



10

INSIDE: WHAT SHOP
OWNERS SHOULD BE DOING

26

PREVENTING COLLISIONS — SAVING LIVES

Delving into the world of ADAS is not a question of
“If,” but rather, “How long will you wait?”

14 **GETTING READY
TO SERVICE ADAS-
EQUIPPED VEHICLES**

Build your understanding of these systems,
their operation, technology and opportunities

40 **ADAS — A MOBILE
TECH'S EXPERIENCE**

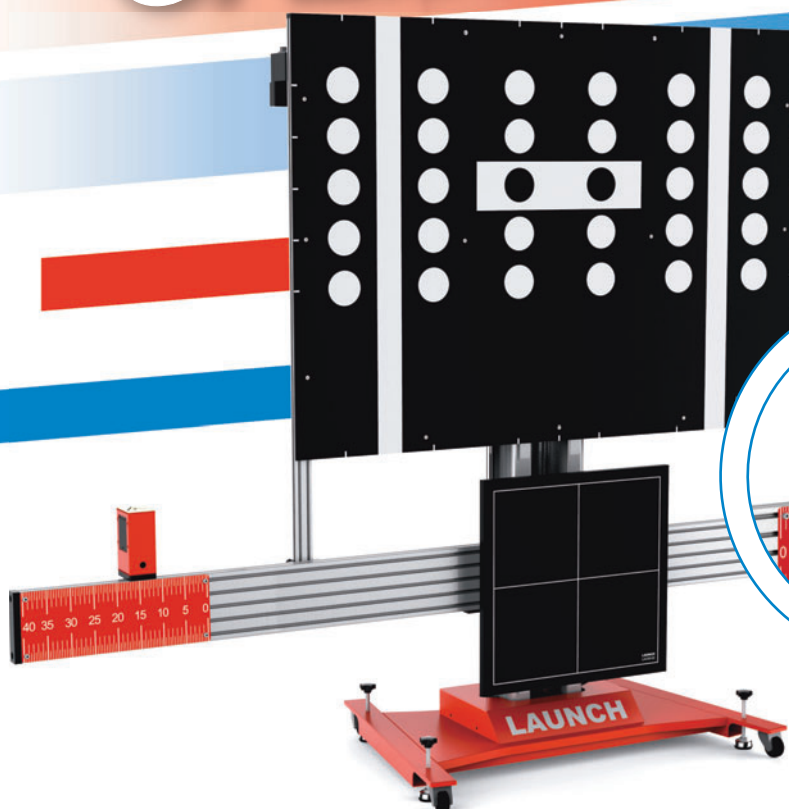
Understanding proper diagnosis and
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8 LESSONS LEARNED AND HOW TO APPLY THEM TODAY

Five things we have realized in the pandemic that can help our business

CHRIS "CHUBBY" FREDERICK // Contributing Editor

FINANCIAL FIGURES

10 WHAT A SHOP OWNER SHOULD BE DOING IN THEIR BUSINESS

Management is a position in the shop with key responsibilities

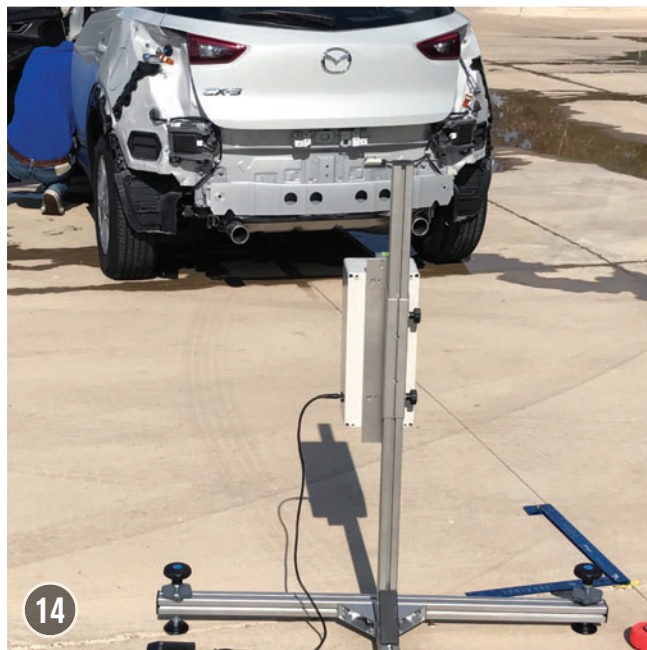
BOB GREENWOOD // Contributing Editor

ASA INSIGHT

12 CONGRESS CONTINUES ECONOMIC STIMULUS INITIATIVES

Paycheck Protection Program Flexibility Act becomes law

ROBERT REDDING // Contributing Editor



14

TECHNICAL

14 GETTING READY TO SERVICE ADAS-EQUIPPED VEHICLES

Build your understanding of some of these mission-critical safety systems, their operation, technology and the service opportunities they present

ERIC ZIEGLER // Contributing Editor

26 PREVENTING COLLISIONS — SAVING LIVES

Delving into the world of ADAS is not a question of "If," but rather, "How long will you wait?"

TRACY MARTIN // Contributing Editor

40 ADAS — A MOBILE TECH'S EXPERIENCE

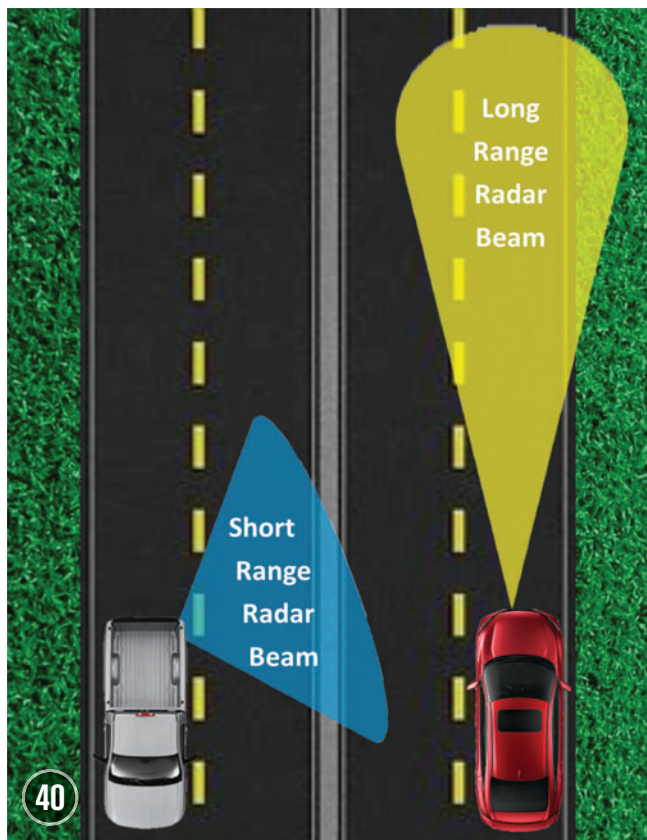
ADAS is tied into nearly every other electronic system on a vehicle today, so understanding proper diagnosis and calibration is vital

MIKE REYNOLDS // Contributing Editor

64 ALTERNATOR DECOUPLER PULLEYS — A SHOCK ABSORBER FOR THE ACCESSORY DRIVE

ADPs are designed to reduce shock loads in the accessory drive system. Learn more about their service and inspection.

PETE MEIER // Director of Training



40

IN EVERY ISSUE



4 INDUSTRY NEWS

AUTO CARE INDUSTRY RESILIENT, SET TO REACH \$448 BILLION BY 2023

MITCHELL 1 NAMES TECHNOLOGY STUDENT WINNER

50 TECH TIPS

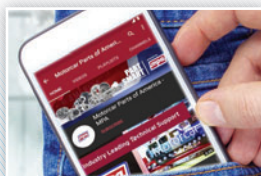
58 AUTOMOTIVE PRODUCT GUIDE

60 AD INDEX

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PARTS SMART NEXT LEVEL KNOWLEDGE

Learn more about MPA's new training resources for techs.
MotorAge.com/PartsSmart



WEB EXCLUSIVES // MOTORAGE.COM

GET EASY-TO-READ WIRING DIAGRAMS

Gary Hixon, marketing manager for ProDemand with Mitchell 1, walks you through how the update can help you find the exact wiring diagram you need, which can then make you a more efficient and accurate diagnostician. Using real wiring diagrams, Gary shows how the update takes seemingly simple ideas and brings them to life. No more flipping through 16 pages of wiring diagrams to find one small section. Jump to the area you need. Interactive diagrams allow you to click on components to highlight wires. Highlight the entire length of the wiring to keep your place from page to page. Bringing together a variety of information into a wiring diagram, Mitchell 1 illustrates how the new features can improve your skills. Watch and learn how to utilize the update for yourself!

MOTORAGE.COM/WIRINGLOOK

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AUTO CARE INDUSTRY RESILIENT, SET TO REACH \$448B IN 2023

MOTOR AGE WIRE REPORTS //

 The Auto Care Association released its award-winning and industry-leading online publications, the 2021 Auto Care Factbook and the 2021 Auto Care Factbook & Lang Annual. The new editions of these annual reports come at an unprecedented time as the auto care industry is just beginning to recover from the global economic effects of COVID-19. This edition, more than any other in its 30-year history, serves as a vital resource that provides the latest and most critical data and insights that aftermarket businesses need right now to make informed, data-driven decisions for their bottom lines and their future.

The 2021 Auto Care Factbook includes industry analysis in light of the

pandemic and stay-at-home orders that have impacted driving behavior and, consequently, vehicle maintenance, repair and purchases. Despite the downward forecast for the industry's performance in 2020, the industry continues to be a pillar of the U.S. economy, projected at \$380 billion for the year and expected to rebound in 2021, reaching \$448.9 billion in 2023.

New this year, Auto Care Association members accessing the Factbook will be able to access up-to-date data in the new TrendLens interactive data platform. There, members can drill down on data points, and filter and overlay with other data sets to get the full picture of the industry.

In the 30th edition of the Auto Care Factbook, readers will find:

>> **FACTS CONTINUES ON PAGE 6**

BREAKING NEWS

AWARDS

MITCHELL 1 NAMES TECHNOLOGY STUDENT WINNER

 Rowdy Wood from Coalgate, Okla., has been named the 2020 Mitchell 1 Automotive Technology Outstanding Student. Each year, Mitchell 1 recognizes one U.S. or Canadian student for outstanding achievement in automotive technology and auto shop repair scholastics. Wood will receive a \$3,000 scholarship and a \$250 Snap-on gift card. The scholarship program is administered through the North American Council of Automotive Teachers (NACAT) Education Foundation.

"Mitchell 1 is proud to recognize Rowdy Wood for his outstanding achievement and dedication to pursuing educational excellence in the automotive technology field," said Nick DiVerde, senior marketing director, Mitchell 1. "With his drive and passion for auto diagnostics

>> **WOOD CONTINUES ON PAGE 6**

TRENDING

BOLT ON TECHNOLOGY LAUNCHES THIRDGEAR

BOLT ON TECHNOLOGY has released ThirdGear, an upgrade to its NextGear platform that will incorporate robust online appointment setting capabilities to ensure repair bays remain busy.

MOTORAGE.COM/GEAR

WIX FILTERS UNVEILS EXPANDED E-LEARNING

WIX Filters launched a new, modern version of their Filtration eLearning Center, providing multiple curriculum levels specific to the world of filtration, in a convenient online training center.

MOTORAGE.COM/ELEARN

BUILD BANKING RELATIONS TO BOOST BUSINESS

In this Remarkable Results episode with Carm Capriotto, he speaks with sources about why it is important to maintain a relationship with your banker.

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THE GROUP ADDS ELECTRIC COURSES

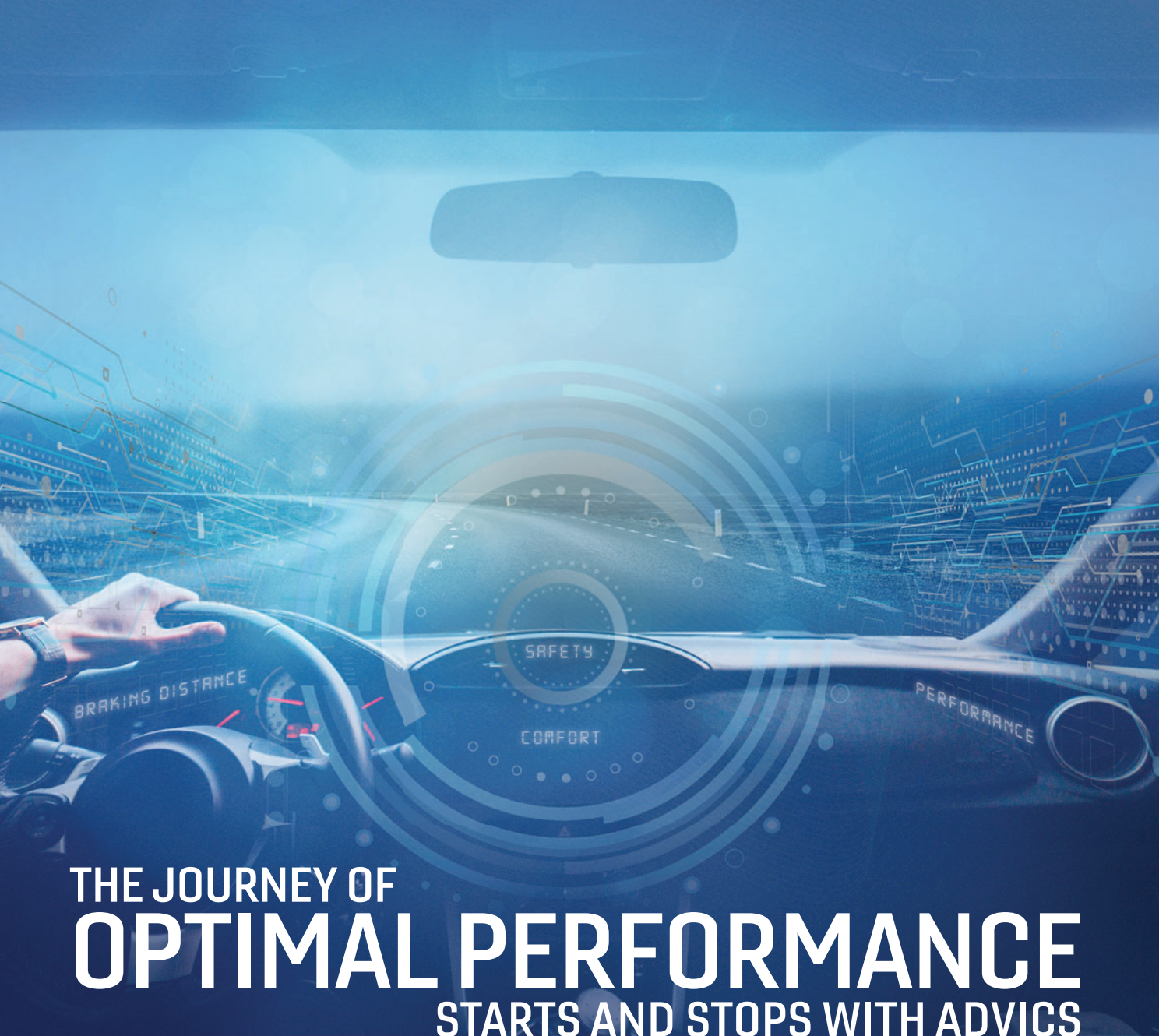
The Automotive Parts Services Group is adding an advanced training tool and courses to The Group Training Academy to educate techs about electric and hybrid electric vehicles.

