel needed. They want shop goals set up that involve the entire team, not just the front or the back. They want and expect their workmates to be “family,” and they want to have fun. They want pay plans that they can understand and are able to calculate. Several mentioned that family members of the shop owners were interfering with their ability to do their job and they want those people kept out.

Nontraditional Benefits

The Bureau of Labor Statistics collected data showing that employees who have little in the way of workplace benefits have the highest voluntary quit rate. If you can't afford or aren't offering traditional benefits, it's time to start getting creative with nontraditional ones. Take the time to find out what makes your employees tick so you know how to motivate them individually. Everyone is different and you can't just assume that they all want the same things.

If you find out what your employees' dreams are, you can use that information to motivate them. All of you have a great wealth of resources at your fingertips. Most of you have a customer database of more than 1,000 customers. In that database there are realtors, investment brokers, music teachers, party planners, etc. Once you find out what your employees' dreams are, match them up with someone who can lead them in the right direction.

If your employee's dream is to purchase a house, introduce him or her to a realtor and maybe a financial planner so they can find out what is involved. If your employee's dream is to pay for their daughter's wedding next year, match them up with a party planner. This type of nontraditional motivation is not only very cost-effective, but very effective. Today's employees want you to take an interest in them personally. They want to feel like their dreams are important to you.

I know that some of you are sitting and shaking your head right now, saying that there is no place for this type

of new-age employee handling in the automotive industry. But according to the hundreds of service advisors we surveyed, it's what is going to keep them married to you for life.

If you would like a checklist of things you should do to improve your employee retention, for a limited time go to www.ationlinetraining.com/2014-07 and download our Employee Satisfaction Checklist. [TZA](#)



**CHRIS “CHUBBY”
FREDERICK**
CONTRIBUTOR

Chris “Chubby” Frederick is the CEO and founder of the Automotive Training Institute. ATI's 108 associates train and coach more than 1,150 shop owners every week across North America to drive profits and dreams home to their families. Our associates love helping shop owners who are having the same struggle as many of them have had, and who are looking for the same answers — and in some cases looking for a lifeline. This month's article was written with the help of Kim Hickey, an ATI coach and former shop owner.

 E-mail Chubby at cfrederick@autotraining.net



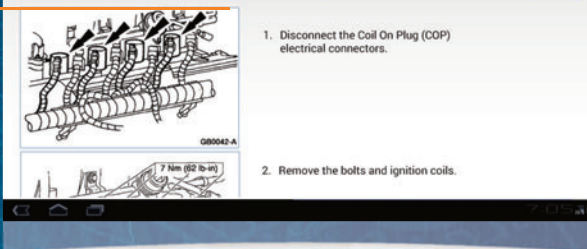
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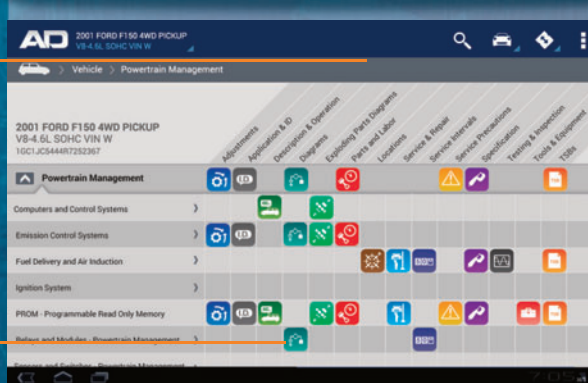
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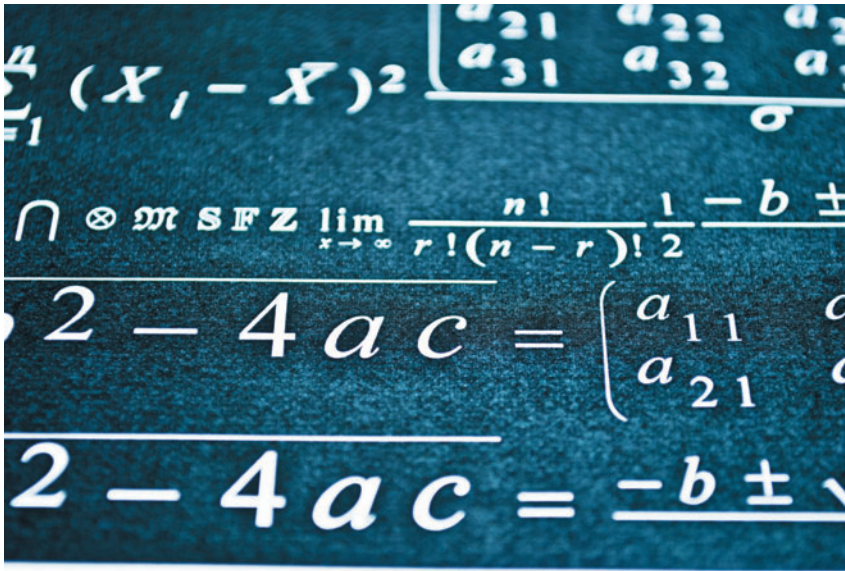
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UNDERSTANDING THE MATH IN PRODUCTIVITY

YOU CAN AFFORD THAT TOP, COMPETENT TECHNICIAN ONCE YOU GRASP THE NUMBERS.

BY **BOB GREENWOOD** | CONTRIBUTOR



WE ALL agree there is a severe shortage of competent technicians within the industry, and many shop owners tell me that when they see one lost to another industry, they cannot compete on technician wage levels other industries are prepared to pay. I'm very concerned management just shoots that statement out without any justification or backing it up with mathematical facts.

I respectfully disagree with management when they bring an emotional response to the table and not business facts.

Do the math.

It is not all about you and what you pay hourly. It is all about how many hours per day the technician gets billed. A \$25 per hour technician who works 40 hours a week is paid \$1,000


gross per week (\$25 x 40 hours). Let's say the shop charges a door rate of \$100 per hour and this technician is billed out for an average of 5.3 hours per day at that \$100 per hour. That means he or she generates \$530 per day times five days a week, which equals \$2,650 in billed labor per week. The technician being billed at that level contributes \$1,650 gross profit per week to the business (\$2,650 - \$1,000) or based on working 50 weeks a year, \$82,500 gross profit per year contribution to the shop after he/she is paid.


Now let's examine a really competent technician who is commanding a \$39 per hour wage and, based on a 40-hour week, a weekly salary of \$1,560. One who is uninformed immediately would say it can't be done. Stop and think. Do the math. It is not what he or she is getting paid per hour, it

is all about how many hours per day they are being billed out. If this technician is that good and consistently being billed out eight hours a day at \$100 per hour, he or she would produce \$800 per day or \$4,000 in billed labor per week (\$100 x 40). This technician contributes \$2,440 gross profit per week to the business (\$4,000 - \$1,560) or based on the same 50 weeks per year will generate \$122,000 gross profit contribution per year to the shop after he or she is paid. That's an additional \$39,500 contribution to the shop (\$122,000 - \$82,500) the higher paid tech contributes than the lower paid, less productive technician.

As you can see, it isn't always just about the labor rate being charged to the client. You must have the right labor rate based on the competency of the technician and support staff. It is about the productivity rate of the shop.

The issue is not the hourly wage; the issue is how many hours is the technician being billed per day. This should be a pre-requisite question to the technician before you hire them. "How many hours are you billed on average per day?" I would be very concerned if the technician does not know that answer, because today we



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are in the knowledge business, the billed hour business.

A competent licensed technician should be producing a minimum of 10 to 12 billable hours per day, while an apprentice technician should be producing a minimum of four to six billable hours per day. If the shop is not at that level, then a full review of the shop processes coupled with an "inventory" of the staff competencies must take place. Is further training required? Are our internal processes conducive to creating the right productivity? Do we have the right client base? A shop that works on general consumer vehicles should average two to 2.5 billed hours per invoice/repair order. If the shop is averaging below two billed hours per invoice/repair order, then the shop has a definite internal process problem.

Now if the shop does not have the work to keep the technician busy and billable all day, don't blame the technician. That is strictly an internal process problem as to how the shop goes about its business with its clients, which is another topic all together.

It's Not Just the Techs

You also must evaluate front counter staff. A competent professional service advisor who knows how to communicate clearly to educate the client and build a secure and trustworthy relationship is worth so much more to the shop than a service advisor who simply sells the flavor of the day or seasonal special as instructed by management. The consumer is not stupid; the consumer is uninformed. A professional service advisor today clearly understands that and knows how to engage in a proper conversation with the client

based on the client's actual parameters to secure a long-term profitable relationship with the shop.

One final note is that you must develop shop culture that embraces two points and they are non-negotiable:

1. A strong work ethic is required to work in this shop.
2. You have a strong desire to compete.

Show up every day with the attitude that we are going to get it done today

and we are going to do it right, providing a great experience for our clients, because we can beat the dealerships. We are the independent sector and we are good. Imagine how many hours your competent people could bill if the entire team was that focused.

Slow down and learn the math of your business because perception of what you can do and afford can be way off base as compared to the reality of the actual situation. **ZZ**



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E-mail Bob at greenwood@aaec.ca



OPERATIONS

SHOP PROFILE

A snapshot of one of the industry's leading shops

ATLANTIC TIRE & SERVICE / CARY, N.C.



In the City of Excellence

Atlantic Tire stands out in a city full of quality shops.

BY **ROBERT BRAVENDER** | CONTRIBUTING EDITOR

There must be something about Cary, N.C., beyond its location in the state's famed research triangle, its massive growth in the new millennium and its incredibly low crime rate. It also must have some of the best automotive repair facilities in the country, for at least three different shops from the town have submitted entries for *Motor Age's* Top Shop consideration.

"I don't know offhand," offers Anthony Blackman, owner of Atlantic Tire & Service and one of the submitters. "In 2008, we were selected tire dealer of the year by *Tire Review Magazine*, and that got a lot of exposure down here. It also could be because this area is growing so fast, even with the recession; there are new companies wanting to relocate here. And we do have a lot of very good repair facilities."

Atlantic Tire is actually a chain of three tire retail/auto repair stores, with locations in Raleigh, Durham and the headquarters in Cary. "Between the three stores, we do close to \$10 million," Blackman reports. "Sixty to 65 percent of that number are automotive repairs, and the rest are tires."

Ironically, Blackman didn't enter the market as a car guy.

"I knew absolutely nothing about automotive repairs or tires or anything

like that," he reports. That aptitude was the province of his brother, who wound up being a dentist. So after attending college, it was probably a big surprise to his family when Blackman started with Goodyear.

"I stayed with them nearly 10 years," he says. "I got my training through Goodyear, which was exceptional. I still think it's some of the best when it comes to tire management. But I always knew that I wanted to go into business for myself; it was just a matter of when, where and how soon I could learn the business."

Those answers turned out to be Raleigh, N.C., in 1988, as Blackman and a partner opened their first store, Atlantic Avenue Tire, and work started in true earnestness.

"I hadn't planned to be open that first day," he relates. "But a lady came in. She was pregnant, had two children

AT A GLANCE

Atlantic Tire & Service

Shop name

Anthony Blackman

Owner

Cary, N.C.

Location

3

Number of locations

16

Years in business

41 (all locations)

Total number of employees

14 (all locations)

Number of technicians

8,534 square feet

Shop size

8 (main location)

Number of bays

270 (main location)

Average vehicles per week

\$260 (main location)

Average weekly repair ticket

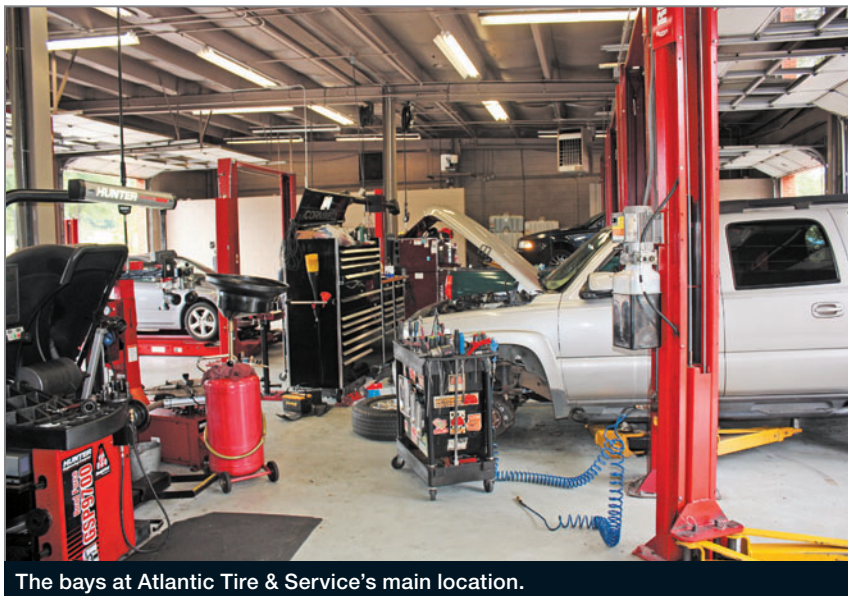
\$3.5 million (main location)

Annual gross revenue

AAA, ASA, BBB, RMA, ASE

Shop affiliations

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The bays at Atlantic Tire & Service's main location.



The glass-enclosed waiting area at the shop.



An employee waves from behind the computer at the front desk.

with her and needed some tires. I told her I wasn't open yet — I needed to get my stuff uncrated — but if she came back at 1 p.m. I would be, and we started that afternoon."

After a decade in business, the partners decided to split up, and Blackman began looking outside Raleigh for a new location. A good friend and major client was being transferred to Cary, and the town seemed as good as any. In 1998 Blackman decided to follow him, dropping "Avenue" from the shop's name.

"Cary is a great place, one of the top cities in the country to live in," he happily reports. "I went out and bought some property, out in the middle of nowhere, but my real estate agent promised that within a year there would be a shopping center across the street. Sure enough, that's what happened, and within our second year, we did close to \$2.5 million and we've never looked back."

Recently, Atlantic Tire received a Torch Award from the Better Business Bureau, which Blackman reports "is one of the nicest awards we've ever gotten. Sometimes the relationship between small business and the BBB is not real positive, but we got the award for being the most outstanding large business in Eastern North Carolina. We're constantly out there promoting, digging up accounts; we really hustle."

That hustle shows in the community, where he notes that people often ask him how the company can be so successful.

"You surround yourself with good people and let them buy into the business, share your growth with them. It's worked great for us. If the model works here (in Cary), we just replicate it and take it to another location," he states. "Trust is not a factor; we give them a partnership in the business and we've had no issues as a consequence. That's the key."

For example, Blackman hired one employee right out of high school, and he now is one of the company's general managers over the three stores.

"When an employee gets to the point where we feel they've been trained, we offer them a partnership. They pay so much to get into it and at year's end we just share the profitability of that with them," he explains. "When we do that, we don't lose people and they do extremely well. These guys work hard; sometimes they'll call me when they've had a real good day, like one who had made (a significant amount) that day — he was so excited about that."


What if someone says no to a partnership? "I've never had anybody do that," Blackman admits. "As we open up our fourth store in the next year or two, we've already got the people plugged in for that."

It takes about 18 months to assemble a complete staff for a new store, and Blackman prefers to hire people, who like himself, start off with little experience in the business, but are willing to learn — just like Blackman still is.

"I love marketing, but I also knew very little about social media," he admits. "I knew that was where the industry was heading, so at one time I thought about going back to school just because I felt so lost. So we partnered with a PR firm that does all of that for us, and they've done a fine job of building our website and getting us out there on networks like LinkedIn and Facebook."

For Atlantic Tire made a decision years ago to not be intimidated by technology. "If we weren't willing to invest in new technology, then it really didn't make a whole lot of sense to stay in this business, for without technology you can't diagnose. So we made the commitment, made the investment. We trained our people in hybrids years before they hit the market, so we stayed ahead of that curve."

"It's been a great journey in this business," Blackman concludes.

Or just another day in the City of Excellence. 



ROBERT BRAVENDER
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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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PAN EXPANSION

ATP expands Graywerks trans pan line to 165 million vehicles.

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NOT THE SAME

GM's 6T70 and Ford's 6F50 FWD trans are similar but not the same.

/similar

PLANETARY SET

A technical demo of a planetary gear set in an automatic transmission.

/planetary

A look at the Dual Clutch Gearbox

THIS MANUAL TRANSMISSION WILL SEND EVEN THE MOST EXPERIENCED TECHS LOOKING FOR A REFRESHER COURSE.

BY **WAYNE COLONNA** | POWERTRAIN PRO PUBLISHER

THE DSG or Dual Clutch Gearbox, is a manual transmission using a Mechatronic system to shift the transmission automatically via a double wet or dry clutch with double input shaft arrangement (Figures 1 and 2).

TVS Engineering is a company in the Netherlands that specializes in the

repair and tuning of Volkswagen/Audi DSG transmissions. TVS began seeing a need to modify both the clutch assembly and programming approximately 10 years ago (Figure 3). Premature clutch failure was on the rise due to a turbo being mounted to these vehicles (Figure 4). They currently repair about 1,500 of these a year through 18 deal-

ers around the world selling clutches, Mechatronic, gearboxes and software (Figures 5 and 6). This article is the result of having an interview with Ronald Logmans, the software engineer for this company.

Currently, there are four generations of high production DSG transmissions on the road worldwide (others are on their way). They could be either longitudinally (AWD) or transversely (FWD) mounted. Of the four generations, one is a six-speed while the remaining three are seven-speed transmissions. The names of these different transmissions are as follows:

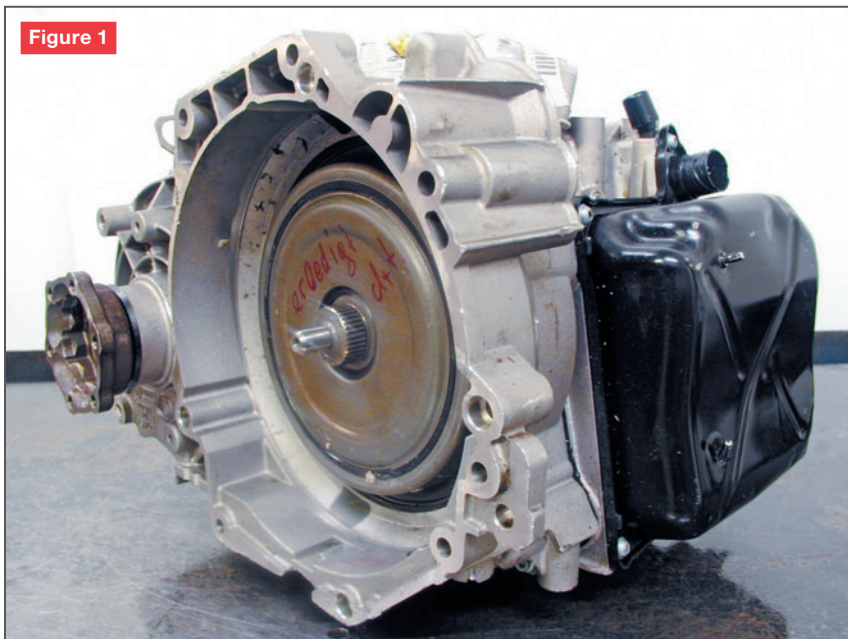
- 2003 - DQ250 - 6 speed wet - F/AWD
- 2008 - DQ200 - 7 speed dry - FWD
- 2008 - DL501 - 7 speed wet - AWD
- 2010 - DQ500 - 7 speed wet - F/AWD

The D represents Dual Shift Gearbox (DSG), the L is for longitudinal (RWD) and the Q is for transversely mounted (F/AWD).

