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COMMITMENT TO TRAINING
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INSIDE: MAKING SENSE OF CHRYSLER'S SGW
56

24

A/C SERVICING — ARE YOU DOING IT RIGHT?

While A/C system service is fundamentally unchanged, changes in technologies and system designs require you to pay more attention to the details.

MEET ROXIE

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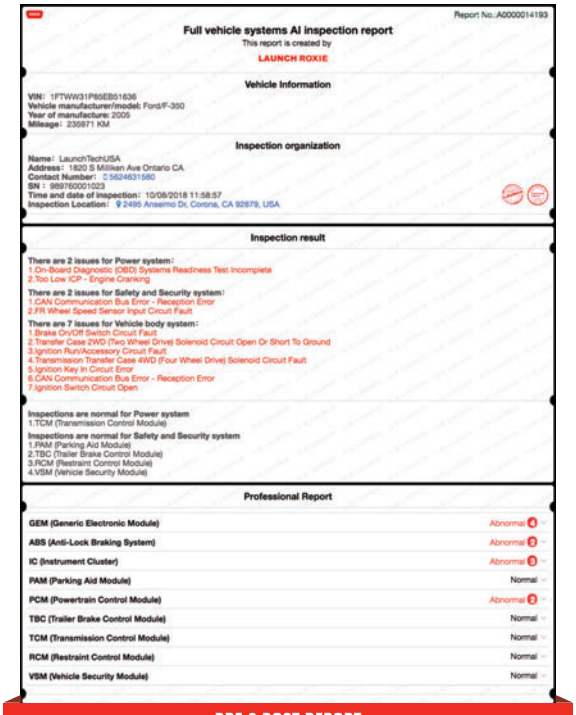

Full vehicle systems AI inspection report

This report is created by LAUNCH ROXIE

Report No.:A0000014193

Vehicle Information

VIN: 1FTWW31P85EB51636
Vehicle manufacturer/model: Ford/F-350
Year of manufacture: 2005
Mileage: 235971 KM

Inspection organization

Name: LaunchTechUSA
Address: 1820 S Milliken Ave Ontario CA
Contact Number: 5624631580
SN: 98976001023
Time and date of inspection: 10/08/2018 11:58:57
Inspection Location: 2495 Anselmo Dr, Corona, CA 92879, USA

Inspection result

There are 2 issues for Power system:
1.On-Board Diagnostic (OBD) Systems Readiness Test Incomplete
2.Too Low ICP - Engine Cranking

There are 2 issues for Safety and Security system:
1.CAN Communication Bus Error - Reception Error
2.FR Wheel Speed Sensor Input Circuit Fault

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

Inspections are normal for Power system
1.TCM (Transmission Control Module)

Inspections are normal for Safety and Security system
1.PAM (Parking Aid Module)
2.TBC (Trailer Brake Control Module)
3.RCM (Restraint Control Module)
4.VSM (Vehicle Security Module)

Professional Report

GEM (Generic Electronic Module)	Abnormal 4
ABS (Anti-Lock Braking System)	Abnormal 2
IC (Instrument Cluster)	Abnormal 3
PAM (Parking Aid Module)	Normal
PCM (Powertrain Control Module)	Abnormal 2
TBC (Trailer Brake Control Module)	Normal
TCM (Transmission Control Module)	Normal
RCM (Restraint Control Module)	Normal
VSM (Vehicle Security Module)	Normal

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

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Talk Shop Anytime

MAY 2019
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IN EVERY ISSUE

WEB EXCLUSIVES // MOTORAGE.COM

EFFINCIENCY, PRODUCTIVITY, PROFITABILITY

These are three key points shop owners demand as they strive to be successful. David Rogers, president of Shop4D, discusses in this short video a new integrated shop management solution that combines a number of programs shops rely on to help your repair shop achieve these goals.

The video outlines eye-opening stats, such as how many programs and subscriptions the average shop has, and also explains ways to use one program that covers: inspections, estimates, repair orders, marketing, customer communications, labor guides, parts ordering and much more!

See what Shop4D is and how it could work in your shop.
MOTORAGE.COM/FIRSTLOOK

Motor Age

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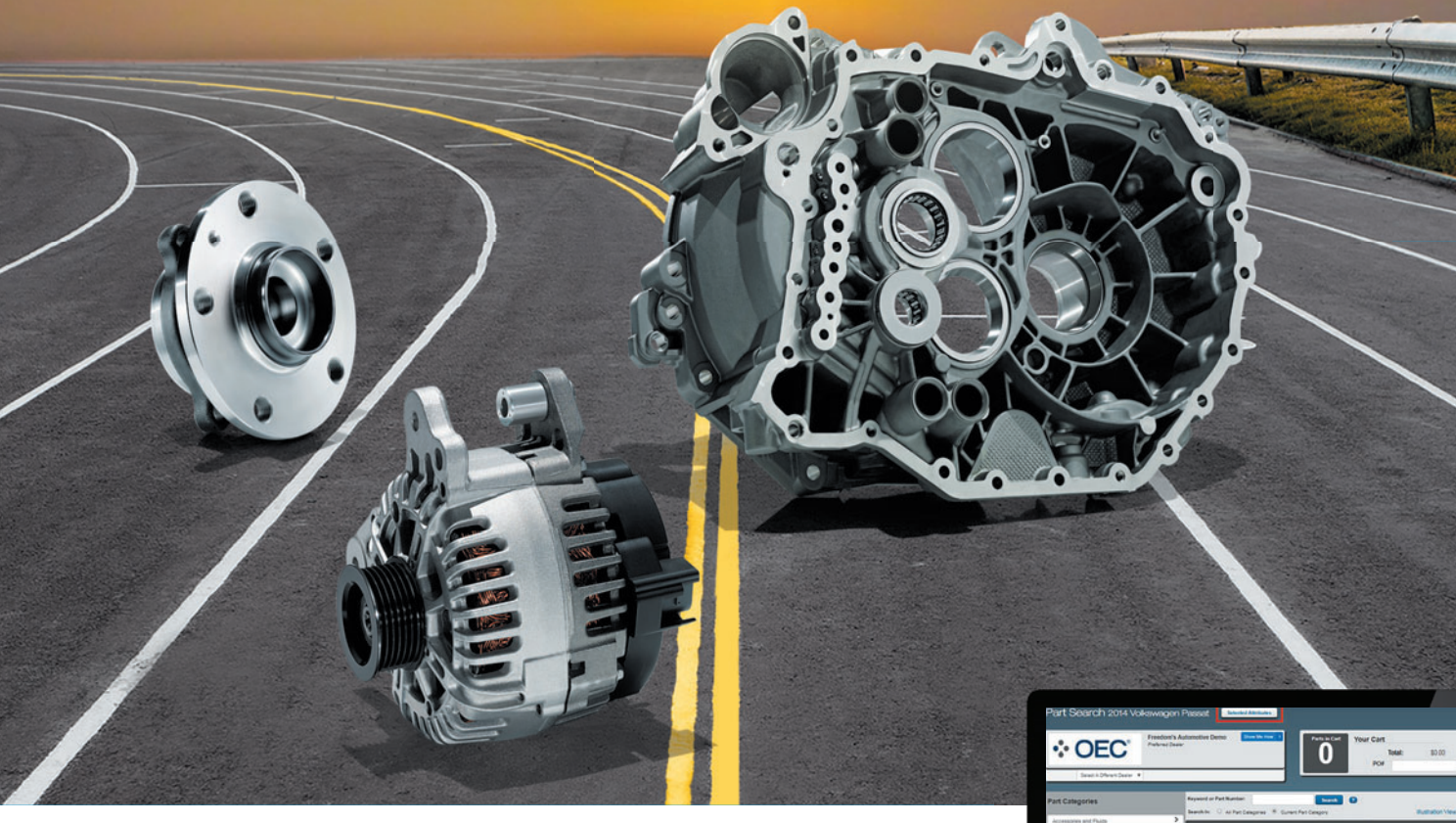

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AASA VISION

HOW THE INDUSTRY IS FIGHTING FOR REPAIRERS, CONSUMERS

KRISTA MCNAMARA //
Content Channel Director

DEARBORN — Preserving consumers' freedom of choice for vehicle repairs and maintenance and data accessibility is an ongoing battle — one that industry associations and representatives are fiercely fighting.

Bill Hanvey, president and CEO of the Auto Care Association, sat down with Bill Long, president and CEO of the Motor Equipment Manufacturers Association (MEMA), during the Automotive Aftermarket Suppliers Association (AASA) Vision conference in Dearborn, Mich., on April 3 about the steps being taken to ensure freedom of choice and access to data continues.

Hanvey first tackled the status of Right to Repair (R2R). When the current R2R legislation was approved in Massachusetts in 2013, telematics was excluded because at the time, the industry wasn't sure what it was and the potential, he said. Also, every OEM's definition of telematics and the data available was, and remains, different. Now the associations are partnering to

>> CONTINUES ON PAGE 6

BREAKING NEWS

PANEL DISCUSSION

VEHICLE DATA ACCESS, CHOICE NECESSARY

This year's Washington Auto Show, which took place in early April at the Walter E. Washington Convention Center in Washington, D.C., featured some of the latest technological innovations driving the auto industry into new frontiers, including connected and autonomous vehicles. But what many consumers don't know about are the vast amounts of data these vehicles collect — or with whom vehicle manufacturers share this data.

Your Car. Your Data. Your Choice., an education and advocacy initiative created to engage car owners, policymakers and other stakeholders on car data, brought together automotive, security and privacy experts, policymakers and consumer advocates for an engaging discussion on, "How the Connected Car Impacts

>> CONTINUES ON PAGE 7

TRENDING

E-COMMERCE IS RESHAPING THE SUPPLY CHAIN

As more companies sell product online and as traditional online retailers enter the market, the pressure is high on aftermarket suppliers to keep up with demand.
MOTORAGE.COM/KEEPUP

BUILDING A BRAND STORY

In this Remarkable Results podcast, learn how Kim Walker and her husband Brian, through Shop Marketing Pros, are helping shop owners hone their story and bring clients to their brand.
MOTORAGE.COM/STORY

MACS SPONSORING ELECTRONICS BOOT CAMP

MACS will sponsor the Automotive Software and Electronics Boot Camp with Dr. Mark Quarto in partnership with FutureTech Auto in Pennsylvania, Sept. 16-20.
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SENATE APPROVES SMALL BUSINESS CYBERSECURITY TRAINING

Two bills approved by the Senate in late March would give small businesses the tools they need to safeguard against cybersecurity risks.
MOTORAGE.COM/BILLS

TEXT TO PAY COMING TO AUTOMOTIVE REPAIR

BOLT ON TECHNOLOGY and 360 Payments have joined forces to offer automotive repair shop customers Text to Pay, the ability to pay repair bills from the convenience of their mobile phones
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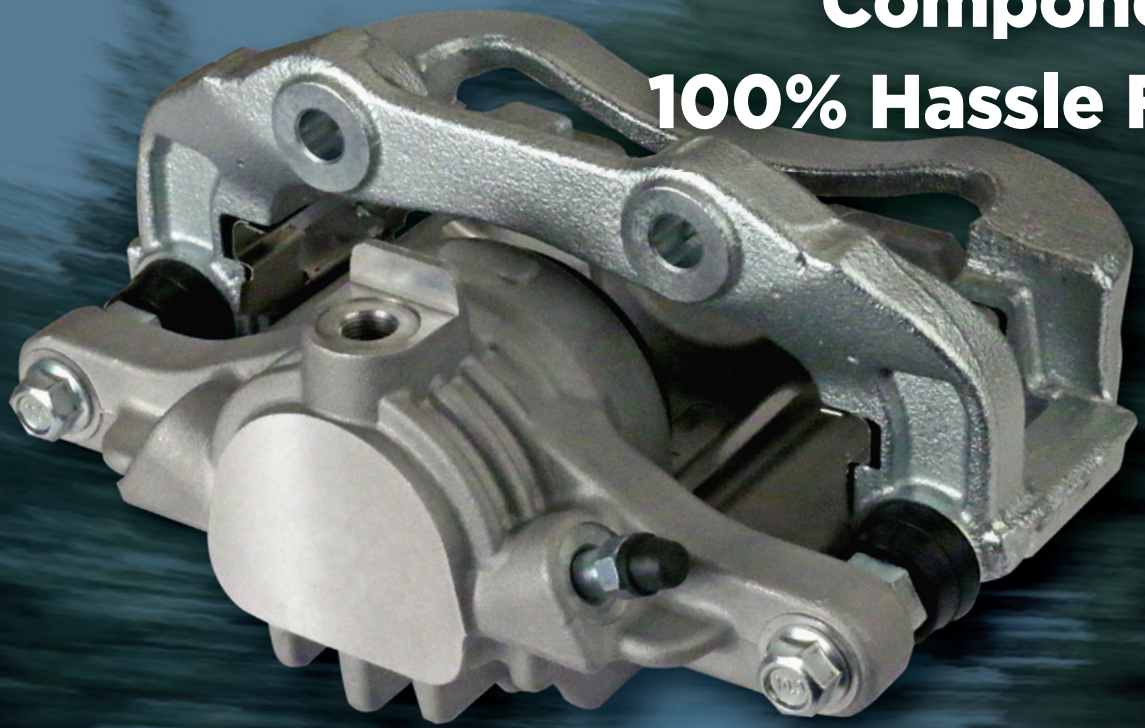

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>> CONTINUED FROM PAGE 4

build on the R2R brand.

"What we are trying to do together is preserve our industry, but when we get the right to that data, what can our industry be. We are trying to preserve our growth and efficiency," Hanvey said.

New legislation proposed in late 2018 seeks to amend the 2013 law and includes some key elements: standardization of the mechanical and diagnostic data to and from the network of the vehicle; for model years 2022 and further to allow the repairer to access that data with a mobile device (scan tool, tablet, phone, etc); it requires that consumer be notified that their data is being stored and transmitted; and dictates how that notification will be sent to the consumer informing that their data is being stored and transmitted.

Currently, the legislation has 55 cosponsors, but the OEMs are working with lobbyists to fight this on the cybersecurity side, Hanvey said.

Also, a coalition — the U.S. Vehicle Data Access Coaltion, which includes not only aftermarket trade groups like the Auto Care Association and the Automotive Service Association, but also the Coalition for Automotive Repair Equality (CARE), rental car companies, fleet groups, telematics companies and consumer groups, among others — is working to build this as a consumer data privacy issue.

The coalition believes Congress should have led the role in establishing standards for open data access for vehicle owners for all data generated, collected and stored by vehicles, Hanvey said. With the start of the 116th Congress in 2019, the Coalition supports enactment of legislation that safeguards the rights of vehicle owners to:

- securely access and control their vehicle data, including authorizing access by third parties;
- directly, through in-vehicle access, in real-time;
- through a technology-neutral, standards-based, secure interface;
- that provides interoperable and bi-directional communication with the vehicle

"It is important to get the consumer on our side. The rights of vehicle owners to control and access data generated by their vehicles is too important to be left unaddressed by Congress," Hanvey said. The Coalition supports bi-partisan legislative efforts to establish a framework for securing the continued rights of vehicle owners — and the entities that secure the express permission of the vehicle owners — to control and access vehicle-generated data on a real-time, secure and competitive basis."

Despite the challenges, and others that may be to come — such as encrypted software and data, Long said — the industry must instill the confidence of the consumers.

>> CONTINUED FROM PAGE 4

Consumer Choice." Each year, vehicles get "smarter" and infused with telematic technologies that enable real-time, wireless transmission of information related to driving behavior, vehicle health, GPS location and maintenance and repair data. However, as this technology advances, vehicle manufacturers are gaining exclusive access to, and control of, vehicle data at the expense of consumers.

The discussion, hosted at the Marriott Marquis in downtown Washington, D.C. during the policy and media days of the Washington Auto Show, featured issue expert panelists Sally Greenberg, executive director of the National Consumers League; Joseph (Joe) Jerome, policy counsel for the Privacy & Data Project at the Center for Democracy & Technology; and Greg Potter, chief technology officer at the Equipment and Tool Institute.

Jeff Plungis, lead automotive investigative reporter at Consumer Reports, guided the 60-minute conversation and insightful Q&A session through a variety of topics related to vehicle data, including consumer rights, data privacy and potential federal and state policy proposals.

"So much of the debate around privacy right now is framed around the lens of Facebook and Google, and I understand that, but cars are a real manifestation of how the privacy rubber meets the road," said Jerome.

Much of the dialogue focused on what drivers know about vehicle data, what data vehicles collect and why consumer access to and control of their vehicle data is vital.

"Yes, we should absolutely, as consumers, have access to data we generate," said Greenberg. "We should know if it's sold, shared, collected — consumers want to know that. Eighty-six percent of consumers say they want control of their vehicle's data. I am concerned that we not leave this in the hands of automakers."

The panel discussion also provided an opportunity to premiere The Driver Bill of Rights — a list of drivers' inherent rights regarding the data their vehicles collect, such as the right to transparency about the data; the right to choose what data is collected; and the right to share repair and maintenance data.

"If you don't have a meaningful ability to say 'no,' then don't attach the word consent to it, as it's not real consent," said Jerome. "As we're seeing in the car space, people are concerned. When people say 'no' they don't have options other than ripping stuff from their car."

As far as the path forward, panelists discussed policy proposals at the federal and state level related to consumer data privacy, and cited the recently passed California Consumer Privacy Act and the European Union's General Data Protection Regulation (GDPR) as examples.

WHAT ARE YOUR SAFETY BELIEFS?

Not keeping safety top of mind makes injury that much more likely

TONY MARTIN // Contributing Editor

What does it mean when a person says that they "believe" something? In my view, the term is often misused. I see the word "belief" as having deeper meaning than what society often allots to it. It is probably more accurate for a person to say "I think" or "I guess" rather than "I believe," because the latter implies that you are certain of its truth. Our beliefs form the foundation of our view of the world and act as our compass when we make decisions. Beliefs may even be important enough to an individual that they are willing to fight for them.

Some of our beliefs have been stated so many times that they can now be classified as platitudes. A platitude is a moral statement that has been overused to the extent that it has lost meaning. When we hear the same phrase over and over, the effect is dulled and it doesn't grab our attention any longer. Those beliefs (now platitudes) are still represented by a voice in our consciousness, but they are no longer dominant voices and can be easily overruled by other concerns.

Many of us would say that "Safety First" ranks among our personal beliefs. We often don't give it a second thought when we say it or see it on a poster, because we have heard it innumerable times over the years and nobody seems to ever question it. However, while it seems to be the right thing to say, do we actually believe it and act on it?