MOTORAGE.COM/COURSES

IMR: CHALLENGES FOR SHOPS AND TECHS

IMR Inc. has released an update to a February report specific to COVID-19 to its original findings focused on the top challenges for independent repair shops and techs in 2020.

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>> FACTS CONTINUED FROM PAGE 4

- Updated “Key Economic Indicators 2015–2019” and COVID-19 outlook by Northwood University (p. 6-7);
- Impact and Sentiment of COVID-19 on the U.S. Aftermarket (p. 10-11);
- An extended Industry Forecast through 2023, including COVID-19 impact, by IHS Markit (p. 14-15);
- An updated “Global Automotive Aftermarket Review” by Jefferies, factoring in the COVID-19 impact on the industry (p. 24-41);
- Delayed Maintenance, Market Potential and Time to Market by IMR Inc. (p. 50-51);
- Insights on the Automotive After-

market in India (p. 100-101);

“Over the course of our more than 100 years as an association, the Auto Care Association has been providing products and services to the industry to help our members succeed,” said Bill Hanvey, president and CEO, Auto Care Association. “In times of uncertainty, having the appropriate data is critical to finding clarity and making informed decisions. This year’s edition of the Factbook provides key data on COVID-19 impacts and implications that our industry needs to confidently navigate the road to recovery.”

DIY and e-commerce are growing exponentially during the pandemic, further indicating an accelerated shift

to digital in the auto care industry and its ability to adapt to consumer demands. Early indicators show that the average age of vehicles on U.S. roads will continue to rise as consumers hold on to their aging vehicles during economic uncertainty. Miles driven, while disrupted due to stay-at-home orders, started seeing the first signs of recovery in mid-April.

The 2021 Auto Care Factbook & Lang Annual includes the Auto Care Factbook plus the Lang Annual, which provides a supplemental, comprehensive overview of the U.S. light vehicle aftermarket and presents information and analysis available from no other source. **TL**

>> WOOD CONTINUED FROM PAGE 4

and repair, we know he will achieve his goals and have a very successful career

in the auto care industry.”

As a recent high school graduate, Wood will attend Oklahoma State

University Institute of Technology in Okmulgee, Okla., in the fall of 2020. His goal is to obtain a Bachelor of Applied Science Degree in Automotive Technology with a specialization in General Motors. He will intern at Stuteville Chevrolet in Durant, Okla., as part of the program’s requirements.

While in high school, Wood also attended the Kiamichi Technology Center in Atoka, Okla., for two years where he was enrolled in the automotive technology program. He represented Kiamichi at the 2019 Skills USA national conference and was named the Kiamichi Technology Student of the Year 2019-2020.

To be eligible for the Mitchell 1 Automotive Technology Outstanding Student scholarship, applicants must be a current student majoring in automotive technology/auto shop repair course work and must meet the following criteria, be nominated by his/her NACAT instructor, maintain a minimum overall 3.0 GPA, have plans to attend (or already be enrolled in) an accredited college or university, and be a U.S. or Canadian citizen. **TL**

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Lessons learned and how to apply them today

Five things we have realized in the pandemic that can help our businesses

For better or for worse, we have all been touched by the pandemic in some way. ATI's Coach Team Leader Mike Haley explains what ATI clients have been doing during the outbreak.

When the authorities started shutting down the town, the county and eventually the state, chances are, your shops were still filled with cars, customers were buying and the technicians were busy. We all questioned if the COVID-19 virus was really a pandemic and how long it will last. Then we wondered what we were going to do to protect our families and businesses.

Lesson 1: Fight or flight?

When humans see a threat, their first response is fight or flight. I must have fielded 50 calls from shop owners asking if auto shops were an essential business. My answer: of course! Auto shops are needed to keep this country moving and to keep first responders and other essential workers on the road to do their jobs.

In today's pandemic, the important thing is to choose the correct response

for your business, family and community.

To stay open or shut down was a hard decision that every owner had to make with very little information. Whatever you decided at that time, you quickly learned that it had to be communicated to customers and your community. You had to use all your communication tools to let everyone know what you're doing — especially if you're open for business.

A FIRST RESPONSE MAY BE FLIGHT. BUT CHOOSE THE CORRECT RESPONSE FOR YOUR BUSINESS, FAMILY AND COMMUNITY.

Lesson 2: Who stays and who goes?

The safety and health of our employees and their families needed to be our top priority. We had to consider who lives with a family member who has a compromised immune system? Who has infants at home and daycare issues? Any

of these factors could trigger a flight response for employees. Then we had to take our best guess at determining the impact of the quarantine restrictions on car count over the following months. We had to decide whether to furlough, lay off or run a modified schedule.

What I learned is that shops quickly determined a staffing plan that utilized their team in a way that made the most sense. In some cases, they got creative by splitting their staff into two teams and alternated their work schedules.

Lesson 3: How long can I afford to do this?

What do I have in cash and how long will it take me to access more? Knowing I have deferred and renegotiated every expense possible, what is my new sales goal? Have I taken 3 percent of my gross sales and put that into a rainy-day account? Did I listen to my coach and keep three to six months of operating expenses in the savings account? What am I willing to give up to keep this business going?

Lesson 4: How to provide touchless services?

Great forward-thinking owners and employees jumped into action and created the touchless processes we are using today. Taking advantage of our early bird drop-off system. Removing the seats in the waiting room. Creating sneeze guards at the service counter. All our tools that were used for keeping the customer's vehicle clean were now used to keep the technicians and the customers safe. Wiping down everything the customers, advisors and technicians



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touched on the car. Dusting off the drop-off and pickup program we put to the side because it was a hassle. And figuring out a touchless process for collecting money. Thankfully, credit card processing companies and POS companies stepped up with text to pay programs.

Lesson 5: How do I keep feeding the machine?

Our marketing strategy had to change. Everyone was home scrolling on Facebook, so we had to focus our energy on social media. In the beginning, shops had to announce if they were open for business. Then, they promoted how they could service customers' vehicles in a safe and convenient manner. Last, many of them got creative to increase car count — partnering with neighboring businesses, takeaways and adding value by engaging people with contests and other forms of entertainment.

This experience validated what I knew since I entered retail. People will pay for convenience. Dropping off, servicing, and performing an unrelated service is something customers crave. Really take a hard look at your drop-off and pickup program. I also found customers enjoyed the after-hour offerings. The ability to rid the vehicle of harmful germs and bacteria would be helpful for customers that suffer from compromised immune systems.



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


than 1,700 shop owners every week across North America to drive profits and dreams home to their families. Our 32 full-time Certified Performance coaches have helped our members earn over ONE BILLION DOLLARS in return on their coaching investment since ATI was founded. This month's article was written with the help of ATI Performance Coach Team Leader Mike Haley.

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Other good practices and services to keep include partnering with your vendors and other small businesses to co-market or fundraise for the community. Continue to give the customers multiple ways to communicate and pay with you.

Regarding staffing and scheduling, consider alternative work schedules. Could you transition to a four-day work

week, change your hours of operations, or stagger shifts? I challenge every shop to improve your shop operations and services for your customers.

You cannot prepare for everything. But you can be better prepared than you were yesterday. For a copy of ATI's COVID-19 Checklist, simply go to www.actionlinetraining.com/2020-07. 

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What a shop owner should be doing in their business

Management is a position in the shop with key responsibilities

Many owners struggle with the point of “managing” their business. Management is a “position” within the business and has key responsibilities. Here are two checklists to guide your function and if in doubt on any points, get into a shop management business class to understand with clarity management’s role today in a successful business.

Business Financial checklist

- Complete a year-end bankers analysis and the Return on Investment form.
- List business strengths and weaknesses and prepare a written plan to eliminate weaknesses.
- Update software to track the recommended revenue categories required in order to analyze the business properly.
- Set the gross profit percentage return for each revenue category.
- Adjust and implement the maintenance, diagnostic and reflash door rates according to formula.
- Use the Pricing for Profit formula to calculate the number of customers the business can afford to lose in a worst case scenario at the new door rates.
- Track recommended revenue and expenses.
- Review inventory and track and measure inventory turns by category and line as recommended
- Review all account receivables and complete a profit analysis on each account. Bring A/R into recommended guideline.
- Complete the personal breakeven form to establish desired personal net monthly income.

- Complete a business operation and profit plan with daily sales objectives.
- Calculate average billed hours per invoice. Review increases required to meet objective.
- Calculate shop site efficiency.
- Calculate the requirements to achieve 80 percent shop site efficiency.
- Review front counter processes, capturing the techs’ time to achieve the billed hours objectives

GET INTO A SHOP MANAGEMENT BUSINESS CLASS TO UNDERSTAND WITH CLARITY MANAGEMENT’S ROLE IN A SUCCESSFUL BUSINESS.

Business Operational checklist

- Check management’s attitude daily to ensure positivity.
- Set up a meeting with the bank account manager to review business results and the business plan.
- Define in writing the value the shop offers its customers and clientele and hold a staff meeting to explain the new business philosophy, the shop strategy to deliver the value and retain clients and what’s in it for them.
- Hold staff reviews to re-enforce the staff meeting and define expectations of each staff member to complete their role as part of the total team.
- Report daily to the staff reviewing the business objectives and the progress being made as each month moves forward.
- Review vehicle inspection and

documentation procedures.

- Subscribe to all necessary websites that enhance the business in operations, information and knowledge.
- Review front counter processes for invoicing.
- Review outside and inside shop appearance and atmosphere as it pertains to client perception.
- Meet with the main parts supplier to review the business objectives, strategy and how you can work together to achieve a win/win business relationship.
- Complete individual staff reviews every six months.
- Review monthly key business and technical articles in aftermarket journals.
- Meet with the business attorney to complete a Power of Attorney form.
- Meet with the business accountant to discuss and prepare a baseline succession plan.
- Review annually all insurance requirements for the business and personal needs such as liability, life and disability income supplement.
- Meet every 6 months with the bank and submit a report on business progress.

The shop business today is far from a “trade” concept and truly is a “profession”. **TZ**



BOB GREENWOOD,

AMAM, is president and CEO of Automotive Aftermarket E-Learning Centre Ltd. (AAEC), which provides business

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

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Congress continues economic stimulus initiatives

Paycheck Protection Program Flexibility Act becomes law

The U.S. Congress has completed work on four COVID-19 economic stimulus initiatives. Recently, Congress has moved forward with the Paycheck Protection Program Flexibility Act. This new law includes the following key provisions:

- Extends the covered PPP period from 8 weeks to 24 weeks.
- Replaces the 75/25 rule with a 60/40 rule. The current rule requires that 75 percent of the loan must be used on payroll costs and 25 percent to be used on mortgage interest, rent and utilities.
- New PPP loans will receive a 5-year maturity. Existing loans remain at a 2-year maturity.
- Allows businesses that receive forgiveness to also receive payroll tax deferment.
- Ensures small businesses won't be penalized by high unemployment benefits.
- Creates a safe harbor for businesses that are required to open at only 50 percent capacity.

Prior to the Paycheck Protection Program Flexibility Act becoming law, the House of Representatives passed its fifth COVID-19 economic stimulus package, the HEROES Act.

This partisan legislation proposes additional changes to the PPP program. The Senate has not yet scheduled action for the HEROES Act, but is considering its own fifth stimulus legislation, likely to occur this summer.

Congress has continued to monitor the PPP and EIDL programs. Numerous members of Congress have proposed additional legislation to assist small businesses during the pandemic period. The Administration has been very active in implementing these new programs and reforms quickly. As part of Congress' oversight of the stimulus programs, in a recent hearing before the U.S. Senate Small Business Committee, Secretary of the Treasury Steven Mnuchin testified, "Turning to the PPP, the SBA and Treasury worked together to launch this unprecedented program in only six days. In less than two months, the PPP is supporting the employment of



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approximately 50 million workers and more than 75 percent of the small business payroll in all 50 states. This is an extraordinary achievement."

The Automotive Service Association (ASA) has been concerned about the long-term impact of the COVID-19 pandemic on auto repair shops and has joined the America Recovery Fund Coalition comprised of over 100 organizations across 30 business sectors. The Coalition seeks to address those economic issues for the business community that reach beyond the assistance of the PPP program. Specifically, the Coalition has asked Congress to consider a fund that:

- Provides federal grants for operational expenses to help businesses reopen and stay open as they navigate a new normal.
- Includes anti-abuse mechanisms and strict federal oversight.
- Differs from PPP in several meaningful ways:

It is much less restrictive to the size and type of businesses that are eligible. It gives businesses important additional leeway for how they use funds. It is designed to avoid the unintentionally competitive environment created by PPP scarcity. It provides a level of certainty at a time of unprecedented levels of uncertainty. And, it would be a largely automated, transparent application that does not require existing relationships with third-party lenders.

With this year being an election year, this second session of Congress will likely be short. Hopefully, the Senate will complete work on the fifth COVID-19 economic stimulus package before going home for the August break. Congress will return in September for what will be a brief period to complete work on the Fiscal Year 2021 appropriations legislation. **TR**

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

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GETTING READY TO SERVICE ADAS-EQUIPPED VEHICLES

BUILD YOUR UNDERSTANDING OF SOME OF THESE MISSION-CRITICAL SAFETY SYSTEMS, THEIR OPERATION, TECHNOLOGY AND THE SERVICE OPPORTUNITIES THEY PRESENT

ERIC ZIEGLER // Contributing Editor

We are all fishing in the lake of automotive diagnosis, repair and service, looking for our big catch. With the newer technologies available in virtually all of today's vehicles, it's as though the lake has been freshly stocked. See how your business can capitalize on and acquire the proper tools and training to deal with the technologies of ADAS and take your business well into the future.