Besides the various generations and designs, what makes this a bit more confusing is that there does not seem to be any logical pattern as to application. An Audi A3 could be fitted with a 1.8L engine and have either a DQ200 or a DQ250.

The first DSG was a six speed "wet" clutch design that started in 2003 for the Audi TT. This transmission is referred to as the DQ250 (02E) and had AWD. The second generation began in

Figure 1



WAYNE COLONNA

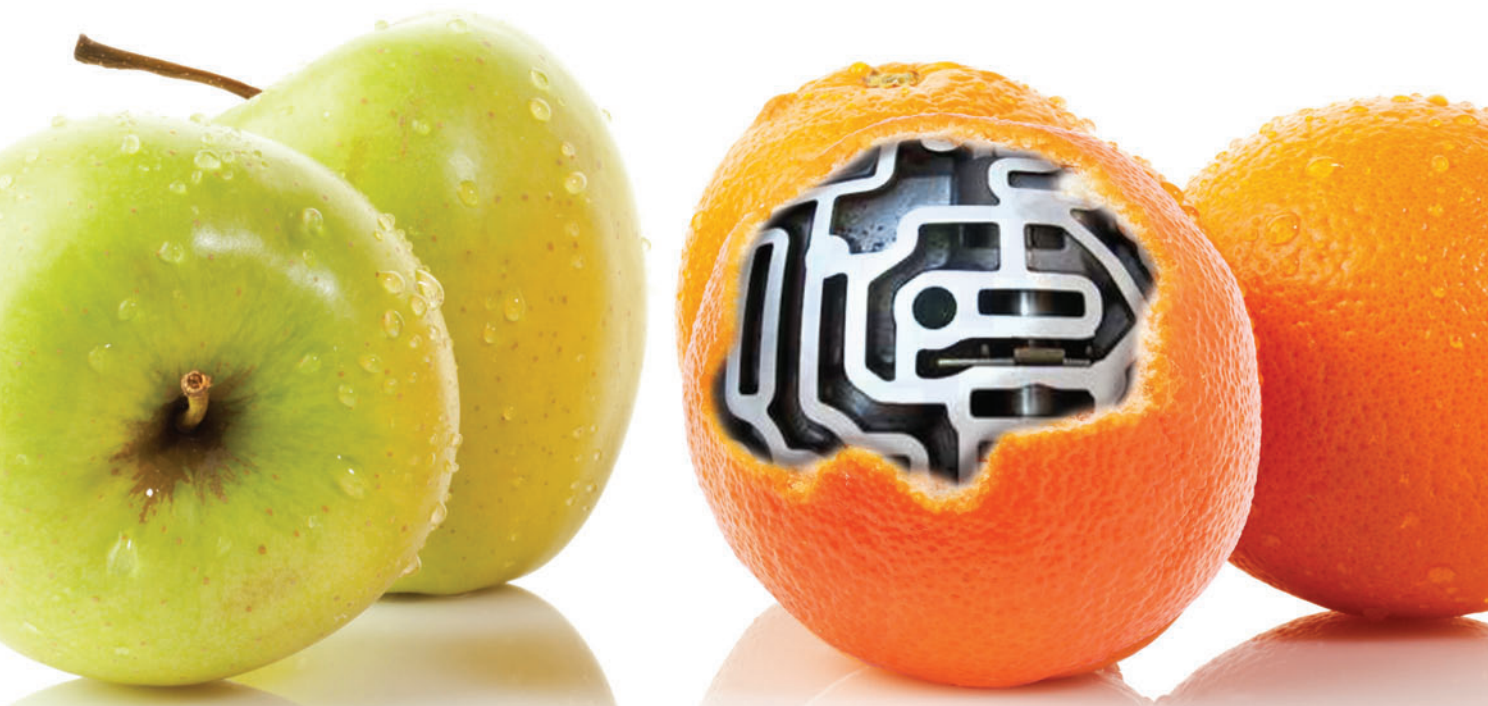
is President of the Automatic Transmission Service Group (ATSG) in Cutler Bay, Fla., and a frequent speaker/instructor for transmission training around the globe.

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Photos: Wayne Colonna



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2007. It was the DQ200, which is a seven-speed double “dry” clutch design that came as a front wheel drive only. There is no AWD with a dry clutch design. It is the only dry clutch unit in the DSG family, and of all the DSGs, this is the most problematic of them all. It also was the most sold transmission worldwide except here in the United States. Globally, it is in two Audi vehicles (A1 and A3) and 16 different Volkswagen vehicles (Beetle, Bora, Caddy Van, Golf, Jetta, Lavalida, Passat, Polo, Sagitar, Scirocco, Sharan,

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Tiguan, Touran and UP). Skoda and Seat models use the DQ200 and the DQ250.

The main failure with this transmission is the clutch wearing out. Signs of failure begin with feeling a shudder on mild acceleration after deceleration from 18 mph to 3 mph during a 2nd gear hold, especially in turns. This DSG holds 2nd gear even longer than the others during deceleration. The computer commands the clutch to slip as the vehicle is nearing a stop to prevent engine surge and stalls. The design of this dry clutch

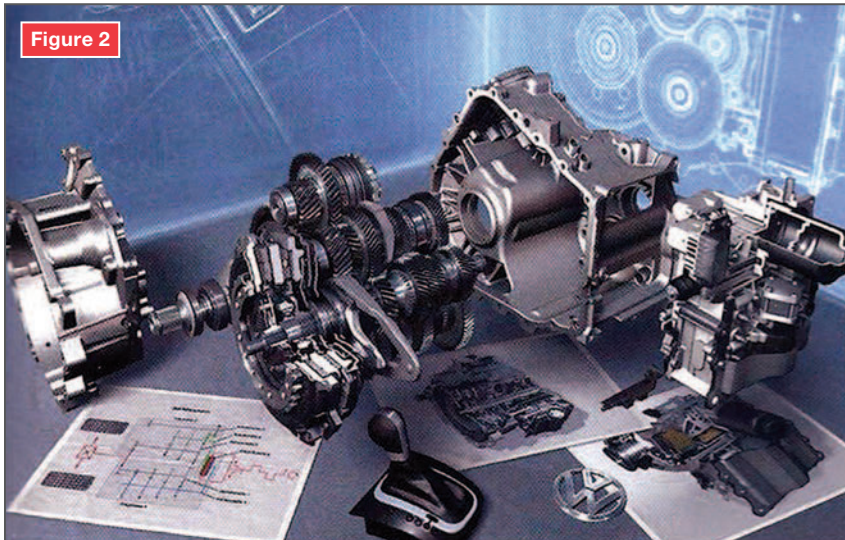
assembly, as well as it being a dry clutch, along with this long hold 2nd gear slip strategy, causes the clutch assembly to overheat. This is especially true during acceleration before coming to a complete stop.

There is an approximate two-by-one-inch gap in the clutch housing to allow air to enter for cooling. But it has proven to be insufficient, as clutch temperatures can reach as high as 392°F, resulting in the upper layer of the clutch lining to glaze causing the judder. They usually see failures as low as 13,000 miles to a maximum of 62,000 miles with gas powered vehicles. In an attempt to improve the life, the dry clutch assembly has undergone six different design changes. These encompassed design changes from the clutch arm to the friction material.

Due to the assembly design of the dry clutch, this transmission is inherently noisy. When you are driving on a bad or bumpy road with the windows down, you can hear what sound like pieces of metal in an empty paint bucket echoing off the passing houses. Some of these noises can be attributed to loose internal mechanical end play clearances causing shift levers to hit the gearbox casing. Other issues causing this noise can be play in the flywheel and play in the dampening springs in the clutch (which are identical to what you would find in a manual gearbox clutch assembly).

Damage to these parts increases the noise, especially when traveling in seventh gear; engine rpm can be as low as 1,150 rpm making it just right for it to rattle. A slight change in the programming that TVS offers alters the rpm by increasing it to 1,400 rpm, which is enough to eliminate this vibration spot. Curing this under rpm problem not only assists in lengthening the life of the clutch, it also improves the performance of the vehicle. Additionally, they changed clutch pressure control and eliminated the 2nd gear hold bringing the transmission down into first when it should make the downshift. All of this is designed to alleviate premature failure of this easily overheated dry clutch assembly.

This DQ200 also experiences bearing failure causing the gearbox to wear producing excessive metal (Figure 7). The magnets used as shift



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Figure 4



Figure 5

fork position sensors begin to attract this metal. If there seems to be about 15 mm of buildup, VW recommends a new transmission as changing these bearings may not produce the desired repair (Figures 8 and 9).

The DQ250, on the other hand, does not seem to experience the same frequency of bearing failures. TVS builds about 1,000 of these transmissions in a year, and it might see as many as

five of them with bearing failures. The complaint it does experience frequently with this transmission is that the shifts get clunky due to synchronesh ring wear. This is a tough problem to deal with due to the fact that these synchros are not sold separately. In fact even rebuilding one of these transmissions can be challenging. More times than not you have clunk issues with Drive and Reverse engagements.

The double wet clutch drum assembly can be a troublesome area as well. It is known to develop a shudder on acceleration from as early as 2nd gear on up through the gears. It comes in at around 2,000 rpm when the turbo kicks in at max torque. It is the type of shudder that can feel like a fuel or injector problem. Changing the complete clutch assembly in some cases resolve this problem while reprogramming the


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Figure 6

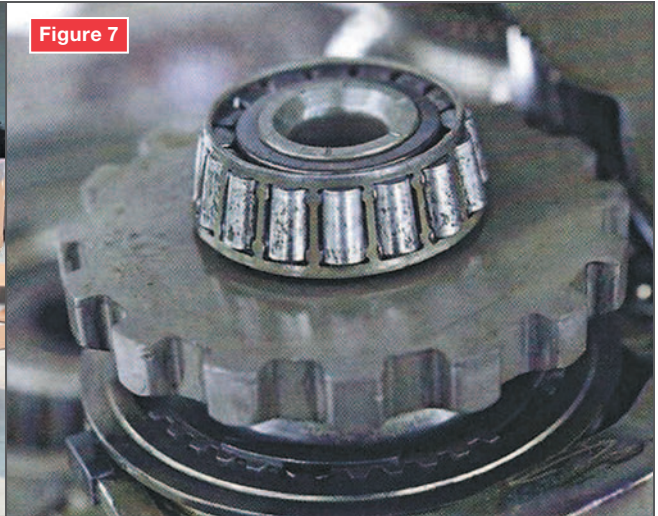


Figure 7

computer with a modified slip program has a higher ratio of success reducing future failure.

Ronald made a point to say that though one might have 20, 30 or 40 years experience working on manually shifted transmissions, working on these automatically shifted manual gear boxes is a whole new experience.

On to the Computer

The computer software used to shift these transmissions is very complicated. If it is not understood, diagnostics becomes difficult. Temic developed the software, which works in a closed loop system with adaptive values.

Ronald analyzes the software and makes modifications to it. Just with the six-speed only (DQ250-02E), there have been 40 generations (like

windows '95 '98 'XP etc) and 1,000 versions of software. Modifications include changes in the structure of the program with things like changing, adding or subtracting variables. At the moment, there are about 2,000 variables written into the software. An example of one of these variables is, as a safety precaution, software is written to never let the engine exceed 7,300 rpms. Remember this: The DSG controls the engine, not the opposite.

An example of variables related to the function of the transmission is how the clutch is engaged. Engine idles around 700 rpm while in Park or Neutral. When Drive or Reverse is selected, engine rpm is increased to 1,000. As the clutch is engaging, engine rpm decreases slightly to 990. The DSG Mechatronic commands the

ECM to provide 5Nm more torque, engine rpm increases back to 1,000 rpms launching the vehicle. As the brake pedal is being released, the DSG Mechatronic command clutch pressure to be around 34.8 psi, which Ronald calls the kiss point, or when the clutch is fully applied to drive away. These examples of controlled variables also pointed out an aspect of the operating system that is important to understand: the DSG Mechatronic is the master and the ECM is the slave.

When writing software, OEMs need to be concerned about emissions and fuel economy. Sometimes this can cause problems with the livability of the gear box. An example of programming issues that has come up is when you select D and lift your foot from the brake. The instrument cluster may show 1st or 2nd gear or will blink for just a fraction of a second. Engine rpm suddenly ramps down to about 400 rpm. This is done to prevent engine stall, as the clutch is being applied. It then ramps up before the clutch is fully applied causing a bump on the engagement. This problem can only be resolved with programming corrective TVS software.

Another interesting programming issue that comes up with this transmission is the way clutch clamping pressure works in proportion to output transmission speed and wheel speed (ABS); speed meaning just a small degree of rotation, not full revolutions. If clutch slip and wheel speed is not what the DSG Mechatronic unit is expecting to see, a command is given

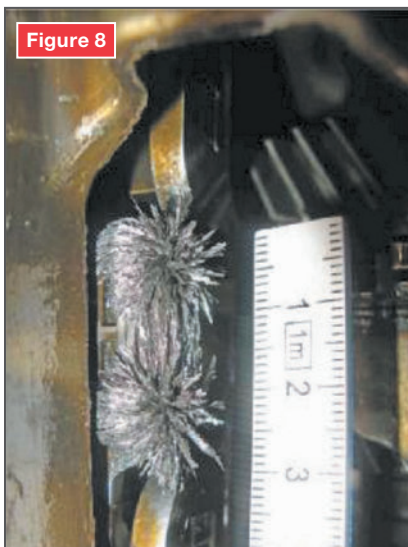


Figure 8



Figure 9



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to increase or decrease pressure. The increase and decrease in pressure goes back and forth like a swing. This swing, or surging sensation, can be caused by the breakdown of the viscosity in the fluid and can be temperature related.

Let's dig in to this a little deeper and explain on of the multiple "regulations or functions" that take place inside the software. With the DSG Mechatronic unit being controlled by a tricore pro-


cessor, it can make thousands upon thousands of calculations per second. When the brake is released, it commands 34.8 psi to apply the clutch and also commands the ECM to supply 50Nm of torque at 1,200 rpm. The car should then accelerate. Acceleration is measured by looking at the speed of the drive shafts and ABS signal, ± 30 times per 1 rotation.

With this accurate signal, it is possible to measure the exact acceleration

of the shaft, and even the quadratic function of that called A2. If the shafts do not accelerate exactly according to the to the pre set variables stored in so-called maps, then a 10th of a second later it increases clutch pressure from to 36.2 to 40.6 psi until it sees the specified quadratic acceleration. With a sudden increase in pressure, the clutch will grab and the vehicle will accelerate faster than wanted.

Clutch pressure is then commanded low (37.7 psi) at which time the clutch begins to slip causing the vehicle to slow down. A command is then given to increase pressure and the cycle repeats itself. All of this taking place within seconds resulting in a swinging motion of the vehicle. Besides degraded fluid, lazy solenoids or compromised valve trains can produce the same surge or swing complaint. There has been occasion when the solenoids, valve body and fluid are all good yet it still has the surging problem. Nothing can be seen with the clutch assembly but change the assembly and the surges are eliminated. TVS assumes that since the friction is made up of some organic material, a break down takes place in the co-efficient properties of the friction.

"With an accurate signal, it is possible to measure the exact acceleration of the shaft, and even the quadratic function of that called A2."

This DQ250 is being used in many different models of cars, all using their own unique software versions, with specific maps for acceleration cruise control and other. Things like the weight of the car curb weight value, AWD losses are all integrated variables in the software. Therefore you will see hundreds of different software versions. If you have a gearbox code LTE, it is used in over 10 different models of Audi/VW and all using there own specific software, so be aware. 



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You can see the inner fender is partially installed, and how the skirt supports the weight of the harness.

REPROGRAMMING AND OLD MURPHY

AVOIDING THE FAILED
PROGRAMMING EVENT WHEN
DIAGNOSING TODAY'S VEHICLE
COMPLAINTS.

BY **JAIME LAZARUS**
CONTRIBUTING EDITOR

Have you ever noticed how time itself seems to have a large influence on one's misfortune? What I mean is, it seems as if the probability of something unusual happening is directly and inversely proportional to the amount of free time you've allowed for a particular task. The less free time, the more likely something will go wrong. In addition, the severity of complications has the same inverse relationship to time. The less free time, the worse the complication becomes. Can you relate?

One of Murphy's Laws says, "If something can go wrong, it will, and at the wrong time." It seems like no matter what you do to prevent anything from going wrong, something still goes wrong. If whatever it is that goes wrong happens while you're attempting to program an Electronic Control Unit (ECU), then it's entirely possible

you won't be very happy either. I'll outline in this article the procedures I follow before, during and after programming, most of which are done to prevent something from going wrong in the process. I'll also present one technique I use to remedy the situation(s) when things do go awry.

In addition to being a technical article contributor, I also am a mobile automotive diagnostic technician; one who travels from shop to shop helping them diagnose problem vehicles. I have a service area that is larger than the state of Rhode Island, therefore it is very important for me to diagnose efficiently. I need to be well organized in order to fulfill my promises, because I might have many shops scheduled to visit in one day.

Don't you have similar needs (excluding travelling, that is)? Don't you have to diagnose vehicle problems efficiently in order to fulfill the rest of



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your scheduled jobs? The problem is we can't always know how long it will take to determine the cause of a customer's complaint ahead of time. Coining a phrase that my buddy Sam might say, "We don't know what we don't know," so we can't always accurately estimate how long it will take to come to the conclusion of what's causing the problem.

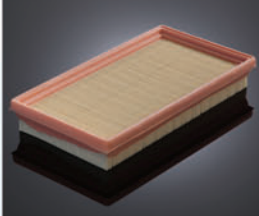
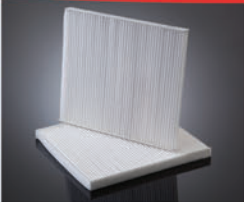
In all cases there is a certain amount of work that should be done to determine the causes of the pre-

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viously unknown culprit (some call them gremlins). I ask my customers to do as much of the diagnostics they can themselves, whatever they are comfortable with, before enlisting my services. I prefer to not be the one actually diagnosing a vehicle, so in most cases I'll work with my customers (mostly the technicians) over the phone to help them confirm their findings prior to lending a physical presence if it's needed. Sometimes they aren't familiar with the vehicle or the system they're working on. Sometimes they lack the confidence in their tools or in their own abilities or sometimes they just want to "bounce something off" another person who might have a different perspective.