Mike Rowe of TV's *Dirty Jobs* fame has some interesting thoughts on the subject. Rowe has proclaimed the idea of "Safety Third," which immediately grabs his viewers' attention. No matter how you interpret his statement, it causes you to stop and wonder who would have the nerve to say such a thing. Taken at face value, Rowe appears to be an unfeeling brute to say that any concern could be more important than safety.

My personal take on Rowe's Safety Third declaration is that he is trying to get people to think about what they truly believe. He is absolutely correct when he says that Safety First has become a platitude that no longer has the desired effect on the listener or the person who utters it. Many of us have been conditioned out of believing that safety

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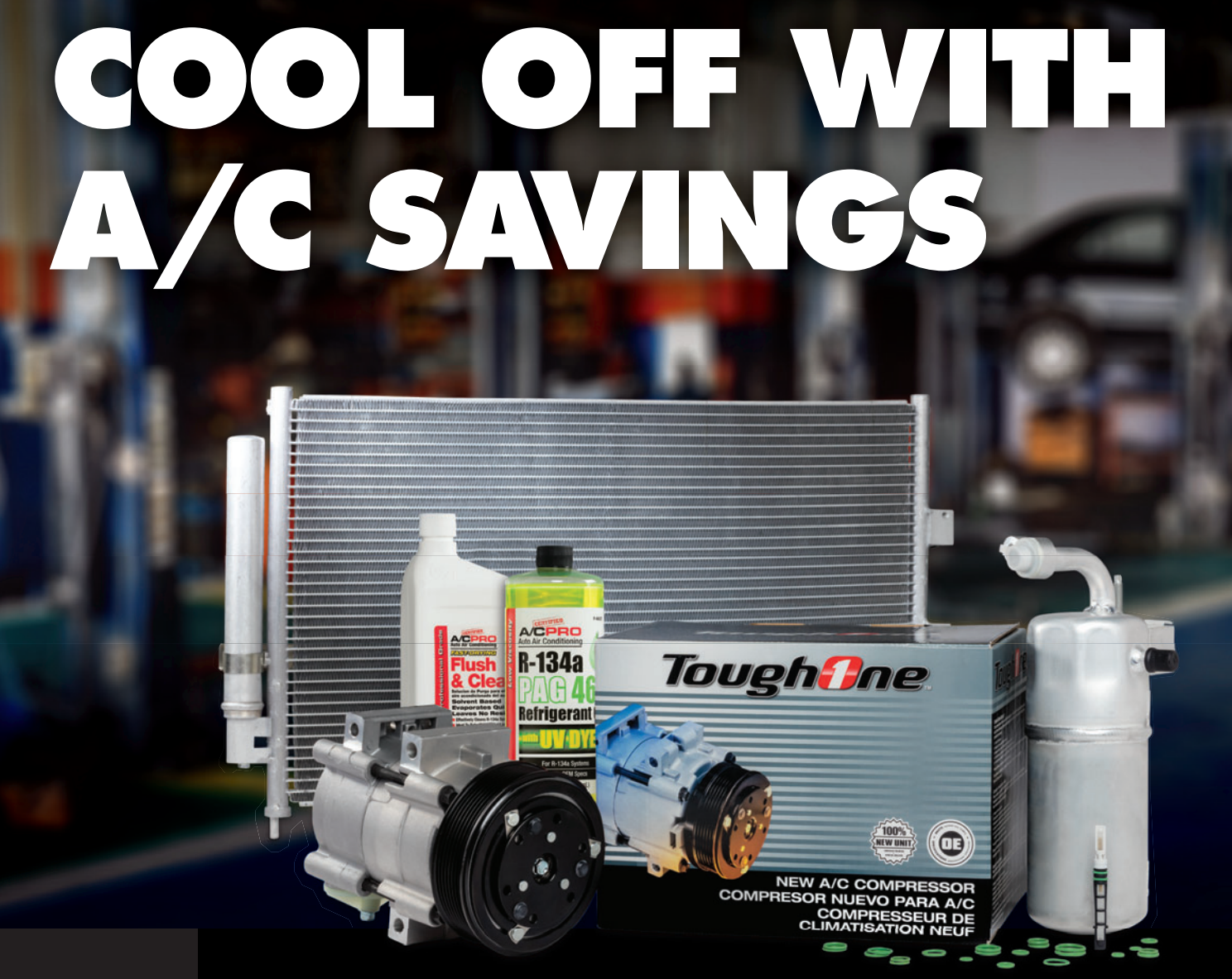
COOL OFF WITH A/C SAVINGS



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should be the dominant concern when we make decisions.

Our problem with the safety message is that it implies an investment, and to some extent, deferred gratification. As humans, we have certain traits that have always been and will never change, and one of those is our bent towards what I call "Faster Easier." We analyze pretty much every task we perform in terms of how much time and effort it will require to get the job done. Decisions on the methods we will use are often made with the goal of reducing the personal investment required to complete the task. Risk can also be a factor in our decision making, but we tend to downplay the risk if we perceive there is a significant reward waiting for us.

This is where our beliefs come in to play, and unfortunately, many of us cling to beliefs that run counter to the safety message. Worse yet, these are the beliefs that tend to be reinforced by our inclination to Faster Easier. While the still small voice of safety isn't completely muted, it tends to be drowned out by the voices that advocate for getting the job done as quickly and easily as possible.

So, what are the beliefs that influence our decision making towards putting ourselves and our coworkers at risk? I would suggest that for many of us, these beliefs reside in our subconscious, only making themselves known when we are under pressure to get a task done. Let's take a look at some common examples and consider carefully whether we grant them safe harbor in our personal belief system.

Safety and production are two different things

The age-old struggle between production and safety will probably never go away. This is driven by our natural tendency to acquire a case of tunnel vision as we work. In the here and now, it can be enormously difficult to discipline oneself to see the bigger picture, which is that incidents are so expensive that safety has become a solid business decision. When I say incidents are expensive, I'm not just talking about the dollar value. The physical, emotional, and spiritual costs related to a workplace injury cannot be quantified in those terms.

An interesting aspect of this belief is how its voice gets louder as the work day progresses. As the worker draws closer to quitting time, their ability to objectively analyze risk diminishes. That, combined with the overvalued reward of getting home on time often leads workers to make bad safety decisions late in their shifts.

Taking risks makes me a better employee

Some workers believe that their supervisor would prefer them to stick their necks out, if necessary, to get their jobs done. This might be an accurate perception, as it could very well be that their supervisor has made room in their personal belief system for this attitude.

The supervisor has the most control over whether this belief takes a foothold in their workforce. Without even realizing it, they may be rewarding their workers for taking risks by slapping them on the back for getting a job done quickly, while not bothering to ask whether they had done it as safely as they could have. This is known as tacit approval, where the supervisor reinforces unsafe behavior by not asking nor saying anything when they suspect their workers are assuming inappropriate risk to get their jobs done.

The only way to dampen this voice is to demand accountability from the people who work for you. Think carefully about whether you unintentionally reward your workers for unsafe behavior and consider ways of giving "carrots" to those who do work safely, even if they take more time to get their jobs done.

My shortcut will always work

Faster Easier leads humans to take shortcuts whenever possible. So, for every task we are faced with, we are immediately thinking about ways that we can reduce the time and effort required to complete the job. This may lead us to take shortcuts that could get the job done faster, but might also increase our risk.

Shortcuts are brain candy. When we get a job done more quickly or with less effort, we feel smarter than those who came up with the procedure we were supposed to follow. This also reinforces our resolve to "beat the system" anytime we can, as well as increasing our overall risk tolerance.

When we attempt a shortcut for the first time, we may not know for sure if it will work, so we watch carefully to make sure it doesn't go sideways on us. However, if we manage to pull it off and nothing bad happens, we immediately start down a slippery slope where we get comfortable and stop thinking about the risks we assume when we take that shortcut. Eventually, the time comes where a variable changes and an incident occurs.

Just because a shortcut has worked in the past, it doesn't mean it will always work. There are always variables that must align in your favor in order to successfully complete a task. If you get comfortable with a shortcut you've devised, your guard is lowered and you eventually stop asking "what could go wrong?" The voice of this belief is much louder now, making it more likely to drown out the still small voice of safety.

The people you work with could be the best antidote to this belief. Are you open to hearing outside opinions on your work practices? Think carefully about how you respond to your coworkers when they approach you with a safety concern. If you react negatively to a coworker's efforts to keep you safe, you are sending out a message that you aren't interested in other people's opin-

ions regarding safety. This could be your undoing, because your coworkers are going to withdraw from you and won't be there to serve as the voice of safety when you need them the most.

The rules are written in blood, but not MY blood!

In other words, it won't ever happen to me. You can pretty much rest assured that anyone who has been injured or killed in the workplace had thought this at one time.

We often associate this belief with the youngest, least experienced workers, but that is a myth. The truth is that this thinking is rampant among workers of all ages, particularly those who haven't suffered loss due to a workplace injury. The majority of workers who get hurt or killed in workplace incidents are veterans, and in many cases they are within a few years of retirement.

It is sad to say that the most effective method for lowering the volume of this voice is a workplace incident that involves yourself or someone close to you. While this is the most effective method, it is certainly the least desirable. Do your best to learn from the mistakes of others through incident reports and personal stories shared by your coworkers. And, remember that a little humility goes a long way; never allow arrogance to overrule your personal voice of safety.

Someone other than me should be most concerned about my safety

If this is one of your personal beliefs, I would pose this question to you. Who will suffer the most if you get hurt in a workplace incident? Anyone who says that their employer will be impacted more than themselves needs more information. Your employer will be set back on a financial level. However, you could lose everything that is important to you, I daresay everything that defines you, if you don't work safely.

I would encourage you to do an audit of your personal safety beliefs. This could be a difficult exercise and will require brutal honesty on your part. However, the rewards can be great because purging beliefs that serve to compromise your personal safety will help you, your family and your coworkers prosper.

TONY MARTIN is the author of *Tuning In to Safety*, a book written to help workers get their priorities straight in regards to safe work practice. Tony is employed in the mining industry in Fairbanks, Alaska. He is a qualified Heavy Duty Equipment Mechanic and former post-secondary level educator.
tony@tuningintosafety.com

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Three ways to stop trading profit for convenience

Automation may be preventing you from addressing your customers' needs

In today's digital world, there are not many shops doing things the "old-fashioned way." There are many Point of Sale (POS) systems specific to the automotive industry. Automation saves time and helps us become more efficient, but the downside is you may be sacrificing maximum profit and the needs of your customers. Some things we used to do the old-fashioned way should stay that way. Here are the top three:

1. Review customer history

Many service advisors are not thoroughly reviewing a customer's history. Some may be looking at what services were already performed, but many are not looking for what we haven't done yet.

If your service advisor is not thoroughly reviewing the history for what services have and have not been performed, you are not alone. Somewhere along the line in this modern world, we forgot that it's the service advisor's job to make recommendations based on time and mileage. It is the technician's job to make recommendations based on condition.

2. Read between mileage intervals

Another common mistake is when the advisors and techs only make maintenance recommendations at the mileage intervals of 30, 60, 90, etc. If a customer has a service performed off the traditional mileage interval, other services can slip through the cracks. Don't miss out on services that are due at different intervals, like cabin air filters, for example.

3. Use a checklist

To ensure that your service advisor covers all bases, use a checklist that we refer to as the "Nowhere to Hide Form." It lists the most common wearable items by time and mileage. Add the mileage and time interval that your shop recommends those items be serviced. Then, when reviewing the history, your advisor can add the date of the last service of each item, the mileage that service was performed, and mark whether that service is due now based on time and/or mileage. The form then goes out to the techs as a companion to their courtesy inspection where they will verify condition.

MY RECOMMENDATIONS ARE NOT ABOUT SELLING UNNECESSARY SERVICES. THEY'RE ABOUT PROPERLY EDUCATING AND ADVISING YOUR CUSTOMERS ABOUT THEIR VEHICLES AND THE BEST WAY TO MAINTAIN THEM.

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CHRIS "CHUBBY" FREDERICK is the CEO and founder of the Automotive Training Institute. ATI's 130 full-time associates train and coach more than 1,500 shop owners every week to drive profits and dreams home to their families. Our full-time coaches have helped our members earn over 1 BILLION DOLLARS in a return on their coaching investment since ATI was founded. This month's article was written with the help of former shop owner and ATI member, Head Coach Kim Hickey.
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Educate the customer on the labor component

Shops must have multiple labor rates to cover the scope of work necessary

The most progressive independent shops have become very focused on their knowledge base within their operation. With the shortage of competent technicians within the industry, we have to acknowledge that a shop's skill level that has been achieved is expressed through its labor rate. No shop has the right to charge top rates to the public if they are incompetent in terms of automotive maintenance/repair knowledge; conversely, too many shops do not charge enough for the skill level they have acquired. Skilled shops must charge the right dollar for their skill level.

For 15 years now we have been talking about the necessity of a minimum of two door rates. The first is a basic mechanical rate used for work such as brakes and suspension, and the second is a diagnostic rate representing the skill required to diagnose a drivability problem or interpretation of information. Vehicle complexity requires a broader depth of knowledge and to maintain the right technician skill level to handle the technology, the right dollars must flow into a shop to support its capabilities.

The basic mechanical door rate is established for "remove, replace and repair." The second door rate is established for electrical diagnostics and is usually referred to as the shop's "diagnostic rate." This labor rate is used for interpretation or analyzation of numbers, graphs, electrical and codes. This rate is critical in order to bring in the right dollars to sustain the right skill level. In this category, more training, more equipment and more one-on-one time with the client is required to sustain shop credibility. Consequently, the lower mechanical door rate is not sufficient.

Time to introduce your clients to a third door rate

We now need a third door rate. A shop must acquire specific skills over a period of time in order to complete the loop of knowledge to serve a client professionally. The critical business philosophy to understand is that a client is not paying a shop "to fix a problem now." The client is paying the shop for "the knowledge obtained to this point in time." To gain this knowledge, a shop has and does incur costs, and future knowledge will incur additional costs if the shop wants to remain on top of their game. Rates will be adjusted as these future costs and investments are continually evaluated.

PROVIDING THE RIGHT SERVICE MEANS APPLYING THE RIGHT SKILL LEVEL IN THE SHOP TO DEAL WITH THE TASK THAT NEEDS TO BE SOLVED.

The client today requires the right service backed up with the business philosophy of: "We will not let you down." The right service simply means applying the right skill level in the shop to deal with the task that is required to be solved. It is important for management to deploy the right skill level on a job with the end result being a totally satisfied client leaving the building.

This new third door rate represents a skill level that is often overlooked. Our clients have shown that it can represent in the range of an additional $20,000 to $30,000 per year today in a 6- to 8-bay operation when executed properly. Over the next five years, this third-rate income will grow substantially for all the shops who are on top of their knowledge base. With this much money involved, it is definitely worth consideration. This third door rate is called the re-flash rate. It represents the skills and processes required to reset the vehicle's computer from an OEM website with a vehicle computer update and/or where a basic reset of the vehicle's computer is required. The OEM websites for the re-flash subscriptions and process can be found on the NASTF website at www.nastf.org.

There are mathematical formulas and procedures to establish and implement all the various labor rate levels; however, the point is to acknowledge that the consumer has not been properly educated as to what the labor rate in a shop stands for. The important point for management to understand here is to ensure the implementation and execution of the philosophy "We will never let you down" and "This is what we require to do it right." MM

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Congress debates privacy, data access, cybersecurity

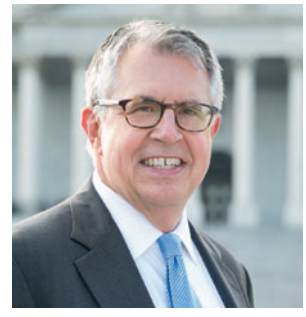
U.S. House, Senate committees take a look at privacy, access and threats

The 115th Congress saw limited success in resolving many questions on vehicle data access and cybersecurity. One significant missed opportunity was the failure to pass the U.S. Senate AV START Act, which included the Inhofe Amendment, language establishing a stakeholder advisory committee at the National Highway Traffic Safety Administration (NHTSA) to exchange views on vehicle data access and cybersecurity.

Recently the U.S. House Energy and Commerce Committee's Subcommittee on Consumer Protection and Commerce held its first hearing on privacy. Beginning so early in the new Congress with the issue of privacy and data access demonstrates the importance of these issues for the 116th Congress.

Important for this discussion is the bipartisan interest in protecting consumers' privacy. As the Automotive Service Association and other stakeholder organizations work to assure vehicle repair shops have access to the necessary data and tools to repair newer vehicles, policymakers in this first Subcommittee hearing have reminded us that the consumer privacy issue is of greatest concern. House Energy and Commerce Chairman Frank Pallone, Jr. (D-NJ) and Consumer Protection and Commerce Subcommittee Chair Jan Schakowsky (D-IL) wrote to the Federal Trade Commission (FTC) following the hearing outlining concerns about protecting consumer privacy rights.

The Committee released the FTC letter and noted key provisions: *"We are writing today to better understand the resources that FTC needs to fulfill its important consumer protection mission and meet the challenges posed by rapid changes in technology. A series of recent high-profile privacy incidents have caused significant concern to consumers and this Committee. For every high-profile case, there are many more that do not get attention in the press and therefore may not be prioritized by the FTC. Nevertheless, consumers may face significant harm from these less well-known privacy and data security incidents."*



Pallone and Schakowsky requested responses from the FTC to questions including:

- What resources would the FTC require to boost its enforcement activity with respect to privacy and data security? How would the FTC deploy new resources if it were to receive an additional $50 million for consumer protection and privacy? How about $75 million? How about $100 million?
- If Congress directed the FTC to hire technologists to aid in case development, enforcement, rulemaking and/or policy recommendations, what resources would the FTC need and how would the agency deploy those new resources?
- If the FTC received notice-and-comment rulemaking authority with respect to privacy and data security, would the FTC require additional resources to develop and update new rules without detracting from the agency's enforcement activity?
- What would the FTC be able to accomplish with 100 new attorneys focused on privacy and data security that it cannot do currently?

It is anticipated that numerous data access and cyber security bills will be introduced in the coming months impacting automotive repairers. This is already occurring at the state level including the California Consumer Privacy Act. NHTSA and the FTC have shown little interest in moving forward on these issues without congressional action. NHTSA has released several guidance documents relative to new vehicle technologies and the responsibilities of state and federal governments. Without congressional action, we will likely see the proliferation of state activity on these most important issues.