It seems like the term ADAS — Advanced Driver-Assistance Systems — is everywhere you turn. It is all over training print materials, print ads and magazines such as this one. It is most certainly automotive repair's new "it" topic, indeed! One would have to either have been on a deserted island or in a coma for the last few years not to have heard mention of this new technology that is migrating its way into the modern automobile. What once was a conjecture of cartoons of the past like the Jetsons is now commonplace on not only high-end but also many bas-level vehicles offered by many auto manufacturers. The question is, "Are you/is your shop ready for ADAS-equipped

vehicles and the service opportunities and challenges it presents?" This article will examine some of these mission-critical safety systems, their operation and technology, the service opportunities they present, as well as the service information required to do so.

One of the first precursors to ADAS systems we have to experience was the backup camera. It started in high-end vehicles and became common as the technology became more affordable. The legislation was introduced in 2014 to have it become standard equipment and OEMs were given a few years' grace period. By 2018, all US vehicles were required to have this life-saving feature. According to NHTSA, nearly 200 people are killed each year and another 14,000 are injured in so-called "back-over accidents" when drivers backed over another person without noticing them. This is the impetus of all ADAS systems. They improve vehicle safety, reduce accidents, injuries and in many cases save lives! A simple high-resolution camera much like the one in your laptop webcam or even a cheap cell phone attached to the rear of the vehicle, usually above the license



ONE OF THE FIRST SYSTEMS TO USE CAMERAS was the rearview camera, or back-up camera. Convenience was secondary to safety in developing this system, designed to help prevent the more than 14,000 instances of drivers backing over individuals they didn't or couldn't see.

plate or on the trunk or hatch, gives the driver a better view of what was before below the field of vision. Distance lines or grids are often added to the camera's viewed image to give the driver a sense of depth and to aid in backing up while parking. This works in conjunction with Park Aid Sensors on higher-end vehicles to detect the proximity of the vehicle to objects while backing up. On many vehicles, the back-up camera with grids was substituted for the ultrasonic park aid sensor system, reducing the cost because the camera technology was far less expensive to produce than the multiple ultrasonic sensor systems. As the price of these ADAS

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technologies comes down, more models are produced with them. What once were luxury car amenities are now showing up as standard equipment on many OEMs' base models. Both of these were Level 0 autonomous features as defined by SAE. They assisted the driver, but the driver was responsible for all driving. They are limited to warnings and some momentary assistance. Later as technology and sensor fusion advanced, we added the ability to apply the brakes while backing up to avoid hitting a pedestrian or a vehicle we may be backing out in front of. Let us investigate some of the other levels of autonomy, their definition, ADAS systems and safety features they provide the driver.

SAE five levels of autonomy

Level 1 offers a small degree of driver assistance, allowing for some hands- or feet-off operation. The driver is still in charge of the vehicle, but the vehicle can provide steering or acceleration or braking independent of the operator, but not at the same time. An example would be ACC or Adaptive Cruise Control.

Level 2 is similar to Level 1, with the driver still in control, but the ADAS system can provide steering and acceleration simultaneously. Levels 0, 1 and 2 ADAS systems support the driver, who is still in control of the operation of the vehicle.

Level 3 is truly the point where the vehicle starts to become autonomous. These vehicles allow for the operation of the vehicle without direct driver input. The vehicle can "drive" itself from "point A" to "point B," but only after certain enable criteria or conditions are met. In the event of an emergency, the driver is to take control. Cadillac's Super Cruise or Audi Autonomous Self-Parking would be examples of this technology.

Level 4 removes the driver from

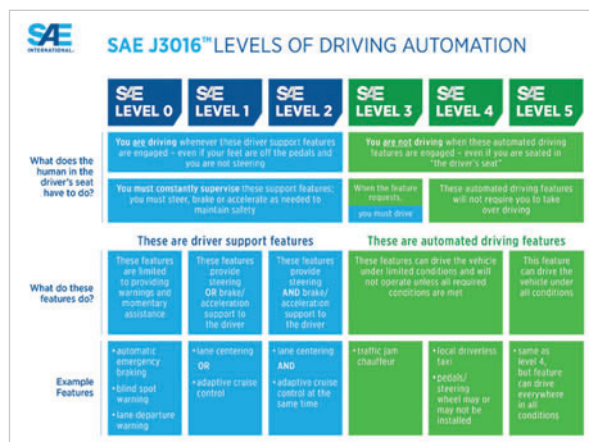
the operation of the vehicle. You are just a passenger along for the ride. Many Level 4 vehicles may not even have pedals and/or steering wheels. An example of these vehicles would be local driverless taxis.

Level 5 is like Level 4 vehicles, just at a more advanced level. They will not have pedals or a steering wheel. The main difference is that they can operate the vehicle under all conditions. These are truly autonomous vehicles, where one would enter and tell the vehicle the destination and sit back and enjoy the ride!

There is no doubt that ADAS is not just a one-off but is here to stay. The technology saves lives and reduces collisions/losses. So, there will be no putting the genie back in the bottle. Moreover, the question isn't one of whether or not you service these systems, rather one of when you are going to. ADAS changes a lot of the everyday tasks we already do like suspension, alignment and brake work.

The eagle eyes of ADAS

While back-up cameras and ultrasonic park aid sensors may not seem to be the latest cutting-edge equipment when we think about modern vehicle ADAS accouterments, they represent some of the fundamental technologies that make ADAS work. It may be an oversimplification to state, but most ADAS systems work off either cameras and their images or a sensor(s) emitting sound, light (LIDAR) or radio waves (RADAR). For the scope of this article, we will limit the discussion to RADAR and camera image technologies. Often, they can be used for the same ADAS function, just



SAE DEFINES FIVE LEVELS OF AUTONOMY

used differently between OEMs. For example, Adaptive Cruise Control (ACC) needs to know the distance of the vehicle in front of you and the rate of speed at which you are closing in. Several manufacturers such as Toyota, Ford and Honda, embrace RADAR technology for the job and have a sensor or module in the front of the vehicle sending out electromagnetic pulses and making calculations of the rate of closure and distance based upon the time it takes for them to return. Other OEMs like Subaru and Tesla embrace camera technology for their ACC operation. Both have their advantages and disadvantages; no one technology dominates in the ADAS world. There are even OEMs that through what is known as sensor fusion incorporate both. As we move into the higher level of autonomous vehicle classification, Level 3 and higher, we see multiple technologies incorporated like long, medium and short-range RADAR, multiple cameras, ultrasonic sensors and LIDAR all working in tandem with one another.

Knowledge is power...but it's also profitable

All this technology is life-saving and very appealing to the modern vehicle owner. But what does this mean to us as technicians and shop owners? The short answer is it's opportunities! Think about



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all the traditional revenue streams that we were used to that have been slowly scaled back from us. Parts are lasting longer, dealers are price matching tires, installing wiper blades, performing flushes, etc. ADAS provides us an opportunity for a new revenue stream. It also requires us to invest in some tooling, training and infrastructure to perform these repairs and calibrations. It is the same trait we have had to embrace in our industry — being able to adapt to change. Whether you feel the inevitable autonomous car is a bad idea or whether you want to own one is irrelevant; the question is are you willing to adapt to the change in technology and take advantage of the opportunities they

present to service?

So where do we start? Knowledge is power — accurate service information is an absolute bare minimum to start servicing these mission-critical ADAS systems on modern vehicles. Knowing when to perform ADAS calibration is arguably as important as to how to perform the calibration. I prefer OE SI (Original Equipment Service Information). There are many vendors of service information that cut/paste OE SI, so it doesn't necessarily mean you need OE SI for every OEM. I am always a little leery of tools that have the instructions built-in. I would strongly suggest to ALWAYS look up the OEM's procedure and read it thoroughly and



OUR COLLISION COUSINS ARE FACED WITH NUMEROUS CHALLENGES

when it comes to restoring a customer's car. If it isn't done right, someone can get hurt. Keep in mind you face similar responsibilities — and liabilities.

completely for EVERY ADAS calibration performed! OE SI documents give very specific details as to how much space is required, critical measurements for grid setup and target place-



WHETHER ALIGNING A CAMERA OR RADAR, placement of the target is critical. Any change made to the vehicle that alters its ride height or centerline will likely require recalibration. Check the SI for details.



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ment, target heights, special tools and targets required to do the calibration accurately and properly to ensure the correct operation of these mission-critical safety systems. Read and follow the instructions listed in OE SI documents to the “T.”

The OE SI document will also list the tools specified by the OEM to per-

form the calibrations on their systems. The OEM writes SI for dealer/factory technicians and specifies the tools required to be ones that the dealer already possesses. For example, Toyota calls for use of the OE scan tool Techstream and specific essential tools for targets. It does not specify an aftermarket alternative to the OE factory tools.

This is where there is a split or difference of opinion in the repair industry. There are many non-OEM players in the ADAS tool calibration industry and more and more coming out every year. Often, there is a complete “system” of targets — some even resized from the OEM original targets and an aftermarket universal scan tool. The “advantage”



THINK OF SIGHTING A CAMERA OR RADAR LIKE SIGHTING A RIFLE SCOPE. Remove the scope and you'll have to readjust it — no way to put it back in the exact same position. And if the rifle isn't level, you're never going to properly align the scope.

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for a shop purchasing these tools is a “one tool fits all approach” that keeps shops from having to purchase each OEM scan tool, SI and OEM-specified targets. Proponents of these tools claim the tool merely directs the ADAS system to look for the target and that poor setup and target placement are a greater risk than which tools one uses. There is a moniker of truth to this as I see it. The question to me is more an issue of liability. There is a liability in everything we do in the auto repair profession. The goal, as I see it, is to limit one’s exposure to said liability and these mission-critical safety systems. A trainer friend of mine used to say, “It all depends on your tolerance to pain.” I have a shop owner friend who ada-

manly instructed his techs that their shop’s goal is that comebacks of any sort should be avoided. He goes on to tell them if the vehicle comes back due to the check engine MIL coming back on, that is one thing. But, if they were to have a comeback due to having no brakes after doing brake work, that is a different scenario. The exposure to liability is much greater in that scenario than if the MIL is coming back on. Now think about ADAS systems that can brake, accelerate and steer the vehicle! Therefore, we must be extremely thorough in knowing where, when and how to do these calibrations. Moreover, they require a technician to be extremely detail-oriented and precise in their setup, target placement and execution of the procedures.

Taking the short-cut can lead to consequence

The other side of the split in the industry would be the one I and many others favor, all OEM — all the time. This school of thought is to use OEM SI for looking up the exact procedure and the specified OEM tools required to perform the calibration. I base my opinion on this on a couple of principles. First, who better than the OEM to know how they want their systems scanned, serviced and calibrations performed. Consequently, liability plays a large role in my decision to follow the OE tool method. My “tolerance to pain” is small. Some may be familiar with the John Eagle lawsuit that sent waves through the collision repair industry.

A great deal of the judgment revolved around a vehicle being repaired and whether OE service procedures were followed exactly. The case involved a Honda Fit that had the roof replaced; when it was installed it was chemically attached with a common industrial adhesive used in the collision industry rather than spot welded

in a specified manner Honda outlined in its OE SI. There was a subsequent accident with multiple injuries. The collision center was ultimately found negligent and the plaintiff was awarded millions of dollars in damages. My interpretation of this lawsuit was that the OEM — Honda, in this case — had VERY thorough and detailed instructions as to how to repair their vehicles post-collision damage and failure to follow them resulted in exposed liability. I see ADAS calibration much in the same way. Some may disagree, I get that, but as an owner of a small business that performs these calibrations daily, I can ill afford to expose myself to any more liability than is needed. The OE SI is incredibly detailed as to the calibrations of these mission-critical ADAS systems. There has not been a John Eagle-style ADAS lawsuit as of yet, but I believe it is just a matter of time. I don’t mean to give folks apprehension about servicing these systems, but rather to inform so you can approach this with eyes wide open so you can make informed decisions regarding servicing, tooling and information allocation.

The next question for repair facilities is to look at when to perform an ADAS calibration on vehicles. If you are involved with local collision centers doing sublet work for them like suspension, steering, brakes, pre or post scans or module programming, this is just another service you can provide them. If you are servicing collision centers, you might want to look into trying to add them to your clientele. Moreover, if you are just servicing the general motoring public, ADAS opportunities are either currently present in your bays or soon will be. Again, consider the possibilities of being able to add another revenue stream to your shop. Regardless of your business model, the important part is that you are not unwittingly turning out

JOHN EAGLE VICTIM SPEAKS OUT

In late 2017, Matthew and Marcia Seebachan caught the attention of the collision repair industry by winning a \$42 million verdict against John Eagle Collision Center in Dallas, TX with the help of attorney Todd Tracy. Now, in an exclusive interview with *Texas Automotive* (the official publication of the Auto Body Association of Texas and the Houston Auto Body Association), Marcia speaks to industry writer Joel Gausten about the aftermath of the near-fatal 2013 accident and the life she and her husband have now.

In addition to frequent pelvic pain and ocular migraines, Marcia now has a stent in her aorta that needs to be assessed by a vascular surgeon on a regular basis. She was in her late twenties when the crash took place. Read more at [MotorAge.com/JohnEagle](https://www.motorage.com/JohnEagle).



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work — let's say front end or suspension work that is fundamentally incomplete due to calibration not being performed or the customer apprised. So where do we find this information? Quality service information is a must. I prefer OE SI. Look up every procedure and read through it to see if the parts you are servicing require any specific calibrations. Something as simple as changing a headlight assembly that required the removal of the bumper cover on a late-model vehicle with ACC will require an ADAS calibration. Replacing a cracked windshield in the modern vehicle also requires an ADAS calibration. Even disconnecting a battery may result in having to perform vehicle calibrations critical to ADAS. Consequently, as a rule of thumb, any significant change to ride height and steering geometry affects the positioning of cameras, radar and other fixed-position sensors. I would equate this to the sight of a rifle at the range. Once you get the scope sighted in, there is no way that you could remove it and reinstall or change its position and still have the rifle shoot exactly the same as before.

The goal of this article and subsequent coverage of this topic is by no means meant to scare off anyone who is on the fence about getting into servicing these ADAS. On the contrary, I believe they present opportunities and additional revenue streams for progressive shops that have a forward vision of their business model. There is a liability in everything we do. This is just part of the modern repair facility.