I define diagnostics as the process of elimination. We verify what's working correctly and eliminate those as causes of what's not right. Some diagnostic routines used to include the statement "install a known-good part." Most professional technicians and shop owners have found the "part substitution"

method of diagnostics just doesn't work these days and even might cause more problems than the vehicle originally came in with. Also, it's gotten expensive condemning a part in modern vehicles.

Some of the expense can be calculated in non-billable labor hours because installing parts to see if the problem's solved might be wasted time. Therefore, one must be sure a replacement part will solve the problem before ordering it. In addition, part substitution is not what I call diagnosing; it's guessing.

Reflash First or Last?

If it's determined that a reflash (or a module replacement that also requires programming) is in order, then we are at the point where we have eliminated all other possibilities of the cause. In other words, I use programming as a last resort instead of a "try it first and see if it fixes anything" choice. Part of my reasoning is the unknown. For example, we don't have X-ray microscopic vision. Therefore we can't say that there is not a pre-existing condition inside a module. We cannot say beforehand that there isn't a bad solder joint, a faulty electronic component, poor connection, etc. inside there.

With any of these module faults Old Murphy, the author of those laws,

could rear his ugly head and use them against you.

Also, pertaining to the vehicle, we can't say there isn't a bad wire somewhere, a poor connection, etc. Those conditions might not have been evident before, but might become so when programming takes place. So when programming a module, I try to

be prepared for the worst case scenario – the failed programming event.

Worst case scenario, I'd sure hate to have to deal with a failed programming event and replace a module, only to find out it didn't fix the customer complaint. That's a whole lot of money and time spent needlessly, time that could have been used more productively (read: profitably) instead. Isn't prematurely programming a module – that is, doing so before eliminating all other potential causes of a customer's complaint – sort of like the part substitution method of diagnostics?

To prevent something (besides the unknown) from causing such a thing from happening, I routinely go through important steps that I'll describe later in this article. If I do experience a failed programming event after taking all the proper precautions, I know I've done everything in my power to prevent it from happening and it was just meant to be.

Hedging Your Bets

My experience as an automotive diagnostics specialist has taught me, among other things, to allow plenty of time when I'm called upon to program modules. In addition to the time spent eliminating all other causes of a problem, there is a lot of what I call preparation time, or time that's invested before I'll even get to the programming and post-programming steps.

I prepare the vehicle for programming by first performing visual inspections, then by checking the whole electrical system, then by scanning the vehicle's computer systems and lastly by ensuring no outside interference will influence the results. This last precaution is done by remaining vigilant and observant while programming

Want a different perspective on reprogramming? Check out this from Dave Hobbs.
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Only a few strands remained intact on the PCM ignition feed wire.



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takes place so no one interferes with the vehicle, electrical cords, etc.

During my visual inspection checks, I look for anything that might interrupt communications while programming. I might look underhood, in the vehicle and maybe even underneath the vehicle, depending on the system requiring programming. In the engine compartment I look for evidence of creative engineering, like additional electrical components or wiring not originally included by the manufacturer, aftermarket anti-theft devices, labels indicating certain self-proclaimed performance enhancing devices have been installed and so on.

In the vehicle, I peek under the dash to see if non-OE devices are installed (like telematics transmitters, tracking devices, insurance company recorders and the like). I also look around to see if any aftermarket audio or video components have been installed (stereos, back-up cameras, DVD players for example,). Under the vehicle, I look for damaged wiring, aftermarket trailer lighting and electric braking harnesses,

modifications and anything else that isn't factory. If all my visual inspections don't indicate anything to be concerned about, I move on to the electrical system inspection.

Included in the electrical system inspection are battery load and conductance tests (on all batteries if applicable); both tests are required because neither one provides 100 percent of the information needed regarding the battery(ies) health and state of charge. I won't program any module unless I see no problems at all revealed with these tests.

Because I know what the battery voltage reads, now is a good time to see what the ignition voltage reads at the module connector too, just in case I neglected to view that Parameter Identifier (PID) in the data list. It helps to have an accurate wiring diagram and connector pin-out for this test. Once I'm confident there are no concerns about voltage supplies or grounds I'll proceed to the actual programming of the module.

It should be noted that most of the time I'm called in to assist another shop with a failed programming event of their own, I find the cause to be a low voltage condition; not necessarily a low battery, but a low system voltage condition. There are many reasons why the Electronic Control Unit's (ECU's) battery or ignition-fed voltage might be less than required during programming. Depending on the vehicle design, there might be many connectors, switches, and/or relays, where a voltage drop may occur before reaching the ECU's connector. We must be absolutely sure what the system voltage is before, and during, the programming event.

If the measured battery voltage is low at the ECU, the first step I do is verify that the battery connections are clean and tight. I mean all battery connections, not just the multiple battery vehicles either. I also inspect those remote junctions where battery positive cables are attached to a stud where other wiring gets their positive voltage feeds. These have to be clean and tight as well.

Once the same voltage is read at the battery and at the ECU, then I will proceed to verify ground integrity(ies) of that module. There are many tools available today that can load those cir-

cuits safely, and once those tests are successful I move on to the next step.

I cannot stress enough the importance of monitoring system voltage(s) while programming. Even after we tested everything before programming, we must monitor this during the process as well. Just like checking the static battery charge and watching how much it changes when cranking, modules aren't using the same amperage with the key on and the engine off as they draw when operating or when they're being programmed.

“Just like checking the static battery charge and watching how much it changes when cranking, modules aren't using the same amperage with the key on and the engine off as they draw when operating or when they're being programmed.”

Lessons Learned in the Real World

Not too long ago, a very knowledgeable, well-trained technician who is an experienced reprogrammer called me regarding a programming issue he was dealing with. He follows the pre-programming instructions I mentioned every time he flashes modules. He's experienced some problems in the past while reprogramming modules, as everyone does eventually, and learned lessons from them all.

However, he had never encountered the error messages he was receiving while trying to perform an update to the Powertrain Control Module (PCM) of a 2004 GMC bucket truck. The truck had been driven there, was in for other service work and the flash was supposed to address one of the driver complaints. Of course, by the time he called me, the allotted amount of time promised to the customer had run out.

This module should program very similarly to one in a lighter vehicle



With the inner fender removed for service, the harness support was lost and the broken wiring strands were no longer contacting one another, leaving just the few to carry the current load.



We found the same problem developing on another truck. Can you say pattern failure?

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with some minor exceptions, but in this case, the process stopped part way through and at seemingly random steps on subsequent attempts, delivering differing error codes each time. The technician exhausted all his knowledge resources before calling on me (and even tried installing a different PCM with the same results).

During his call to me, I had him perform some tests including ones on his programming interface (Tech 2), all of which passed successfully. Once I was confident he wasn't dealing with a tester issue, I asked him for the Vehicle Identification Number (VIN) and researched the OE service information (SI) for known programming anomalies. According to GM SI, there was nothing out of the ordinary that had to be done in order to program this module. Everything mentioned was straight-forward; the job should have been a slam dunk, but Old Murphy was in the house. When I felt he'd answered as many ques-

tions as I could muster and he still was unable to successfully program that PCM, we agreed I should go to his shop and take over the perplexing diagnosis of the failed programming event.

Without any disrespect intended, I always confirm other technicians' test results. The reason I do is because not everyone tests things the same way. For example, when obtaining a voltage reading, one might use a dash ground. I prefer to use the battery negative post. The two readings may differ greatly. Besides, on more than one occasion, I have come up with completely opposite results in person than what I was told over the phone, which usually will require a different diagnostic path to be followed. I won't get into the reasons in this article as to why two different people might get differing test results. In this case though, all of my test results were identical to the technician's results.

To be sure we were not dealing with a tool issue, we initially used my equipment instead of the shop's tools, but the results were the same. Partway through the process the programming would stop, it would allow two more attempts, then cease with an error message. This confirmed we had a vehicle issue and not a PC, tool or cabling issue.

My instincts told me I'd better monitor the voltages at the PCM (as I mentioned earlier). I used a four-channel oscilloscope instead of a Digital Multimeter (DMM), because I could view numerous circuits at the same time. That method is less time consuming than testing circuits individually (and will show momentary drop-outs where a DMM might average those into the displayed voltage). Sure enough, on the next attempted flash I lost my ignition feed to the module. None of the other monitored circuits changed when this happened.

You might ask why I only lost the ignition voltage only at a certain time during the flash process. You might wonder how come I could still read data and the engine could still run if I lost ignition voltage? What would be your next step, knowing what you know now? How valuable would an accurate wiring diagram become if you were presented with this problem?

It was through a process of elimination that I isolated the circuit fault to a small area between the fuse protecting the circuit and the PCM connector. Looking at the pictures of the looped harness and the wire that was damaged, and then picturing the vehicle in a road-worthy state, one can answer almost all the previous questions. The right inner fender is installed when the vehicle is not being serviced, and it was pushing up on the harness, ultimately wearing through the ignition feed wiring to the PCM connector. Just a strand or two were intact — and barely at that — until the harness was allowed to hang freely (it had no support once the inner fender was removed for servicing). When the vehicle was fully assembled, there was enough current flowing through the wire to enable normal PCM operation but not enough current could pass to the module once the strands were only touching their ends.

Imagine what the customer was told when the PCM update was sold, then imagine what the customer had to be told once Old Murphy reared his ugly head. Also, imagine the scheduling nightmare that was created throughout the whole shop once this job that was expected to take less than an hour took an exorbitant amount of time. Remember the proportions of free time to degree of complication mentioned earlier?

Did the tech expect the problems he experienced that were caused by preparing the vehicle for service? Would you have? I've learned there is no set time for programming modules, and I tell my customers this up front. Prepare them — and yourself — for the unknown and for the unexpected ahead of time. If you allow ample time, the likelihood it will be needed is greatly reduced. Call that Jaime's Law. *JL*



JAIME LAZARUS
CONTRIBUTING
EDITOR

Jaime Lazarus is an ASE Master Technician with L-1 certification. He has regularly presented technical seminars since 1985. He recently taught instructors at the North American Council of Automotive Teachers conference and the NASCAR Technical Institute.

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With the inner fender removed, the signs of harness contact were easy to see.



With the harness supported, there was just enough electrical contact to allow the truck to run and the scan tool to communicate. It's a perfect example of the importance of voltage drop testing.

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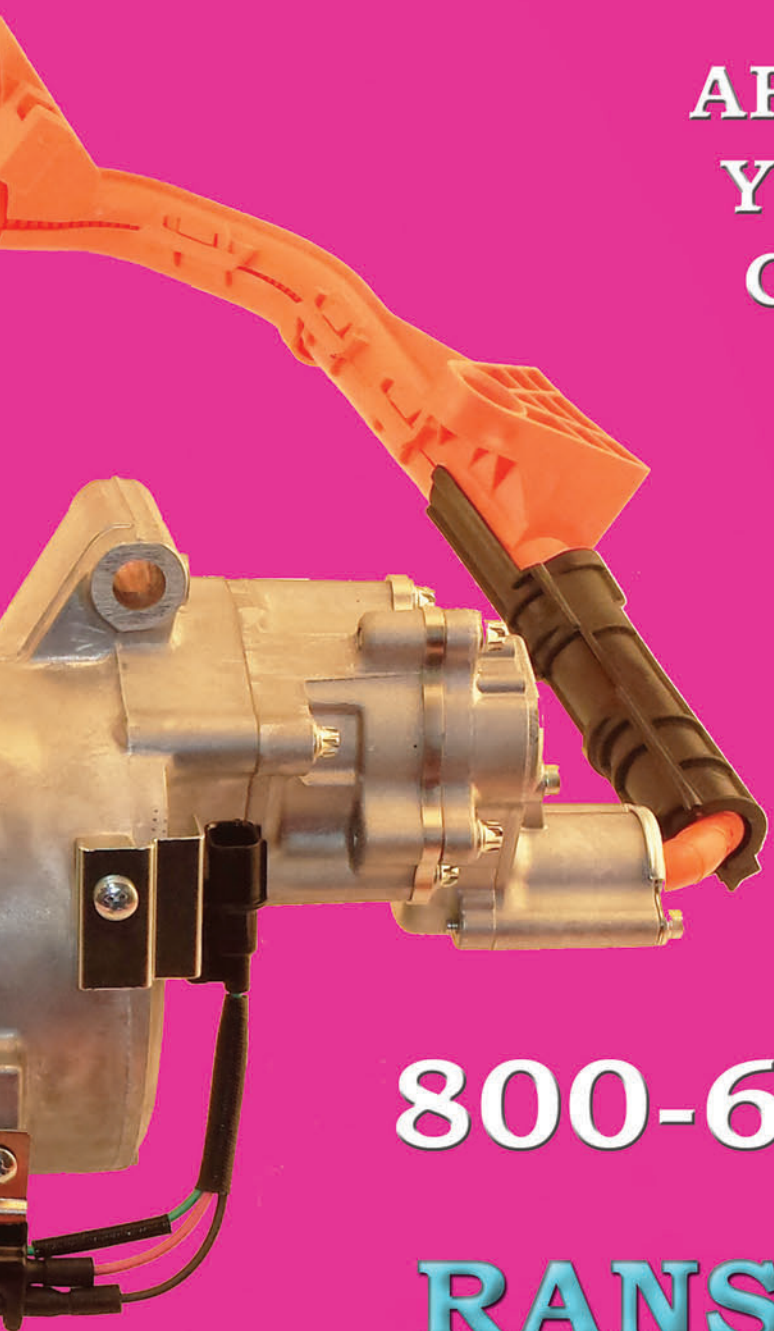


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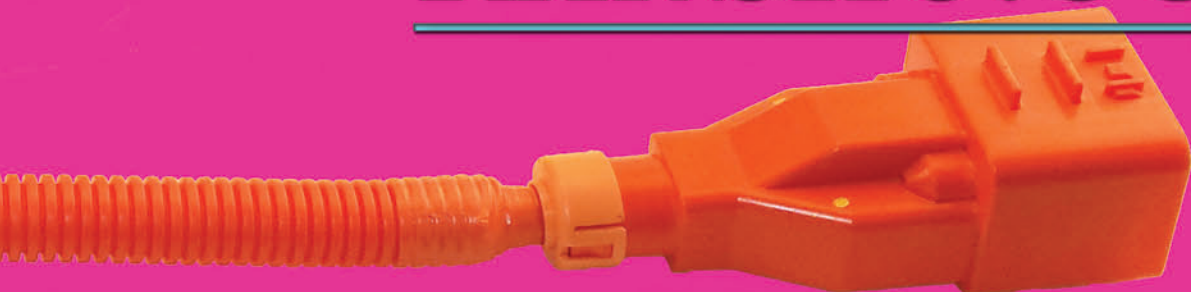


Figure 2

BIND OR BRAKE

**IT TOOK A TOW TRUCK DRIVER TO CLUE IN
ONE TECHNICIAN ON THIS LITTLE TRANSMISSION TRICK.**

BY **WAYNE COLONNA** | POWERTRAIN PRO PUBLISHER

A long-time local tech here in Miami named Mario Aristides (and quite the personality as well), has made a living working on and repairing automatic transmissions in European vehicles. He recently worked on a ZF6HP transmission in a 2005 BMW 745Li (Figures 1 and 2). He had made some modifications to the valve body, and he and a fellow tech went out for a test ride.

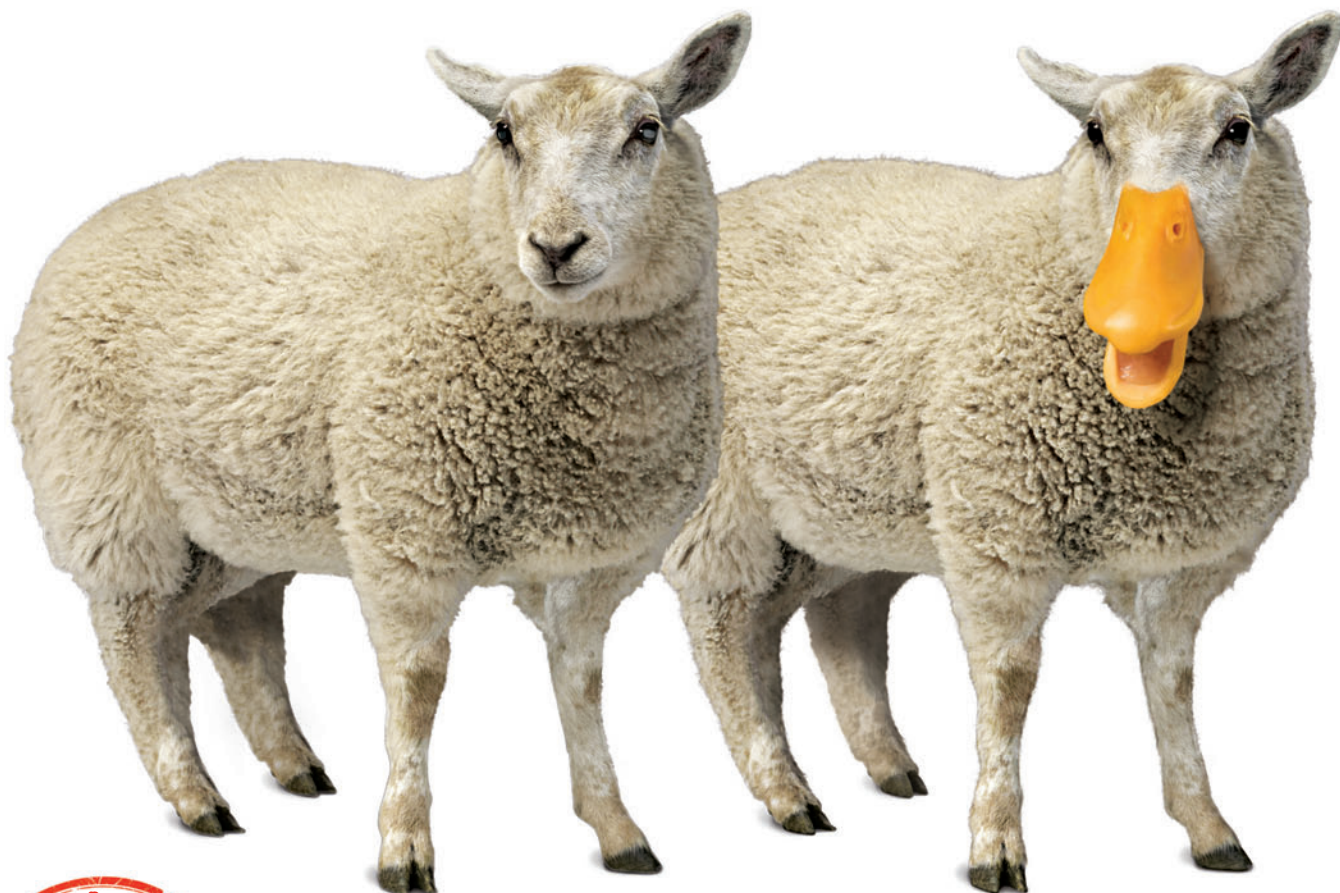
The transmission was shifting well, but they noticed the vehicle was low on

fuel and decided to stop to get some gas. After fueling up, they started the vehicle and went to drive off, but the transmission felt like it was bound up both forward and reverse. Because he just finished working on the transmission, he immediately thought something he did went wrong. Because this transmis-

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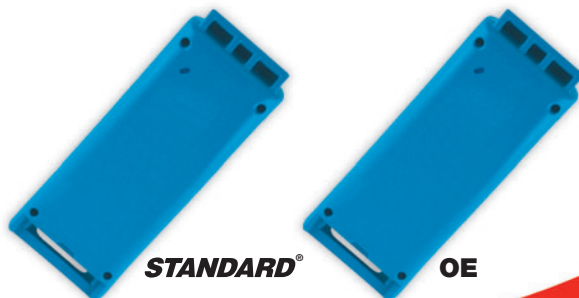
sion engages and disengages Park electronically, his first thought was to pull the emergency park release cable. The handle for this is located under the dash behind a small door that can be accessed using the ignition key. Once the lever becomes accessible, pulling on it mechanically releases the transmission from a

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park engagement via a Bowden cable.