ROBERT REDDING is the Automotive Service Association's Washington, D.C. representative. He has served as a member of several federal and state advisory committees involved in the automotive industry. *rlredding@reddingfirm.com*

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Lead new industry recruits up the mountain

OFFER PATHWAYS OF SUCCESS TO ATTRACT YOUNG PEOPLE INTO THE MARKET

CHRIS CHESNEY // Contributing Editor

Over the last several years I've written on many topics related to the technician shortage, and I've often said that I'm influenced by the British-American leadership author, Simon Sinek. Two years ago, I heard a profound statement from him. He said that the youth of our world that we typically see as lazy, uninspired, lacking direction, un-committed etc., really know what they want in life. It's as if they are standing at the base of a mountain and can see their dreams and goals at the top of the mountain. However, they can't see the mountain. Society and technology have enabled our youth to get what they want when they want it to the point if they don't get it instantly or in the time that is acceptable to them, they go another direction.

The answer is simple: we need to describe the way up the mountain! Surely then, as they take the path we describe and enable them to pursue, they'll find their dream. This is a key element to what we as an industry must do by defining the career paths for those entering the industry and those in our industry currently. But it is only one piece of the puzzle.

The type of talent we need to attract are those who have a desire to solve problems and work in a high-tech industry. With the unstoppable onslaught of technology coming into our bays, we need technicians who have an insatiable thirst for understanding, analyzing and solving problems with these technologies. But those kids aren't entering our industry because we don't look like that. At the end of the day our industry is selling something the talent doesn't want. We are selling the wrong mountain!

We, the automotive service industry, must remodel ourselves in a way that attracts talent to our doors. It must be different in the way of benefits, in the way of career pathways, and it must offer the same flexibility in time and life that the other industries that we are competing with offer. We must stand out. We must make our future workers learn about us and go WOW!

We must learn to treat them as technologists, not grease monkeys. And the same goes for the sales and management staff. We are working on highly sophisticated, extreme engineering marvels that cost more than the first two houses I owned. Yet we continue to sell on price and require our technicians to own their own tools and pay them based on flat rate. We put them in a dark hot box and give them a drop light and expect them to be perfect and fast. We expect our techs to never grow in their career. Sure, we train them enough to repair the next car in the bay, but we don't ask them what their life goals are. We don't ask what's important to them. We offer discounted services to attract new customers, and we expect the production team to build the work along with producing the work. And at the end of the day we look exactly like our industry did 40 years ago.

We as an industry need to totally rethink how we attract young talent. If we don't start changing today, our industry dies. A stark statement? Yes, but to attract talent we need to transform ourselves into an industry that is attractive.

Think about how you position your business as a technology company that is focused on mobile sources. What are your entry requirements? Do you require a degree? Do you assist in getting that degree? Do you provide all tools and equipment? Or better yet, do you have a facility that looks like a technology center rather than a poorly lit dungeon. Do you have a defined career path for your team that places them on a road of growth and encouragement? Do you offer benefits and flexible work hours that meet their needs and goals? Maybe that is as simple as assisting with child care or offering flexible work hours.

Do you have a workflow that is well documented and includes a standardized set of tools, equipment and processes? Do you onboard your new staff? Does your business look like the rest of today's industry? Think about what I've started here. Please don't take it personally, but consider its importance. What we are selling the youth of today isn't attractive. We need a serious makeover, and this article was intended to start that discussion. It's time to look at other mountains for inspiration.

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MECHANICAL MOMENT

SERVICE REPAIR PROBLEMS AND SOLUTIONS THAT JUST MIGHT BENEFIT YOUR SHOP TECHNICIANS

MINI COOPER LIGHTS & WIPERS INOPERATIVE — 27 DTCS

VEHICLE: 2008 Mini Cooper S (R56), L4-1.6L Turbo (N14), VIN WMWMF73518TV33661

MILEAGE: 114,261

PROBLEM: The exterior lights and windshield wipers were not working.

DETAILS: The customer mentioned that he regularly gets in the car with snow on his boots and the carpets get wet. When the technician connected his scan tool, he found 27 DTCs from numerous different modules: 12 from the FRM (Footwell Module), 4 from the DSC (Dynamic Stability Control) Module, 5 from the JBE (Junction Box Electronics) Module, 4 from the DME (Digital Motor Electronics) Module, 1 from the CAS (Car Access System) Module, and 1 from the ACSM (Advanced Crash Safety Module).

Armed with that information, the Tech-Assist consultant recommended that the technician inspect inside the FRM first. Those modules have been notorious for having water infiltration issues. The technician removed the cover and found that water had gotten into the module and caused corrosion of the circuit board.

CONFIRMED REPAIR: Replacing the FRM and reprogramming it resolved all the problems, and the DTCs did not return.

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A/C SERVICING — ARE YOU DOING IT RIGHT?

WHILE A/C SYSTEM SERVICE IS FUNDAMENTALLY UNCHANGED, CHANGES IN TECHNOLOGIES AND SYSTEM DESIGNS REQUIRE YOU PAY MORE ATTENTION TO THE DETAILS.

PETE MEIER // Technical Editor

System refrigerant and oil capacities are smaller, R1234yf is more common, and loss due to refrigerant leakage impacts system performance more now than ever. The fundamentals you learned in school or on the job still apply when it comes to troubleshooting and servicing these systems, but they are increasingly less tolerant of errors, so it's important to pay attention to the details you may have forgotten.

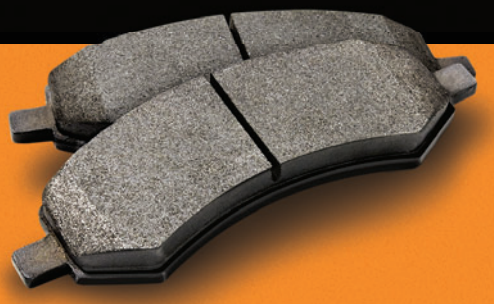
Let's start with R134a

In the early days of R134a, system refrigerant charges of two pounds or more were not uncommon. Over time, though, system capacities have become smaller with the current average hovering just over a pound or so. And there are several models in production (and have been for the last few years) that use a little more than 10 ounces of refrigerant to cool the cabin. When you consider that the industry standard variance is only +/- 10 percent, that means that an overcharge or undercharge will result with a variance of as little as one ounce!

And what does that mean in the real world?

Overcharged systems run hotter than they should, experiencing increased compressor head temperatures that can lead to breakdown of the lubricating oil and accelerated wear in the compressor. Undercharged systems are unable to keep the oil circulating through the system and that means oil starvation to the compressor with the same results. Of course, neither condition will be able to cool the cabin as ef-

PHOTO: ROBINAIR



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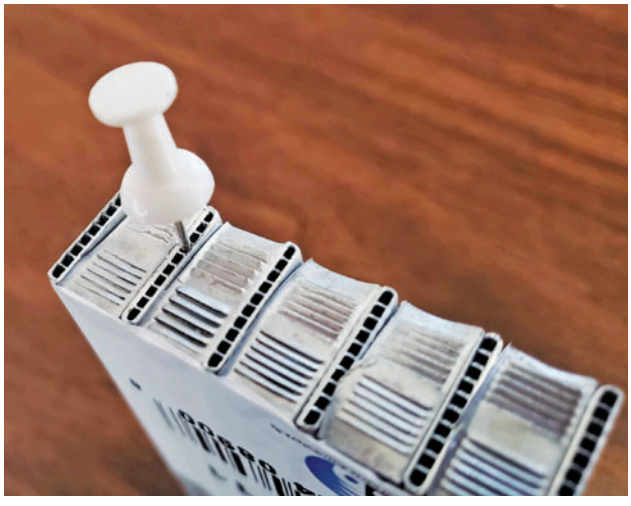

HEAT EXCHANGERS (condensers and evaporators) are moving to these flat-tube designs. Note the small passageways and multiple flow paths. You are not going to flush these clean.

R1234YF MACHINES REQUIRE refrigerant identification prior to recovery and it's a "best practice" on any A/C system you service.

ficiently as a properly charged system.

The R/R/R (Recovery/Recycle/Recharge) machines in use at the time did not have the capabilities needed to ensure the full recovery of the existing charge or the accurate refill of the vehicle after the repairs were completed. Roughly 10-12 years ago, the SAE established new standards for servicing mobile air conditioning systems under SAE J2788. R/R/R machines made to these standards had to be capable of removing at least 95 percent of the vehicle's charge and recharge the system to within 1/2 ounce of the desired amount. Unfortunately, there are still shops using their older equipment to service late-model systems. And those who did invest in the newer machines are bypassing some of the features in the interest of saving a few minutes on the job.

Today, we're faced with new challenges as more and more vehicles come equipped with R1234yf. The cost of the refrigerant makes recovering as much as possible more important than ever. Even with the recovery capabilities of the latest machines, you can help the process by preheating the A/C system before hitting the "start" button. Simply close the hood and run the engine for five to 10 minutes to raise the temperature of the components (and pressure as a result) prior to evacuation. You can also turn the heat on full blast in the cabin to coax more gas out of the evaporator. You'll know you did the best you could if you open the system and don't hear the "hiss" of escaping vapor!

Along with refrigerant capacity, system oil charges have also been on the decline. Here, too, accuracy is critical to a correct service. Too little oil will bear the obvious consequences while too much can actually coat the heat exchangers (condenser and evaporator) internally, reducing their ability to dissipate the heat taken in by the refrigerant.

And it's not just quantity. It's where you initially add the oil. When we completed a major repair in the old days (compressor and components), we would add half the oil charge directly to the compressor and split the remainder between the drier (accumulator), evap core and condenser. Today, most of the oil is supposed to remain in the compressor — up to 75 percent in a running system — so be sure you follow the OEM service procedures to the letter.

Keeping compressors healthy

Leaks in the A/C system are inevitable over time. As the refrigerant is lost, the amount of liquid charge available in the evaporator drops and is less able to carry off any oil that has collected there. In the meanwhile, normal wear in the compressor is causing the accumulation of fine, abrasive wear particles to collect in the oil, which are then transported throughout the system. Left unchecked, these factors eventually lead to the demise of the original compressor.

But replacing the compressor without addressing the root causes is only asking for a repeat of the failure — often, a repeat that occurs much sooner than it took for the first compressor to die. I'm sure that many of you have seen that little written warranty notice many compressor manufacturers have been including in the parts box. It states the manufacturer's requirement that the system be flushed and the accumulator (and orifice tube) or the receiver/drier be replaced at the same time the compressor is being replaced. Either that, or immediately void the warranty.

Raise your hand if you're following those directions!

I absolutely insist that the accumu-

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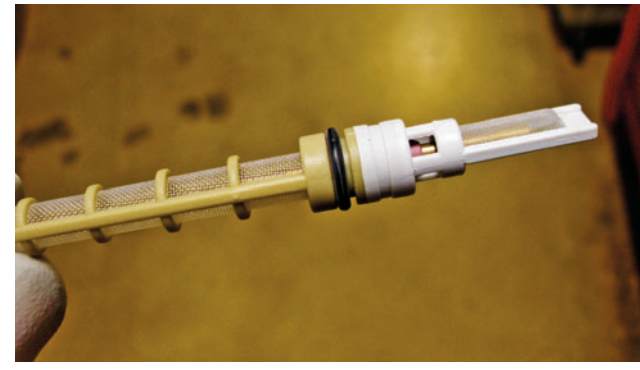


THE ORIFICE TUBE on the left is clogged with a sealant additive while the one on the right is shown for comparison. Perform a check for sealant prior to recovering a vehicle's charge to protect your equipment from contamination.

lator/orifice tube (or the receiver/drier) be replaced whenever I perform an A/C system service, whether it be a new compressor install or a simple leak repair. The main reason I do so is to ensure that what little remaining moisture left in the system after I've had it under a vacuum is contained. I do not, however, flush the system — at least, not all of it — when performing a compressor replacement.

For a long time now, the industry has been using flat tube, multi-path multi-pass heat exchanger designs. There simply is no way to flush these components and be successful in getting all that abrasive debris out. The only right way to ensure that the debris is entirely gone is to replace the condenser and the evaporator as part of the repair. The same is true of any line that has an inline filter or muffler in it. They cannot be flushed and must be replaced.

I've already talked about oil a bit, but I do want to reiterate here that following the OEM procedure for adding oil to the system must be followed. It is also critical that you use the correct oil. If your R/R/R machine has an oil injection mode on it, do yourself a favor and DON'T use it. When your machine is being used to service a number of different vehicles, the oil in it is almost surely cross-contaminated and filled with moisture. You do know that PAG oil, like brake fluid, is hygroscopic, right?

Another commonly missed step is a critical part of the install process. Once the compressor is bolted up, connected and the system charged, be sure to rotate the compressor through several times to prevent the possibility of "slugging" on initial start-up. On some models, this is a problem even in everyday use, and the ECM has a special logic in its programming to control initial compressor engagement. There is nothing worse than suffering a hydraulic lock on that brand new compressor.

Keeping you and your machine healthy

Another issue that seems to be on the increase is contamination of the refrigerant charge in the customer's vehicle. Counterfeit refrigerants are one cause — the most common, in my opinion — but not the only one. There are too many YouTube "experts" that are showing untrained DIYers how to use alternative refrigerants in their systems, including the popular "Dust Off" aerosol designed for use as a computer/electronics cleaner.

Another source of potential trouble for you and your shop equipment is sealant. Stop by any big box retailer or automotive parts supplier, and you'll see shelves filled with do-it-yourself cans of refrigerant. Look even more closely and you'll see that nearly every one of them also contains some kind of sealant additive. I'm not going to argue the merits, or lack thereof, of sealants in this article, but I will say that I know of no OEM that approves the use of sealants of any kind in any of their systems. And that's good enough for me.

Unfortunately, the DIYers aren't listening to the OEs. And if a little is good, more must be better!

In order to protect your own health and safety (from the possibility of blend or hydrocarbon-based alternative refrigerants that may be in the system) and your service equipment (from ingesting additives that may clog them up worse than eating 10 pounds of cheese), I'm going to once again preach to the need to perform a sealant check and a refrigerant identification prior to recovering the vehicle's charge. Basic identifiers can be had for a nominal investment, and if you've already taken the plunge into service equipment designed for R1234yf, you know it's not even an option. The high cost of the new gas makes it imperative that you don't contaminate it with any other during recovery, and the R/R/R machine requires this step before allowing you to do so.

Speaking of new machines and new refrigerants, it was brought to my attention at the recent Mobile Air Conditioning Society (MACS) conference that many of you are using R134a machines modified to recover R1234yf. I cannot stress how wrong that is, and I don't blame you guys since many of you purchased the refits from "reputable"

sources. It is a pure matter of safety that you cease and desist today!

We all know that R1234yf is "mildly flammable," and there are certain safeguards built into machines certified to the proper SAE standards for servicing these newer systems that the old R134a cabinets simply do not have. Another big difference is the R1234yf machine's requirement that a refrigerant identification test be performed prior to evacuation and recovery of the vehicle's charge. Are you doing that prior to pulling in the charge on that retrofit machine?

Considering that you'll be servicing R134a systems for some time yet and the number of vehicles you'll see fitted with R1234yf will just keep growing, bite the bullet and invest in the proper equipment to do the job.

Finding those lost dollars (leaks)

Locating and fixing even the smallest system leaks is also more important, in part due to the high cost of R1234yf. It's also critical due to the lower system capacities. As I've already noted, even a 10 percent drop in charge will impact cooling capabilities and oil flow through the system.

The most commonly used leak detection method is fluorescent dye, so allow me to offer a few notes on its use. First, it may take a bit longer for dye to circulate through the system than it used to on some models. If you've fixed the big leaks and want to make sure you got them all, ask your customer to return after a few days for a recheck.

It also helps if you match the UV light you're using to the dye and wear the yellow lenses that the dye maker includes with their detection kit. Yes, UV lights operate in a range of frequencies, and the dyes can also vary from maker to maker.

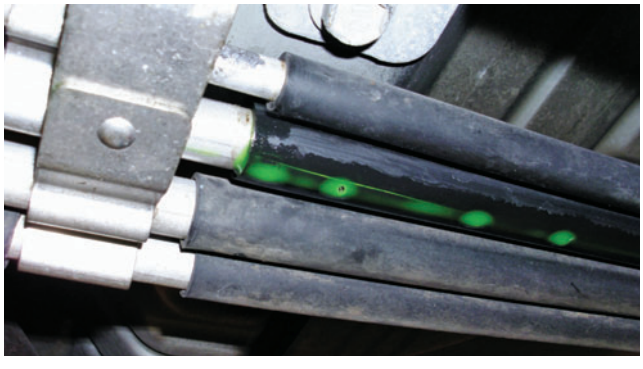
Also, be aware that many manufacturers are adding dye at the factory. It's not going anywhere unless there's a leak, so check to see if dye is already in the system before adding any. If you do add some, add only 1/4 ounce to the system. With the lower oil capacities of today, it is easier than ever to overdose the system with dye if you use too much.

A neat tip I also learned at the MACS

PHOTO: TRACER PRODUCTS

MANY NEW CARS COME WITH DYE from the factory so check before adding any additional dye to the system. If you do add, add 1/4 ounce only to avoid "overdosing" the system.

TO MAKE THE DYE EASY TO SEE, use a UV light recommended by the dye manufacturer. For best fluorescence, the two should be matched.



THE SNIFFER COULDN'T DETECT THE LEAK since the refrigerant was trapped under the protective sheathing, but after letting the system run for a while, the dye became obvious.

event (in a class taught by Standard Motor Products' Peter McArdle) may be helpful when you suspect that small leak is in the evaporator core. Park the suspect vehicle in the sun and close up the cabin nice and tight. The idea is to build up the interior heat level to raise the pressure of the refrigerant in the evaporator core and to give the oil that may be coating the interior surfaces of the core to fall to the bottom. The heat increases the pressure of the gas, too, making it easier for the gas to escape.

After the vehicle has sat for a few hours, take a Styrofoam cup and place it under the evap drain tube prior to starting the car and turning the A/C on "max cold". The idea is to capture the first droplets of the water condensing on the outside of the evaporator in the cup. Now use your UV light to look for dye.

You can also use your sniffer to check for the captured gases in the evaporator case by sticking it up in the evap drain line prior to start up. Since refrigerant is heavier than air, the fumes should collect in the bottom of the case. On some cars, removing the blower motor resistor allows access to the base of the evaporator as well.

On the high side, hose leaks right at the hose crimps are common. To help you find those stubborn ones, get the system pressures high by running the system for a while and then checking for leaks immediately after shutdown. An option is to use the same tactic I discussed when trying to coax out every last ounce of refrigerant — preheat the system by closing the hood and running the engine until it reaches normal operating temperature. If you live in a warm climate, simply putting the vehicle out in the sun for a while may be enough to push up system pressures and reveal the leak. All of these are techniques you can try using the service equipment you likely already own.

Yes, the fundamental principles that allow us to keep our customers cool in the summer and warm in the winter haven't changed. But the way we have to service these systems to keep them at their peak efficiency has!