ADAS systems have a direct impact on personal safety, but so do brakes, tires and steering/suspension repairs. Consequently, technicians performing this work must be conscientious and detail-oriented. I would encourage you to start looking into the possibilities of ADAS. Educate yourself with quality training and service information. Read up on

SI regarding the tools and procedures required by the OEM to perform these calibrations and consider them when making any tool purchases. Don't fall for just a salesman's pitch; ask tough questions like, "Is this validated by the OEM?" Kick some tires and make an informed decision as to what will work for your business model. *M*

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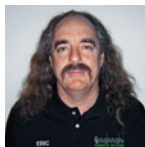
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ERIC ZIEGLER is an ASE Certified Master Tech who specializes in module programming, drivability, electrical and network systems diagnostics. He

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DELVING INTO THE WORLD OF ADAS IS NOT A QUESTION OF “IF,” BUT RATHER, “HOW LONG WILL YOU WAIT?”

TRACY MARTIN // Contributing Editor

Electronics makes up a significant portion of any automobile made in the last 35 years. This started in the 1980s with the widespread replacement of carburetors with early electronic fuel injection. Today, advanced driver-assist systems (ADAS) are one of the fastest-growing segments in automotive electronics and is the precursor technology to fully autonomous driving vehicles. One example of advanced ADAS electronics is Mobileye's EyeQ technology, which is used by 27 OEMs on 40 million automobiles worldwide. Mobileye is an Intel Company that manufactures the EyeQ vision-processor System-on-Chip. EyeQ

vision processors constantly monitor the driving scene in front of a vehicle and alert the driver of an impending accident with another car, pedestrian, bicyclist or motorcycle. The EyeQ system is also capable of detecting speed limit signs and controlling the vehicle's high and low headlight beams during night driving. Future-generation Mobileye devices will include camera-only automatic electronic braking, as well as various features enabled by self-driving technologies. Mobileye also makes retrofit systems for heavy-duty truck fleets.

Early ADAS systems include anti-lock brakes, stability control and traction control. It is estimated that around

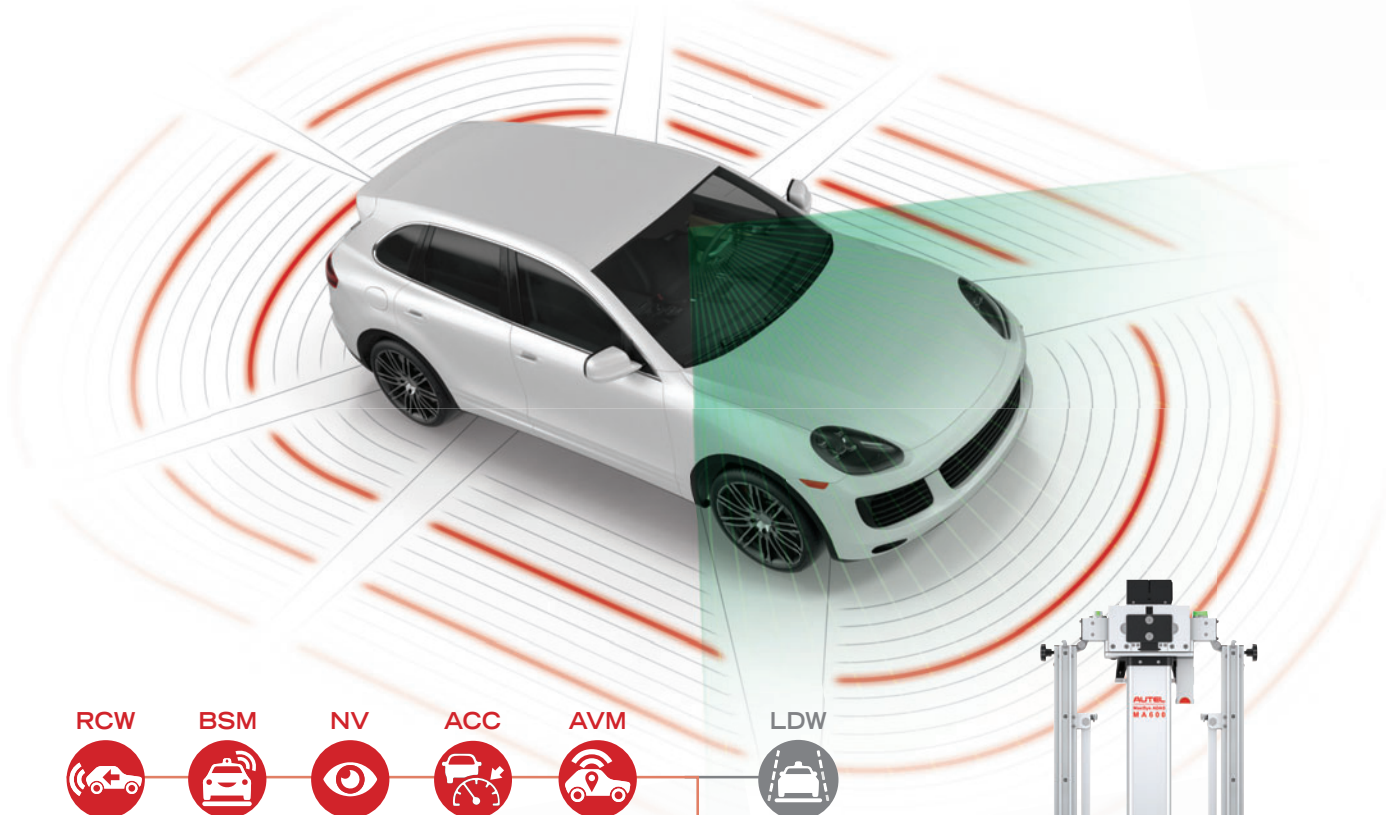
80 percent of vehicles today have at least one driver assistance system. Consumer surveys show that the car-buying public is becoming increasingly more interested in ADAS applications that offer driver comfort, safety and convenience. In this article, we will take a look at two ADAS systems: driver alert and collision avoidance.

The increased usage of ADAS will have a significant impact on the auto repair industry as well. Even a simple job like replacing a windshield or bumper is complicated by the presence of ADAS sensors that need to be re-calibrated. Companies like Autel, that manufacture the MaxiSys ADAS

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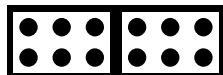


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PHOTO: MOBILEYE



THE MOBILEYE 8 CONNECT SYSTEM

provides drivers with audio and visual warnings of potential hazards on the road. These systems can be retrofitted to any vehicle and are often installed on truck fleets.

Calibration Tool, and Bosch, who sell their DAS 1000 Calibration Set offer potential revenues for independent repair shops who will, in turn, have to educate consumers regarding increased costs for windshield replacement and/or accident repair.

Sleepy driver alert systems — a voice of reason

Wake up! Anti-sleep pilot, Driver Condition Monitor, Fatigue Detection or Tiredness Detection Warning are some of the names of systems that warn a driver that they are not paying attention to the road ahead — time to get some coffee or pull over and take a nap. Studies have shown that an estimated 21 percent of fatal crashes, 13 percent of crashes resulting in severe injury and 6 percent of all crashes involve a drowsy driver. Becoming sleepy while driving creates issues that can cause bad things to happen. Sleepiness reduces reaction time, vigilance, concentration and alertness that all effect attention-based driving activities. Besides, the quality of decision making is affected by slower information processing. Studies in the U.S. and Europe have identified young, male drivers, under 30 years old, as a high-risk group that is involved in sleep-related accidents. The demographic is between



PHOTO: BOSCH

AFTER AN ACCIDENT OR COMPONENT REPLACEMENT, the Bosch DAS 1000 calibration set offers a means for professional adjustment of sensors and cameras used in ADAS systems.

21 to 25 years old and is another factor in high insurance rates for this age group. Also, sleep-related accidents tend to be more frequent between the hours of 2 a.m. to 6 a.m. and in mid-afternoon between 3 p.m. and 4 p.m.

There are four types of systems used in driver fatigue detection systems. Steering pattern monitoring uses input from a steering wheel sensor or input from an electric power steering system. These systems focus on monitoring steering wheel movements and deviations from the lane position to detect sudden or excessive corrections in the direction the vehicle is traveling. These inputs can trigger a driver alert if they become too frequent.

Another system uses a lane monitoring camera and works only when a driver is steering the vehicle, vs. an automatic lane-keeping system. Onboard artificial intelligence (AI) uses smart learning about driver behavior and can react to keep the driver alert. For example, if a vehicle receives frequent lane departure warnings, the system can alert the driver that it's time to pull over to take a break.

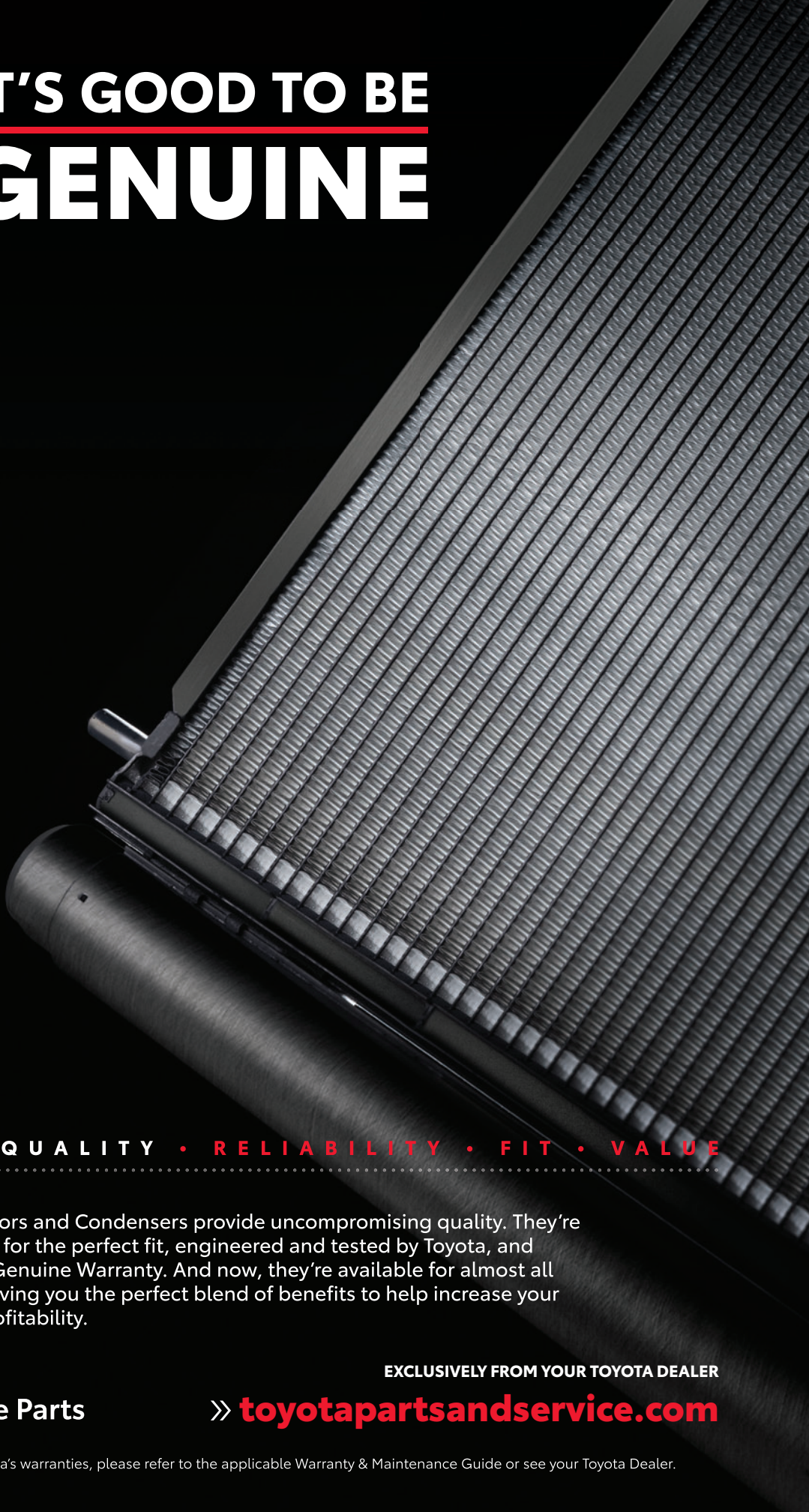
Driver eye/face monitoring is another technology used to detect driver fatigue. These systems use a camera to observe the driver's face, and in real-

time determine the driver's physical and mental condition based on its driver-face image database. The driver's state of alertness can be estimated from eye closure frequency, blinking, gaze direction, yawning and head rotation. These systems will sound an alarm when the driver reaches a hypovigilance state that indicates fatigue and/or distraction. Hypo vigilance is defined as an enhanced state of sensory sensitivity and anxiety that often leads quickly to exhaustion.

A fourth technology to determine driver alertness is a physiological measurement that requires body sensors to measure parameters like brain activity, heart rate, skin conductance and muscle activity. The reliability and accuracy of driver drowsiness detection by using physiological, or body measurement signals, is higher when compared to face-monitoring cameras. However, the intrusive nature of measuring physiological signals remains an issue. Just imagine, a driver would shave their head and place a dozen electrodes on their scalp to monitor brain activity (or lack thereof) and place other sensors on their chest to measure heart rate—who would want to look like a science experiment while driving down the highway? Instead,



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researches are exploring the use of sensors/electrodes placed on steering wheels and/or within the driver's seat as a more practical way to take these measurements.

While these four types of technologies can be used as a stand-alone system, it's more likely that they will be used in combination. For example, too many large steering inputs combined with too many eye blinks and excessive drifting into adjacent lanes of traffic would trigger a "stay-awake" alert.

Forward collision warning

Most drivers like to think that they are careful, attentive and have the driving skills to keep from running into other vehicles. And yet, drivers are human (or at least until fully-autonomous cars are on the road) and even the most skilled driving humans make mistakes. While driving we can become tired, distracted or misjudge the speed and distance of other vehicles around us, all resulting in a potential accident — and that doesn't include all the other drivers on the road that are, of course, less skilled than we are. It would be great if we had just a little help keeping us safe on the highway.

Not to state the obvious, but not having an automobile accident has many advantages, including one's car or truck looks better — no dings, dents, scratches on the paint and/or no missing parts; one doesn't have to visit the body shop — body shop work is never planned, routine maintenance; lower insurance rates — getting in too many fender-benders results in high premiums and/or no insurance coverage and finally, less driver/passenger stress — we have all ridden as a passenger with a driver who is constantly a hair's breadth away from running into another vehicle.