Once he pulled on this lever, the transmission still felt bound up in for-

ward and reverse. He had no other choice but to call for a tow to bring the vehicle back to the shop. When the

driver of the tow truck arrived, having experiences with this issue before with other BMW 7 series vehicles, he



Figure 1



Figure 5



Figure 3



Figure 6

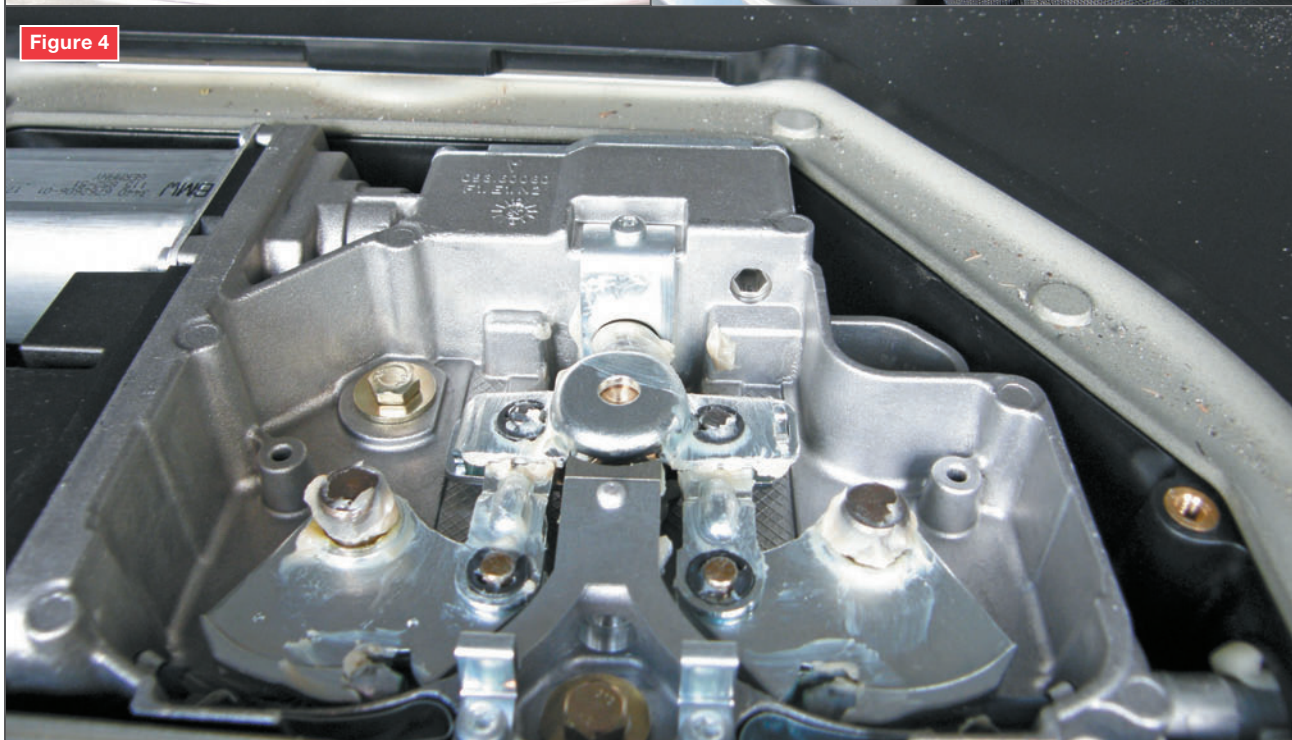


Figure 4

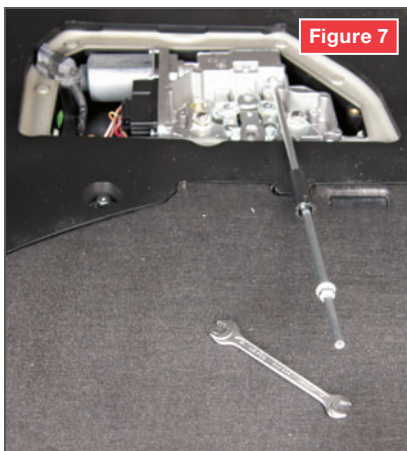


Figure 7

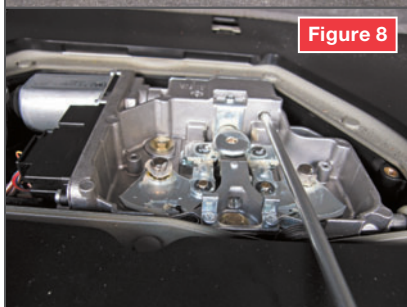


Figure 8

knew about both the emergency park release cable and the emergency parking brake system.

There is a very sophisticated traction control system utilizing a Dynamic Stability Control (DSC) strategy. Part of this braking system includes an Electro-mechanical Actuating Unit (EMF). When the EMF receives a request to activate the parking brake, it operates an electric actuator (motor) to tension the parking brake cables. This unit is located under the luggage compartment floor in front of the spare wheel recess (Figures 3 and 4).

When malfunctions occur, all four wheels can have their brakes applied, preventing the vehicle from moving. Normal safety reasons incorporated into the computer strategy that will cause an Automatic Hold would be if the hood contact switch indicated an open hood. Another would be that the driver stepped out of the vehicle while the engine is running noted by seat occupant sensor. Once the driver returns sitting down into the seat stepping on the brake to select drive or reverse, the EMF system will deactivate the automatic hold feature.

Mario never considered looking at the instrument cluster when he felt what he thought was a bind up and

thinking he did something wrong to the transmission. What actually happened was that something was wrong with the ABS system, which illuminated the ABS light. The bind up Mario thought he felt was a transmission in gear trying to move a car with all the brakes applied (The gears in the EMF system are known to strip out causing a no brake release issue simulating a similar condition).

The tow driver saw the ABS light

on and knew what was occurring. He also knew of an emergency release procedure of the brake system. In the trunk there is a tool kit with a special tool (Figures 5 through 8) to be used to release the brake hold through the mechanical actuating parking brake unit. Once the driver released the brakes using this tool, Mario was relieved knowing that what he thought was a bind was a brake problem and he drove himself back to the shop. *TL*

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	EOU (All Others)	(All Others)	(All Others)	Others)	
TSS	T15	0	580.8	1427	1413
O2S12	T29 (GTDI) E23 (All Others)	(L)	(D)	(D)	(D)
ACC	PID	OFF	OFF	OFF	OFF
APP	PID	0 (GTDI) 0 (All Others)	0 (GTDI) 0 (All Others)	13 (GTDI) 4.5 (All Others)	14 (GTDI) 17 (All Others)
BARO	PID	14.12/155.1	14.12/155.1	14.12/155.1	14.12/155.1
BOO	PID	OFF	ON (F)	OFF	OFF
CPP/PNP	PID	NEUTRAL	NEUTRAL	DRIVE	DRIVE
DECHOKE	PID	YES	NO	NO	NO
EONV_RDY	PID	NOT READY	NOT READY	NOT READY	NOT READY
EQ_RAT11	PID	0	-2 TO +2	-2 TO +2	-2 TO +2
EQ_RAT21	PID	0	-2 TO +2	-2 TO +2	-2 TO +2
ETC_ACT	PID	7.81	1.22	11.4	8.04
ETC_DSD	PID	7.62	1.21	11.36	7.68
ETC_TRIM	PID	0.15 (X) (GTDI) -0.01	0.19 (X) (GTDI) -0.01	0 (X) (GTDI) -0.02 (X) (All	0 (X) (GTDI) -0.05 (X) (All

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- 3.5L 4V Fusion/MKZ
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In this image we see the expected PID values for the 2010 Flex at different operating conditions when the vehicle is at or near sea level.

FINDING INTERMITTENT
FAULTS ON FORDS

THERE ARE WAYS YOU CAN GROW TO LOVE PINPOINT TEST Z.

BY MARK DEKOSTER | CONTRIBUTING EDITOR

What is Ford's Pinpoint Test Z? It's a test that is designed, in my opinion, to do two things. First, it can teach you how vehicles work. It does this by grouping inputs and outputs that are related to each other and most likely will show a concern caused by certain problems. Second, it will help you learn the test procedures that Ford uses throughout their service manuals, specifically test drives while gathering data and the wiggle test.

Pinpoint Test Z details which Parameter Identifiers (PIDs) a Ford Powertrain engineer would use if he or she had a vehicle that was exhibiting a specific concern. This is why I say that you can use it to help you learn how vehicles work.

There is one caveat to my discussion. What service information system are you using? If you use a source other than Ford's PTS website, the path to Pinpoint Test Z may or may not be accessed easily. Sometimes, after-market service information systems

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Service is our best part.

In a June 2013 article, I talked to you about how to find intermittent misfires in Ford's using fuel trim and the downstream (post-catalytic converter) O₂ sensors. Once you learn to use the procedure in Ford vehicles, you can apply the same procedure on most other manufacturers' vehicles. The same applies to Pinpoint Test Z.

A quick review might be in order. In that article, I said that if you had an intermittent misfire caused by an ignition concern, the downstream O₂ sensors would go to high-voltage, greater than 600 mV. Fuel trims (FT) would increase by less than 20 percent and, in many cases, less than 10 to 15 percent from the non-misfire baseline.

For example, if FT was +15 percent (a potential issue itself) without a misfire then it will increase to about 25 to 30 percent during the event. The heated oxygen sensor (H O₂S) downstream will be over 600mV and often at 1.0V.

An intermittent misfire caused by a fuel concern typically would cause the fuel trims to increase by more than 20 percent and downstream O₂ sensors to go low-voltage, less than 100 mV.

For example, a vehicle with a baseline of FT at -5 percent as it begins to misfire caused by a lack of fuel, FT will go beyond +15 percent. I have seen them actually increase by more than 30 percent during this type of misfire event. The downstream O₂ sensors will be at less than 100mV.

Watching your scan tool while these events occur and comparing before and

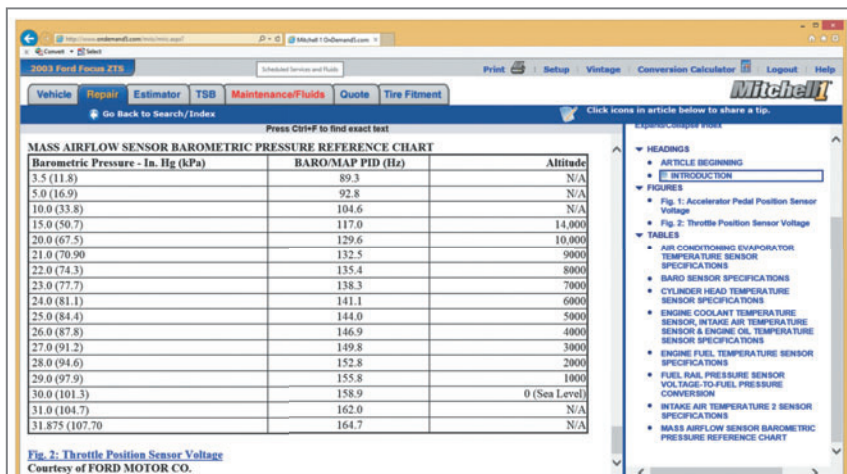
after will give you good direction on where to test next to find your concern. The question is how did I determine which PIDs to monitor to determine the cause? The answer can be found in Ford's Pinpoint Test Z.

Chasing Phantoms

Pinpoint Test Z is designed for use with vehicles that have intermittent concerns or phantom codes that might require you to road test them extensively in an attempt to see the concern by recording data on the scan tool. The question a tech needs to have answered is what data should be recorded while road testing? With today's PC-based scan tools, you easily can record dozens of PIDs and still get valid data. This was not always the case. Back in the days of the Ford NGS scan tool, when you recorded more than four PIDs the ability of the scan tool to capture data significantly degraded.

But even with today's tools, recording only those PIDs that are most likely to show the concern is still desirable, especially as there isn't much point in watching various inputs or outputs that have nothing at all to do with the concern.

Let's take a look at when you'd use Pinpoint Test Z on a Ford, keeping in mind that similar procedures will work on other manufacturers as well. There are four things that you should do to every vehicle that comes through the door and may be done in any order you choose.



This image shows the BARO PID values for different altitudes. When watching these values on a scan tool it is not unusual for them to change by 1Hz, maybe 2Hz, from standing still idle.

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Step one: Attempt to verify the concern exists as stated by the customer.

Step two: Perform a good visual inspection.

Step three: Check for related service information and Technical Service Bulletins (TSBs).

Step four: Begin your troubleshooting initially with nonintrusive tests.

This is where you might run into your first real hurdle to fixing the vehicle. Yes, these computers are very good at finding the correct faults, but they are not perfect. Failures within operating parameters of certain components will cause concerns to show up as other problems.

Here's an example. My brother-in-law brought over his 2009 Ford Flex with a trouble code indicating that the upstream wideband air fuel ratio sensors were bad. In fact, the Mass Airflow Sensor (MAF) was contaminated and the real cause of the concern. I used the principles taught by using Pinpoint Test Z to figure out this concern.

Ford's starting point for all drivability analysis is Pinpoint Test QT1. This pinpoint test covers what any good initial drivability diagnosis should. There are a number of things that you need to confirm before you do any serious analysis of any vehicle: fuses, quality of fuel, mechanical integrity and others just as they are listed in the QT1 test procedure.

When looking at QT1, the first thing you do after getting the vehicle ready is to scan it for any Diagnostic Trouble Codes (DTCs). Of course, if you have codes, you review them first and do

an analysis of the concerns by code. If there are no codes, Ford directs you go to Symptom Analysis. When you are doing symptom analysis, you are not sent directly to Pinpoint Test Z. That might be several selections down the list of things to do. At this point, keep in mind that any record of DTCs might be real concerns and/or they may be a symptom of another problem. You may be sent to Pinpoint Test Z from any one of the other pinpoint tests.

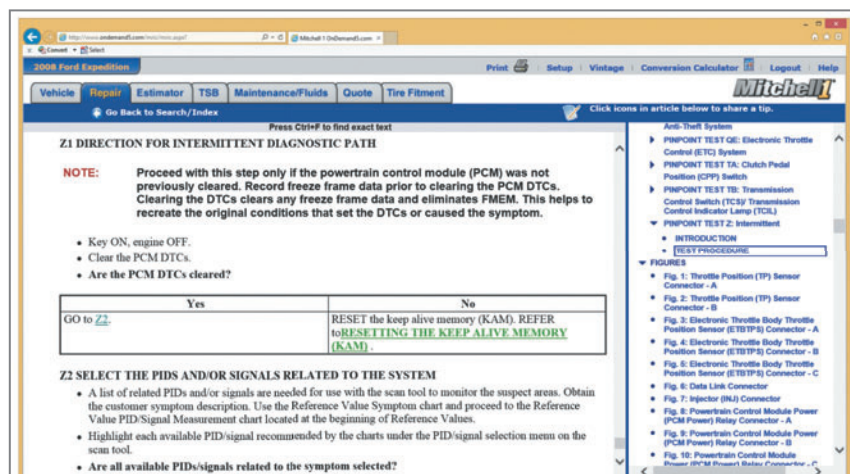
Cause or Effect

Once you are directed to do Pinpoint Test Z, the first steps might ask you to do several things that seem redundant, like clearing any set codes and test driving to see if they reset. The next steps of the test are instructions on road testing and data gathering, while the remainder of the steps are instructions on wiggle testing.

There are two sets of symptom charts in this part of the manual. The first gives you a symptom and then tells you which chart to go to for analysis.

Symptom Occurs During	Symptom	Category Number
Startup	No start/ Normal crank	1
Startup	Hard start/ Long crank	2

The second is called Reference Value Symptom Chart, and this one tells you



In the first step of Pinpoint Test Z, the technician is reminded to reset the PCM so that data stream can be accurately recorded.

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which category of PIDs you will select based on the symptom.

From there you go to the Reference Value Parameter Identification (PID)/Measured Signal Chart to get the PIDs for recording. This can be a bit confusing at first, as Ford uses hyphens in between numbers in their lists. You may see something like this: 1-4-7-10. Most of us are used to seeing a number series like 1-4 and interpreting that as being 1, 2, 3 and 4. That is not what they mean. In this example, you would select this PID for category 1 and 4 and 7 and 10.

It looks like this:

Category Number	Related PIDs/Measured Signals
5-10-17	ACP
1 thru 21	FP

Let's look at a couple of important considerations in using this test. First and foremost is that Pinpoint Test Z is written to be year specific. It is true that if you have a hesitation on acceleration on a 2004 Focus that the PIDs, you will be directed to view for that model year will be very similar to the ones for a 2012 Focus. However, a 2012 Focus has gasoline direct injection and 2004 does not. There will be different things to view for each.

In fact, if we go back to Quick Test 1 there will be different things to check just to prepare the 2012 for testing versus the 2004.

Once you have your recording comes the analysis. For this you turn to Section

6 of the Ford PCED or whichever service information source you're using, and find the PIDs you've monitored. Section 6 are Reference Values for each engine and gives typical values for PIDs at idle, low load and high load driving conditions.

The real art to intermittent diagnosis comes from trying to determine whether the PID values that you see when you record an event are the cause or an effect. Let's take an example to show what I mean. You are driving a car that has intermittent hesitation. The vehicle acts up while you are driving it and recording the event with a scan tool.