PETE MEIER is an ASE certified Master Technician with over 35 years of practical experience as a technician and educator, covering a wide variety of makes and models. He began writing for *Motor Age* as a contributor in 2006 and joined the magazine fulltime as Technical Editor in 2010. Pete believes in the mission of the magazine to "advance the automotive professional" and provides resources to working techs around the country through print, social media and YouTube.
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HYBRID AND EV COOLING SYSTEM SERVICE

UNDERSTAND WHAT YOU NEED TO KNOW TO PREPARE FOR THESE TYPES OF REPAIRS

JOHN D. KELLY // Contributing Editor

Hybrid and electric vehicle cooling systems are anything but boring. Unless you have had no internet access, you have probably read that the entire automotive industry is moving towards the electrification of their vehicle lineup. It is time to get the proper training and tools to service these complex cooling systems.

Two years ago, our automotive technology department received a grant to develop and provide hybrid and electric vehicle training to automotive program teachers at high schools and colleges in our state. The purpose of the training was to help prepare the next generation of service professionals for jobs in the electrified automotive industry. We purchased three new electrified vehicles for this training: A Hybrid-Electric Vehicle (HEV), a Plug-In Hybrid-Electric Vehicle (PHEV), and a Battery Electric Vehicle (BEV).

As part of the curriculum development process, I began exploring the technology of each of these vehicles. One technology I had not thought much about is their cooling systems. As you will see, some of these cooling systems are very complex with multiple coolant loops, switching valves, one-way valves, chillers, heaters, pumps and dozens of hoses. PHEVs have the most complex systems, followed by HEVs and then BEVs.

REFILLING THE HIGH-VOLTAGE BATTERY cooling system using a vacuum fill procedure on a 2017 Chevrolet Bolt EV.

All of these cooling systems require special procedures for diagnostics, service, maintenance and repair. For this article, we will concentrate on the liquid cooling systems; however, some hybrid and electric vehicles use air cooling for some of their components.

Hybrid-Electric Vehicle (HEV) cooling systems

The first vehicle I explored was a 2017 Toyota Prius HEV. We picked the Prius because it has been the top-selling hybrid in the U.S. for the last 18 years. Any HEV will have a complex cooling system due to the fact that an Internal Combustion Engine (ICE) is still involved in propelling the vehicle. The Prius is a series-parallel hybrid; this hybrid type has the most complex cooling system when compared to series hybrids and parallel hybrids. The Prius has five coolant loops as shown in **Figure 2**.

Prius Internal Combustion Engine (ICE) cooling — The 2016-2019

PHOTOS: JOHN D. KELLY

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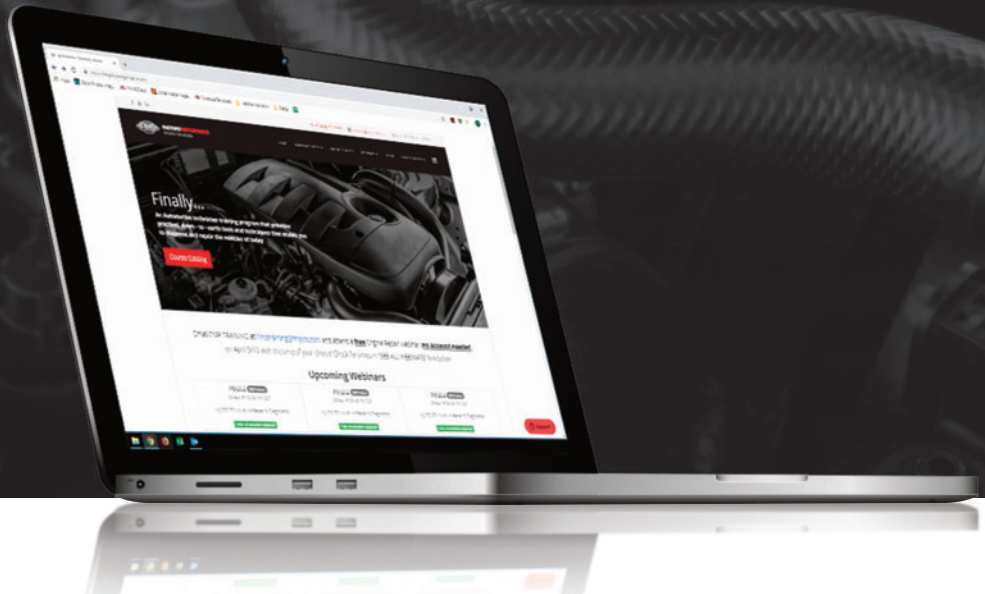

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Prius has four parallel coolant loops that are connected to the upper section of the radiator just for the ICE. This cooling system has 11 major components and 14 coolant hoses!

1. ICE Cooling Loop 1, for ICE Cooling
2. ICE Cooling Loop 2, for Expansion and Air Bleeding Loop
3. ICE Cooling Loop 3, for Exhaust Gas Recirculation (EGR) Cooling and Throttle Deicing Loop
4. ICE Cooling Loop 4, for Exhaust Heat Recovery for Fast Warm Up Loop

Prius Power Electronics (PE) and Transaxle cooling — There is a single coolant loop connected to the lower section of the radiator for the high-voltage electronics and transaxle. This cooling system has five major parts and six coolant hoses.

5. Power Electronics and Transaxle Cooling Loop

Prius High Voltage (HV) Battery cooling/heating — The HV battery on the Prius is air cooled/heated with a single cooling fan pulling in air from the passenger compartment and pushing it out the one-way pressure relief vents in the rear quarter panels.

Plug-In Hybrid-Electric Vehicle (PHEV) cooling

The second vehicle I explored for our training project was a 2018 Chevrolet Volt PHEV. We picked the Volt for training purposes because it has the longest range (53 miles) of any PHEV sold in the U.S.A. As you may know, GM recently stopped production of the Volt and has made a commitment to move to a Battery Electric Vehicle (BEV) lineup.

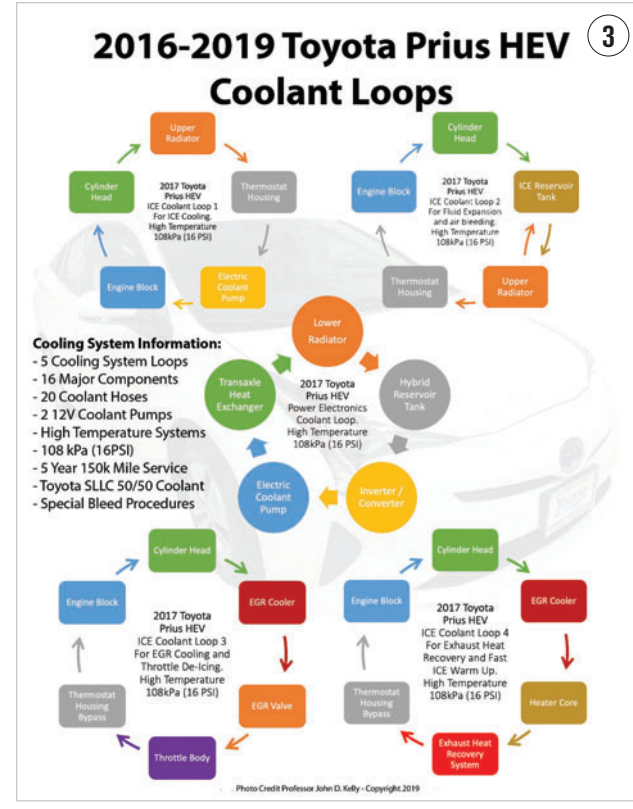
The 2016-2019 Volt has the most complex cooling system I have ever seen in a vehicle! The Volt has seven coolant loops, 25 major components, 31 coolant hoses, and three electric coolant pumps as shown in **Figure 2**. The incredible complexity of the Volt cooling systems is a result of having almost all the same basic components found in the Prius HEV plus four additional liquid cooled components:

1. The On-Board Charging Module (OBCM): Located in the trunk area, this module is used when an Alternating Current (AC) charge cord is plugged into the vehicle to charge the HV battery. This module does not develop heat unless the charge cord is plugged in. Although the vehicle is typically powered off while the charge cord is plugged in, it is normal for coolant pumps, fans, heaters or the air conditioning (A/C) compressor to run to maintain battery temperature.

2. The Accessory Power Module (APM): Also located in the trunk area, this module provides power for the 12V system and charges the 12V battery. It develops more heat when the demand for current in the 12V system increases.

3. The HV Reserve Energy Storage System (RESS): RESS is GM's name for the HV battery in their vehicles. It develops heat while both charging and discharging. For optimum performance, the HV battery must be heated in cold weather and cooled in hot weather.

THE 2017 TOYOTA PRIUS has a two-section radiator, five cooling loops, 16 major components, 20 coolant hoses and two electric coolant pumps.



THE FIVE COOLANT LOOPS of the 2016-2019 Toyota Prius HEV

4. HV Cabin Coolant Heater Control Module: This module is used to heat the passenger compartment with the ICE off.

Volt Internal Combustion Engine (ICE) cooling — The 2016-2019 Volt uses three parallel coolant loops that are connected to the ICE radiator. This cooling system has seven major components and 11 coolant hoses! Additionally, the

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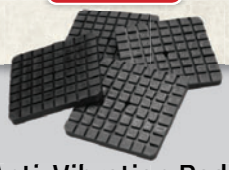

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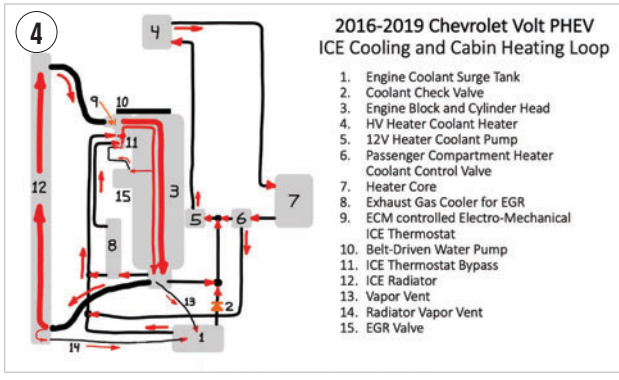


THE ICE COOLING and Cabin Heating Coolant Loops of the 2018 Chevrolet Volt

Volt uses a heated electro-mechanical thermostat that is controlled with a Pulse Width Modulated (PWM) signal from the Engine Control Module (ECM).

1. ICE Cooling Loop 1, for ICE cooling
2. ICE Cooling Loop 2, for EGR cooling
3. ICE Cooling Loop 3, for Expansion and Air Bleeding

There is a single coolant loop connected to a PE radiator for the high-voltage electronics and transaxle. The PE radiator is actually the upper portion of the A/C condenser. This coolant loop has six major parts and 10 coolant hoses.

4. Power Electronics (PE) cooling loop

Volt High Voltage (HV) Battery cooling/heating — The HV battery on the Volt uses a single coolant loop with an external coolant chiller (a mini-evaporator connected to the A/C system), and a 1.5 kW internal heater, coolant hoses, cooling manifolds and cooling plates. These cooling plates have tiny coolant passages. Never use stop leak or used coolant or cooling passage restrictions can occur.

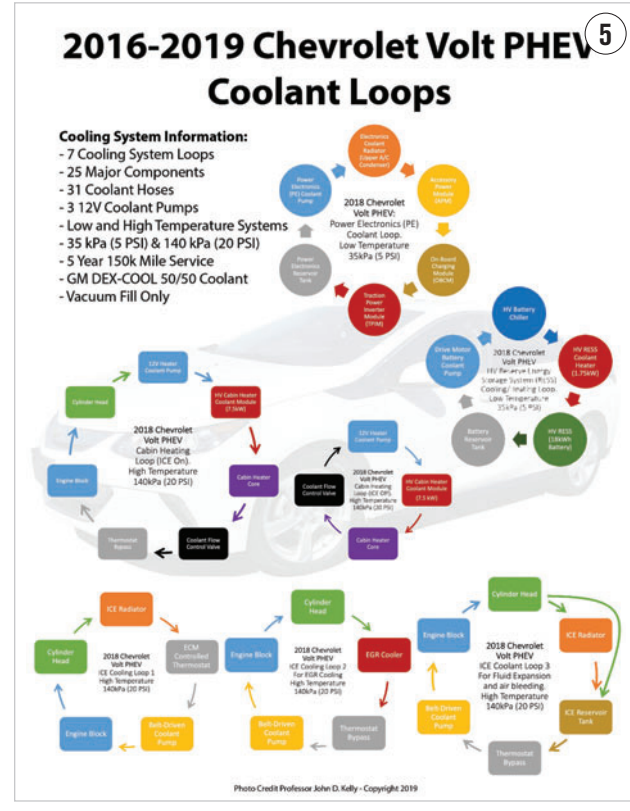
5. HV Reserve Energy Storage System (RESS) Battery cooling/heating loop

Volt high-voltage Cabin heating — Cabin heating uses two coolant loops. The Volt uses a HV 7.5kW electric heater in the right front fender to heat the coolant before it is fed to the heater core. In certain low temperature conditions, the ICE can be activated to help add heat to the coolant for additional passenger comfort.

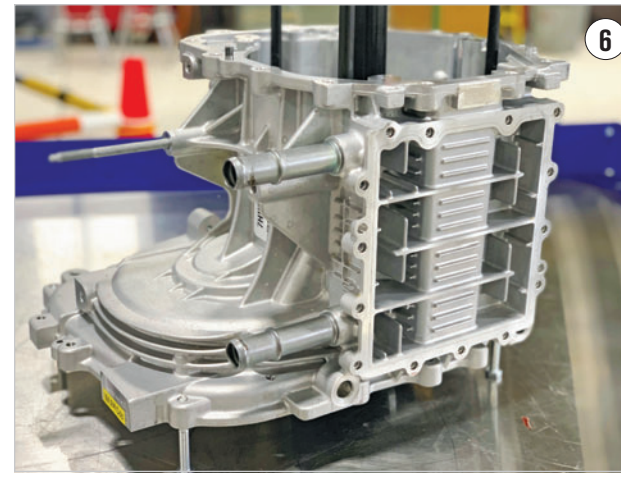
6. Cabin heating (ICE Off) loop
7. Cabin heating (ICE On) loop. This loop utilizes a one-way coolant flow check valve to prevent cabin heater coolant from entering ICE reservoir with the ICE on.

Battery Electric Vehicle (BEV) cooling systems

The third vehicle I explored for our training project was a 2017 Chevrolet Bolt EV (BEV). We picked the Bolt EV for training purposes because at the time, it had the longest range (238 miles) of any electric vehicle for less than $40,000. Obviously,



THE 7 COOLANT LOOPS of the 2016-2019 Chevrolet Volt PHEV

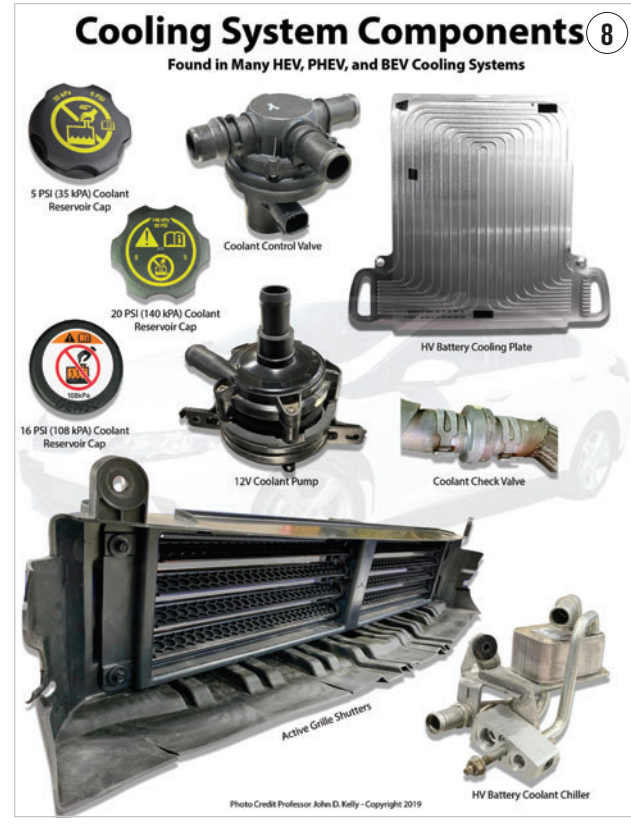


THE BOLT EV DRIVE UNIT (Traction Motor and Gear Reducer) housing showing the coolant passages with heat sink fins.

there is no ICE to complicate things, but without waste heat created by an ICE, BEVs need a way to heat the coolant for the heater core in the passenger compartment. This means that BEVs have an extra coolant loop that most other vehicles do not have. The Bolt EV has three coolant loops as shown in **Figure 3**.

Bolt EV Power Electronics (PE) cooling — There is a single coolant loop connected to a dedicated PE radiator for

THE 3 COOLANT LOOPS of the 2016-2019 Chevrolet Bolt EV BEV



HEV, PHEV AND BEV cooling system components

the HV electronics. This cooling system has seven major parts and 10 coolant hoses.

1. Power Electronics cooling loop

Bolt EV High Voltage (HV) battery cooling/heating — The HV battery on the Bolt EV has an external 2.5 kW heater, external coolant chiller (a mini-evaporator connected to the A/C system) and internal cooling manifolds, cooling plates and coolant hoses.

2. HV Reserve Energy Storage System (RESS) battery cooling/heating loop

Bolt EV high-voltage cabin heating — The Bolt EV uses a HV 7.5 kW electric heater to heat the coolant before it is fed to the heater core to heat the air in the passenger compartment.

3. Cabin heating Loop

Cooling system maintenance procedures

In North America, HEVs have been around for almost 20 years; PHEVs and BEVs have been around for almost 9 years. I am sure their coolant hoses have hardened, their coolant has degraded and their heat sinks have started corroding, but they continue to function well. If I operated a service center, I would look into the maintenance guides for these vehicles and selling the required services at the correct intervals.