The basic concept that two vehicles should never try to occupy the same space at the same time is what forward collision warning (FCW) systems are

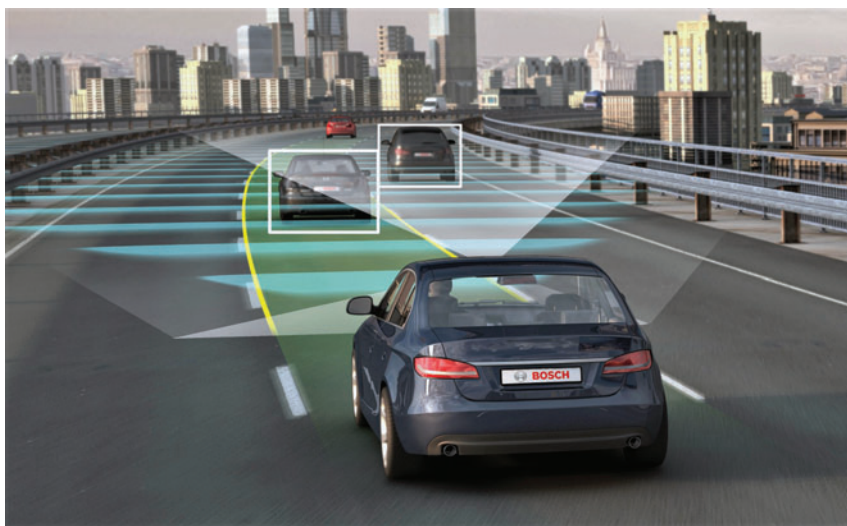


PHOTO: BOSCH

FORWARD-FACING RADAR, LIDAR AND STEREO-VIEW CAMERAS connected to a fast computer processor can detect other vehicles' speed and distance and provide alerts to drivers to avoid accidents.



PHOTO: BOSCH

A BOSCH RADAR UNIT CAN DETECT an oncoming vehicle that runs a stop sign or red light and provide input to warn the driver and/or apply emergency braking.

all about. OEMs are consistent in that they all choose a different name for their collision avoidance systems like Ford Forward Alert; BMW Pedestrian Warning with City Brake Activation; Mitsubishi Forward Collision Mitigation; Chrysler Full Speed Forward Collision Warning Plus, and of course Star Trek's Full Warp Speed Ahead — don't run into a stray planet.

Forward collision warning systems have been around for a few years, mostly

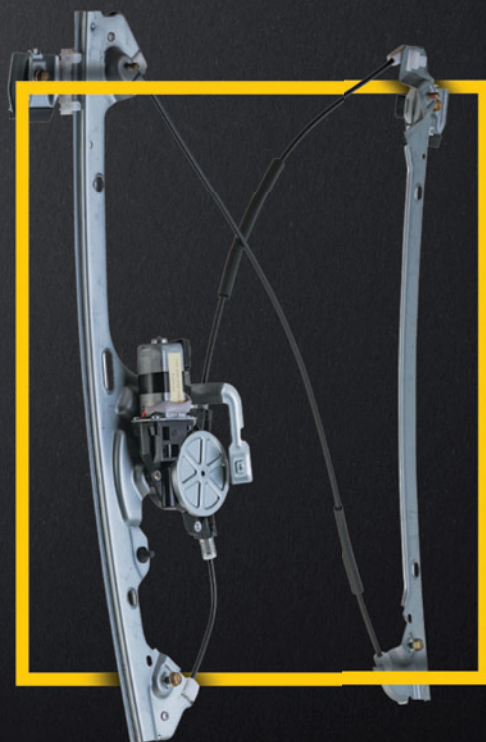
on high-end luxury cars. It has only been in the last few years that these systems can detect pedestrians, automatically apply the brakes and use electronic steering to swerve around vehicles or other objects. Today, FCW systems are offered on more mainstream, lower-cost vehicles. It's only a matter of time before some form of FCW will be required on all new cars. For example, the United States and the European Union are mandating that all vehicles be equipped

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with autonomous emergency braking and forward-collision warning systems by 2022. This is no different than past mandated safety technology like seat belts, ABS braking systems, airbags and tire pressure monitoring systems.

The most basic of FCW systems monitor a vehicle's speed, the speed of vehicles ahead and the distance between them. The system's computer does the "math" and if parameters reach a level where it is determined that a collision is about to happen, the system sounds a warning to the driver and/or on some vehicles applies the brakes in certain circumstances.

Depending on the manufacturer, several technologies are used for FCW systems including radar, lidar and cameras. Soon, when vehicles are wirelessly connected to the driving environment, GPS sensors will detect fixed dangers like stop signs, railroad crossings, lane merging and others. Radar is also known as "echo ranging," where a high-frequency light, audio frequency or radiofrequency pulse is sent out by the vehicle's radar collision avoidance sensor. If the pulse strikes an object, it reflects part of the pulse energy to return to the radar emitter where it is detected. The difference in time between when the detection pulse was sent out and the arrival of the reflected wave is then used to calculate the speed and/or range or distance to the object.

Light imaging, detection and ranging (Lidar) works on the same principle as radar but uses light energy to illuminate an object. The difference in the return time and the wavelength is used by the system to create a three-dimensional representation of the target or object. Lidar, also known as 3D laser scanning, was originally used to make high-resolution maps and has been adapted for use in ADAS systems. Lidar can sense objects as far away as 600 feet (200 meters) and because of its high energy avoids

most radio frequency interference. However, the downside is that it can take inaccurate readings from objects that have poor or no reflectivity — like clothing worn by pedestrians.

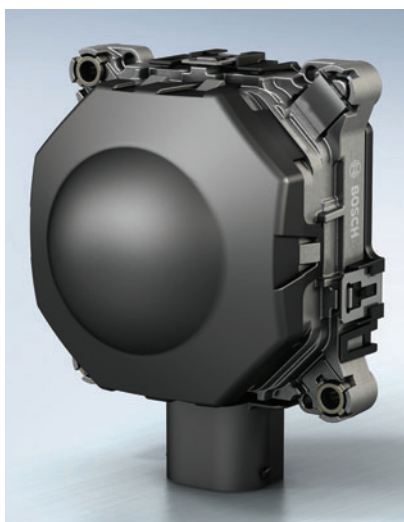
Using an onboard camera (or stereo-view cameras) is another method to detect surrounding vehicles or pedestrians. The camera produces a digital

image that a computer extracts dimensional data from and converts to numerical or symbolic information. This process is known as computer vision and is the analysis and understanding of information from a single image or a sequence of images. The computer compares digital images to a database and determines what an object is and what

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PHOTO: BOSCH



THE BOSCH LRR4, FOURTH GENERATION, LONG-RANGE RADAR SENSOR can detect other vehicles at a distance of 820 feet (250 meters). It can be used as part of FCW systems, adaptive cruise control and other ADAS systems.

to do about its presence, i.e. sound an alert and/or apply the brakes.

Other life-saving countermeasures

On some vehicles, similar technology offers collision avoidance for pedestrians. As early as 2004, Honda's Intelligent Night Vision is a system that detects pedestrians in front of a vehicle and alerts the driver. In the event of a collision with a pedestrian, the Volvo V40 uses seven sensors embedded in the front of the car that transmit signals to a control unit. The control unit evaluates the signals, and if it registers what it interprets as the vehicle running into a human leg, the pedestrian airbag is deployed. The hood hinges are each equipped with pyrotechnical release mechanisms which, when the system is activated, pull out a pin and release the rear of the hood panel. At the same time, an airbag is activated in front of the windshield. During the inflation sequence, the airbag raises the hood 4 inches (10 cm) and it remains in the raised position. The gap between the raised hood and the en-



PHOTO: VOLVO

WHEN THE VOLVO PEDESTRIAN AVOIDANCE SYSTEM ON THIS VOLVO V40 detects that a pedestrian has been hit, it raises the hood slightly and deploys an airbag that covers the windshield.

gine creates a space for the hood to deform and provide a dampening effect when it is struck by a pedestrian.

The use of ADAS that helps drivers with steering, braking, monitoring and warning tasks is expected to increase over the next 10

years. In part this increase in advanced driving technology will be driven by the automobile insurance industry, consumer advocacy groups and the government to provide safety applications that protect drivers, pedestrians and reduces accidents. Is your shop prepared?

Because ADAS technology can be critical in providing drivers forward collision, lane departure and pedestrian alerts, and on some systems automatically activate the vehicle's braking system, it is paramount that it functions properly. Many factors can cause an ADAS system to be knocked out of calibration, including collisions (even a minor fender bender), windshield replacement, wheel alignment and suspension repairs. Other factors affecting calibration include sensor mounting bracket removal or replacement, changes in tire size, front airbag(s) deployed or ADAS-related DTCs set.



PHOTO: AUTEL

WITH MORE VEHICLES EQUIPPED WITH ADAS SYSTEMS on the road, drivers' overall situational awareness of other vehicles offer a safer driving environment.

ADAS systems have to be properly calibrated to gauge speed and distance that are critical to their performance.

For example, a vehicle is involved in a minor accident that affects the front grill, knocking the forward-facing radar unit out of calibration (not pointing to where it's supposed to) could result in a misapplication of automatic braking. If the radar sensor is pointed up (even by a few degrees) the forward-collision warning system could interpret a bridge as a stopped vehicle and as the driver approaches the bridge, the ADAS system applies the brakes. Automakers recommend recalibration of ADAS sensors after collision repairs that also include a diagnostic scan before and after any work performed on these systems.

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PHOTO: AUTEL

A TECHNICIAN USES WHEEL CLAMPS AND LASERS to set up the Autel Calibration Frame level and parallel to the vehicle. The frame holds OE targets used to calibrate radar and camera sensors.

Complete Frame Targets Calibration Package for All Sensors, combined with their MaxiSys ADAS calibration tablet, provides independent shops the ability to work effectively on ADAS systems. The calibration packages include a frame that holds target pattern boards, sliding target crossbar, wheel clamps and wheel lasers, and vehicle-specific target boards.

With the vehicle level, wheel clamps with lasers are attached. This allows the technician to adjust the calibration frame parallel to the vehicle. The Autel MaxiSys tablet with ADAS calibration module offers technicians video and graphical step-by-step guidance for setting up and calibration procedures. The MaxiSys tablet instructs the technician as to which targets to use and the OEM procedure required for camera, radar or night vision calibration. With insurance companies paying between \$200 to \$300 for each ADAS calibration, and \$100 to \$150 for pre- and post-diagnostics, independent shops can justify the cost of this equipment.

The technological advancements that make up the systems representing ADAS are here to stay and are bringing



PHOTO: AUTEL

THE AUTEL MAXISYS TABLET IS USED TO SET UP THE FRAME TARGET CALIBRATION TOOL for ADAS calibration procedures. The tablet guides the technician through the process using video, graphics and complete instructions.

society ever-closer to the fully-autonomous vehicle. Encounters with these systems can no longer be avoided as they have virtually infiltrated every system on today's modern vehicles. The time is never better than right now to get the necessary training, information and tooling to see the prosperity of your business well into the future. **TM**



TRACY MARTIN has covered the powersports industries since 1998. He is also the author of six Motorbooks Workshop Series books published by the Quarto Publishing Group and is

a regular contributor for *Motor Age*.
tracy.martin@yahoo.com

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ADAS – A MOBILE TECH'S EXPERIENCE

ADAS IS TIED INTO NEARLY EVERY OTHER ELECTRONIC SYSTEM ON A VEHICLE TODAY, SO UNDERSTANDING PROPER DIAGNOSIS AND CALIBRATION IS VITAL

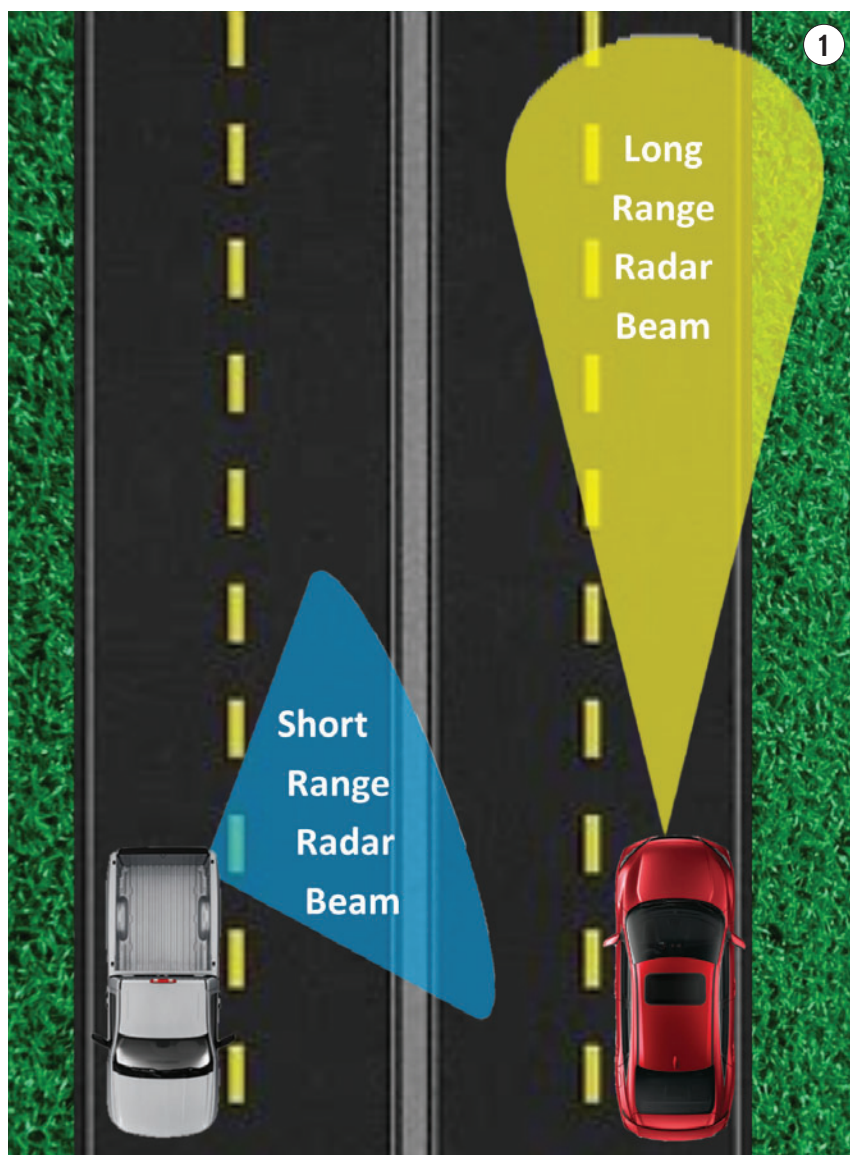
MIKE REYNOLDS // Contributing Editor

I enjoy diagnostics and am constantly looking for the next challenge. I'm in my third year as a mobile technician. This business and the work we do has evolved into something I could never have imagined when I was still working in a shop and dreaming up the idea of MASS (Mobile Automotive Service Solutions).