How many PIDs are going to show the concern? If you answered more than two, you are correct. Which ones do you concern yourself with? You look at PIDs that have higher authority than others. Which sensors are higher authorities in getting the Powertrain Control Module (PCM) to make changes? Does the fuel pulse width commanded make changes in the oxygen sensor signal or does oxygen sensor signal make the PCM change the pulse width? The oxygen sensor signal is an input to the PCM and therefore is more likely to be the cause of a concern than the fuel pulse width commanded.

Fixing the Flex

To explain this, let's go back to the case study on my brother-in-law's Flex. Why did I look at the MAF sensor? Certainly a faulty HO₂S might cause a problem and it is a fairly high authority input. Let's think about how the system works. The PCM uses the HO₂S

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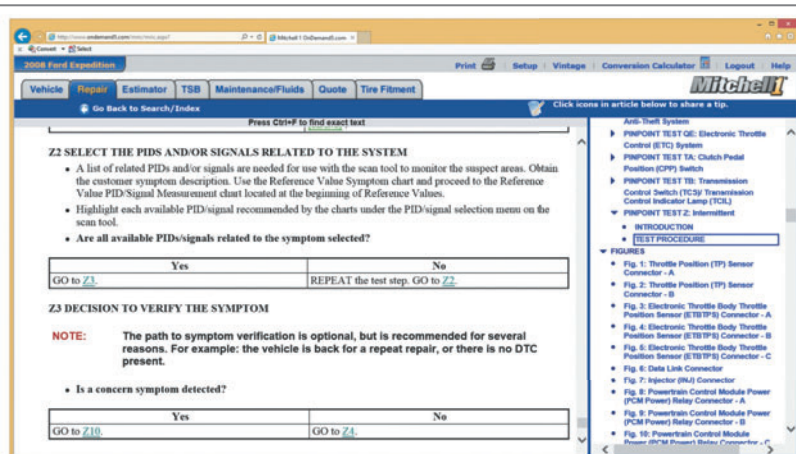


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Step two has you setting up your scan tool with the appropriate PIDs for the concern. Step three is asking you to verify the symptom to assist in making a correct analysis.

to determine if the air/fuel ratio is at stoichiometric or not. The PCM makes changes in operation based on the input provided by this sensor. Is there any sensor that may be even more important or have higher authority than the HO₂S in terms of engine operation?

I did the inspections and went to QT1 and tested the vehicle. The vehicle had an illuminated Malfunction Indicator Lamp (MIL) and codes. I looked at the codes and then I looked at Freeze Frame data. The codes were all set at idle. I looked in the service manual for the codes and their typical causes as well as the test procedure to analyze the fault. It was a code for an inoperative wideband sensor.

The first thing to do was to verify the codes by looking at the operation of the sensors. The fuel trims were around 29 percent positive at no load idle. As I increased the engine speed, the fuel trims started coming back towards zero percent, some of the more classic symptoms of either a vacuum leak or a contaminated MAF. In the case of an air leak, the fuel trims will be very high at idle and drop towards normal at higher speeds.

As soon as I saw the fuel trims react, the DTC no longer was valid, as it detailed a faulty sensor. Now it's an

Read how this relates to MAF sensor testing in features from other contributors online at MotorAge.com/maftesting

opportunity to use Pinpoint Test Z. Using the charts, I pulled more PIDs and began to look for other concerns. Knowing how these systems work, the first PID I looked at was the Barometric Pressure (BARO) PID, which is from the MAF sensor and reports as a frequency.

In the case of the Flex, the MAF was telling the PCM that less air was entering the engine than actually was. The PCM took the faulty information and added the amount of fuel that it thought should be enough. This resulted in a mixture that was too lean for the operating conditions. The HO₂S sensors were not faulty and therefore read the lean A/F and sent a signal back to the PCM to richen the mixture. The PCM did this and continued to add fuel up to its limit that was still not enough to get the sensor to switch. It set a code.

A contaminated MAF usually will swing from under reporting airflow at idle to over reporting at high speed. I never took the car on the road to see what it did, because as soon as I saw the HO₂S start to switch as I brought the rpm up and the fuel trims dropped, I knew the wideband sensors had to be working.

The fastest way to check the condition of the MAF on most Fords is to look at the BARO PID and see what it is. In

this case it was reading 152Hz. I live in Grand Rapids, Mich., about 500 feet above sea level. The BARO reading in frequency for Grand Rapids should be no less than 155 to 157, depending on weather conditions.

That information has most often been found in the pinpoint test for a MAF code. There is a table of frequency to altitude. Variation of 3Hz or more is cause for concern. When you do a Keep Alive Memory (KAM) reset, the value will be 149.7Hz. When the MAF loses power or the PCM loses its memory for any reason you will see this number. What this represents is the default value the Ford uses when it is reset and represents about 3,000 feet above sea level. This number was picked because most of the country is somewhere between 5,000 feet above and sea level, and this falls somewhere in the middle.

We cleaned the MAF and cleared codes and KAM. The vehicle was fixed.

The principles of Pinpoint Test Z are used regularly by anyone analyzing a vehicle with a concern to determine whether the code is true or phantom, is a failure within operating parameters or an intermittent concern that shows up only on a Tuesday.

But you can also use it to learn the relationships between inputs and output and how these cars work. What was seen on the recording I made of the Flex stood out if the tech knows what to look for. I have seen many technicians stare at a trace on a scan tool, the concern as big as life but they could not see it because they did not know what normal looked like. If you don't know what normal looks like, if you don't understand how things work then not even Pinpoint Test Z is going to help you fix that broken car. *MD*



MARK DEKOSTER
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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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2010 Ford Focus

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REFERENCE VALUE PARAMETER IDENTIFICATION (PID)/MEASURED SIGNAL TABLE

The following listing reflects PIDs and/or measured values which may reveal a possible concern within each system shown. Match the category number with the related PID/measured signal and go to [TYPICAL DIAGNOSTIC REFERENCE VALUE TABLES](#).

PID/MEASURED SIGNAL TABLE	Category Number	Related PIDs/Measured Signals
5-10-17		ACP
5-10-17		ACP V
1-23		APP1
1-23		APP2
1-23		APP3
23		BPP (BOO)
18-19		CHT
18-19		CHT V
1-2-3-5-6-7-11-12-13-14-15-16-17-20-21		CMP
1-2-3-5-6-7-11-12-13-14-15-16-17-20-21		CKP
1-2-3-5-6-7-11-12-13-14-15-16-17-20-21		CMP1/2
10		CPP/PNP
3-5-6-7-9-11-15-16-20-21		DPF/EGR
4-18-19-21-22		ECT
4-18-19-21-22		ECT V

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- Transit Connect
- 2.0L Transit Connect
- Fusion/Milan
- Edge/BLX
- Flex/Taurus
- Fusion/MG2
- MAX/MKT
- Mustang
- Crown Victoria/Grand Marquis

Once you have determined which category to use for analysis and you are in test Z2, you may go through this chart and select the PIDs related to your concern.

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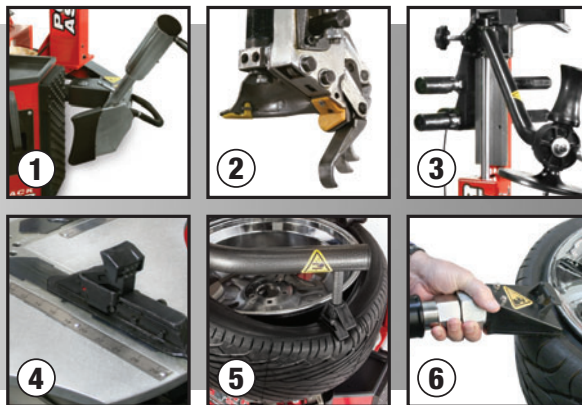
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TAKING CARE OF TODAY'S VEHICLES

Figure 7

ONE LITTLE OVERSIGHT CAN RESULT IN BIG – AND COSTLY – MISTAKES.

BY G. JERRY TRUGLIA | CONTRIBUTING EDITOR

Today's cars can go longer and harder than those of even a decade ago. But that doesn't mean we can treat them less kindly. In this article, I'll talk a bit about everything from the routine oil change to the diagnostic problems that were caused by the lack of proper maintenance.

Not So Routine

Recently, I got a rude awakening being back in the shop doing simple tasks such as oil changes and maintenance. Now, I am not complaining about the maintenance or diagnostic work. That's

no problem since I always keep my skills up to speed working on problem vehicles. The area I want to focus on is oil changes. Not that it's so hard to change oil, but resetting the oil lights or messages are another story.

If you have been around a while then you know most of the domestic and Asian vehicles are not that hard. But if you work on European vehicles, you know what I am talking about. Let's take a look at some of the helpful information sources that you can utilize.

The information systems ALLDATA, AutoData, Identifix, Mitchell and MotoLogic have very helpful informa-



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tion, but you need to follow the steps very carefully until you do a few of the tough resets and get them down. Let's not forget that there is very helpful information on YouTube and Google when someone has gone through the

process of documenting the procedure, or better yet videotaping the process. The other solution is from Launch Cresetter and CanDo Reset+ that offer a small handheld oil reset tool that plugs into the system similar to most scan tools. The Launch Cresetter and CanDo Reset+ (Figure 1)

units offer an automatic or a manual reset. Having the hand held units are very convenient since you have all the information right in front of you without have a laptop or tablet.

Let's talk about oil; it's not your father's motor oil any more. Specifications for motor oil are extremely important in order for an engine to operate properly. Besides using the correct weight oil, the oil needs to meet one or more of the follow specifications;

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API, SAE, ILSAC, ACEA and Dexos to name a few. The following is an example out of ALLDATA: VW Oil Quality Standard VW 502 00. Other than heading over to your local VW dealer to buy the approved oil, what do you do?

You know how I preach checking the Technical

Service Bulletins (TSBs), right? Guess what? For a list of engine oils that meet Volkswagen oil quality standards refer to the most current TSB "Engine oils which meet Volkswagen Oil Quality Standards." Use only engine oils that expressly meet the Volkswagen oil quality standards specified for this vehicle. Using any other engine oil can cause serious engine damage that will not be covered by any Volkswagen Limited Warranty. Other OEs have similar warnings on the use of oil in their engines.

"What's the big deal?" you might ask. "Oil is oil, right?" Engines today are the high-performance sons and grandsons of years past and run much tighter tolerances with less room for errors. Variable Valve Timing (VVT) actuators use oil pressure to function properly and the use of improper oils will impact, even damage, VVT components. This ain't your granddaddy's Buick Roadmaster, anymore!

In addition to having to adjust your oil change habits of yesterday to keep up with the technology of today, other areas we once considered "routine" have changed. Not all are new, but many of these are still giving technicians fits from lack of information and training. One example is Tire Pressure Monitoring System (TPMS) reset. It's something we all need to deal with, even if we are just rotating tires.

Some TPMS systems are very simple, while other vehicles need a special tool to reset the system or program new locations into the Electronic Control Unit (ECU) in charge. Another "routine" service area that isn't so routine anymore is brake service. With more electronic braking systems coming into play, and electronically-actuated parking brakes installed, beginning a rou-

tine reline could end up costing you a lot more than a set of brake pads to fix.

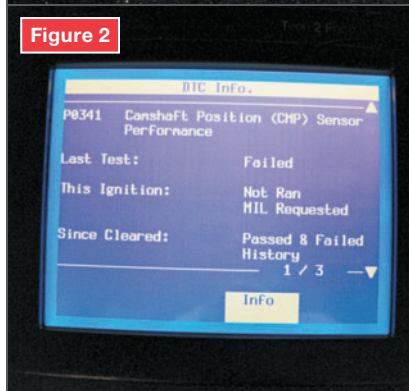
Why Should I Perform Maintenance Work?

It's time to move on to problem vehicles that came in with issues that could have been avoided if the proper maintenance was performed. Our first vehicle is a 2002 Saturn SC1 1.9L that came in with a P0341 (Figure 2) cam sensor Diagnostic Trouble Code (DTC). This DTC can be confusing for the tech who is not familiar with this vehicle. The 1.9L engine does not have a cam sensor, but rather uses the Electronic Ignition (EI) that has capacitive pickup plates located under the 1-4 coil pack that determines the polarity sequence for a cam input.

The cause for this problem was a neglect of maintenance on this vehicle that had not seen routine service in a few years or more. How is that related? Worn spark plugs lead to wider plug gaps. This, in turn, leads to a higher energy demand in order to fire. And while coils are more than capable of meeting the demand, they are not designed to do it all the time. They overheat and the secondary insulation breaks down, leading to a shorted coil. This fix for this vehicle was new spark plugs, wires and the No. 1-4 cylinder ignition coil.

Our next story is about a 2008 MB GL450 4.6L with air suspension that came in with a message "AirMatic Service Required" after the vehicle was serviced at another shop. The owner of this Benz went for the cheapest oil change he could find which wound up costing him more in the long run. This wasn't exactly caused by lack of maintenance as it was by lack of knowledge and training.

The problem occurs if the vehicle is lifted without first turning off the air suspension system. Any trigger, like a door opening, could activate the system with no load on the suspension. The air suspension spring can be damaged or moved off its seat. Ford products with air suspension systems had a switch in the trunk (or at the passenger's side lower trim panel) to turn off the air suspension, but the Benz has to be turned off via a scan tool or may be turned off on some models by the control module automatically. Make sure before you lift up a vehicle, you check if it has air



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Fig. 1-Piston and Connecting Rod

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

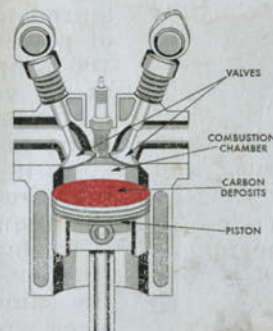


Fig. 2-Combustion Chamber

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suspension and know how to turn it off and don't forget to turn it back on when you let the vehicle down.

How about a 2004 Ford F150 XLT 4.6L with 186,000 that has not seen ignition maintenance in more than 90,000 miles? Well you probably know where I am going with this one if you have had the joy of removing the spark plugs (Figure 4) on this engine.

Because the plugs have a tendency of breaking there are a couple of things that you can do before removing them. The following are a few things that you can try before removing the plugs. First, warm up the engine; second, perform a fuel system cleaning/decarbonize before remove the plugs; and third, pray and make sure you have the special tool (Figure 5) that removes the broken plug along with an air vacuum to suck up any small debris that may have been left behind.

Or a 2002 Cadillac Escalade 6.0L with 80,000 on the odometer with a brake problem that could have been avoid in two ways. The first way she could have avoided a costly repair was

when she first heard the noise (Figures 6 and 7). She should have brought the vehicle right in rather than continue to drive. You've never had a customer like this one, have you? As you can see, she drove the vehicle until the caliper blew out. The other way she could have saved a boatload of cash was to have had the service done when the shop first recommended the brake work.

“Worn spark plugs lead to wider plug gaps. This, in turn, leads to a higher energy demand in order to fire. And while coils are more than capable of meeting the demand, they are not designed to do it all the time.”

Wait, There's More!

On to a 2007 Ford F350 6.0L diesel with a P0401 (EGR Insufficient Flow) DTC detected. I encountered this problem vehicle as I was teaching a class. The shop I was at had installed a new EGR valve that did not resolve the problem. You can go to MotorAge.com/egrvalve to see the EGR valve operating by scan tool bi-directional control on the TST YouTube channel.

The problem with this EGR system as well as many others is that the EGR passages clog up and need to be cleaned. I recommended that they contact their local BG representative and purchase the special EGR cleaning kit along with the chemical. Once they ran the BG cleaner through the system the problem was solved. This is a great service that needs to be performed on diesels as well as gas engines such as Honda motors that are known to clog EGR passages.

A lack of routine oil changes brought a 2005 Subaru Legacy 3.0L 75K into the shop. It came in with a P0011 (Intake Camshaft Position Timing Over Advanced Bank 1) and P0021

Figure 3



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(Intake Camshaft Position Timing Over Advanced Bank 2) along with an idle and stalling problem. This engine had clogged VANOS (Figure 8) screens that are inserted in the solenoid's oil passages. The problem most likely would have not occurred if the regular main-

tenance along with the correct oil was used during regular oil changes.

The 5w30 oil required for this engine is an ILSAC (International Lubricant Standardization and Approval Committee), GF-3 with an API SJ standard. The use of the wrong oil, low or dirty oil can cause the above DTCs. To test the system, use your scan tool's bi-direction ability to actuate the valves.

An alternative procedure also can be used by connecting a Power Probe or fused jumper wires. The caution is to make sure you index the terminal to make sure what side has power and ground in case the solenoid uses a diode. Turn the key off followed by disconnecting the wires to the solenoid, followed by turning the key back on and touching the Power Probe point very carefully without jamming it in the terminals to see what side has power and ground. Your next step would be to apply power and ground to the solenoid to see if the engine makes an rpm adjustment as the phaser adjusts one way or another.

Our last story of the day is a 2006 Chrysler 300C 5.7L with a NAG1 transmission and a complaint of a vehicle that will not move until the engine is shut off and restarted. This vehicle is one that I owned and at the time was under warranty. I noticed that the transmission developed a leak and returned it to the dealer. They installed a new connector plug and wiring harness that is usually a problem but was not in this case. The vehicle was returned to me and still leaked transmission fluid that I found was leaking from the front pump seal.

I returned the vehicle to the dealer where they replaced the front seal and now that all the leaks were fixed I thought the problem would be solved. Anytime the vehicle was driven for more than three hours, the vehicle exhibited the same problem it had before. I would be driving anywhere from 5 mph to 75 mph and suddenly experience no forward speed until I coasted the car over to the shoulder of the road, placed the selected in park, followed by shutting it off and restarting it. The final fix for this vehicle was a complete transmission replacement.

The moral of this story is to make sure a transmission leak gets repaired as soon as possible as not to cause a low fluid level that will overheat the electronics in the transmission. It seemed that the leak went on way too long, causing an internal problem that put the unit in limp mode.

As professionals, we see cases just like the ones I shared here today every day in our shops. We share these stories with our customers in every effort to help them save money in the long run. Why, then, do so many customers refuse to perform routine maintenance? No matter, I guess. I'll fix it either way! **TM**



G. JERRY TRUGLIA
CONTRIBUTING
EDITOR

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

✉ Email G. at gtruglia@tstseminars.org



Figure 4



Figure 5



Figure 8



Figure 6

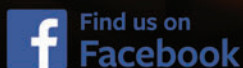


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The 8.4-inch Uconnect screen sits in the center of the dash. It allows the driver to interface several devices through either USB or Bluetooth connections such as smartphones. It displays everything from Sirius Satellite Radio to navigation with weather, and controls multiple interior functions from climate control to seat warmers. You also set most of vehicle's convenience options using the touch screen.

A FRESH DESIGN BREATHES NEW LIFE INTO AN ICONIC NAME.

BY TIM JANELLO | CONTRIBUTING EDITOR

The new Dart has plenty of power and agility, compliments of its Alfa Romeo heritage. The 2013 Dart uses high-tech materials along with state of the art technology to provide first class safety and convenience features. Only three advanced technology engines are now offered compared to the old school's 11.