GENERAL COOLING SYSTEM INFORMATION:

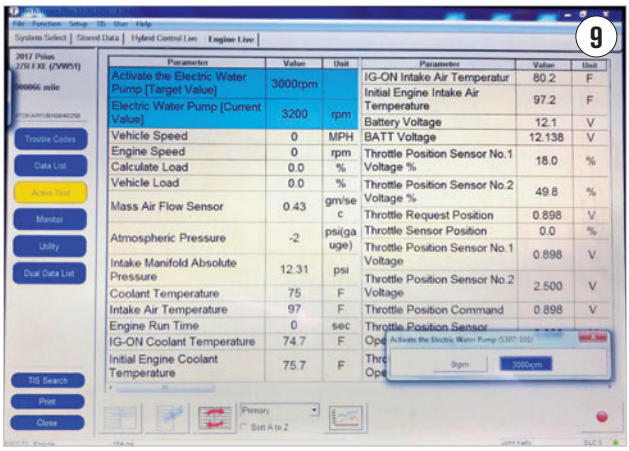
ICE and PE coolants: Each vehicle manufacturer has their own coolant recommendation based upon the materials in which the coolant must flow as well as the operating conditions in which it must exist. Coolants for HEVS, PHEVs and BEVs are typically the same coolant used in the ICE, but with the following additional precautions and warnings:

Only use new pre-mixed 50/50 coolant upon refilling the cooling system. Failure to use new coolant, the correct type of coolant or the correct 50/50 ratio of coolant to distilled or de-ionized water can cause:

- Cooling fin corrosion inside the heat generating Power Electronics components leading to poor heatsink performance, overheating and eventual premature failure.
- Restriction of the passages inside the HV battery cooling/heating plates. This can lead to overheating, setting Diagnostic Trouble Codes (DTC), and HV system shutdown
- Loss of HV isolation at a battery coolant heater element. This will set DTCs and shut down the entire HV system.

SCHEDULED MAINTENANCE:

Toyota: The pink colored Super Long-Life Coolant (SLLC) is scheduled to be replaced in the:



SCAN TOOL CONTROL of ICE coolant pump during air bleeding procedure

- ICE, every 10 years or 100,000 miles (160,000 km) and then every 5 years or 50,000 miles (80,000 km) afterwards.
- PE, every 15 years or 150,000 miles (241,400 km) and then every 5 years or 50,000 miles (80,000 km) afterwards.

General Motors (GM): The orange colored DEX-COOL coolant is scheduled to be replaced every 5 years or 150,000 miles (241,400 km).

Nissan: The blue colored premixed NISSAN Long Life Coolant used in their BEVs is scheduled to be replaced every 15 years or 125,000 miles (200,000 km).

SERVICE PROCEDURES:

Pressure testing the cooling systems for leaks is permitted; however, keep in mind that some low temperature PE cooling system pressures as low as 5 PSI (35kPa) may be much lower than the 20 PSI (140 kPa) for the high temperature ICE cooling system. Over-pressuring a system could cause coolant leaks and possible component damage. WARNING: If the PE or HV Battery coolant levels are low, the vehicle may not be safe to drive. A leak test and visual inspection must be performed. Some batteries have an inspection plug to check for coolant leaks.

After draining the coolant, a vacuum fill procedure is required for refilling the PE and RESS cooling systems on the Chevrolet Volt and Bolt EVs. This method works very well at removing the air from these complex systems before pulling the coolant into the system. The Toyota service information only recommends a traditional air bleeding procedure for their PE cooling systems. Many Toyota HEV have air bleed valves to help remove trapped air. I believe the vacuum fill method would work great for the Toyota HEVs.

After the vacuum fill or traditional air bleeding, an electric water pump must be activated with a scan tool to circulate the coolant and remove air bubbles. If all of the air is not removed from the inverter coolant loop of a Prius, inverter damage can occur and trigger up to 17 non-recoverable trouble codes.

Some original spring style hose clamps are glued in place on the hose. When attempting to remove the hose clamp, it is critical that the clamp is not rotated or repositioned so that is tears or damages the hose. You must replace the hose if the clamp needs replacing.

Newer vehicles have active grille shutters to control airflow through the radiator and improve aerodynamics at higher vehicle speeds. A scan tool can test the function of the shutters if an overheating issue is encountered.

Summary

We have covered a lot of material in this article, but there is much more to learn. Hopefully you have learned enough from this article to determine if you need more training on this and other hybrid and electric vehicle topics. Best wishes!

JOHN D. KELLY is a professor of automotive technology at Weber State University in Ogden, Utah, and a former technician. He specializes in automatic and manual drivetrain and NVH diagnosis and hybrid and electric vehicle technology.
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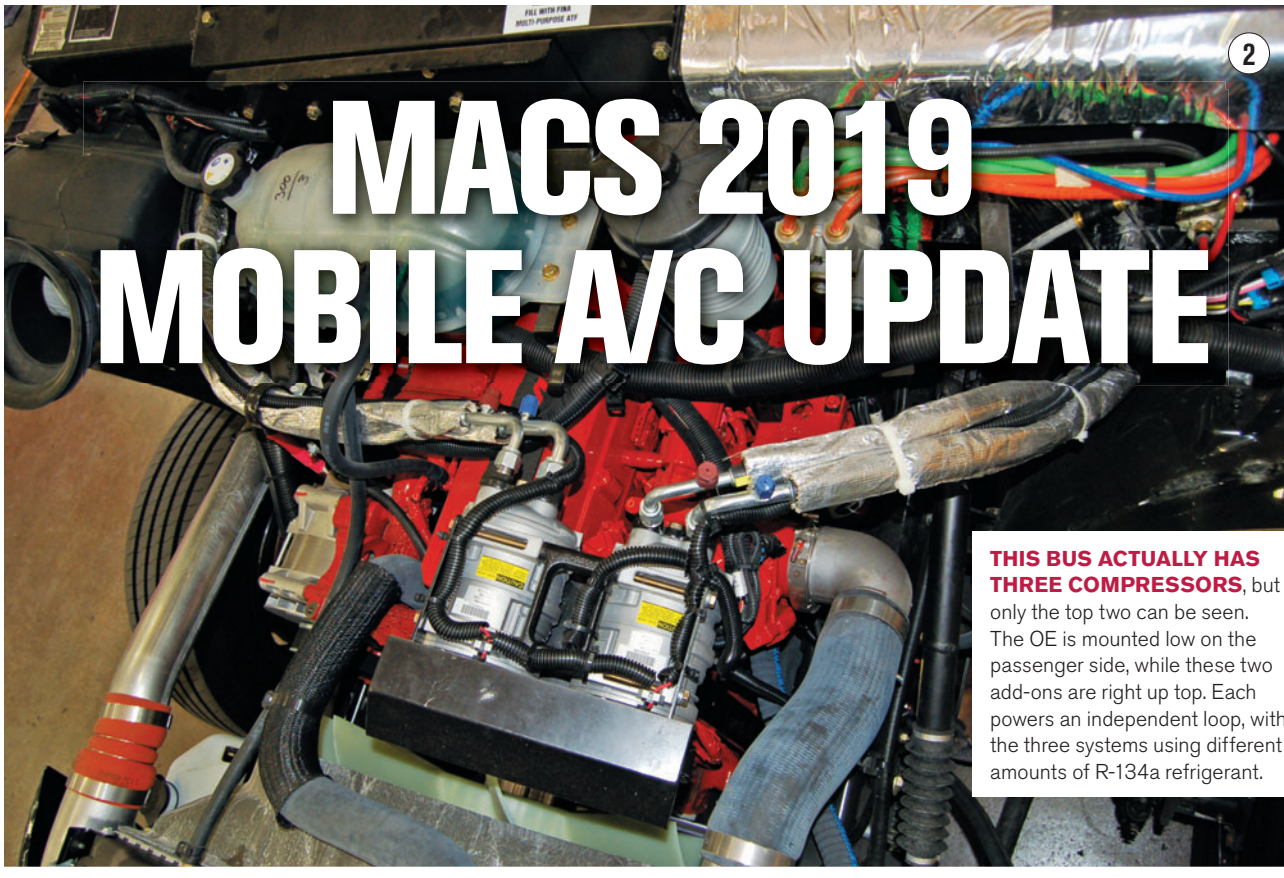
MACS 2019 MOBILE A/C UPDATE



THIS BUS ACTUALLY HAS THREE COMPRESSORS, but only the top two can be seen. The OE is mounted low on the passenger side, while these two add-ons are right up top. Each powers an independent loop, with the three systems using different amounts of R-134a refrigerant.

THE ANNUAL MOBILE AIR CONDITIONING SOCIETY'S TRADE SHOW AND TRAINING EVENT ALWAYS HAS PLENTY TO OFFER ATTENDEES. DIDN'T MAKE IT? HERE'S WHAT YOU MISSED!

STEVE SCHAEBER // Contributing Editor

MACS returned to California for our annual Training Event and Trade Show (MACS 2019) on Feb. 20-23 in Anaheim. Many of the industry's top trainers were there from companies like ACDelco, Bosch, Carquest and Delphi (just to name a few), along with several HD manufacturers like AGCO, CAT and Komatsu. We learned about A/C troubleshooting from Honda Tech Support, what's going on in A/C repair shops (through Ward Atkinson's survey report), and saw new technology at the trade show.

Possible new EPA regulation coming in 2019

There's been a lot of activity regarding refrigerant regulations in the last few years, and our recent saga started back in 2015 when the EPA issued what we call "Rule #20." For those of us who work on passenger cars and light trucks, one of its main points said that beginning with model year 2021 vehicles, it would no longer be acceptable for manufacturers to use R-134a. This is mostly due to its (Global Warming Potential (GWP), which is said to be 1,430 times more harmful to the environment than CO_2 (carbon dioxide).

Following that rule (in fact, the very next day) two refrigerant manufacturers, Mexichem and Arkema, sued the EPA over this requirement. They thought the rule was unfair because the only practical alternative OEM car makers had was to switch over and use the new R-1234yf refrigerant, which is subject to many patents that prevents them (the plaintiffs) from making it.

The way they went about the court case was to say that the EPA did not have the authority to regulate HFCs because the original Clean Air Act only specified CFCs and other ozone-depleting substances. Since Congress never gave EPA authority over these global warming gases (as is proposed by the recent Paris accord and Kigali amendments to the Montreal Protocol, which our Congress has not yet ratified), the EPA is not allowed to regulate them.

PHOTO: STEVE SCHAEBER

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Federal Judge Brett Kavanaugh and two others agreed with Mexichem and Arkema, effectively throwing out that part of Rule #20 back in August 2017. Since then, there have been appeals, with the most recent going to the U.S. Supreme Court. However, as Kavanaugh is now an Associate Justice, the highest court declined to hear the appeal, making the lower court's rule stand.

In the meantime, EPA issued Rule #21 in September 2017, which gave us our current refrigerant regulations (the purchase restriction), among others, such as self-sealing cans. The rule primarily affected Section 608 and was widely supported by the industry, so nobody thought it would become an issue.

And it hasn't really, except that EPA is now reconsidering some of those regulations. Although we primarily live in the 609 world here with respect to mobile A/C, we are still affected by what happens with 608 (which includes the EPA's refrigerant management program, under which it regulates the purchase of all refrigerants).

This brings us up to date with what's been going on. But the story's not over yet.

Back in September 2018, EPA issued a proposed rule (Protection of Stratospheric Ozone: Revisions to the Refrigerant Management Program's Extension to Substitutes). In it they plan to revisit regulations pertaining to HFCs and other substitute refrigerants. Most of these would have the biggest effect on technicians and companies who work in the commercial/residential/industrial refrigeration markets, such as those techs who service rooftop air conditioners on office buildings, warehouses and residential home central A/C units.

However, there is one line in the proposed rule that could affect those who work in mobile A/C. The line simply says, "EPA is also taking comment on whether, in connection with the proposed changes to the legal interpretation, the 2016 Rule's extension of subpart F refrigerant management requirements to such substitute refrigerants should be rescinded in full." That's a mouthful, but basically it means that the EPA is considering whether it should rollback the rule requiring technician certification to purchase mobile A/C refrigerants (like R-134a and R-1234yf), along with the requirement for small can manufacturers to install self-sealing valves in those cans.

Should EPA decide to move forward with this rule, anyone would be allowed to purchase mobile A/C refrigerant (with the exception of R-12 which is statutory under the original clean air act).

And while it would also rescind the self-sealing valves, we don't expect to see them go away. Can makers have spent huge sums of money changing over their production lines to manufacture self-sealing cans, and market prices have already adjusted to the change. Plus, the adapters and hose sets are readily available, and getting rid of them now would seem to be unfavorable.

So, at the time of this writing, we don't know exactly what's going to happen. All we've heard from the EPA so far is that they're planning to announce their next regulation soon — maybe before this year's A/C season starts.

2019 VEHICLE COUNTS @ PHL AUTO SHOW

43.7% R-134a (139/318)
56.3% R-1234yf (179/318)

Aftermarket modifications of MVAC systems

Sometimes after a vehicle is manufactured by an OE, it's sent to an outfitter for modification. These can range from luxurious interiors (including rear seat beverage coolers and secondary A/C systems) in limousines, party buses or conversion vans, to converting a vehicle for accessible use. When the technician needs to modify the factory A/C system to do this, they are required to comply with the EPA's SNAP use conditions for the OE refrigerant.

This basically means that if a vehicle was originally manufactured with an A/C system that uses R-1234yf, then the technician needs to keep that system, any additional A/C circuits, and any additional refrigeration loops, as still using

BUS A/C INSTALLATION VARIES depending on its configuration. On top is "Type A" made from an incomplete chassis. Below is a "Type D" transit-style converted to look like a trolley train car. Note its skirt-mounted condensing unit, just forward of the rear axle.

PARTY BUSES AND AIRPORT SHUTTLES like this have such large interior volumes to cool that one A/C system simply can't keep up. Note the rear ceiling-mounted evaporator/blower assembly, which is driven by an independent compressor and refrigeration circuit that's separate from the OE dash-mounted unit.

yf and not some other refrigerant or blend. This also applies to R-134a vehicles.

But as you've no doubt seen before, not too many of these modified systems are set up exactly the same from one vehicle to another — see **Figure 1**. That's just how it is with custom mods. The EPA knows this, and they provided some guidance for the industry as to what would be acceptable to the regulator.

For example, if a technician is adding rear A/C to an extended van with an existing front/dash-mounted system, they are required to use the same refrigerant as the OE. So, if it's an R-134a system, you must keep it R-134a. Likewise if it's an R-1234yf system, you must use yf in the conversion, while also following the SNAP use conditions for yf (like using an evaporator that meets SAE Standard J2842).

In another scenario, some modifications require the installation of a second (or even a third) completely separate A/C system. An example would be installing A/C in a school bus or party bus, which sometimes have so much interior space that even with two evaporators, a second compressor with one or two more evaporators is required (**Figure 2**). Because these buses usually start out as incomplete chassis by the OE, they are not allowed to use yf refrigerant, and R-134a needs to be used in each of the separate systems. However, if it's a modified complete chassis that originally came with yf, any additional refrigeration loops must be filled with yf and not R-134a.

Primarily the reason is because the EPA does not want vehicles running around with two A/C systems that use two different refrigerants, as this presents an all-too-easy opportunity for refrigerant cross-contamination. But they're also concerned with technicians trying to defeat safeguards (like using service port adapters that convert a system from a low-GWP refrigerant to a higher one).

MACS 2018 field survey

Every few years MACS conducts a survey of both our member shops and non-member shops to find out how A/C service is being performed and what are the most common issues facing technicians today.

Shops on average are servicing between 26 and 50 A/C systems during the peak season, and most of the customer complaints are simply, "It ain't coolin'." The majority use R-134a, but we're seeing more yf systems in the aftermarket (more than 200 shops reported working with yf) as some of these vehicles have now been out of warranty for two or more years — see **Figure 4**.

Compressor clutch failures topped the "Reason for Service" list, followed by leaking service ports, line connections, hose crimps, compressor (case or shaft seal), condenser, evaporator, drier, expansion device and finally, switches (**Figure 5**). Not surprisingly, the most common yf component to be replaced

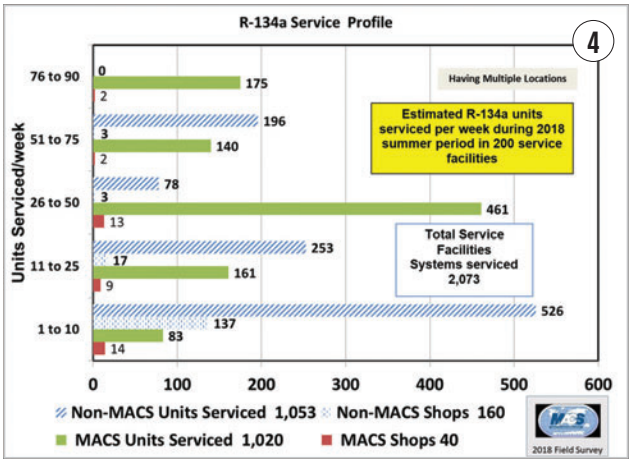
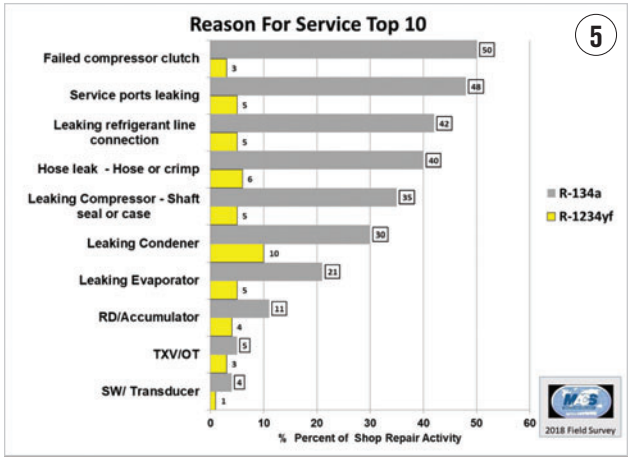


PHOTO: WARD ATKINSON

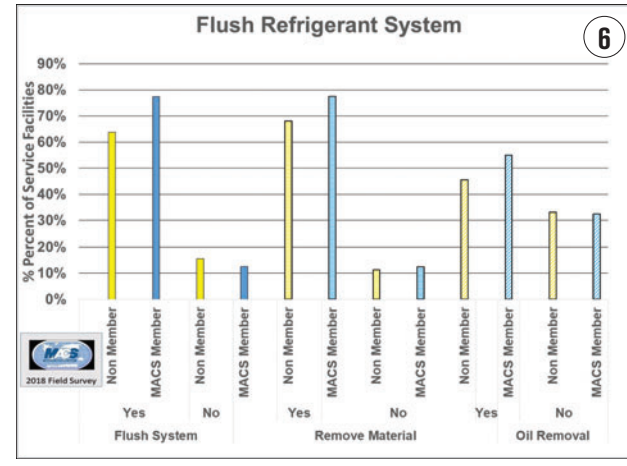
SURVEY RESPONDENTS serviced 2,073 R-134a systems, which accounted for 26 to 50 repairs being done per week during the 2018 summer season.

were condensers, as they're front and center to ram air and all the road dirt, debris, salt and (in the northeast) winter brine solution that loves to rot them out.