Catching up to the curve

Programming all makes and models was much more challenging than I anticipated. Transitioning from an aftermarket shop working on out-of-warranty vehicles to working on brand new vehicles that have been in a collision meant I had to immediately learn five years' worth of technology.

I wasn't completely unfamiliar with ADAS systems, but I wasn't really aware of how much they are tied into nearly every other electronic system on the vehicle. It is easier to think of a system that is tied to the ADAS system than one that isn't. Consider a front radar operating adaptive cruise as it approaches a slower vehicle ahead. It may be receiving signals like wheel speed and yaw rate from ABS and airbag modules, just to name a few. At the same time, it may be outputting signals to the ABS module to apply brakes, the airbag module to lock the seatbelts, TCM to unlock



THE RADAR BEAM FUNCTIONAL DISTANCE and width of the beam varies depending on application.

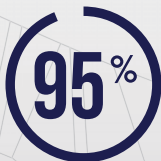


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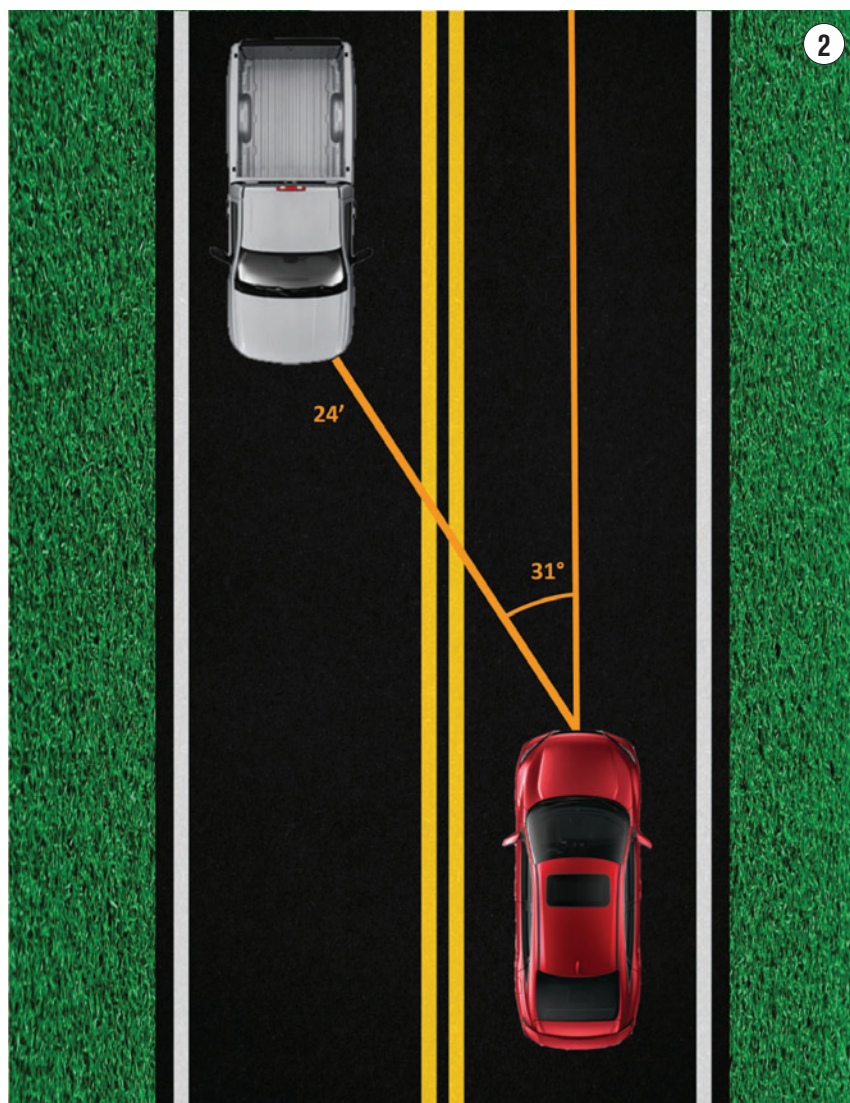
the torque converter or downshift, the radio to operate an audible warning, the cluster to operate a visual warning, the PCM to control throttle angle, the BCM to operate brake lights and maybe even the suspension controller to adjust dampening. If you think that's impressive, check out the Audi pre-sense side system, which uses radar to detect a side impact and raise the vehicle over three inches in half of a second to help absorb the collision.

With that in mind, it makes a little more sense how just about any fault can disable an ADAS system. It's crazy to think that an aftermarket radio can cause an ADAS system not to function correctly, but I've seen it with my own two eyes.

What DOESN'T require calibration?

Aftermarket radios are the least of our worries going forward. Because these systems are intertwined into so much of the vehicle, we are seeing more and more repairs that used to be simple and quick, which now require calibration. If you need to replace the A/C condenser or radiator in a 2017 Toyota Avalon, chances are it is equipped with a millimeter-wave radar sensor that will need calibrating after the repair. You might not think replacing the transmission in a 2016 Ford Transit would have anything to do with ADAS, but if it is equipped with Lane Departure Warning, that Transit will need the IPMA alignment service performed.

The transmissions in those Transits have a high failure rate (ask me how I know). Is your shop performing these calibrations or at least subletting them to someone who can? The problem with our industry has always been underestimating the value and importance of technician training. ADAS systems are quickly bringing that issue to the forefront. Often,



RADAR CAN DETECT THE DISTANCE of an object as well as the position in relation to the reference angle.

a vehicle like this Transit will be put back into service without performing the IPMA calibration because no one at the shop was aware that it was required after replacing the transmission. You might be thinking, "Well Mike, that sounds like a stretch. Why would the Image Processing Module A (windshield camera) need calibrating if I'm replacing a transmission?" The answer to that question can be found in service information. The challenge for technicians is that it is not at all easy to find. It is in there, even in af-

termarket service information, you just have to know where to look and be thorough.

If we look up the transmission R&R procedure, we won't find "IPMA alignment" on the first page. It will take more than a few clicks to get us there. Each step is laid out in the procedure as a step. Step 1: Hoist the vehicle. Step 2: Disconnect the battery. Both of these steps have procedures of their own, but rather than include each individual step for hoisting the vehicle and disconnecting the battery in the transmission

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R&R procedure, a hyperlink is listed in the step for disconnecting the battery that will take you to that specific procedure. There are 64 steps in the removal and installation of our transmission. Of those 64 steps, 18 of them will link you to another procedure such as the R&R procedure for the battery. There are a total of 12 links because some are redundant and some are not (e.g. the starter removal procedure is linked in both the removal and installation procedure, while the link to the adaptive learning procedure will only be found in the installation procedure). One of those links will take us to the R&R procedure for the front subframe, but we still won't find the IPMA alignment there, either. There are 22 steps with two links in the procedure to R&R the front subframe. One of those links takes you to the procedure for the front toe adjustment and, at the very bottom of that procedure, you will find an italicized note that reads:

NOTE: If equipped with Lane Departure Warning (LDW) System, camera alignment is required for the lane-keeping alert and lane-keeping aid to function correctly.

Connect the scan tool and perform the IPMA camera alignment procedure. Follow the scan tool directions. General Equipment: Ford approved diagnostic tool."

To put it into perspective, if you open a new browser window for each procedure, and one for each procedure listed in that procedure, and so on, you will end up with 18 windows of procedures that you will need to read in their entirety in order to read the entire transmission R&R procedure. And, in one of the last windows, at the very bottom, is one warning and two sentences indicating the need for a safety system calibration.

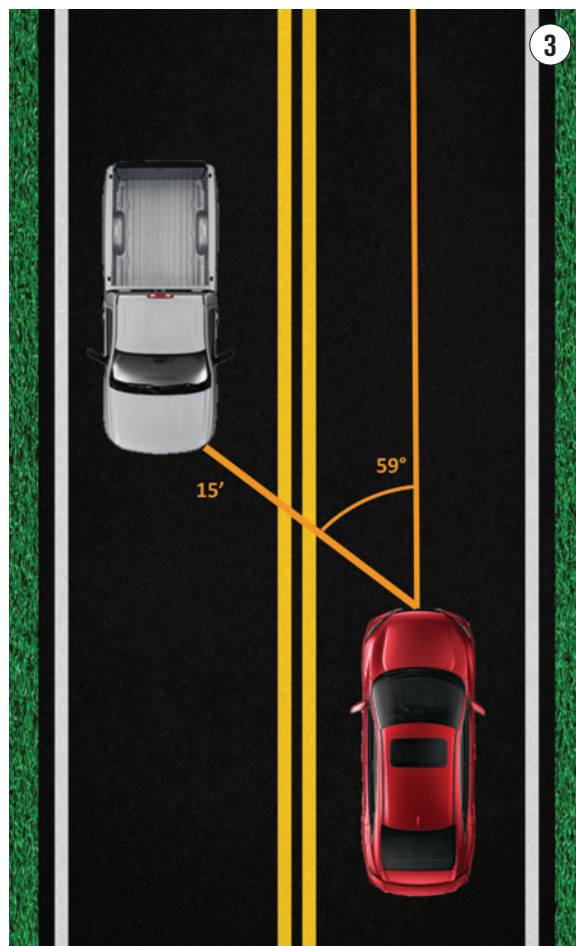
Now, not everybody reads the procedures for jacking and lifting a vehicle,

but hopefully we are at least reading the procedures on things like battery replacement, as more and more resets and relearns are being required once the battery is reconnected. I know I've been embarrassed when a customer returns with their automatic sunroof not operating properly because I forgot to read the procedure for disconnecting and reconnecting the battery. It's just not the way we were trained to operate. In order to make a living in this industry, we needed to be efficient. I would like to blame flat-rate and that one service writer who hands us a "waiting" clutch job, but it really doesn't matter. At the end of the day, it is up to us to make sure these procedures are being

followed. Missing a sunroof relearn is one thing, but sending a vehicle out without performing a required safety system calibration should not be acceptable practice at any repair facility. No matter how buried the procedure outlined in service info is, or how much of a rush we are put in, it is our job to make sure that the vehicle is safe to be put back in service, when we complete any repair.

"...but Mike, are these calibrations really that important?"

Let's get back to the Avalon with the R&R of the A/C condenser or radiator. What happens when the millimeter-wave radar is removed and reinstalled on that Toyota Avalon and calibration is not performed? Well, let's first talk



WHEN THAT OBJECT MOVES and the distance and angle changes, velocity and trajectory can be determined.

about what the millimeter-wave radar is and how it works. Radars are primarily used in adaptive cruise, autonomous braking/collision warning, and blind-spot monitoring systems. The radar units emit a beam of radio waves. The width of that beam (think "field of view") (**Figure 1**) is dependent on application i.e. a blind spot radar will emit a wide beam that allows it to detect vehicles throughout the entire blind spot, whereas a forward-facing radar may emit a tighter beam intended to only identify vehicles ahead. Once emitted, radio waves reflect off of objects and some of those reflected radio waves return to the radar unit where they are used to measure the distance and velocity of whatever object they reflected