Dodge used the Dart to compete in the pony wars of the 1960s and '70s with engine options ranging from the lowly 101 hp, 170 CID (cubic inch displacement) "Slant Six" up to the killer 400-plus hp, 440 CID V8. These new Dart High-Tech engines might not have the cubic inches of the past, but the

new technology they pack more than makes up for loss.

The Dart is offered in five trim levels: SE, SXT, Aero, Limited and a more conservative GT over the concept RT model. Dodge also tossed around a Rallye model, but changed it to an option package, the ones with the eye catching, hard to miss stripes. The Dart's LED rear lighting resembles the Dodge Charger, giving it a distinctive look. Dodge loaded the Dart with technology, everything from driver interface to safety controls. The stance and handling comes from the four wheels pushed out to the corners giving it almost a 62-inch track and legs

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stretched more than 106 inches to the rear with just an overall body length around 184 inches.

The Dart is not sporting the front end of olden days either. The sleek design gives it a very low 0.285 coefficient of drag (Cd). Dodge added active grill shutters and insulated belly pans covering 90 percent of the underbody to cut drag and lower interior noise levels. The shutters cut 10 percent of air drag by closing off the airflow through the lower part of the grill, redirecting the air around the car. Active refers to the computer's ability to open or close the

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shutters according to coolant temperature, speed, and load inputs.

Technology

Chrysler's Uconnect voice command system is optional on most vehicles including the Dart. The Uconnect system gives the driver access to a navigation system, smart phone connect, multimedia center, satellite entertainment and more by simply pressing a steering wheel mounted button and talking. Uconnect can handle phone or conference calls, stream audio from Bluetooth connectivity, give directions and change climate controls all at the same time from voice commands. The 8.4-inch touchscreen has a large screen for viewing the backup camera or driving routes. The Uconnect multimedia center can talk to electronic devices via a USB port or wirelessly through Bluetooth.

Dart owners can choose options like keyless Enter-n-Go, allowing the driver to simply touch the door handle to unlock, enter the car, press brake pedal, push the start button and take off. The remote start allows starting the engine from inside their home or other places, and with the right options the system can thaw out the car on those cold days, even toasting your buns with the seat warmers, or keep you from cook-

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ing on hot days by turning on the A/C.

The Dart can help the driver with normal driving tasks. It uses Smartbeam headlamps for auto dimming, and Rain Sensing wipers to automatically turn on the wipers. The inside rearview mirror is the key player housing a mini camera for sensing light levels

and oncoming traffic for auto-on lighting and automatic headlight dimming. It hides the windshield glass mounted infrared sensor used for detecting raindrops to turn the wipers on and set the wiper's speed. The Ultrasonic Park Assist system located in the rear bumper helps the driver determine rear distances when backing, plus rear cross path detection for avoiding unwanted parking lot meetings.

The Dart is loaded to the gills with safety and handling technology to help keep the driver safe and help them maintain control in some situations. The Dart uses ultrasonic waves to protect itself from unwanted entry or sounds the alarm if it is tipped (stealing tires or being towed). The interior is stuffed with 10 airbags to wrap you up in the event of a collision.

As expected, airbags are in the dash and knee bolsters, but you also will find them in the sides of the front and rear seats long with both roof rails. Plus they added front seatbelt pre-tensioners and reactive front headrests. The body itself is designed to disperse energy from an impact over the whole body and sub-frame to help minimize passenger compartment injuries. They used about 70 percent high strength steel in the construction of the body to lighten the vehicle while giving it greater impact control.

Handling for the Dart comes from electronically controlled electric power steering (EPS) for better road feel and improved fuel economy. EPS is coupled with several active systems to improve handling and avoid crashes. The engineers added 305 mm diameter vented front brake rotors clamped by 60 mm piston calipers while 38 mm rear caliper pistons squeeze 264 mm solid discs. They coupled the brakes to an Electronic



Shown is the new front exhaust design for the base engine. Moving the exhaust to the front of the engine improved emissions over the older designs.

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Stability Control (ESC) system that thinks for itself and even tries to anticipate events. The ESC is an active four-channel advanced handling system that coordinates braking with throttle control to help stop or control the vehicle before it gets away from the driver. The system



The intake piping is hidden under the engine cover. The baffle on the right nestled between the cam cover humps help control noise. From the outside, the all-aluminum engine hides the MultiAir system located under the rear half of the cover.



Notice the cam does not touch the intake valves. The cam operates the pump. The pressure is stored in the accumulator located between the pump and the solenoids. The ECM operates the solenoids to apply oil pressure to the actuators, pushing down to open the valves the desired amount, making the throttle plates unnecessary.

looks at all the wheel speed sensors, steering wheel angle sensor, brake pressure and yaw/ lateral accelerometers to know the forces on the car.

The Electronic Brake Force Distribution system balances the front to rear according to loading for shorter straight line stopping. The ESC has the ability to do traction control, plus the Brake Lock Differential software applies braking to a spinning wheel under all road and weather conditions. More controls to help avoid collisions show up in the form of a Panic Brake Assist, which looks for fast brake pedal movement, then boosts braking pressure and activates the Antilock Braking System (ABS) for shorter stopping distances.

The Ready Alert Braking technology looks for the driver to let up on the accelerator and then applies just enough brake pressure to tighten the pads up against the rotors to shorten the actual apply time. The Hill Start system knows if the vehicle is stopped on an incline and applies the brakes for two seconds while the driver's foot moves between pedals to prevent vehicle roll-back.

The ESC leaps into action if the Dart is susceptible to roll over by using its Electronic Roll Mitigation program to selectively apply the brakes and cut throttle to help the driver maintain control. The system also has a Trailer Sway Control to prevent the Dart's rear from wiggling from towing or crosswinds by applying counteracting brake force to straighten its path. The Rainy Brake Support, activated by turning on the wipers, cuts stopping distance in wet weather by slightly pulsing the brakes to keep them dry.

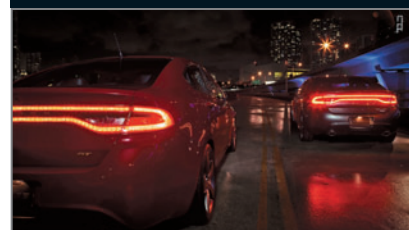
Engine Technology

The Dart is available with three different all-aluminum 16-valve inline 4-cylinder engines. The smallest displacement is a 1.4 L Single Overhead Cam (SOHC) sporting a Turbocharger with MultiAir technology. The 2.0 L Dual Overhead Cam (DOHC) with Variable Valve Timing (VVT) is the base engine for most trim levels. The biggest engine offered is a 2.4 L SOHC MultiAir Inline 4 cylinder.

2.0 liter Tigershark I: The Tigershark I is not the "World Gas Engine" we all know. This torquey little engine twists out 148 foot-pounds at 4,800 rpm and



This cut-away highlights the intake air manifold's shape to increase velocity for better air-fuel mixing and increased flow. The exhaust valves are directly operated in the conventional manner, cam lobe pushing down on the valve lash adjuster to open valves.



The new Dart shares a distinctive bright rear LED tail lighting look with its big brother, the Dodge Charger.

spins up to 6,400 rpm to deliver 160 hp, gaining 5 to 9 percent torque and 1 to 2 percent increase in mpg over previous engines. Unseen upgrades over previous engines include thicker cylinder liners, 36 mm intake valves and a shortened stroke forged steel crank with machine-matched bearings for improved fit. The engineers went the extra steps and incorporated new automation processes like a special cylinder-to-piston machining process for closer tolerances and less break-in wear.

Opening the hood, you will be greeted with noticeable changes from the normal Chrysler engine configurations including a rear mounted intake and front mounted exhaust. To lower friction and increase mpgs, Dodge added roller rockers, a two-stage oil pump relief valve and polymer-coated pistons with low-pressure rings. A Powertrain Control Module (PCM) controlled thermostat and revised intake ports/chambers were added to improve emissions, power and mpgs.

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This DOHC 16-valve engine features Dual Cam Phasers for Variable Valve Timing (VVT). This means that each cam can be independently advanced or retarded for a total of 60 degrees of crankshaft rotation. The VVT fully advances the intake cam for a sewing machine-like idle or adjusts to pull hard over most of the rpm band putting some fun back into driving. The VVT closes the exhaust valve late to re-breathe some exhaust gas for NO_x control to replace EGRs of old.

Dodge redesigned the engine to lower Noise Vibration Harshness (NVH). A nearly silent inverted tooth timing chain (similar to a transmission drive chain) was added to reduce front timing case noise. It added a 360° engine to transmission attachment, improved the oil pan design and added an internal balance shaft to make it hard to feel the engine run. The all-aluminum block and head reduce weight and to make it rev quietly they added lighter pistons, floating piston pins and piston oilers which also lower emissions and increase engine life.

Dodge adopted dual spray fuel injectors for better fuel atomization to improve cold starts and lower emissions while improving MPGs. The spark plugs were upgraded to a platinum center and iridium ground electrodes for longer life and better spark for improved combustion. The PCM can push fuel metering and timing to the maximum limits without engine knock plus adapt to various fuel grades for better performance. This smart PCM has a limp-in strategy to protect the engine even with a complete loss of coolant. It also has a more complete oil life monitor to better predict oil change intervals.

1.4 L FIRE MultiAir Turbocharged: Standard for the Aero and optional on others, this Fiat-built little monster packs 160 hp at 5,500 rpm, but the best spec is the flat torque output. It hits a staggering 184 foot-pound of torque at 2,500 rpm and holds it all the way to 4,000. FIRE stands for Fully Integrated Robotised Engine, meaning the engines are built by robots. Fuel economy is excellent ranging from 37 to



Notice the large 12-inch vented rotors nestled inside the 17-inch wheels. These are the foundation for all the various stability controls, plus they will bring you to a halt in a hurry using the advanced braking system features. The 2.4-inch diameter caliper piston delivers the clamping force. The rears are solid 10.4-inch disc with a 1.5-inch caliper.

41 mpg highway depending on model and transmission choice.

It owes the performance to Fiat's MultiAir intake air control system coupled to a low inertia intercooled turbo-charger. The MultiAir alone adds 10 percent power, 15 percent torque and 10 percent mpg while lowering HC/CO₂ emissions 40 percent and NO_x 60 percent. MultiAir is an advanced form of variable valve timing coupled with variable lift, which can adapt to any situation immediately giving a smooth idle with instantaneous revving.

This system uses oil pressure controlled actuators between the cam lobes and the intake valves to vary lift. The fast response solenoids control intake valve lift per-cylinder per-stroke to control cylinder air charge making throttle plates irrelevant. A camshaft lobe drives a piston pump to develop the oil pressure storing it in a small reservoir located under the cam cover for operation. This technology allows the little engine to rev like a Ferrari, well maybe that good.

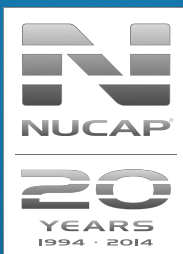
The 1.4 L uses a timing belt (150,000 mile change interval) for quiet operation of the cam and shares much the same of its internal designs with the 2.0L. Don't be surprised if you hear an after-run coolant pump running for up to 10 minutes after key off. This cools the turbo down to prevent high temperature damage.

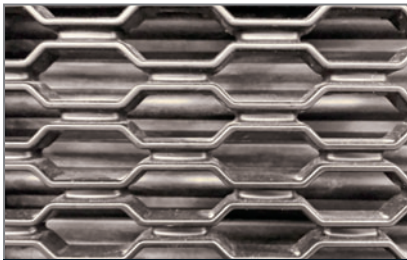
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The Active grill shutters are located in the lower section of the grill. They block incoming air from reaching the engine compartment thus lowering drag. Their position is controlled by the ECM through a small motor attached to rack and determines their position based on engine load, temperature and vehicle speed.

2.4 L MultiAir II Tigershark: Is this the modern day equivalent to the old Demon 340 CID V8 engine? Currently available only in the GT model, it also uses the MultiAir system to produce an eye opening 184 hp at 6,250 rpm from an all-aluminum design. The 174 foot-pounds of torque at 4,800 rpm will push you back in the seat and keep you there.

The approximately 3,200-pound curb weight gives the Dart a good power to weight ratio no matter which engine. The 2.4 L engine shares most of the internal engine design enhancements of the other engines, but is not turbo-charged so it uses a glass filled nylon intake manifold to enhance air flow and limit heat transfer to the charge air. The 2.4 L does incorporate several shields and covers to lower NVH.

Transmission Technology

The Dart has three transmission options starting with the Fiat-designed C635 six-speed manual transaxle. The unique DDCT (dry dual clutch transmission) six-speed automatically shifted manual trans (no clutch pedal) and the more mundane six speed 6F24 Powertech automatic transmission are also offered.

The C635 transaxle is a sporty shifting compact 3-shaft constant-mesh gear changer capable of handling 258 foot-pounds of torque. The output shaft is the third one in this stacked, compact design reducing the length so it can be installed in small areas and

handle more torque. The uniqueness is in having gears 2, 4, 5 and Reverse on one output shaft while gears 1, 3 and 6 spin on the second shaft allowing each output shaft to have a different final drive ratio. Dodge uses a four-plane cable shift mechanism for quick, smooth shifting with a pull-up ring on the shaft handle to prevent unwanted reverse engagements.

The C635 DDCT weighs in under 180 pounds, handles 258 foot-pounds of torque and shifts without interrupting power transfer to the ground. The DDCT is available only as an option on the Aero Dart. This is a sporty shifting automatic giving manual trans-type positive shifts, adding to the fun factor while delivering near manual transmission fuel economy.

The DDCT uses two clutches for power transfer from the engine. The concept is that of parallel gearboxes aligning even and odd gears on their own shafts connected by a single clutch. This system gives the feel of the old time power shifts without any let up in power. An electro-hydraulic

actuator controlled by a dedicated electronic controller does all the hard work while the driver just presses on the gas pedal.

The 6F24 is a fully automatic electronically controlled overdrive trans-axle also capable of handling the same torque as the others and is offered with the 2.0L or the 2.4L engines on all models but the Aero.

The New Dart packs plenty of punch in its own way. It's sporty, quick, and full of big boy technology to interest the younger generation. *TM*



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Tim Janello is an assistant professor for Southern Illinois University in Automotive Technology teaching baccalaureate students for the past seven years. He has 40 years of experience in the automotive repair field with Master ASE certification and L1.

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SCAN TOOL DIAGNOSIS QUICK TIPS

THIS MONTH, WE PROVIDE INFORMATION ON DIFFERENT SCAN TOOLS AND VEHICLE DIAGNOSTICS.

BY G. JERRY TRUGLIA |
CONTRIBUTING EDITOR

In our first case study, we are using the Toyota Techstream OE factory scan tool on a 2005 Scion tC. Let's take a look at one of the most important pieces of scan data (Figure 1) that many of us overlook: monitor information. We should look at this information to make sure all monitors are complete before moving on with our diagnosis so we don't have an unexpected outcome.

Remember, if a monitor is showing as Not Ready/Incomplete, there is a chance that a Diagnostic Trouble Code (DTC) can show up after you have completed your repair. The following example will shed some light on why we need to check monitors and use the Generic/Global portion of the scan tool.

If a vehicle came into your shop with a P2A00 (A/F sensor circuit slow response, Bank 1 Sensor 1) DTC, and you proceeded to replace the sensor without making sure that the Catalyst Monitor was Ready, you might encounter a P0420 as well. A P0420 may appear because the Air Fuel Sensor (AFS) is used along with the rear O₂ sensor to calculate the converter's efficiency.

Other reasons to use a Generic/Global scan tool are simpler. All the scan data such as Fuel Trim and other Parameter Identifiers (PIDs) are the same on all vehicles, the data list is shorter and easier to utilize, and substitute sensor values are not allowed with one exception. The AFS was not being used on vehicles when the

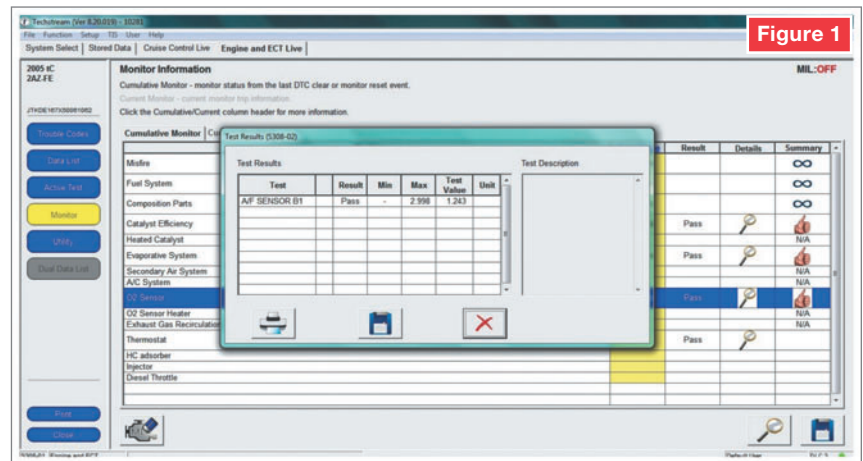


Figure 1

OBDII ruling was finalized. On some Generic/Global scan tools the Toyota AFS will not be displayed at the normal 3.3 volts at idle, but rather be displayed as 0.66 volt.

Our next screen shot displays an example of monitors listed as Not Ready, along with the current passing Mode \$06 test results that indicates one of the many tests that must be completed before the monitor is set to Ready. Take a look at the "Result and Summary" columns of Figure 2 versus Figure 1. Can you see the difference? In Figure 1, the Result column has a Pass and the Summary column has the thumbs up symbol, which means that the monitor has run to completion and is Ready (same as Complete on some tools). Remember that Mode \$06 is always running little tests in the background that need to pass before a monitor will become Ready.

If a series of tests fails a specific number of times, the results will be elevated to a Pending DTC. If the

component test for the monitor fails twice in succession, it will turn on the Malfunction Indicator Lamp (MIL) and become a hard or mature DTC.

In Figure 3, we are utilizing the scan tool's bi-directional control to confirm that the evaporative emissions system's purge solenoid is working or not. Let's take a look at the Short and Long Term Fuel Trim to see if the bi-directional input is having any effect. We should recall that the normal reading on the AFS ratio sensor at idle is 3.3 volts and note where STFT and LTFT is at and see where it goes as we are performing the test.