Ward Atkinson, MACS technical advisor, presented this year's survey data, explaining that since MACS started these



WE ASKED SHOPS to tell us their Top 10 Reasons for A/C System Service, broken down by which refrigerant they were working with. Failed compressor clutches topped the list for R-134a, but it was condensers that failed most often with yf. Considering that most aftermarket service on yf systems is for accident repair, this comes as no surprise.



SYSTEM FLUSHING IS PERFORMED by most A/C repair shops, although some won't take a chance, and prefer to only replace parts. Still most will at least try to flush simple items like lines and hoses, but not more complex items like condensers, evaporators, driers, TXVs, mufflers and certainly not compressors.

PHOTOS: WARD ATKINSON

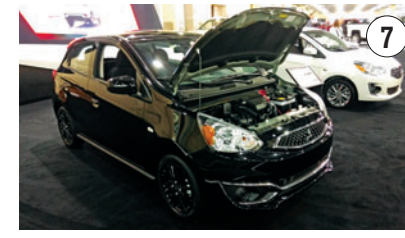
field surveys back in 1990, "We're not seeing the same type of internal mechanical compressor failures anymore like we used to, and that's because of today's tighter, lower charge systems. They're being made to keep the lubricant inside the compressor and not circulated around in the system." This means that even as refrigerant slowly leaks out over time, it's not carrying as much oil with it, and although this leads to eventual performance issues (and the need for service), more compressors are hanging on to cool another day.

We'd bet most shops don't like to admit to this, but inadequate diagnosis was called out by more than 80 respondents, indicating that a closer look may have been warranted in at least some of those cases. Shops reported most often that a second leak had been found (or maybe the original leak was missed the first time), followed by defective replacement parts and secondary failures.

We learned another interesting point when we asked which leak detection method do you use, and more importantly, which do you prefer? MACS members use electronic detectors more often, but both groups prefer to use trace dye when possible. This makes sense too, because especially if dye is added by the factory, it should be present at most leak sites by the time it shows up in our bays. Except for those few locations where dye generally cannot be found in an A/C system, the intuitive nature of dye is what makes it so useful. If you see it, there must be a leak, and if you can see where it's coming from, you know what to repair.

Sealants also continue to be somewhat of a problem with people not wanting to work on exposed systems, although we did find that member shops are more willing to take on the challenge. That likely has to do with a shop's level of expertise, but we don't blame those who pass up the chance. One false move and you "own it," including the potential damage to your shop's equipment.

Flushing is a very interesting subject, and whether or not you can flush dirt and debris versus just oil is a big question that often sparks debate. As most people are beginning to identify, you're probably not going to get most of the big chunks out, but if the little particles can be suspended in liquid, there's a better chance with them. There's also the issue if you can even get most of the flush solvent back out of the system, which is a big question particularly for the OEs. Their concern is that any solvent not removed can remain in the system, diluting the oil and reducing its lubrication capability for the compressor. See **Figure 6**.



MITSUBISHI'S MIRAGE has been the all-time industry leader when it comes to which car uses the LEAST amount of refrigerant, at just 9.5 ounces!

PHOTOS: STEVE SCHAEBER

FORD CONTINUES TO BE THE ONLY OEM who lists the oil type and system charge amount along with refrigerant information on J639 underhood labels for all of their vehicles. This helps technicians know exactly which type of oil belongs in the system and more importantly, how much.

We also wanted to know where shops are buying their parts and what is their estimated amount of "defective new" parts. The bulk of responses said they're getting a

pretty good supply of parts, of course with the majority buying in the aftermarket. Still OE parts play an important role, particularly with low volume items. And as you'd expect, the most commonly returned "defective new parts" were compressors, electrical components, condensers and hose assemblies.

Finding yf

As part of our continuing effort to document the industry's changeover to R-1234yf, MACS once again attended the Philadelphia Auto Show to see the new models, open a few (actually all) hoods, and see what refrigerant is being used. This year we skipped a few brands we knew had already changed, and specifically scoped out those we had missed in previous years, as well as some we were really curious about. Here's what we found.

- Since dealers sold the last R-134a Jeep (Patriot MK74) in 2018, and now having converted the remaining "old" minivans (Caravans built on the RT platform were supposed to be discontinued but have held on due to high fleet demand), the only remaining FCA model that has yet to be yf converted is the Abarth 124 Spider, which we don't expect will happen any time soon. It's built in Japan by Mazda and finished by Abarth in Italy, so until Mazda converts (any) vehicles (this one's a cousin to the MX-5 Miata), we expect it to remain R-134a for the time being.
- The only newcomer we saw from Ford was the Transit Connect van, which is made in Europe and has been the subject of controversy for some time, as many are imported as passenger cars and later converted to avoid a 25 percent U.S. tariff.
- Mitsubishi may only sell three models in the U.S., but one of them holds the all-time record for the lowest refrigerant charge of any newly manufactured vehicle. Mirage uses only 9.5 ounces of R-134a! See **Figure 7**.
- We didn't check any of the BMW models, as they switched their entire lineup for 2018. Same goes for all JLR (Jaguar Land Rover) and Minis. We also tied off other brands that have fully switched this year, including Alfa Romeo, Chrysler, Dodge, GMC, Jeep, Lincoln and VW.
- We could only find two holdouts, and not surprisingly they are Mazda and Mercedes. The latter makes sense, as there was quite a controversy over the new refrigerant more than five years ago that included MB recalling 432 SL-Class yf vehicles through U.S. dealers back in 2012. And now that the EPA's MY2021 cutoff has officially been revoked, there's a real possibility that we may not see Mercedes use yf in the States for many years. One reason they would want to switch is if they need the CO_2 credits. But Daimler is in a unique position, as they build some of the most expensive, high-end luxury vehicles in country, and as such they command a premium which likely includes a few dollars to "purchase credits" from other OEMs who have extra to sell. Mazda, on the other hand, is just exactly that — 2019 Mazdas average 28.2 mpg with their lowest (CX-9) getting 23. Meanwhile MB models average only 20.9 mpg. And with both around 2 percent market share, you're not dealing with huge offsets anyway.
- Acura converted ILX, MDX and RDX production over to yf, but not all variants. MDX hybrids still use R-134a with ND-OIL11 (POE). And now that Honda uses yf in the HR-V, they have only to change the Fit to complete their lineup.
- Hyundai switched a big portion of their systems this year. Santa Fe, Sonata, Tucson, and Veloster now use yf, which gives Hyundai a 2/3 internal majority. And in most likelihood, two of the models we saw with R-134a (Elantra and Santa Fe XL) were probably built right before the factory switch to yf, considering the Elantra GT and Santa Fe base already use it. If that's the case, they saved hybrid models for last to switch, which makes sense given their added complexity.

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HOT CUSTOMER – HOT CAR

NOT ALL AIR CONDITIONING PROBLEMS ARE IN THE AIR CONDITIONING SYSTEM!

SCOTT "GONZO" WEAVER //
Contributing Editor

It's no surprise on a hot summer day that a customer greets you at the service desk stressed out over their car. Their car isn't keeping them cool, it's uncomfortably hot, they're perspiring, and they're probably more than a little temperamental about it. All because today of all days, with all the plans they had made, the car decides to have a non-functioning air conditioner. To make matters worse, the vehicle was recently in the shop (hopefully not yours) for some unrelated work, and now that the air conditioning is out, it most obviously is related to what was done the last time it was in the shop. And, of course, it's entirely the mechanic's fault.

Whatever the case may be, the real issue isn't the who-done-it, but rather determining what is actually wrong and how you are going to solve their problem. So where do you start to solve this issue quickly and efficiently?

As with any diagnostic work, the challenge is to isolate and find the cause and not so much the results that have brought the customer to your door step. We know why they're here; let's find out how to get them back on the road. The first thing is to listen to the customer, but keep in mind, the problem can be two-fold. One, the customer's assumptions can be perhaps… misleading, and two, the air conditioner's lack of cooling the interior may not be the air conditioner's fault.

For this article, we're going to go through a few case studies in which the cause of the failure wasn't the previous shop or the air conditioning system itself. Instead, these studies bring up the point that it could be something that affects the actual air conditioner's performance. I'm not going to dwell too much on the technical side of the repairs, but morese on how you can use your investigative skills to read between the lines of the customer's story and sort out what is really the issue.

Case #1: The dog did It

Besides the customer's name, phone number and address, the first thing on any work order should be what the nature of the customer's complaint is. With that information in hand, you can observe and verify the problem areas of the vehicle using the customer's explanation as a guide.

"Before we can repair, we must be aware" is my little slogan that I often used when diagnosing a problem.

Now, I know this sounds like the same old thing you've read in every diagnostic article, but it's so true. Do the basics first. Observe, check circuit fuses, grounds and communication (not necessarily in that order). Doing the preliminary work is part of every diagnostic job even if it's a drivability concern. Even if the customer only came in because the radio won't tune to their favorite channel. You have to do the basics.

A CLOGGED EVAPORATOR CORE will not only slow the air flow through the core, but will cause less transfer of heat. The head pressure rise will be a clue as to what is happening even before you get a look at the core itself. Photo courtesy of Dan's Automotive Center, Spring, TX

In this particular case, you could have started with checking pressures with a set of gauges, or you could have simply used your thermal gun and checked the system's temperature at various points to determine whether or not the refrigerant load was within specs. However, sometimes listening and observing (to the car and the customer) is the most important part of the diagnostics.

As his story goes, he uses this particular vehicle as a pilot vehicle for large wide loads that are transported across the country. He travels through various climate zones and long distances with lots of hours behind the wheel — meaning, a lot of the vehicle's systems are on for hours and hours, all of which could play a factor in this case. But there's one more detail that he briefly mentioned

PHOTOS: SCOTT "GONZO" WEAVER

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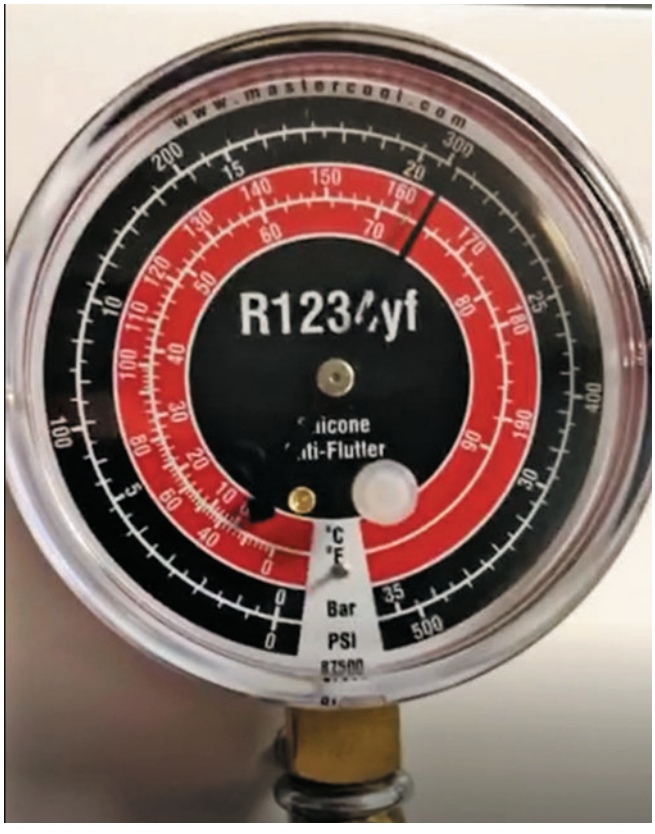


WHEN THE RADIATOR FAN IS OFF, the high-side pressure will rapidly increase until it reaches the cutoff point. Photo courtesy of Dick Kreiger — ConsuLab product is EM-2000HB1234yf A/C trainer.

NORMAL HIGH-SIDE PRESSURE should hover around 175 psi. with everything working correctly. Photo courtesy of Dick Krieger — ConsuLab product is EM-2000HB1234yf A/C trainer.

that led to the solution.

The bed of his truck is set up like a traveling hotel room with all the creature comforts of home. He also brings along his favorite companion, a 3-year-old English Shepherd named Jake.

English Shepherds are known to shed their coats profusely, and Jake spends most of his driving time lying down on the passenger floorboard right in front of the recirculation vent. The recirculation system worked more like an automatic fur removal machine than anything else. The blower motor would suck the loose fur off of Jake through the recirculation vent and deposit it on the surface of the moist evaporator core where it stuck like glue. After some time, the fur would collect into a nice flat matt of hair, almost like a layer of felt.

As I listened to his story, my customer had no idea he was telling me exactly where the problem was. His description of how good of a dog Jake was and how he would stay right there on the floor just watching him drive on a hot afternoon also told me this wasn't a once-in-a-while adventure.

In this case, the air volume from the vents was the issue. So, why in this case does this problem stick out as the probable cause of the air conditioning failure more than anything else? Listening to the customer's story intently, knowing that this kind of dog has a tendency to let the fur fly, and knowing the operational workings of this particular air conditioning system, it all added up to some simple detective work that arrived at the solution to the problem without a single tool involved.

Obviously, the core had to come out. Once the core had been removed, you could clearly see that the evaporator core was a solid wall of dog hair. What is even more remarkable — he didn't mention or notice the muffled sound from the blower motor. The gradual clogging of the evap core had happened so slowly that the eventual drop in the air flow wasn't even noticed over those long trips.

The solution: Replace the core, clean the ducting, and a new blower motor wouldn't hurt either. Then, add a filter in front of the recirculation grille to catch the dog hair that could be easily cleaned when Jake had another flurry of loose fur. Problem solved.

Case #2 – Too much pressure

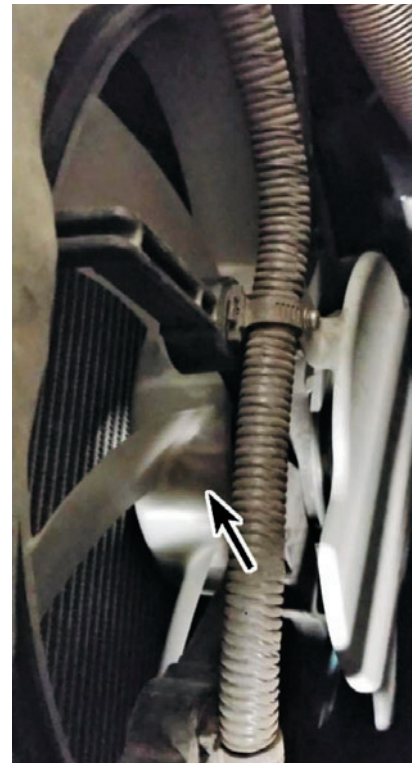
Talk about head pressure! Some customers just have to blow off steam when they come into the repair shop. Whether it's from some poor information or bad service or they're just too dang hot under the collar for much more than a

good old-fashioned rant at the service counter. This time around it's an early 2000 Buick with an air conditioning problem, or at least that's what the customer assumed it was.

Each time the air conditioning was turned on it would turn off after a few minutes, if not sooner. The car was at another shop that had quickly made the call to replace the entire system. This customer wasn't buying that diagnosis. Again, the key to the start of this diagnosis was to listen to the customer's story. As in a lot of these stories, you tend to get a bit lethargic, if not sleepy listening them. But you just have to; it's important.

Think of it this way: don't listen to the story; listen to what they're not telling you. I'm actually listening for things like the time of the day, how long they've driven the vehicle, or how often the problem occurs. Ask questions like, what were the driving conditions, is it in any way predictable, and ask if they can make the problem happen now. The intermixing of grandma's chocolate cookie recipe and the kid's basketball game are not much help in regards to the diagnostic make up, but it is part of the story, so you best act like you're interested in those tidbits, too.

After pulling the car into the service bay, the first thing to do was to simulate the problem and observe the results. I always say that diagnostic work involves looking and examining, not just repairing or adjusting. Whether that includes a scanner read or just a quick lean over the fender, it all falls under the umbrella of the diagnostic fee. However, if you move, disturb, change, adjust or tighten a bolt, you're NOT diagnosing. If to further your diagnostic work you have to install a drive belt, evacuate and recharge the system, that's not diag work, that's part of a repair, and you should charge accordingly. You can continue the diagnostics after that work has been completed.



IF THIS IS WHAT YOU SEE with the air conditioner on, and the head pressure is rising, start looking for causes and cures relating to the coolant fan and not necessarily the air conditioning system.

This time around, the diagnosis was rather simple. Hook up a set of gauges and observe the pressure changes. As the compressor would click on, it would only take a few minutes before the high-side pressure started to rise higher and higher to the point it reached the high-side limit and dropped the voltage to the compressor. In this case, it wasn't the air conditioning's fault at all — it was the cooling fan. No fan pulling air through the core raised the internal pressure of the air conditioning system to the danger point.

The solution: replace the coolant fan. This time around the connections were perfect — just the fan was bad. The best part was that the air conditioning head pressure calmed down as quickly as the overheated customer. Just hope grandma has some of those cookies baked.

What does the future hold?

These days with the "learn strategy" methods of operation, things are quite different. The vehicle's computer can make little adjustments to various systems to maintain them in the desired range of operation. Things like controlling a desired torque response that compliments what the customer feels while driving as well as shift points and emissions levels. The typical A/C compressor engagement that would drop the rpm level slightly can now be mapped out of the system by adjusting the electronic throttle, and the use of the PWM compressors also eliminates the stress on the belt as well as the compressor. (The electrically operated compressors are even eliminating even more of those internal stress loads.)

This can also mean the story from the customer may take on a completely different aspect to the repair. Every component and system being interconnected with the next system can make diagnostic work that much more of a challenge. Today, unlike in previous years, listening to the customer's story may be even more important than ever before. The customer's understanding of the inner workings of today's cars will be even more limited than in the past. So, cooling off that hot customer at the service counter may take a bit more understanding and listening than ever before. (Might ask grandma for an extra batch of those cookies for your service counter.)

SCOTT 'GONZO' WEAVER
After more than three decades as the owner of an automotive electrical repair shop in Tulsa, Oklahoma, ASE Master Tech Scott "Gonzo" Weaver now writes and teaches the latest automotive technology. As a storyteller, he has hundreds of published humorous and anecdotal stories that can be found on his website, www.gonzostoolbox.com. Gonzo is also the author of the book, 'Hey Look! I Found the Loose Nut'.
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TOUGH SPOTS

SOMETIMES WE'RE FACED WITH SIMPLE FAILURES IN PLACES THAT ARE ALMOST OUT OF REACH

RICHARD MCCUISTIAN //
Contributing Editor

EVEN AFTER SITTING IN THE YARD for a few months, this Fusion still looked pretty good after it was washed.