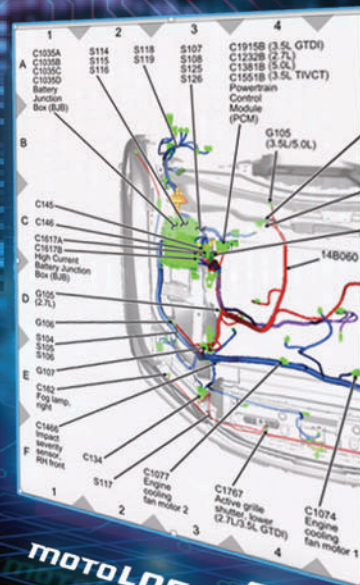


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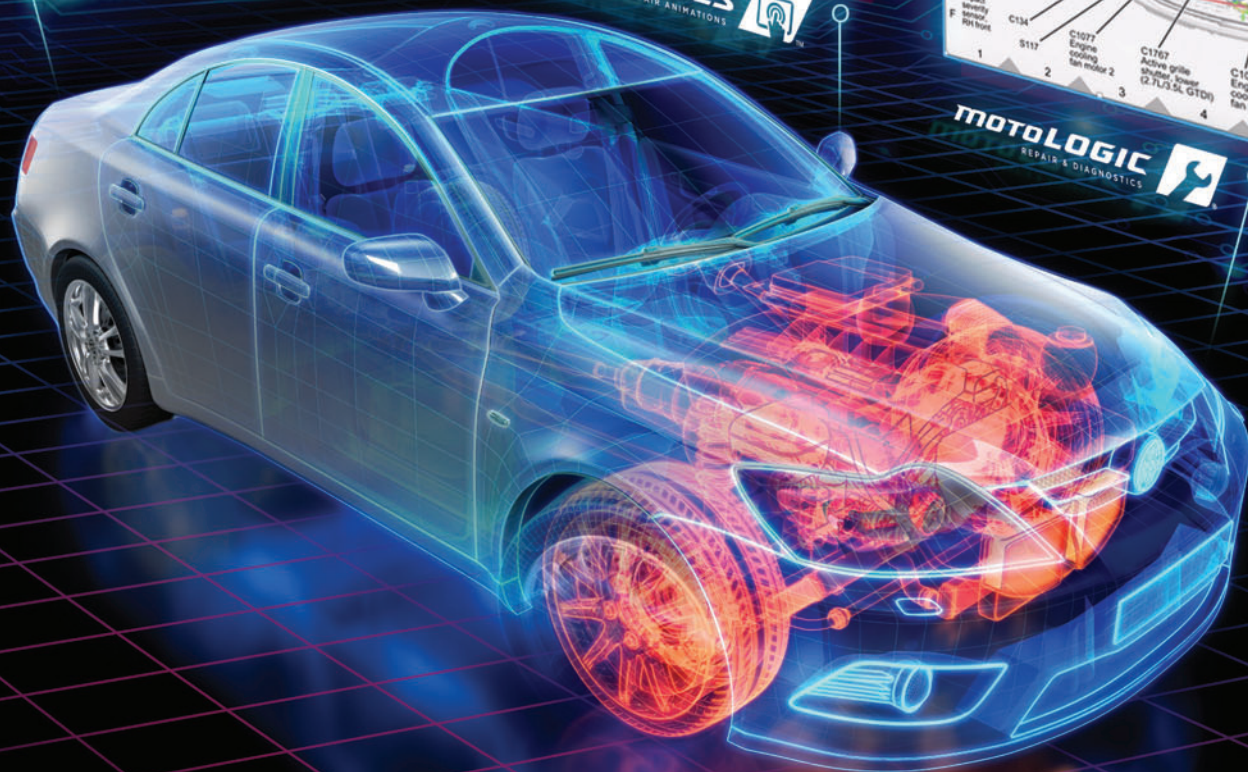
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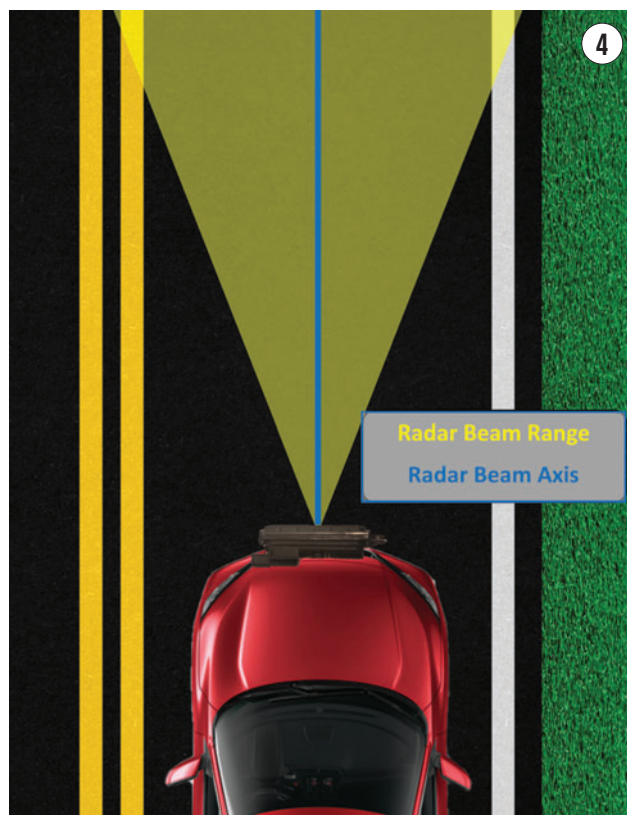
from. In order for the radar to determine this information, it needs to compare measurements taken over time and compare them to a reference angle. For now, think of the reference angle as the center of the radar beam. If an object detected by the radar unit is located 31° to the left of that reference angle (**Figure 2**), and a moment later it is 59° , it can now use that information, along with distance and velocity measurements to determine the trajectory of the object the radar has detected (**Figure 3**). If you feel like “nerding-out,” read up on the doppler effect and azimuth angles for an even better understanding of how this tech works.

Once the radar in our Avalon has identified an object, it's location, trajectory and velocity can be calculated using the reference angle, but it will need to know the trajectory of the vehicle that the radar is mounted on (our Avalon) in order to operate any ADAS function. For this operation, it will look at inputs from steering angle, wheel speeds and yaw rate, to name a few. These inputs allow the system to predict the trajectory, velocity and the vehicle's direction of travel. Compare that data to the data of the object, identified in the radar, and “voila!” We have everything we need to operate our adaptive cruise control. Well, almost... there's more to it than that. For example, in order for radar to know where a detected object is located in relation to the Avalon, it must know where the radar is located on the vehicle. When we perform the millimeter-wave radar calibration on our Avalon, we are feeding the radar that information! The radar has no way of knowing it has been removed and reinstalled and is not likely installed exactly as it was before.

“And if we don't calibrate that radar?”

Assuming our Avalon came into the shop with a properly operating adaptive cruise system, the radar would have calibrated and learned its mounted position in relation to the vehicle. In a perfect world when traveling on a straight and level road, all four-wheel speeds are the same, the steering angle sensor would read 0° and the vehicle will travel straight forward along the vehicle centerline (**Figure 4**). In that same perfect world, the radar would be mounted perfectly on that centerline so that the center of the radar beam (beam axis) matched the vehicle centerline. But we don't live in a perfect world, and chances are that radar wasn't mounted perfectly center when it came in. Odds are even better that it isn't going to be mounted in the same position when it is reinstalled. This is why they must be calibrated. The radar has no way of knowing that its beam axis angle (consider this the angle the radar is looking) has shifted when it was removed and reinstalled, and if it isn't calibrated afterward, chances are the reference angle it is using to calculate the position of objects it detects is not correct.

But does it really make a difference? Consider that an average long-range radar can read over 800 feet. If that radar was



IN A PERFECT WORLD, THE BEAM AXIS OF RADAR would line up with the vehicle centerline before calibration.

removed from the vehicle and reinstalled 2° off horizontally, its beam axis will land 13.96 feet in the wrong direction, at a distance of 400 feet. The average width of an interstate lane is 12 feet, meaning that at HALF of its useable range the radar will be “looking” in the wrong lane if the radar is only 2° off and calibration is not performed (**Figure 5**)!

A little goes a long way

There are two things I am certain of. First, I am not capable of removing and installing a radar unit and having it end up within 2° of where it was before I touched it and second, I do not want to be in a Toyota Avalon with the adaptive cruise set at 65 mph while the radar is looking at vehicles in the wrong lane!

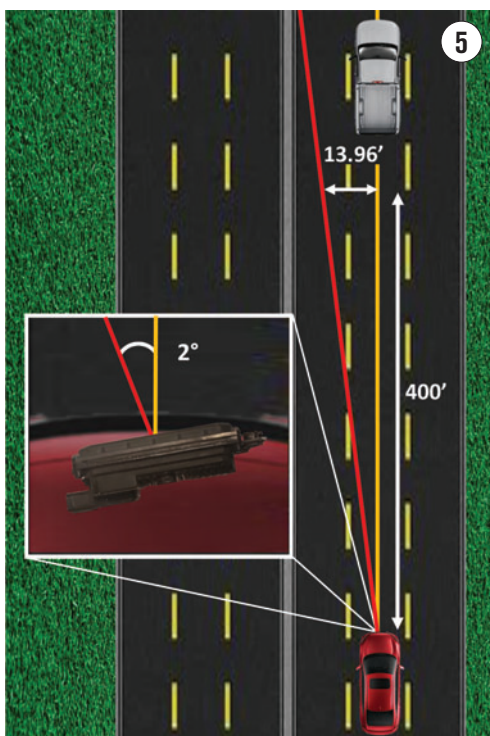
Although LiDAR and camera imaging technology do not operate the same way as radar, the necessity for calibrating them after any service that could shift one of these components is the same. You may be thinking that there is no way we could have shifted the IPMA camera on the windshield during the R&R of our transmission, and you would be correct. So why was the calibration necessary?

I had mentioned that the radar in our Avalon was presumably calibrated and learned. When we calibrate these systems, at least during a static calibration, we are often calibrating the

component in relation to the centerline. But what if our vehicle has a directional pull?

The camera in our Transit is looking at the lane lines and determining the position of the vehicle in relation to the center of the lane in order to operate the LDW (Lane Departure Warning) system. In addition, it is constantly trying to predict where the vehicle is going in relation to the lane markers so that it can give an audible or haptic warning to the driver if it determines the vehicle is about to exit the lane. As I'm sure you could imagine, steering angle input is crucial to the operation of this system. Even a slight adjustment to our toe can change the tracking of our Transit, which would have been learned prior to performing the alignment. The camera has no way of knowing that the vehicle was aligned. Because it may not track the way it previously did before the alignment (and that can directly affect the operation of the LDW system), the service procedure requires the IPMA alignment to be performed after adjusting the front toe.

Our Transit and Avalon are really just the tips of the iceberg. These systems, components and calibrations can vary drastically from model to model. Let alone, make to make. We generally use the term calibration to define a wide variety of ADAS-related procedures and we often try and categorize calibrations as dynamic or static (with dynamic being a calibration performed while driving and a static calibration being performed in the shop using special tools). While this can be helpful, I believe it can also be misleading at times. Not all ADAS-related functions require a scan tool function to per-



A NOT-TO-SCALE VISUALIZATION of how an uncalibrated radar can be "looking" in the wrong lane at a distance.

form a calibration. Just because your scan tool does not have the option for calibration or says that there is not one does not mean there isn't. And, just because your scan tool shows a calibration function (even if it is a dynamic calibration), does not mean that leveling tools or special procedures are not required before performing the calibration. I often see vehicles not being calibrated because the procedure wasn't in the scan tool. When in reality, these components do not need a scan tool for the calibration. Instead, they have procedures requiring special tools used to measure the position and mounting angle of a component on the vehicle.

I usually field multiple calls a day asking if a calibration needs to be performed after certain repairs. Often these are collision calls and chances are that just because the vehicle was not damaged anywhere near the sensor, it may need calibration as part of

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16



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DYNAMICS**

15



**HVAC
SYSTEMS**

12



**VEHICLE
SERVICING**

6



**TOOLS &
EQUIPMENT**

57



**TECHNICAL
INFORMATION**

29



another service. Using Honda as an example, a camera and radar calibration are required after an SRS deployment. This means that even if just the seatbelt tensioners deploy, the radar and the windshield camera must be replaced.

The other big misconception we need to change is the idea that if there are no codes, nothing is wrong. It is a common misconception in the glass industry that if they don't unplug the camera, no codes will set, and it will not need calibrated. That is not the case at all. These components have no way of determining that they have been removed and reinstalled, and most of them will not set a code even if they are unplugged and plugged back in. This is because if they did set codes, a calibration would need to be performed every time the battery went dead. Often these systems will take many miles of driv-

ing to set codes indicating the calibration is off and that is if they will even set a code at all. I have driven plenty of vehicles with no codes that would have allowed adaptive cruise to rear end the vehicle in front if I didn't intervene, as well as vehicles with no codes that activate the brakes when approaching oncoming traffic in the opposing lane on a two lane road. Often these systems will eventually code, but it may take multiple instances of unsafe operation before the system is disabled and codes are set. No codes does not mean no calibration!

Research is a necessity. The one common trait among ADAS systems is that procedures vary.

The only way to find this information is to be thorough in researching each service you are performing. If you are a technician thinking,

"There's no way I can afford to spend 15 minutes researching every service that I perform and still make flat rate," then you should probably let your shop owner and service writers read this article. ADAS is and will continue to be one of the main driving factors that change the repair industry. The gap between shops that are thriving and those that are struggling is growing wider every day and keeping up to date with technology and training is guaranteed to keep you on the right side of that gap. **TL**



MIKE REYNOLDS is the owner of Mobile Automotive Service Solutions in Charleston, SC, and a former automotive instructor at Trident Technical College. He

is certified as an ASE Master Technician (A1-A9, X1) along with L1 and L3.

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Buying your next diagnostic tablet

The last time you purchased a diagnostic tablet for your shop, did you see it as an opportunity to expand your business? I bet you didn't. I bet you saw that purchase as just another necessary expense to keep your shop going. But as a philosopher once said, opportunity is everywhere, the key is to develop the vision to see it. Autel's line of MaxiSYS tablets offer a range of new opportunities to expand your services and create new revenue streams for today and for tomorrow.

At the heart of every Autel tool is diagnostics. This is especially true when it comes to the MaxiSYS series of tablets. A substantial segment of Autel's employees are engineers and it shows with the MaxiSYS tablet's vehicle, system and subsystem software coverage as well as with its logical and technician-friendly interface. Compatible with U.S., Asian and European vehicles, 1996 and newer, these tablets enable technicians to complete every level of diagnostics, from automatically scanning all modules for faults, graphing live data and executing active tests to coding and module adaptations. Autel's tablets are engineered to give technicians OE-equipment-level system access to repair and service the many vehicle brands and models that come to their shops every day.

It is with this significant diagnostic background that Autel confidently expanded its product line with the development of software, parts and toolsets

into Tire Pressure Monitoring System (TPMS) servicing, Key and Immobilizer Programming, and Advanced Driver Assistance System (ADAS) calibration.

The MaxiSYS 906TS, for example, features an embedded antenna that enables it to activate and read all known TPMS sensors and program the Autel programmable dual-frequency 1-Sensor to replace 99% of the sensors on vehicles today. Yet, TPMS sensor replacement is just one of the service opportunities afforded by the 906TS. Autel's engineers have enabled the MS906TS to become an even more valuable tool with several software upgrades. The incorporation of PreSCAN and PostSCAN report generation has made it a favorite amongst collision shops, enabling them to quickly submit repair plans for insurance company authorization.

Such Pre and Post Scans are industry standards with most automakers issuing position statements that recommend them for any vehicle involved in a crash. An important feature of the PreSCAN and PostSCAN reports is the identification of the ADAS safety systems. This identification is vital as it informs the technician that an ADAS device such a camera or radar unit is present on the vehicle and should be inspected and po-



tentially calibrated. (The PreSCAN and PostSCAN reporting feature, initially available on the MS906TS, was found to be so important that all the MaxiSYS tablets now include it).

Responding to the industry's adoption of ADAS safety systems and vehicle manufacturers' inclusion of these systems on even their most modest model vehicle lines, Autel developed the first of its ADAS calibration frame systems. This system calibration system and the patterns, targets and toolsets of its package configurations enable technicians to calibrate the devices instrumental to the safety systems of today's vehicles. The MS908 tablets are compatible with this frame and require just a one-time ADAS software upgrade. Last year, Autel released the mobile ADAS calibration system, the MA600, a lighter, more compact frame system.

As automotive technologies continue to evolve and challenge the industry, Autel remains dedicated to providing technicians with progressive software and tools designed to meet the demands of repairing these sophisticated vehicles. When looking for your shop's next diagnostic tablet, make sure it's developed by a company that wants to create value for you today and for tomorrow.



The next generation of diagnostics is here!

Giotto powered by AutoEnginuity is the only diagnostic platform reinvented for mobile. Giotto offers full coverage OE-level diagnostics through 2020 model year on Windows, iOS, and Android devices across all major Asian, Domestic and European brands. This scan tool software supports ADAS calibration with pre-/post-scan reports to XML, text message, email, and pdf. Giotto is complete with full DTC output, bidirectional controls, and system tests. Perform reset adaptation and calibrations, including SAS, Yaw Rate, Zero Calibrations, DPF Relearns and more.