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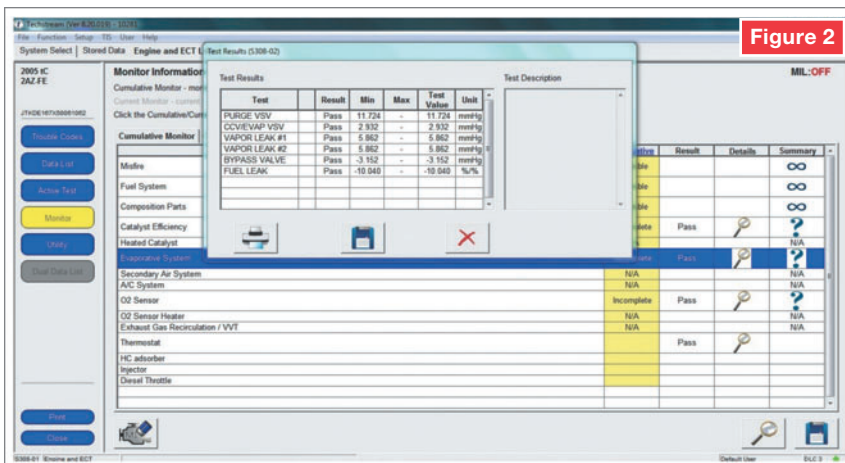


Figure 2

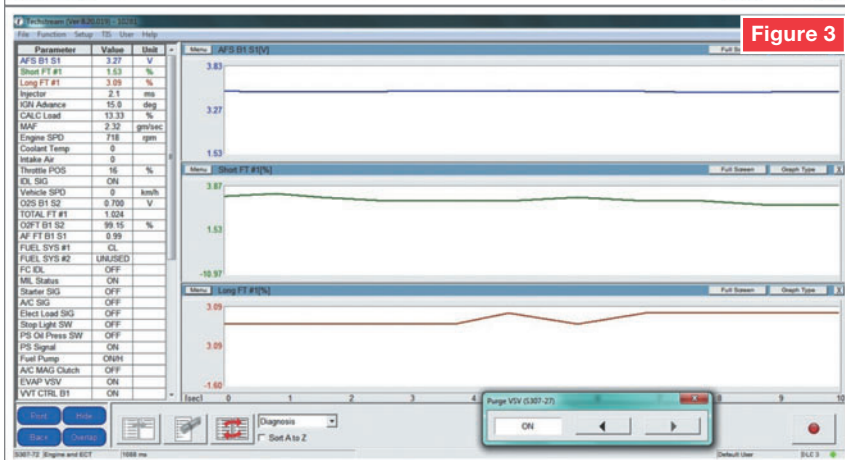


Figure 3

When the command for the normally closed purge valve is opened, there should be a change in the fuel trim readings if the valve, port and connections are in good condition. The AFS sensor voltage is being displayed numerically at 3.27 volts, while the graph portion is a different story showing us some increase and decrease in voltage. The detection of the open purge solenoid from the scan tools bi-directional control is a lean condition that the Powertrain Control Module (PCM) should command more fuel on both the STFT and LTFT graph if the system is working properly.

The PID data to the left on the screen also is displaying the MIL commanded as On, confirming our EVAP DTC. This vehicle's P0455 DTC was a result of a broken EVAP line that connects to

the canister. When the purge solenoid was commanded open it only pulled air, which makes for a lean condition along with a high voltage AF sensor voltage reading. Keep in mind that a reading over then 3.3 volts on the AF sensor indicates a lean condition that should result in a rich command, or higher Fuel Trim.

Another Example

Our second case study is based on using the EScan Generic/Global scan tool on a 2006 Range Rover LR3 with a 4.4L motor. This vehicle came in with the MIL illuminated along with a P0171 and a P0714 lean condition. The vehicle was checked for mechanical condition, vacuum leaks and fuel pressure, which all proved good. One of the components that can have a lean effect on both banks is the Mass Airflow Sensor (MAF) sensor, so our next step was to perform the easiest test first with the scan tool.

Because we were using the EScan scan tool that has a built in MAF test, it made the job easier to complete. The test has the user input the engine size,

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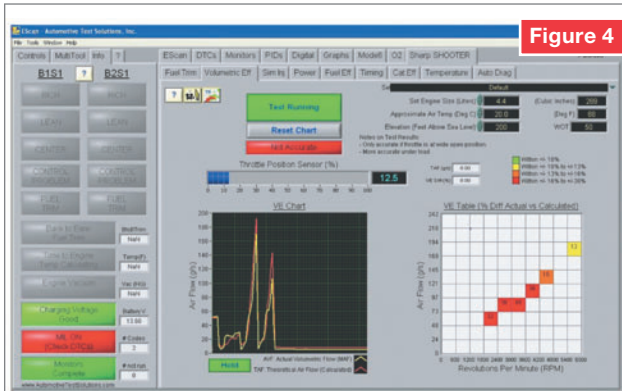


Figure 4

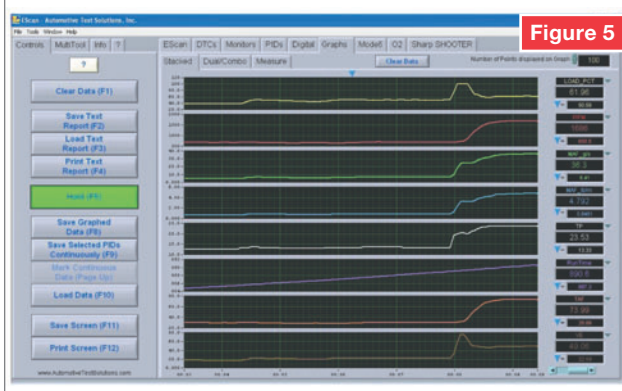



Figure 5

air temperature and altitude so the tool can properly calculate the correct volumetric efficiency of the motor. The graph has a red line that indicates the calculated value for the correct amount that the engine should produce, while the yellow line is the actual amount tested. As you can see in Figure 4, the yellow line does not reach or meet the red calculated line, indicating that the sensor is not correctly measuring the incoming air charge. Of course always check the air filter, throttle plate and exhaust system for excessive back pressure. If you don't own the EScan, you can still perform the test with any Generic/Global scan tool that graphs, using a PID list similar to that shown in Figure 5.

A quick check of volumetric efficiency can be accomplished by graphing the Calculated Load PID while driving the vehicle at wide open throttle (WOT) and checking to see that the graph reaches at least 90 percent calculated load. This test will help you diagnosis problems with a MAF sensor along with restricted intakes and other exhaust systems. 



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

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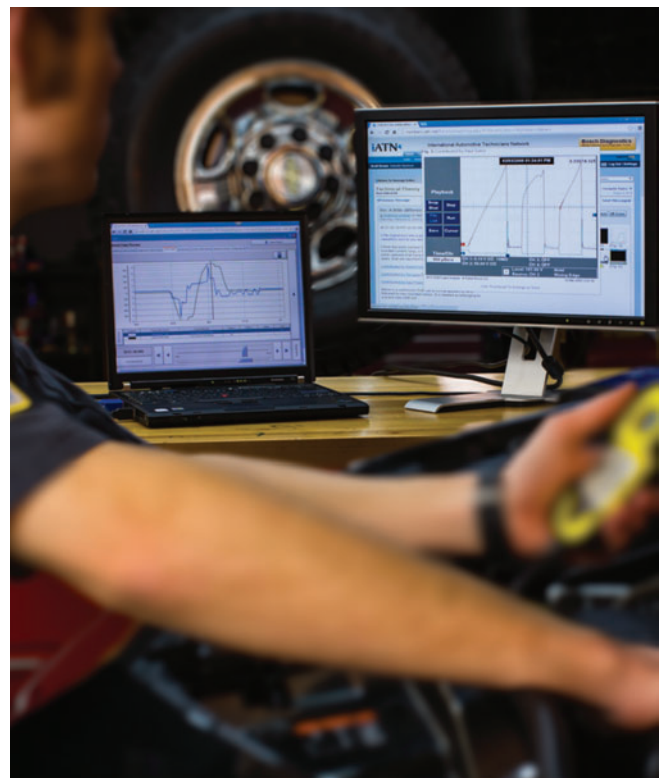
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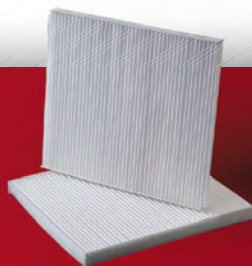
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RECOVERY EFFORTS

OH, THE WORK WE PUT IN TO RESUSCITATE, REPAIR AND RESURRECT A VEHICLE.

BY **RICHARD MCCUISTIAN** | CONTRIBUTING EDITOR

My dad used to take me to his shop when I was a small boy, and so I kind of cut my working teeth on wrenches. And because just about everybody in our area knew my dad or knew of him, my connection to him meant I never had a problem finding a job as a mechanic. Buying and fixing derelict vehicles was a way of life for us, and as I got older, I found myself noticing vehicles in our community that were sitting fallow without much wrong with them.

I was 19 years old when I asked a man named Oscar why that 1964 Chevy pickup he once drove was sitting out next to a pile of tin with a flat tire. At the time, that truck was only 12 years old. Compare the age of that vehicle to a 2002 model today.

"It was running when I parked it there a couple of years ago," he told me. "It just needs that left front tire aired up and I think a battery would get it going."

I knew that truck because I had driven it when it was newer, and I always loved those mid-'60s Chevy pickups. So I bought it from him on the spot for \$150, and it was very easy to get it running again.

Five years later when I was working in Texas, I took a few vacation days and made a trip back to Southeast Alabama. As I visited my friends, I dropped by to see Oscar's son Danny, who also was one of my best buddies, and I noticed that his cloud blue 1973 LTD was sitting covered with pecan tree smut not 200 yards from where that 1964 Chevy truck had been parked. He had purchased that car when it looked brand new and was only a couple of years old, but that had been years ago.

"What's up with the LTD?" I asked. I wasn't surprised at his reply.

"Well, it was running when I parked it," he began. It was déjà vu all over again. That one needed a tune-up and a battery, and while I didn't buy the car, I did volunteer to get it running so he could sell it to somebody besides the

junk man – and it ran really well.

No vehicle is immune from this kind of neglect. Not too far from where I'm sitting as I type these words sits a Toyota Camry of the 2002-2006 body style generation that is parked and wasting away for some reason. A few days ago, I saw a Mercedes of about the same vintage that has obviously been sitting fallow for months.

The Story of the 626

"I put a used starter on it, but it started running really bad, and now it won't start."

That was the owner's original stated concern, nothing more, and as it turned out, he left out some crucial details. Initially a pair of students reported that the coil was weak, but I could stretch the spark almost an inch and it was bright blue. They had



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1997 MAZDA 626

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Mileage

STATISTIC

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fallen prey to the bright sunlight syndrome, which masks the true mettle of a good spark. When we shoved it into the shop, we moved on to check fuel pressure and found that we didn't have any and we couldn't hear the pump running. We also measured the current the pump was pulling and saw about 10 amps, meaning the pump was indeed consuming current. But if the pump isn't humming, it isn't spinning and it needed to come out of there.

Another vehicle that made an appearance at our shop was a gray 2001 Impala unmarked Alabama State Trooper car. It had been sitting up for a few weeks and was thought to have

a security key problem, because sometimes it'd start and sometimes it wouldn't. They stopped using the car because they couldn't trust it, and no cop needs a car with an intermittent no-start concern. Somebody had replaced the battery, but to no avail. We don't ordinarily work on trooper cars, but somebody opted to bring us this one. Because so many GM cars of this vintage have Passlock and Body Control Module (BCM) problems, they assumed the concern would be something like that.

When we duplicated the concern, we did a voltage drop test and we found a 7.0-volt drop between the (side post) positive battery bolt and the starter terminal. That led us to a chalked up positive cable that had gone totally unnoticed by whomever changed the battery. I bought two replacement cables, because this one has a branch coming off that side post terminal that feeds the under hood fuse panel.

I removed the red rubber insulator from the cable, spread the ears of the terminal, pinched the secondary cable's copper with those ears and soldered the second shorter cable I bought in there with a propane torch, fabricating a replacement cable that was configured and looked exactly like the original, red boot and all. Problem solved with \$17 in parts. State college shakes

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hands with state troopers, and the Impala that had been in moth balls for a couple of months is back on patrol surprising unwary speeders with its un-cop car persona. To be candid, I was kind of glad that one was gone, because some students kept fiddling with the siren while it was in the shop.

When It Finally Fails

This set of stories wouldn't be complete without mentioning the ragged 1997 Accord that came in with the brakes so worn that nothing was left of the driver side outboard pad but the sheet metal silencer. Furthermore, it had blown that caliper. While most neglecters will drive one until it doesn't go any more, they literally drove this one until it wouldn't stop.

While we had it on the lift, we had a one of those "perfect storm" mishap situations that sometimes happens in a shop, and that set of circumstances caused this Honda to get knocked partially off the lift by another vehicle (long story). But to give credit where it's due, that Bendpak lift's arm locks did a wonderful job of preventing the disaster from being worse than it was, so kudos to Bendpak.

I also took in a job on a 1999 Expedition with a flat air spring on the left side. That big SUV was filthy with tree dust and had been parked for months when



This was causing the Malibu's intermittent no-crank. Replacing the battery did nothing to solve the real problem, so we replaced this cable with a new one.



This Expedition had a flat air spring; the one on the right had been replaced right before it was parked. We sold them on replacing the rear suspension with coil springs and the kit came with a full set of shocks. This SUV went from being parked to getting a new license plate and lease on life, but not before we replaced the leaking brake pressure switch for safety.



When we got the gas tank off the 626, we found this disaster, along with another 30 pounds of the same gunk in the tank.

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they got a traffic ticket on the way to the shop for an expired license plate. At the shop, we converted that one to coil spring suspension, washed it, and got it back on the road. While we were under the hood, we noticed that the cruise control brake pressure switch was leaking a lot; the old recall had even been done at some point. We replaced that switch to eliminate the fire hazard those switches cause.

Then there was another Expedition, a 2007 model with a 3-valve 5.4L that needed spark plugs and a Coil-On-Plug (COP) coil. It was one of those with the problem-prone long-nose spark plugs, and there are a number of methods

being applied in the field on these. The one that seems to work best (believe it or not) is to use an impact wrench, as destructive as that sounds, because wrenching hard and fast on these breaks that trouble-causing carbon bond and seems to work a lot better than trying to bring them out slow. My guy Bobby heated the engine up on this one and we ran some Motorcraft injector cleaner through the system to soften the carbon, because we had heard of people doing that to “grease the skids,” so to speak. But two of these came apart in their holes, and so we were in for some problem-solving.

I bought the \$95 Lisle tool for shov-



ing the porcelain down and getting the shell out of there, but Bobby decided to try getting the ceramic completely out of one by putting some JB Weld on the inside of the first threaded shell that had come out empty. He screwed it back in over the porcelain with the JBW in place. He let it stay there all night, and the next morning he was able to screw the shell back out so that he removed the ceramic in one piece, leaving only the hollow electrode shell in there, which made using the threaded Lisle tool easier.

On the other separated plug, he wasn't so lucky, and we had to break the ceramic off and shove it down on that one.

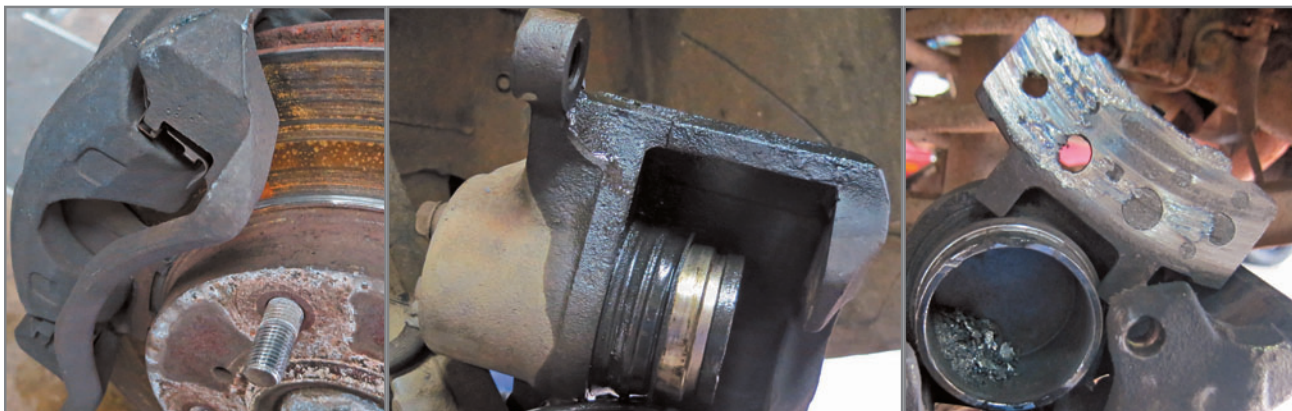
Speaking Of JB Weld...

I'm not here to bash JB Weld; it has its place, and most of us have used it at one time or another. After all, it did wonders on extracting the ceramic on one of those stubborn three valve plugs. And I've seen people use it to do some pretty amazing things when the mating surfaces were properly prepared. But some people would, I think, build a whole car out of it if they could make it happen, and wild stories abound among back-yard DIY folks about magic they've worked with it.

One lady brought her 1999 Tahoe to us with a coolant leak where somebody



At the top, student Bobby got lucky with JB Weld and managed to get the ceramic out in one piece. But the ceramic was nice and dry and we let it set all night, at left, this was the shell for that plug. Bobby used his rounded bolt remover to grab the ceramic on the other broken plug and shear it smooth with the shell. The JB Weld didn't work on that one, because he had sprayed some PB Blaster in the hole earlier in the job and compromised the surface. We had to punch the ceramic down on that one to make room for the tool.



These were brake parts from the 1997 Accord, which they drove until it wouldn't stop. When we told the owner it had been knocked off the lift, she said she didn't mind a dented fender as long as the car would still drive.



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had tried to screw that quick-connect heater fitting out of the manifold and had broken that pewter fitting off down in manifold. They had then proceeded to cut the rib off the aluminum pipe

part of the heater hose and shove it into what was left of the original fitting, then pack on what looked like about \$30 worth of JB Weld. We had to chip a coffee cup full of that stuff out of

the way, then chip that pewter out of the manifold threads so we could follow up with a pipe tap. We then screwed a good steel fitting in there and put a plain piece of heater hose with a worm type clamp on there that wouldn't leak. We also flushed the 350's cooling system and replaced the thermostat.

On a vaguely similar note, we were replacing the passenger side cam sensor on a 2005 Nissan Pathfinder when that plastic heater hose manifold nipple broke off. This one had front and rear heat, and that manifold is where the heater hoses all come together. Rather than buying that entire heater hose harness, I noticed that that plastic heater hose manifold was pretty thick where the nipple broke off. I tapped it with a half inch pipe tap and screwed a nipple fitting in there to reconnect the heater hose with a trusty worm-type clamp. It has turned out so far to be a reliable repair.