I have been writing for *Motor Age* since May 2000, and so, when I submitted my application for the college instructor's job in December of that year, I included copies of *Motor Age* that featured my articles, and to this day, I believe my position as a contributing editor for this magazine was one of the determining factors in landing the job that a whole lot of other guys had applied for. And for those who think they want a college instructor's job, well, you need to realize going in that it's as demanding (and sometimes frustrating) as it is rewarding. There were times when I fully believed I had no idea what I was doing there. As of the writing of this article, I am teaching my way through my 19th year, and I plan to retire at the end of May from my teaching position.

I'll still be writing a feature or two for *Motor Age* every year if Mr. Pete Meier (*Motor Age* Technical Editor) will work with me on that front, but since I'm no longer going to be neck deep in vehicle repairs every week, I'm not sure how many more articles I'll be able to hammer out, because the articles I've been writing for the past 20 years have been real stories from the service bay, and where *Motor Age* Garage is concerned, that's the only kind of story that works. My time in the service bay will be limited after May, I'm afraid, and that's where the photos and stories come from. The point is that, while I'm not saying you've heard the last of me, my articles won't be quite as regular. Although, if I can write enough for *Motor Age* to hang on to my "senior contributing editor" status, that'd be peachy. Time will tell.

During my teaching tenure at the college, I have forged enough of a reputation with those qualified to have work done in this shop to have lots of real-world repair stories, and those are the stories I tell. Most of the customers we serve like the work we do, so they keep coming back for more, and since experience is the best teacher, my people get hammered with a lot of work. Some of it is pretty doggone tough, but that kind of pressure either molds my people into functional techs or drives them away from the profession. I want them to face tough jobs here so they can handle them out there. I consider my program to be "boot camp," and they either pass or fail based on what they're able to handle. My desire is for every graduate to be a living legend, but that's more up to them than it is to me.

"It's broke" is all they know

We get vehicles hauled in on wreckers, trailers and yanked by chains, and sometimes when they show up, nobody even called to tell me they were coming. A couple of weeks ago a 2006 Mazda 6 showed up with the complaint that "something happened, and the timing belt came off," which made no sense whatsoever on this engine, but then, most every service writer faces this kind of thing. Don't get me wrong; I'm not ridiculing my customers, but for years it has boggled my mind that some of them don't even know what year or model their vehicle is, let alone which engine is in the vehicle, but that's OK, because we can figure that out as the work order is being written. But then sometimes they're not sure how to describe what's going on; they just know the vehicle is "broke" and can't be driven, and they want us to work some kind of magic.

In the case of the Mazda, we discovered that the idler pulley bolt had broken off flush with its hole, which, as it turned out, was somewhat difficult to access. There's a thick aluminum bracket between the pulley/spacer assembly and the hole in the block the bolt is threaded into, but the bracket

PHOTOS: RICHARD MCCUISTIAN

is designed in such a way that the bolt passes through a long notch instead of a round hole on the way to the block. This is something of a blessing, because you can at least see the broken bolt — but on the other hand, if the bolt was passing all the way through a hole in the bracket and into the block, the bracket would probably support the bolt rather than allowing it to flex and break off.

On this Mazda, with the tire and splash shield removed, the pulley area is fairly accessible and we managed to use a left-hand twist drill bit to succeed in snatching that broken-off piece of bolt out. Having worked the requisite "some kind of magic" at this point (it's what we do, ya know), we had found the original pulley and its spacer lying in there, and so I found a suitable bolt the right length in a can of junk bolts (8mm 1.25 thread pitch). With a new belt and that replacement bolt in place with the original pulley, we got that one going in short order.

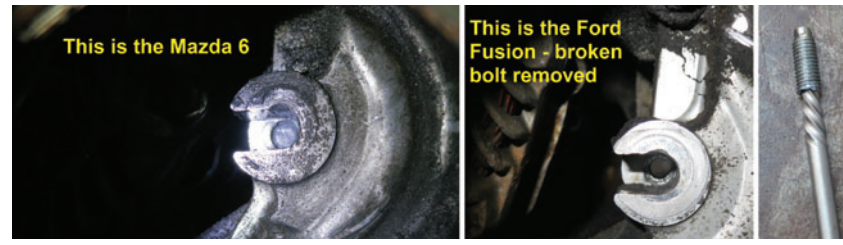
Wait, what? Another one?

About 10 days later, a 2008 Ford Fusion 2.3L, FNR5 Transaxle with 212,564 miles showed up on a trailer. Like the Mazda, this one had been sitting in the yard until all the other pulleys were rusty and there were spiderwebs everywhere. And like the Mazda owner, the Fusion owner struggled to explain what the problem was, but it didn't take long to figure out that this one had broken the same bolt as the Mazda 6 had. This is obviously a high mileage failure due to the flexing of that bolt.

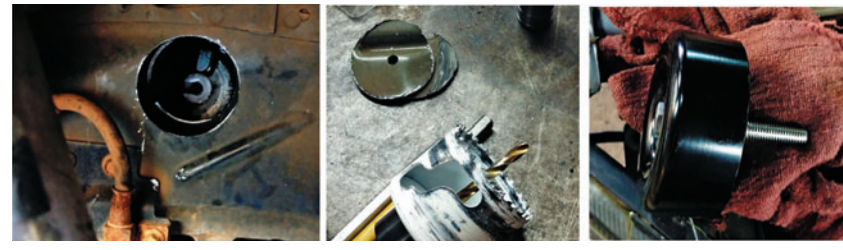
Well, what we knew from experience was that the first thing we had to do was to get what was left of that broken bolt out of its hole, and that was a LOT harder on this '08 Fusion than it had been on the Mazda 6, because the broken bolt wasn't visible at all — that spot on the end of the engine is about two and a half inches from the car body, and removing the fender splash shield didn't help this time, because we were looking at two thick layers of steel between us and the broken bolt we needed to extract.

I know the guy whose daughter drives this car well enough that I didn't need to call and ask him whether I could make a nice round hole in the car body to get to that broken bolt. Heck, the hole would be covered by the splash shield anyway, and it'd make the job a lot easier for the next guy. We did some tape measuring and Sharpie marking, and with a 2-1/4-inch hole saw and an arm-twisting DeWalt 1/2-inch corded electric drill, we made ourselves a nice (if slightly off-center) access port, but this broken bolt wasn't quite as friendly as the one on the Mazda had been.

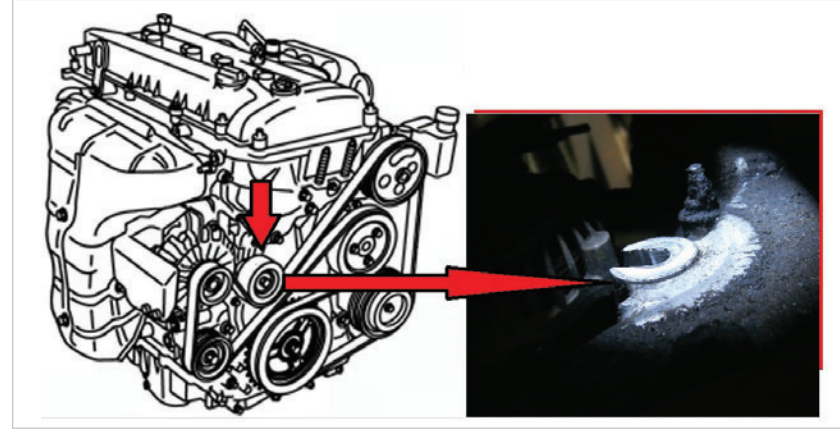
Everybody who works with a drill in situations like this knows that if you spin the bit too fast, both the bolt and the bit tend to get hot. That makes the bolt harder and the bit softer, which



IT HAS ALWAYS BEEN ODD TO ME how we get two jobs alike within a few days of each other with such similar circumstances. Both cars broke the same bolt and both sat in the yard for a few months before anything was done about it. A few years ago we got two identical Ford Explorer Harmonic balancer failures the same week.

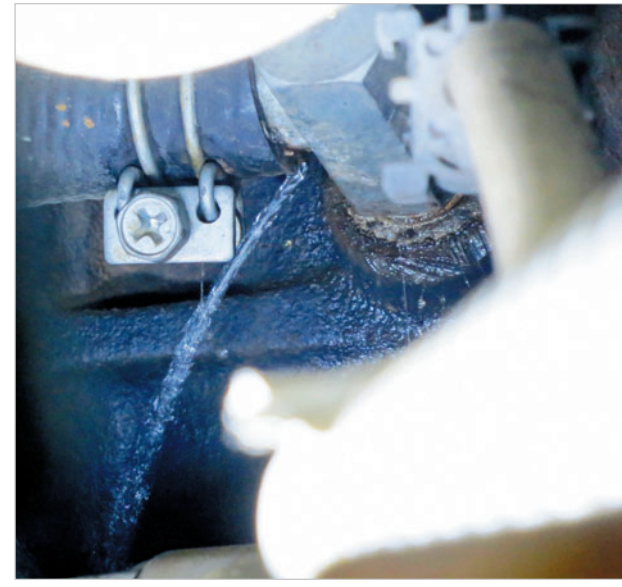


THIS IS ONE WAY TO GET TO A TOUGH SPOT. The caveat would be that, if the hole were sawed in a load-bearing place, body strength might suffer, but that didn't look like it would be the case here.



SOME OF YOU GUYS MAY HAVE SEEN THIS MULTIPLE TIMES — the pulley bolt has almost no support to keep it from flexing in this slot and it eventually gives way. I expect to see more of these eventually.

WE HAD TO PUT OFF STARTING THE FUSION because of this battery situation. This vehicle had suffered some serious neglect and abuse in places.



WE WERE ABLE TO SEE THIS LEAK with the fender splash shield removed, and we were able to remove the fitting after first removing the starter on the Nissan Frontier. I had to explain to her that she didn't need to drive it with a leak like this unless she wanted to cook the engine.

brings the entire job to a screeching halt — literally — since screeching is the sound the bit makes in those situations. A regular air drill isn't the best tool for this job, because with the air drills we have, it's difficult to control the speed of the drill. Using a drill bit extension I snagged from the local Harbor Freight, we managed to use the electric drill and a new bit to put enough of a hole in that bolt to get it out with a screw extractor. Whew!

Okay, now we needed more than just a new pulley, which was all the parts store had to sell us. We also needed the special spacer that goes behind the pulley, but the Ford place had one in stock, along with a new pulley and bolt, all in one neat package for $28.

My problem with this new Motorcraft part is that the 8.8 Metric bolt isn't (in my opinion) hard enough. If it was, these bolts wouldn't be breaking off on more than one vehicle. On the other hand, a harder bolt might be a lot tougher to drill out if it did break. I went with the bolt that Ford included with the pulley, and when we installed a new belt, we found we needed to replace the battery, which was badly cracked around the negative cable, and we had to replace the negative cable end as well, but that wasn't much of a problem. We checked the oil and coolant and fired the Fusion right up. After setting the tire pressures (they were all low), we put it back on the road.

Coolant leak, Nissan style

Back in 1990, I traveled to Panama City Beach with some friends for a Saturday at Shipwreck Island. We were traveling on 2 vehicles, and one of them was a Toyota van, which sprung an odd coolant leak from the joint of a steel heater hose Y on the way back, and they had to stop and refill the radiator about every 15 miles or so. Panama City is only 100 miles from where I live (they were from Tuscaloosa), and so that night we parked the van and I told them I would see if I could do something to plug the leak the next morning after church.

With the van jacked up and the tire and splash shield removed, I wire-brushed the place where the water was trickling out of that tee and used a bottle torch and some acid core solder to forge a repair that got them back to Tuscaloosa without a hitch. In their eyes, I was Superman with a torch. I have since learned that Toyota had issued TSB 007 on 4-15-88 that read this way: *To maximize corrosion resistance of the heater pipes on Vans (YR), the material of the heater tubes has been changed from the previous epoxy powder painted steel type to brass.* That's what the dealer put on their Toyota when they got back home, but they reported later that my repair held all the way.

Well, just last week about the time we got done with the 2008 Ford Fusion, a 2000 Nissan Frontier that belongs to one of the college welding instructors came to us on Friday afternoon with a coolant leak vaguely similar to the one I had fixed back in 1990 on the Toyota van. One of the heater hoses is connected to the passenger side of the engine block via a steel 3/8 pipe-to 5/8 hose 90-degree fitting, and the Nissan had just that morning began to pee coolant out of that fitting. We took a photo of the leak and zoomed in to decide if it was the hose or the fitting and determined that it was indeed the fitting after all. Furthermore, we had to remove the starter to access this fitting,

THIS IS THE LEAK WE FOUND on the Frontier, but locating a fitting like this one in town turned out to be pretty demanding. We made it happen the following week.

HERE IS ONE OF THE COLLAPSED Mercedes E320 mounts (the one on the left) and the bent inner tie rod we discovered in the process.

and we managed to screw it out of there with a 19mm wrench. The fitting was breached from the inside by electrolysis, it appeared, and while we could have welded it, we decided that replacing the fitting seemed more apropos.

Fortunately, this part wasn't so terribly proprietary that we couldn't find another one — except that all the other ones we found that day had 1/2-inch pipe thread rather than 3/8. We ran out of time that first day (which was the end of the week) and so the Nissan had to spend the weekend on the lift before we could get a part, but that job ended well.

Another one bites the hook

Another regular customer came wheeling in with an F-150 on a roll-back — it had sheared the driver-side lower ball joint, and we had to fix that one outside the shop, but it was fairly straightforward. Get a jack and a stand under it, break out the ball joint service set, pop the old ball joint out and replace it with a new MOOG, and the rest is history.

There was also the 2004 Mercedes E320 with collapsed engine mounts that shook the whole car when you dropped it in reverse. We replaced all three mounts (both engine and the tranny mount), which took about four hours, and in the process found a bent inner tie rod, which we also replaced. Interestingly, the dealer he visited had charged him $700 to replace the upper ball joints (which bolt in, list for $80 each and total listed labor time is an hour) then they quoted him $1,100 bucks to replace the two engine mounts, which (list price) are $149 each and the labor is 4 hours. Don't know where that estimate came from. Based on list price and $100 an hour I could come up with about $750 on the mounts, but using the same standard, I could only justify about $300 for parts and labor for the upper ball joints. We don't charge labor, but I generally have my students check dealer parts prices and labor times for grins.

At about that time, a game warden came in on his '98 Chevy K2500 Crew Cab hunting truck with a popping noise in the front end, hubs that wouldn't engage, and rear brakes that liked to skid when stopping cold.

The four-wheel drive problem on that K2500 turned out to be a missing fuse, but the popping noise was a lot more serious — the frame had cracked right at the place where the steering box mounts. When we showed him that, he called a friend who, in his words, "fixes these all the time," but he wanted us to handle the brakes. The shoes on the driver side rear were coming apart, and it needed both wheel cylinders, but first we had to bang around on the drum hubs to get those big 60 pounders off. The same rust that had attacked the frame had also tried to weld the drums to the hubs, but we made it happen with some skillful hammer work and a shot or two of PB Blaster®. The warden got new rear brake shoes and wheel cylinders, and he was good to go. By the time all these jobs were done, everybody was sufficiently hammered. A load of happy customers and students who are slightly more experienced made it all worthwhile.

THIS WAS AFTER THE BRAKE ASSEMBLY had been washed down with brake parts cleaner, but a new set of shoes was definitely in order for the K2500.

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MAKING SENSE OF CHRYSLER'S SGW

CHRYSLER'S SECURE GATEWAY MODULE WILL CHANGE AFTERMARKET ACCESS. HERE'S WHAT YOU NEED TO KNOW.

MIKE REYNOLDS // Contributing Editor

You may have heard about Chrysler's Secure Gateway Module (SGW), but in case you haven't, it is going to change some things as far as aftermarket diagnostics are concerned. I put together a comprehensive write up on the SGW to help technicians understand how it works, why it is necessary and how to prepare for service on SGW-equipped vehicles. It contains some opinion in addition to information from Chrysler factory training as well as service info pulled from TechAuthority.

What is the SGW?

Let's start by talking about what the Security Gateway Module is and its purpose. The SGW was implemented in some models in the 2018 model year and all models 2019 going forward. The SGW in short is a module whose function is to keep the communication networks secure. The SGW protects the vehicle networks by creating a firewall between two portions of the network with the most vulnerability. These are the telematics/radio unit and the DLC.

So how does the SGW work? It separates the vehicle network into private and public sectors. The public sector includes the telematics unit and the DLC. Everything else on the network is considered private. Access to the private sector of the network is limited — as of now — to Chrysler licensed devices.

As for the physical structure of the network, the DLC connects directly to the SGW via a Diagnostic CAN C and a Diagnostic CAN IHS bus. The term "diagnostic" is used to describe the bus from the SGW to the DLC only. The SGW is also connected to the CAN C and CAN IHS busses on the private side of the network but is often not directly connected to the LIN bus. It is connected directly to the radio via a CAN IHS and sometimes an additional CAN C bus. These are also on the public side of the network. This is important to a diagnostician because although they are not identified as separate networks on the wiring diagram, the signals on the public networks may not mirror the private side of the network. The SGW wiring diagram may make it look like the SGW functions as a central gateway, but it is important to note that it is not used to communicate signals among modules on the private side of the network. It serves as a frame gateway and does not provide signal gateway functionality. The SGW does not contain any drivers and does not directly operate or control any vehicle components, but rather allows only authenticated messages on to the private networks.

What is authentication?

The SGW authentication process takes place in the Chrysler servers. As of now, there are two tools that will allow authentication through wiTECH 2.0: the Micropod II and a J2534 device. I asked Joey Hendrich at AE Tools to help explain the advantages/disadvantages of these two options.

AUTEL IS ONE COMPANY that is offering a bypass cable to circumvent the SGW. It requires accessing and unplugging the SGW module.

When using a J2534 device, the wiTECH subscription is registered to the software, essentially locking it to the computer. With the Micropod II, the wiTECH subscription is locked to the tool, allowing it to be used on any computer, tablet, or even smartphone as long as a connection to the internet is available.

When working with the Micropod II, the vehicle communicates through the Micropod II directly with the Chrysler

PHOTO: AES WAVE

servers via WiFi. The browser of said laptop/tablet/smartphone logs into wiTECH to access vehicle communication.

The operation through a J2534 device is a little different. A J2534 device works with drivers and downloaded software, which is ported to the wiTECH cloud instead of using an internet browser. With both of these systems, an internet connection must be available at all times, including during test drives. Most smartphones now have WiFi hotspot capabilities. Using a Micropod II, the WiFi must be registered on the pod as well as the laptop, whereas when using the J2534 device which communicates via USB, the WiFi must be registered to the computer only. This can make the pod less desirable for use when test driving.