Giotto's user interface is designed with simplicity in mind so you can focus on what's important—servicing the vehicle. The following processes have been streamlined to save you time:

- Automated VIN decoding
- Reading and Clearing Trouble Codes from the entire vehicle in a single step
- Printing live data or DTC / Emissions reports with a single step
- Quick installation with true USB Plug and Play (no device drivers necessary)

With Giotto™ powered by AutoEnginuity®, you get a powerful, full-featured diagnostic scan tool that can grow to fit the needs of your growing business.

About AutoEnginuity

AutoEnginuity, founded in 2003 and headquartered in Mesa, Arizona, has developed into a leader in advanced aftermarket automotive diagnostics software and associated vehicle make/model coverage. On January 2, 2020, AutoEnginuity was acquired by OPUS | IVS, the Intelligent Vehicle Support (IVS) division of Opus Group.

OPUS | IVS supports automotive shops in repairing complex vehicles safely and fast. Established in 2018, the business has grown through uniting expertise and technology from Drew Technologies, Autologic, Farsight, BlueLink and AutoEnginuity to develop innovative solutions for more than 50,000 repair shops around the world. With 7 locations throughout the US, UK and Australia, OPUS | IVS is part of the world-leading vehicle inspection and intelligent vehicle support company, Opus Group.



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4 steps to quick car count

With few exceptions, car count is down for shops all over the country since this pandemic began. Fortunately for a lot of shops average tickets are up and are helping bridge at least part of the gap in lost sales.

As more consumers are venturing back onto the roads it's important to have the right plan in place to attract them to your shop. So, let's go over the four key steps that you must have in place for effective and profitable campaigns.

Step #1: Know who you want to attract

Just because a consumer has a pulse and a set of car keys in her hand, doesn't mean she is the right fit for you. Far too often shop owners are doing what I call, "Shotgun Marketing" the equivalent of pointing a shotgun at the sky, pulling the trigger, and hoping that someone gets hit. While somewhat effective, it forces you to weed through a lot of prospects to attract the right customer, with the right vehicle, and the willingness to spend the money to fix and maintain it.

Instead, focus on marketing to your current customer database. There are several benefits:

They already know, like, and trust you
You have a history with them and

know their buying habits

Marketing to your own customers is 5 -10 times more effective

Chances are there are more vehicles in their driveways than you are seeing currently

Step #2: Send the right message

The average person sees over 4000 advertising messages every single day, so it's your job to grab their attention and make them an offer to take immediate action. No need to give away the store mind you, but powerful enough to compel them to call or drive to your shop RIGHT NOW! Otherwise, with all the distractions everyone sees every day, you'll risk losing their focus and let them get on to the next big thing in their life.

Step #3: Use the right media to deliver your message

Even the best message, sent to the best prospect, will fail miserably unless it gets seen. So where are your customers looking and how will you get your killer offer in front of them where they can see it?

Use a multiple-media approach by using the same media that they use every day - email, text, social media, direct mail, and phone. Not only are these

highly effective channels to use, but they have the added benefit of being very inexpensive or even free to use.

Step #4: Time your marketing properly

The best time to be marketing is the same day that the brakes start to squeal, the air conditioning fails, or some other problem appears. The problem is, we don't have a crystal ball to tell us when that is. So, the best thing to do is always be marketing to increase your odds of being in the right place at the right time. Use all of the media that I spoke about earlier, and make sure to spread it throughout the entire month.

More detailed information is available online

The Network Academy is proud to announce a partnership with Repair Shop Coach to provide video training specifically for shop owners in the areas of Car Count, Sales, Profitability, and Leadership over the coming months.

For more in-depth training on the four steps referenced in this article, go to www.TheNetworkAcademy.com to watch our free Car Count webinar and to access the 6-Module Car Count Now training course.



When it comes to vehicle lifts: Be your own cable guy

When was the last time you checked your vehicle lift's cables? If you answered "today," you win! Cables are one of the things you should check before using your lift every single day before you start working. In this article, we'll explore how to maintain your lift cables or "wire ropes," how to look for damage, and when to replace a cable.

Keep them lubricated

The better you take care of your cables, the longer they'll last. One of the best things you can do is keep your cables lubricated with 90-WT gear oil or ALMASOL® Wire Rope Lubricant. These lubricants get deep into the fibers to protect against wear and damage. Lubricate your cables every three months.

Look for damage

Start by relaxing the rope to a stationary position and moving the pick-up points off the sheaves. Clean the surface of the rope with a cloth or wire brush so you can see any breaks.

Flex the cable to expose any broken wires hidden in the valleys between the strands. One way to check for crown breaks is to run a cloth along the rope to check for snags.

Use an awl to probe between wires and strands. Lift any wires that appear loose. Evidence of internal broken wires may require a more extensive rope examination.

Other damage to look for includes abrasive wear, mechanical damage, rotational damage, heat damage and bending fatigue.

Replacement time

All lifting cables should be replaced every three to five years or when damage is visible. Does that mean every cable that looks "less than brand new" after a couple years of heavy use should be replaced? Not necessarily.

A little wear is to be expected over time. A good rule of thumb

is: If, over the course of a single day, you see six random wires sticking out over the length of a single cable (when examining all strands), the entire cable should be replaced. Additionally, if you see three broken

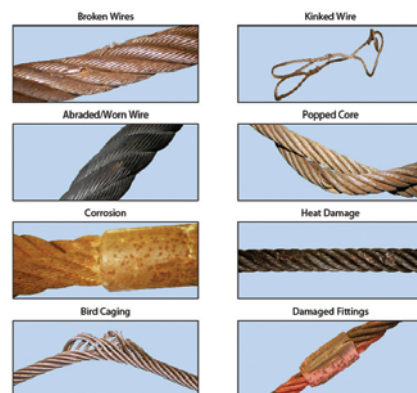
wires in just a single strand over the course of a day, you also need to replace the entire cable.

Also replace cables that have worn down by 10 percent of their original size. For example, if the cable was originally .5 inch in diameter, replace it once it reaches .45 inch. While the difference may seem small, a 14,000-lb. rated cable that loses 10 percent tensile strength will subsequently be rated at just 12,600 lbs. This is a significant reduction in capability when it comes to lifting heavy-duty vehicles.

Cables should also be replaced if they are pitted by corrosion or if there is evidence of kinking, crushing, cutting, bird-caging, a popped core or heat damage.

If you find damaged cables meeting any of these criteria, replace them immediately. Do not use the lift until the damaged cables have been replaced.

For more information on vehicle lift maintenance, contact BendPak at (805) 933-9970 or visit bendpak.com. You can also connect with the company through Twitter, twitter.com/bendpak, Instagram, [Instagram.com/bendpak](https://www.instagram.com/bendpak) or YouTube [youtube.com/user/BendPakRanger](https://www.youtube.com/user/BendPakRanger).





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Motor oil as a liquid spare part

LIQUI MOLY on the background to an invisible helper

Oil does its job well hidden in the engine. As long as everything works, no thought is wasted on it. And because the consequences of not using the correct oil, such as increased wear, may only become apparent at a later stage, faults are often not detected. "Today, motor oil is much more than just a lubricant — it's a liquid spare part that has to fit the respective engine exactly," explains Oliver Kuhn, deputy head of the oil laboratory at LIQUI MOLY.

The oil manufacturer LIQUI MOLY hails from Germany. For many years now, motorists there have repeatedly voted it the best oil brand. This is due to the company's great emphasis on quality as well as the wide range of products that offers the right oil for almost every vehicle.

But choosing the right oil is not so easy. It is a particularly complicated task for European imports. Most European car manufacturers have developed their own oil specifications, which differ significantly in some respects. Whenever a new engine is developed, the exact properties that the oil must have to make this engine work properly are determined at an early stage. These are oils of technologically very high quality. Filling in another oil would be wrong. The consequences range from uneven running of the engine to greatly increased wear and tear, and even up to major engine damage. In any case, the warranty will be void.

With so many different oil specifications from so many different brands, it is difficult to keep track. This is why LIQUI MOLY offers a free oil guide at www.liqui-moly.us. There you only have to enter make, model and engine, and you

will get a list of suitable oils.

With domestic cars, it is not so complicated. Most car manufacturers list a motor oil according to API specifications. A single oil specification for all vehicles — a dream come true for workshops and drivers alike. But here, too, there is a turnaround in the trend.

In May, the latest API standard was published — SP. It comes in two versions. "Normal" oils with API SP bear the well-known Starburst certification mark on the canister. The particularly low-viscosity oils with API SP, for example 0W-16 or even lower, are given the new Shield symbol. The mark indicates: Caution, this is a particularly thin oil that cannot be used in older vehicles.

Why is it becoming more and more complicated with motor oils? It is due to the fact that today's motor oil offers much higher performance than in the past. What was once a simple lubricant is now a high-tech liquid.

Motor oil essentially consists of two components: the base oil, i.e. the actual oil, and additive packages. The latter provide the performance of the oil. This is because oil must not only lubricate, but also keep the engine clean and protect it from corrosion. It must lubricate reliably despite the tight tolerances of the components, even under extreme conditions. In the most modern oils, the base oil is hardly more than just the carrier fluid for the additive packages. If



you were to fill pure base oil into such an engine, the journey would be over after only a few miles.

This plus in performance is often accompanied by a minus in viscosity of the motor oil: The motor oils are becoming increasingly thinner. This development has been driven by the car manufacturers. In their efforts to develop ever more efficient vehicles, oil is one of the many adjusting screws they are turning. With a thin oil, the engine needs less energy to pump the oil than with a thick oil. "That's why the motor oil of the future will have even lower viscosity," says Oliver Kuhn from LIQUI MOLY. "And the world of oil specifications will unfortunately become even more complicated."



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Worldpac Training Institute (WTI) and Carquest Technical Institute (CTI) launched two new training programs, World Professional Automotive Community and Virtual Classroom, respectively, offering no-charge live online training. This joint venture provides automotive industry professionals a training series featuring advanced technical and business management classes. Instructors from WTI and CTI, guest industry leaders and automotive experts from OE and premium aftermarket suppliers and manufacturers deliver course content.

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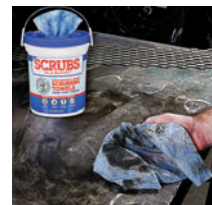
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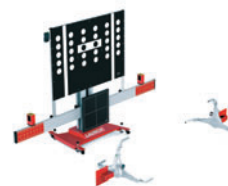
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AD INDEX

ADVERTISER	PAGE #
ADVANCE AUTO PARTS.....	7, 45
ADVICS.....	5, 50
AUTEL.....	15, 27, 47, 51
AUTOENGINEUITY.....	37, 52
AUTOMOTIVE DISTRIBUTION NETWORK.....	39, 53
AUTOMOTIVE MGMT INSTITUTE.....	58
AUTOMOTIVE TRAINING INSTITUTE.....	8
BENDPAK.....	32, 33, 34, 54, 55
BOSCH AUTOMOTIVE SERVICE SOLUTIONS.....	11, 59
CASEY TOOL, LLC.....	6
HUNTER ENGINEERING.....	25
LAUNCH TECH (USA) INC.....	CV2
LIQUI MOLY USA.....	21, 56
MOTORCAR PARTS OF AMERICA.....	35
NAPA.....	CV3, 19
NORTH AMERICAN BANCARD.....	60

ADVERTISER	PAGE #
DEC / REPAIRLINK.....	9
PARTSOLOGY.....	23
PICO TECHNOLOGY.....	49
TOYOTA MOTOR SALES USA.....	29
TRICO GROUP.....	3, 17, 41, 57
TYC GENERA.....	31, 63
WALKER PRODUCTS.....	13, 43
WORLDPAC.....	CV4, 61


PRODUCTS

ADVANCE AUTO PARTS.....	58
HELLA.....	58
LAUNCH TECH (USA) INC.....	58
PERMATEx.....	58
WORLDPAC.....	58


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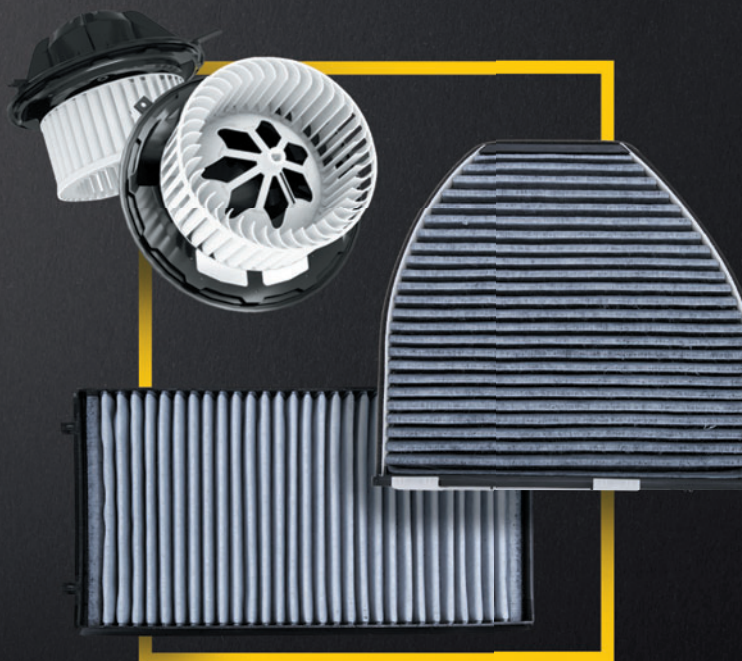
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PETE MEIER // Director of Training

ADP, or Alternator Decoupler Pulleys, are common on many of the vehicles you service. Their role is to minimize belt slippage and shock loads to the accessory drive system transmitted from the engine via the crankshaft. In the bigger picture, the use of the ADP reduces wear and tear on the accessory drive system and all of its components and even adds a bit of fuel economy to the bottom line.

There are two basic types of ADPs: the Overrunning Alternator Decoupler (OAD) and the Overrunning Alternator Pulley (OAP), with the OAP being the most common. Failure of these pulleys can result in a range of customer concerns, from noise to an illuminated battery or check engine light on the instrument panel. Both can be tested in a similar

manner and may even look the same from the outside, but one cannot be replaced with the other and neither can be replaced with a solid pulley. In fact, OAD pulleys are often specifically mated to a given engine design and it isn't uncommon to see rebuilt alternators fitted with the incorrect pulley for the application.

In this month's edition of The Trainer, I'll share some additional tips related to ADPs including how you can avoid some of the common mistakes made in their service and inspection. **TL**

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