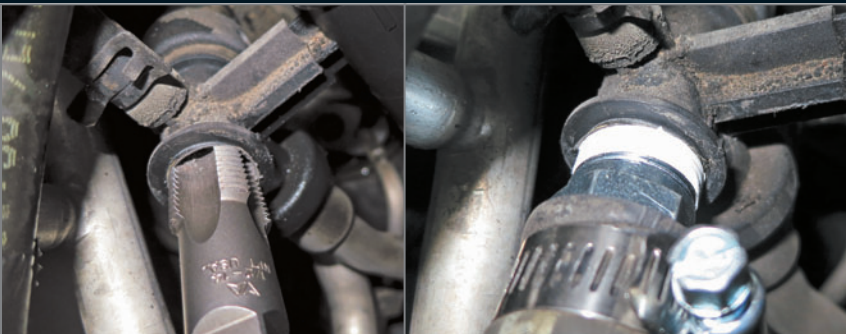
Closure on the 626

When we got the plastic gas tank off of that 626, we found putrid, rotten gas in there (complete with the rusty-looking muck it turns into in extreme circumstances). I ordered a fuel pump and Melissa, a student, steamed out the tank, replaced the pump, flushed the fuel lines and popped a new fuel filter on it.

After that, it still wouldn't start until we got rid of the six wet spark plugs that would never fire again. After changing the oil and replacing the ragged wiper blades with some new ones, we saw that Mazda drive out of the shop still sporting a 2010 license plate that might generate a traffic ticket before it got back home. Who knows? It might just get that ticket from whatever trooper was driving the Impala we fixed. *TM*



Speaking of JB Weld, the 350 in this 1999 Chevy had been the victim of a serious patch job after the heater hose quick connect fitting broke off. It kept leaking, and the owner's friend kept adding more JB Weld.



This was our fix for the broken nipple on the Nissan. This heater hose manifold was robust enough to handle some pipe threads and a replacement fitting.



RICHARD MCCUISTIAN
CONTRIBUTING
EDITOR

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

 E-mail Richard at rwm19@mail.com

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CRP Automotive has expanded its line of specially formulated Pentofrost Antifreeze for Asian vehicles with three new formulations: A2 (Green), A3 (Blue) and A4 (Pink). These new fluids join with Pentofrost A1 (Red) Antifreeze. The new antifreeze formulations match the OEM's specifications for performance and protection as well as the specific liquid color used by the vehicle manufacturer. Pentofrost Antifreeze A2, A3, and A4 are designed specifically for the water-cooled engines used in Asian makes. They are based on a phosphate organic acid technology, which is categorized as hybrid organic acid (HOAT) technology in the U.S. market. The antifreeze does not contain any silicate, borate, nitrite or amine containing additives, since these are known to be harmful to technicians and vehicles, the company states.

For more information, visit

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Lista International Corporation presents its newly redesigned Automotive Service Bay System, specially designed for the automotive service and repair industry. When organization, precision, and performance are critical, Lista reports it delivers with highly functional and flexible workspaces. Integrated service bay and workbench solutions are feature-packed and give technicians quick and easy access to tools, parts and equipment, it reports. A full range of workbenches, storage cabinets, toolboxes and mobile work centers can be custom configured to meet the individual demands of every workspace and will turbo-charge any automotive service bay. Workbenches provide plenty of room for technician assembly and tear down operations, and promote optimal organization and productivity. Sleek, durable, and easy to maintain counter and workbench surfaces handle the daily rigors of any service department. Surfaces come in stainless steel, galvanized steel, and 1 3/4-inch thick butcher block.



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www.listaintl.com. Lista International



900 HP ENGINE

Now, Lingenfelter is expanding its standard crate engine line with a powerful 900 hp engine that will be an off-the-shelf, stocked product. Prior to the release of the new engine, Lingenfelter's supercharged crate engine line topped out at 750 hp. The new 900 hp Lingenfelter Performance Engineering crate engine is fitted with a forged crankshaft, pistons and rods for maximum performance and durability. It also features GM LS9 heads with Lingenfelter's CNC porting program for improved airflow, resulting in more torque and horsepower, the manufacturer states.

For more information, visit

www.lingenfelter.com. Lingenfelter Performance Engineering

CORDLESS GREASE GUN

Ingersoll Rand has expanded the IQV20 Series line to include a new 20-volt cordless grease gun. Powered by advanced battery technology from Ingersoll Rand, the cordless LUB5130 makes it easy for operators to grease fittings in the shop and in the field. The LUB5130 comes with a standard 30-inch hose to maneuver tight spaces. The patent-pending inline battery-mount design improves the versatility of the LUB5130 and makes it easier to access hard-to-reach area, the company states. The LUB5130 has three grease loading options: bulk, cartridge and manual, so users can refill quickly, helping increase jobsite productivity. Because the grease gun is frequently used in harsh environments for tough applications, Ingersoll Rand incorporated the latest technologies to ensure optimum tool durability, efficiency and safety for the user. The LUB5130 has an LED indicator and electronic shutoff valve to prevent the motor from overheating, which maximizes its durability. These features also prevent pressure backfill to protect the motor. In addition, the LUB5130 has an impact- and chemical-resistant housing case to withstand repeated drops.



For more information, visit

www.ingersollrandproducts.com. Ingersoll Rand

ELECTRONIC SUSPENSION DAMPER

Tenneco's Monroe Shocks and Struts brand is helping automotive service providers increase ride control sales through an expanded range of solutions for vehicles originally equipped with air or electronic suspensions. The Monroe brand now offers original equipment-replacement electronic suspension dampers for several late-model domestic and import applications, as well as additional suspension conversion kits that enable consumers to replace an air or electronic system with a mechanical suspension. Tenneco is expanding its line of OE-replacement electronic dampers to cover several additional Cadillac, Land Rover and Mercedes-Benz applications. These units help restore the "like-new" performance of the vehicles' electronic suspensions, the company says.

www.tenneco.com
Tenneco Inc.



TIRE SENSOR TOOL ADD-ON

The Snap-on TPMS3 Tire Sensor System Tool just got better with the introduction of the Snap-on Programmable Sensor Add-on Package (TPMS3PRG). With this new capability, service technicians can program replacement or duplicate aftermarket tire pressure monitoring sensors, saving time and reducing sensor inventory. The new Snap-on TPMS3PRG is an optional activation that allows users to utilize their existing or new Snap-on TPMS3 tool to program aftermarket TPMS programmable sensors, the company says. The TPMS3PRG can replace a sensor with low battery life or one that is non-functioning, as well as create a duplicate set of sensors for customers that change from summer to winter sets of tires. The TPMS3PRG works with all the major aftermarket sensors including EZ-sensor, Alligator sens. it, Dorman DiRECT-FIT, Standard Clone-able, NAPA Echlin Clone-able, Intermotor Clone-able and OEC ID Copy (Orange).

www.snapon.com
Snap-on Tools



NITRO RACING OIL

Drivers of smaller, alcohol- or nitromethane-fueled engines competing in today's domestic and foreign race circuits now have a racing oil formulated specifically for their needs. Prolong Super Lubricants introduces its 40W Nitro Racing Oil, which is designed to deliver extra protection and boost performance in engines that rely on a higher compression ratio than other fuels, for higher engine power outputs. Featuring a blend of premium synthetic base oils and additives, Prolong's 40W Nitro Racing Oil is formu-



lated with Prolong's advanced Anti-Friction Metal Treatment technology to protect against high temperature oxidation, wear and viscosity breakdown during severe use, it reports. It is formulated to meet the demands of high-horsepower, high-rpm engines, with highly effective detergent dispersants and corrosion inhibitors to keep engine parts clean and free of sludge, varnish and rust.

www.prolong.com
GoldenWest Lubricants

IMPORT VIDEO SOLUTIONS

Standard Motor Products has released a new TechSmart Tech Session video featuring TechSmart import solutions. Highlighting the Tech Sessions are TechSmart's all-new, not remanufactured, electronic throttle bodies for Nissan and Infiniti, and TechSmart VVT chain tensioner kits for VW and Audi. These VVT kits include every necessary component to get the job done right. Also featured are power distribution centers for VW and Audi, an ignition coil harness repair kit, expansion tank service kits for BMW and more. The Tech Session video series is available for viewing on the TechSmart YouTube channel, www.youtube.com/TechSmartParts, as well as on www.facebook.com/TechSmartParts, by clicking on the video channel button. SMP says Tech Sessions are designed to help professional technicians find new and better ways to solve their automotive repair issues.

www.smpcorp.com
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LED LEAK DETECTION FLASHLIGHT

Tracer Products has unveiled the Tracerline OPTI-PRO Max— a cordless, state-of-the-art, true UV (violet light) LED leak detection flashlight. It makes automotive leaks easy to spot, while slashing valuable diagnostic time for technicians, the maker states. The OPTI-PRO Max works with all Tracerline® universal/ ester and PAG A/C dyes, as well as TP-3400, TP-3405, TP-3900 and TP-3940 fluid dyes. Leaks can be seen using the true UV LED light even without using the yellow glasses provided. This powerful unit is specially designed to fluoresce dyes brighter and with greater contrast than standard blue light inspection lamps. With an inspection range of 25 feet (7.6 m) or more, the OPTI-PRO Max easily gets into tight, cramped areas that larger lamps can't. Its rugged, corrosion-resistant, anodized aluminum body stands up to years of heavy shop use. Powered by a rechargeable lithium-ion battery, the lamp provides four hours of continuous inspection between charges! The unit has a 100,000-hour LED service life.

www.tracerline.com
Tracer Products



TPMS APPLICATION AND ILLUSTRATED PARTS GUIDE



Standard Motor Products, Inc. has released a new, printed TPMS Application and Illustrated Parts Guide. This comprehensive catalog includes many new items as well as updates to existing product coverage for both the Standard and Intermotor OE-matching, clone-able TPMS sensor lines. Catalog highlights include numerical index for TPMS sensors, service kits and sensors grouped together by vehicle application, additional details on valve stem applications for Audi, BMW and Mercedes, expanded frequency applications for Toyota and new sensor illustrations with enhanced features and service kit applications. With applications being updated daily, visit www.StandardBrand.com for the most current catalog information, the manufacturer reports.

www.smpcorp.com

Standard Motor Products Inc.

BATTERY CHARGER



CTEK has introduced its new MUS 4.3 POLAR, a 12V, 4.3 battery charger specifically designed to offer all-around charging with special cold weather performance. The POLAR mode is a special cold weather feature that delivers a higher 15V charge to ensure a 100 percent charge is achieved, even in the coldest conditions. It is available on the 0.8A, 4.3A and AGM Battery settings. The POLAR mode can optionally be set as required on any of the modes (motorcycle, car or AGM), according to the manufacturer. The MUS 4.3 POLAR is an advanced microprocessor controlled battery charger providing unrivalled performance on batteries from 1.2Ah up to 110Ah.

www.smartercharger.com

CTEK Power

PORTABLE JACK SYSTEM



Ranger Products unveiled its new QuickJack portable jack system that makes vehicle maintenance on the track and off convenient and lightning fast. The 3,500-pound capacity lightweight QuickJack can go anywhere and can be easily stowed in the trunk or back seat of most cars when not in use. Bring it to the track or drop it on your garage floor to perform routine maintenance in the comfort of your home, all in seconds. Simply position the lightweight jack frames under the vehicle, push the raise button on the remote hand-held pendant control and in less than ten seconds the entire car is almost two-feet off the ground ready for tire changes, chassis tuning or other maintenance. The QuickJack collapses to a low three-inch profile so it fits where other jacks don't, the manufacturer states. Features open-center design, rugged safety lock bars, remote pendant control on a 20-foot cord, quick-connect hoses and a built-in flow divider for precisely equalized lifting. The QuickJack comes complete with an eight piece set of rubber lift blocks, convenient positioning handles and a mini portable hydraulic power unit that runs off standard 110-volt current. An optional 12-volt DC unit also available.

www.bendpak.com

BendPak/Ranger

SLEEVE PROTECTION

DEI's new Titanium Protect-A-Sleeve with LR Technology offers sleeve protection. Developed specifically for any application where extreme high heat is present, these Titanium sleeves will protect wires, lines and cables when

exposed up to 1,800°F direct heat/2,500°F radiant. Developed with DEI's LR Technology, these high-temperature rated sleeves provide superior thermal protection for street vehicles or race engines, protecting fuel, oil lines, spark plug and electrical wires from direct or under hood radiant heat, the company says. The sleeves will fit many of today's larger diameter spark plug wires for protection against hot exhaust manifolds and headers. Water and heat resistant, they are also ideal for Powersports – ATV/UTV, motorcycle, personal watercraft, snowmobiles, and marine use.



www.designengineering.com

Design Engineering Inc./DEI

NEW AIR SUSPENSION PRODUCTS FOR BMWs

Arnott has released new aftermarket air suspension products for BMWs: a new rear air spring for the 2007-'13 BMW X5 (E70 Chassis), an air spring for '09-'14 X6 (E71 Chassis) and a new air suspension compressor for the '99-'03 5 Series (E39 and E61 Chassis) and '02-'06 7 Series (E65 Chassis). Arnott air springs are backed by a limited lifetime warranty while compressors carry a two-year warranty.



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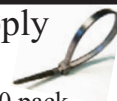
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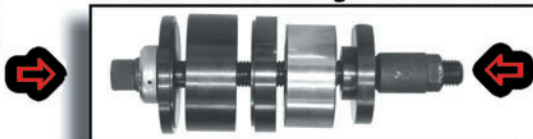
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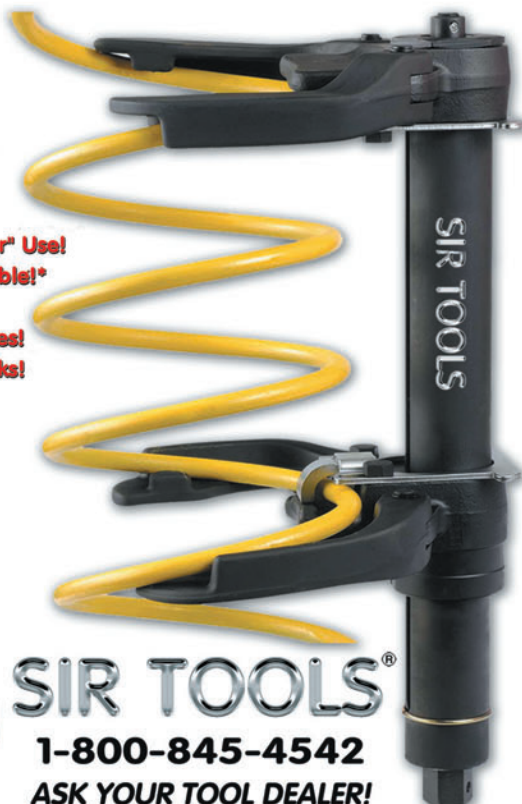
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FINDING THE MISS

WHAT TO DO WHEN SWAPPING PLUGS AND WIRES DIDN'T FIX THE PROBLEM.

BY PETE MEIER

Technical Editor

"The car isn't running quite right. It feels a little rough when I'm stopped." Not an uncommon customer complaint, right? Your service advisor brings you the ticket and the keys, and you hop in the car to bring it inside.

Unfortunately for you, the car appears to run just fine as you let it sit and idle in the lot. But Lady Luck smiles down on you, and the Malfunction Indicator Lamp (MIL) is on. You find a P0300 (Random Misfire) code stored in the Engine Control Module's (ECM's) memory. You also notice the car has some miles on it, and if you're like many of us, your first instinct is that the car probably needs a "tune up." You pull a plug after you have it in your bay and see that it is worn. It seems to have been in there for a while, so you recommend plugs and wires (just to be on the safe side, right?) and proceed to the next job on your hook.

The parts arrive later that afternoon; you install them without any problem and return the car to the customer. Three days later, they're back and they're upset. The car is running the same as it did before.

This repair was doomed from the start, wasn't it? Assumptions were made, no testing was done (unless you count pulling the plug) and the repair was never verified. How many



potential causes for this kind of complaint are there, and how do you narrow all of them down to the one that is the culprit?

Isolating the cause of a random or cylinder-specific misfire need not be a fault solved by "seat of the pants" troubleshooting. Following a logical order, applying a few simple techniques and using a little of what God gave you can lead you to a successful repair the first time. And that's the topic of this month's edition of The Trainer. *TM*

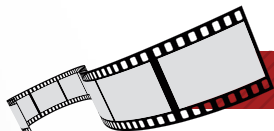
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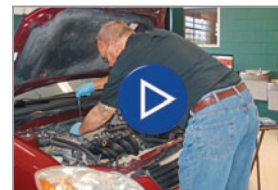
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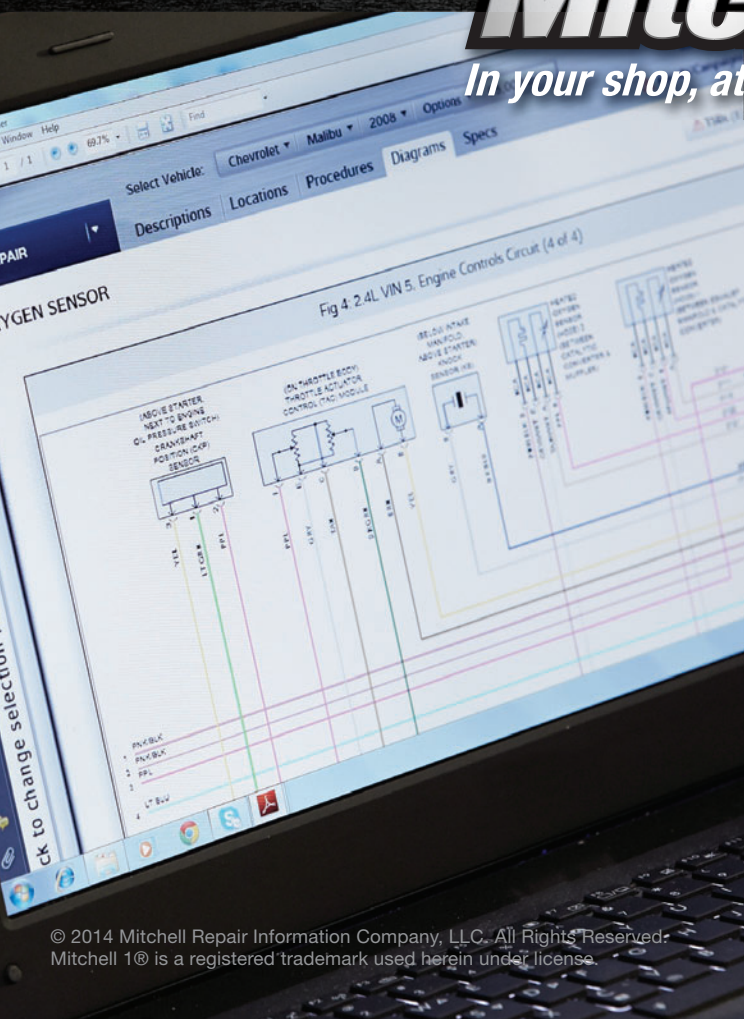
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