It is important to note that the J2534 wiTECH software only offers coverage from MY 2010 forward. The Micropod II coverage goes back to 2004 on CAN vehicles and covers all models 2009 forward. Chrysler is also using MEGA CAN, which is only supported by J2534-3 devices. While a J2534-2 device will work with wiTECH, it may have limited functionality on some of the MEGA CAN vehicles. MEGA CAN is used on everything 2018 up, but it can also be found in the Renegade and Fiat 500 going back to 2015 as well as the Compass, Alfa Romeo Giulia, and Fiat Spyder in 2017.

What does all this mean for us?

Unauthorized devices will be allowed read-only or passive access to the private network. "Passive" means the ability to read codes and data but does not include the ability to clear DTCs, perform actuator tests, special functions, ECU configuration, flashing or module resets on the private side of the network.

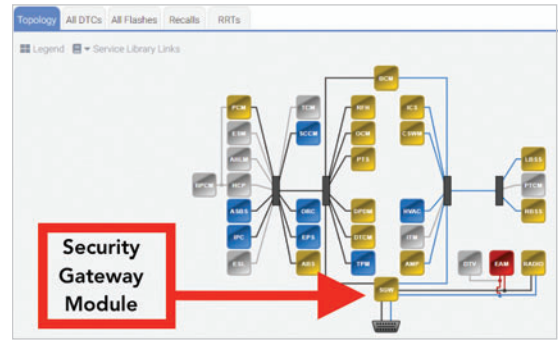
There is, however, a ray of sunshine for repair shops not yet ready to invest in tooling right away, in that Mode $04 on the generic side of a scan tool will still allow codes to be cleared in the PCM only. When dealing with the engine controller, a sub-$100 scan tool from the parts store can have nearly the same capabilities on these vehicles as a five-figure aftermarket tool with the latest updates. It is important to note that many generic code scanners will often show cleared codes as permanent codes, whereas the wiTECH will not display permanent codes. This can be important when pre-/post-repair scanning.

FCA opened up access to aftermarket companies in November 2018. Snap-on, Bosch, Autel and G-scan are all working with Chrysler towards a solution, but there will likely be some challenges getting a tool to work with the FCA servers and integrating a solution to the need for constant WiFi.

I have always said that many of the aftermarket tools are much more user friendly and often offer much better data display and recording features than the OEM tools. Overall, I have been impressed with the wiTECH software, except for the data graphing and record functions. These functions might end up being more user friendly on an aftermarket interface.

If you're on the AESwave email list, then you have probably seen the 12+8 adapter Autel has released. This cable essentially goes in place of the SGW. It will require removal or access of the unit, which is typically located either under the driver's side of the dash or behind the infotainment unit (the torque spec for the SGW bolts is 44 in-lbs. in case you were wondering). Removing the infotainment unit may not be ideal, but since the SGW does not serve any function beyond securing the network,

it would seem like this should be a viable solution and would provide full network capability. Furthermore, this solution may be useful in diagnosing faults with the SGW, as faults in the SGW may mimic faults in other modules. It is also notable that "no communication with SGW" codes do not exist when using this cable. I might still expect to see communication codes associated between the radio and modules that communicate with it, as the circuits will be interrupted.



THE SGW IS NOT A GATEWAY in the sense that you are used to. It's more like a fence, blocking most of the modules from public access.

Why the SGW?

Before you begin to think Chrysler is intentionally attempting to lock out the aftermarket using the SGW, let's first talk about the security vulnerabilities vehicle owners face across all car lines, how Chrysler has addressed them, and how we may see other manufacturers jump on board with similar systems.

In 2015, hackers were able to remotely take control of a 2014 Cherokee and manipulate many vehicle features including the steering and braking. This certainly wasn't the first instance of vehicle hacking, but it gained the most attention, much of which revolved around a well-documented video of the attack posted on YouTube. The video goes into detail about how the hackers studied potential weaknesses in the system and were able to manipulate them — even going so far as to talk about the potential to target specific VINs and control them remotely using the cell networks, without ever needing to make physical contact with the vehicle. This led to a recall being issued on these vehicles and ultimately played a role in the development and implementation of the SGW.

While the hackers in that particular instance focused on the telematics units, that is not the only weakness in modern vehicles. You will notice that the SGW also isolates the DLC, which is what we, in aftermarket repair, are concerned about. Consider how many cheap dongles I am sure many of you have removed from your customers' vehicles in order to connect your scan tool. I would say at least 25 percent of the vehicles I see daily have a dongle from either an insurance company, a DLC to cellphone code-reading device or fleet/mileage tracker. All of these units work wirelessly, and many of them transfer data directly through wireless or Wifi networks. It stands to reason that if hackers can hack a factory Chrysler radio/telematics unit, that getting into one of these networks would be less of a challenge. Hopefully I have painted a picture of why this type of technology is necessary and likely to become standard with other vehicle manufacturers.

I am told that other manufacturers like Ford, Nissan and Subaru are following suit and that they may even be rolling them out in 2019-2020 models. I don't necessarily think this will make the aftermarket scan tools obsolete; however, I do see many changes on the horizon. Maybe the aftermarket tools are able to integrate with the OEM systems, which would likely give them OEM capabilities like programming. At the same time, I could see this driving the cost of the aftermarket tools sky high. Either way, changes are coming, and it is up to us to be prepared.

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PHOTO: FCA

Keep moving ahead at AAPEX 2019

EXPLORE NEW TECHNOLOGY WITH THE ENTIRE AUTOMOTIVE AFTERMARKET INDUSTRY IN LAS VEGAS

The automotive aftermarket doesn't take a year off. To stay ahead of the competition and keep your customers safe on the road, you have to be on the leading edge of the trends, products, and innovations evolving the industry.

AAPEX 2019 is the one place you can take part in three action-fueled days of hands-on training and explore the new-to-market products and services that prepare you to handle any challenge that comes into your shop. At the automotive aftermarket's premier event, you'll participate in education handpicked for service professionals and connect with industry experts and colleagues from around the country.

The latest insights, education, and groundbreaking products will be at the Sands Expo in Las Vegas November 5-7. Here's just a sample of what you'll find at AAPEX 2019:

Deep dive into Advanced Driver-Assistance Systems (ADAS)

Build your technical expertise in the growing technologies and products that can increase your customers' safety. You'll discover the potential for new business opportunities, discuss how many vehicles can be retrofitted, and learn proper installation. The ADAS Forum provides a path to the future of the automotive aftermarket industry.

Groundbreaking new products

Innovation is crucial for anyone running a shop. In addition to exhibitors announcing new products on the exhibit floor, the New Product and Packaging Showcases feature hundreds of groundbreaking products all released within the past year. You can preview future products yet to hit the market at AAPEX Technology of Tomorrow.

Hands-on training in the Mobility Garage

AAPEX's leading-edge Mobility Garage provides underhood and alternative fuel training throughout the event. Check that your shop has all the standards and certifications needed to service today's advanced vehicles, and engage one-on-one with suppliers and exhibitors in this forward-focused area.

The hottest industry topics at Let's Tech

These 20-minute sessions put you on the fast track to emerging technologies in the automotive aftermarket. You'll learn about what's new in products, tools, and mobile apps throughout various segments of the industry.

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You'll get the latest on the most pressing industry topics through AAPEXedu sessions. In last year's Service Professionals General Session, attendees learned how they can help to build a competent technician workforce and how to change the future education model. This year,

you can learn more useful insights for the year ahead at the 2020 Aftermarket Outlook session that will prepare you for tomorrow's automotive aftermarket.

AAPEX also keeps you up to date on event information and the latest aftermarket news through the AAPEX Blog, featuring technology, trends, and all the hottest topics, published every two weeks. Check out the latest post from AASA Senior Vice President Chris Gardner, The Aftermarket Needs a New Adage: Technology Is an Enabler. You can also find AAPEX TV-360 episodes covering aftermarket news, insights, and tips, including the most recent episode covering the shortage of technicians in the workforce, at www.aapextv.com. And stay in touch with the entire automotive aftermarket community on social media using the hashtag #AAPEX19.

AAPEX 2019 is the only event that will keep your business and your career driving forward. See what else is in store for you and visit www.aapexshow.com now to register to attend November 5-7, 2019!

AAPEX is a trade-only event and is not open to the general public.

AAPEX is co-owned by the Auto Care Association and the Automotive Aftermarket Suppliers Association (AASA), the light vehicle aftermarket division of the Motor & Equipment Manufacturers Association (MEMA). For more information, visit www.aapexshow.com.

Tracerline® Fluoro-Lite® 5 UV Fluorescent Leak Detection Dye

To meet industry trends, Tracerline® has developed leak detection products made specifically for R-1234yf A/C systems. The Tracerline® R-1234yf product line includes complete leak detection kits, dye injection kits, and replacement dyes. Over the past few years, automotive manufacturers have shifted over to using modern A/C units that utilize R-1234yf refrigerant. R-1234yf refrigerant has a lower Global Warming Potential (GWP) Rating than its predecessor R-134a. Today, most automotive manufacturers have adopted these highly efficient, ultra-low impact refrigerant systems.

The TPOPUV19 UV Leak Detection Kit is the perfect tool for diagnosing R-1234yf air conditioning systems. Each kit comes complete with three Mini-EZ™ dye cartridges, an EZ-Ject™ dye injector assembly, an R-1234yf hose/coupler and purge fitting, and a 2 ounce (60 ml) bottle of GLO-AWAY™ Plus florescent dye cleaner. Also included in the kit is the TPOPUV OPTI-PRO™ UV cordless, violet light leak detection flashlight.

Each Mini-EZ™ cartridge treats one vehicle. These cartridges are excellent for automotive repair shops because it allows for single, billable dosing. This helps technicians and business owners simplify quoting jobs to customers. Additionally, these cartridges can be easily disposed of once the dye is added to the vehicle. Each Mini-EZ™ cartridge is filled with the exclusive Tracerline® FLUORO-LITE® 5 dye formula.

In 2019, Tracerline® announced the release of FLUORO-LITE® 5 – the brightest, most advanced fluorescent leak detection dye formula in the world. As the inventor of fluorescent leak detection, Tracerline® has been at the forefront of leak detection technology for over sixty years. This is the first time in over twenty-plus years that Tracerline® is releasing a completely new dye formulation.

FLUORO-LITE® 5 is brighter than the previous dye formula and provides the industry's most optimal fluorescent response — far exceeding the performance and quality of comparable dye products. It has a greater resistance to extreme temperature ranges and moisture. This means the new dye formula has a much longer shelf-life. In addition, the dye performs better under stressful conditions and has greater stability. All of these qualities make FLUORO-LITE® 5 an excellent tool for long-term preventative maintenance and leak detection. FLUORO-LITE® 5 dye is also co-solvent free and manufactured with OEM-Grade materials. The dye can be safely added to the vehicle system and it won't affect chemical properties or change how the equipment works. This means the dye can remain indefinitely within the system for ongoing 24/7 leak detection.

Once a repair is made, the dye can be used as part of a preventative maintenance program. Every time a customer comes back to have their vehicle serviced, all a technician must do is scan the vehicle system with a leak detection lamp. If there are new leaks in the system, the fluorescent dye will glow brilliantly and indicate the exact location of all new leaks. Fluoro-Lite® 5 dye can find the smallest and most problematic leaks that would otherwise be impossible to detect.

Pairing with the new FLUORO-LITE® 5 dye formulation are two new and improved violet light LED leak detection lamps: the OPTI-PRO™ UV and the OPTI-PRO™ UV PLUS. These lamps provide optimal fluorescent dye response and contrast when scanning for hard-to-find leaks.

After more than five years of R&D, the new Tracerline® product portfolio featuring FLUORO-LITE® 5 is now available. Over 250 million vehicles have used Tracerline® UV fluorescent leak detection dye to ensure quality, system integrity, and professional vehicle service.

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WWW.VDO.COM/USA

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BRAKE DISCS

Textar engineers have utilized the know-how that comes from decades of producing premium OE brake pads to develop a perfectly matched brake disc that ensures the ultimate braking performance of your vehicle. The Textar range of brake discs is manufactured to precise German specification and are application engineered for cars driven in North America. Textar brake discs, Textar brake fluids (DOT 3, 4, 5.1), Textar anti-squeal pastes and Textar brake tools are available exclusively at WORLDPAC , as well as a full range of premier Textar brake pads, e-pads and brake shoes.

WWW.TEXTAR-WORLDPAC.COM

PARKING SENSOR DETECTOR

This 6 ½-foot long lead and specialized detector from Pico Technology allow a technician to test the operation of a vehicle's ultrasonic parking sensors. Combined with a PicoScope oscilloscope, the strength of each sensor's signal can be visually displayed and used to isolate malfunctions, installation issues or obstructions by aftermarket accessories.

WWW.PICOAUTO.COM/A305

TECHNICAL TRAINING

WORLDPAC Training Institute (WTI) offers carline-specific advanced technical training, business management solutions and exclusive Smart Groups designed explicitly for independent repair shop professionals. Always developed and taught by experienced instructors, WTI training keeps you ahead of the learning curve to ensure your business remains competitive and profitable. View the complete class listing at the below website.

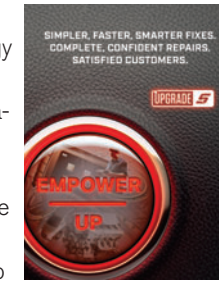
WWW.WORLDPAC.COM/TRAINING

PLAN AHEAD FOR AAPEX 2019

The Automotive Aftermarket Products Expo (AAPEX) is an event where you can connect with the more than $1 trillion global automotive aftermarket industry. In 2018, AAPEX featured 2,500 exhibitors and more than 51,000 target buyers. Save the date for AAPEX 2019, which will be held November 5-7 at the Sands Expo in Las Vegas. Visit the below website to register today.

WWW.AAPEXSHOW.COM

SOFTWARE UPDATE



Snap-on® invests in the latest technology innovations, resources and aftermarket repair relationships to strengthen tool capabilities on a regular basis. In the newest release, Snap-on helps technicians power up their productivity and overcome tough obstacles more quickly, thanks to innovative new features and the ability to handle hundreds of vehicle systems from 49 different vehicle manufacturers.

HTTP://DIAGNOSTICS.SNAPON.COM/SOFTWARE

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Carquest Platinum Painted Rotors, an exclusive line of premium rotors offered by Advance Professional and Carquest, are designed to meet professional repair facilities' need for a high-performing rotor product that is visually appealing to today's drivers. Engineered with a rust-inhibiting barrier that provides more protection than non-painted rotors, Carquest Platinum Painted Rotors help decrease brake noise and increase the life of a vehicle's brake pads. For more information on quality Carquest products, call your local Advance Auto Parts or Carquest delivery location.

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APG // AUTOMOTIVE PRODUCT GUIDE

MORE EFFECTIVE STOPPING

Adaptive One brake pads feature an advanced noise reduction system that includes superior friction formulations and noise reducing features such as slots, shims and chamfers, which makes them effective on your car — and easy on your ears. But, that's not all, Adaptive One Passenger Car brake pads' Gold CleanCoat technology make them more effective at stopping during the break-in process.

WWW.NAPABRAKES.COM

CARPET CLEANER

Meguiar's, the worldwide leader in car care, introduced an exciting new product to its impressive line of premium car care products, Carpet & Upholstery Cleaner. This professional-strength carpet and upholstery cleaner is formulated specifically for stain removal, performing general cleaning and freshening the entire interior with odor-eliminating technology.

WWW.MEGUIARS.COM

TREAD READER

The TreadReader™ from Atlas Automotive Equipment is an ingenious handheld scan tool that provides an instant 3D image of the tire, providing vital data such as tread depth and adverse wear. Advisory information like mis-alignment or uneven wear due to under or over-inflation is also displayed, presenting a "no-question" presentation to the vehicle owner on the condition of their tires, and the recommended resolution whether it is immediate or in the future.

WWW.ATLASAUTOEQUIPMENT.COM/TREADREADER

DIGITAL BATTERY TESTER

Clore Automotive introduces a new 12 Volt Digital Battery and Electrical Systems Tester with Integrated Printer, Model No. BA227, from SOLAR. The BA227 offers a complete testing solution for 12 Volt batteries and systems. Compatible with a wide variety of battery types, the BA227 is designed to test flooded, AGM flat plate, spiral wound, gel cell, start-stop AGM and enhanced flooded batteries.

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AD INDEX

AD INDEX

PRODUCTS

TRAINING

BREATHING EASY — THE NEED FOR CABIN AIR FILTER SERVICE

THE CABIN AIR FILTER IS THERE TO PROTECT THE CABIN OCCUPANTS FROM DANGEROUS EXPOSURE TO AIRBORNE POLLUTANTS AND ALLERGENS. WHEN WAS THE LAST TIME YOU RECOMMENDED IT BE CHANGED?

PETE MEIER // Technical Editor

How often do you inspect or replace your customers' cabin air filter? It's one of those service items that isn't always the easiest to inspect, and it's easy to overlook when speaking with them at the service counter. I hope that, after this little lesson, you'll be more aware of just how important this filter is to the health of your customer and take this service a bit more seriously going forward!

What is the purpose of the filter? You may have thought, as I once did, that the main job of the cabin air filter was to prevent leaves and other materials from entering the evaporator case. We've all seen evaporator cores clogged by waste on models not equipped with filtration and experienced the musty, moldy, odors that were a result of the decaying debris. And while that is a part of the filter's job, it's only a small part.

Consider a few facts. One, the concentration of airborne pollutants in the cabin can be six to seven times higher than the concentration in your customer's home. His or her morning commute doesn't help, either. The concentration of pollutants on the highway is six times more in the center of the road than on the shoulders — which makes sense when you consider you're traveling behind another car's exhaust!

But it isn't only the exhaust that is trying to enter the cabin. Diesel particulates, tire debris and brake dust are just a few of the more than 200 identified pollutants circulating through the interior of a typical automobile.

Let's not forget pollen and other allergens. More than 40 million Americans suffer from these allergens and the problem becomes worse when these allergens are concentrated inside the car. If you're one of them, you know what I'm talking about.

How do you know when the filter needs replacement? How do you help your customer choose a replacement filter that will deliver maximum performance? Those are just a few of the topics I'll cover in this month's "The Trainer." And when you're done watching, you'll be able to help your customer breathe a little easier!

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BRAKEBEST SELECT

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- OE-style friction material formulations
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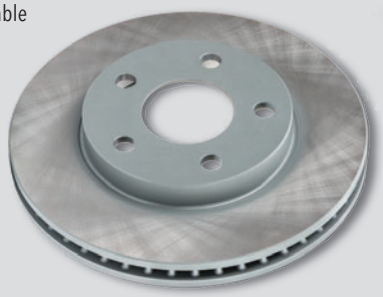

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