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Talk Shop Anytime

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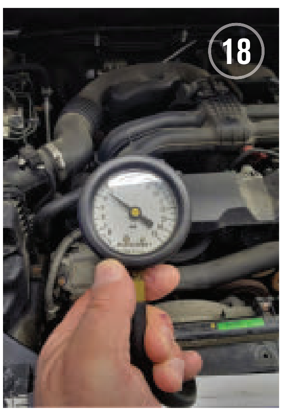
OPERATIONS



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TECHNICAL

IN EVERY ISSUE

VIDEO

SERVICE DONE RIGHT 11: TESTING FUEL PUMPS

You've diagnosed the cause of your customer's "no start" concern as a "no fuel" concern. What do you do next? You may want to rethink your diagnostic process after watching this episode of "Service Done Right" with Pete Meier.

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WEB EXCLUSIVES

THE 10-MINUTE MONEY MAKING STRATEGY FOR AUTO REPAIR SHOPS

In this exclusive guest blog, Dennis Michael explains how spending 10 minutes with your customer could launch millions of dollars in additional revenue.

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Endeavor Business Media, LLC

1233 Janesville Avenue, Fort Atkinson, WI 53538. Phone: 920-563-6388

EDITORIAL STAFF

AMANDA SILLIKER
EDITORIAL DIRECTOR
asilliker@endeavorb2b.com

JAY SICHT
MANAGING EDITOR
jsicht@endeavorb2b.com

PETE MEIER ASE
DIRECTOR OF TRAINING
pmeier@endeavorb2b.com

BRANDON STECKLER
TECHNICAL EDITOR
bhsteckler@gmail.com

RHONDA COUSIN
ART DIRECTOR

CONTRIBUTORS

BRIAN CULOTTA
JERRY "G" TRUGLIA
DAVID ROGERS
RICK WHITE
LEANNE WILLIAMSON

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JILLENE WILLIAMS
SALES COORDINATOR

SALES STAFF

LISA MEND
lmend@endeavorb2b.com
MICHAEL PARRA
mparra@endeavorb2b.com
PAUL ROPSKI
propski@endeavorb2b.com
CORTNI JONES
cjones@endeavorb2b.com
DIANE BRADEN
dbraden@endeavorb2b.com
MATTIE GORMAN
mgorman@endeavorb2b.com
JAMES HWANG
Inside Sales & Brand Manager, ASE Study Guides
jhwang@endeavorb2b.com

REPRINT SERVICES
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CUSTOMER SERVICE
Subscription Customer Service
MotorAge@omeda.com
(877)-382-9187

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LEGISLATION

PROMPT DECISION NEEDED FOR RIGHT TO REPAIR LAWSUIT

EMILY MARKHAM // Associate Editor

It's been almost one and a half years since Massachusetts voters approved the Right to Repair Act, which would give independent repair shops the ability to access vehicle data necessary to make repairs. The lawsuit against this act has caused many delays surrounding its implementation, and though some delays are to be expected, the Massachusetts Right to Repair Committee has now submitted a brief calling for a prompt decision.

According to the brief, this isn't the first time auto manufacturers have tried to limit independent repair shops' access to information needed to make repairs. Auto manufacturers put up similar resistance when the Clean Air Act required them to install on-board diagnostic (OBD) systems in vehicles and again when anti-theft devices or immobilizers were introduced. In both instances, the auto manufacturers presented arguments against allowing independent repair shops to have access, which were later found to be unwarranted.

Previous to the current Right to Repair Act, in 2012, a right to repair law was passed. This law stated that vehicle manufacturers share the same service information, tools, and software that they provide to their franchised dealers. However, more recently, manufacturers have been collecting this information via wireless technology, which was not covered in the original law. The Right to Repair Act is meant to update the law, giving vehicle owners back their rights to have their vehicles serviced where they see fit.

Telematics and vehicle diagnostics

The telematics provision in the Right to Repair Act applies to the model years 2022 and later. Because the act cannot be implemented until this lawsuit is resolved, that means 2022 vehicles on the road are only providing data through their telematics systems to the vehicle dealers, not independent shops or the vehicle owners.

The act is also requiring manufacturers to put a standardized OBD port in their vehicles. Without a standardized port, independent shops are having to turn away customers because they are unable to make certain repairs without port access.

A prompt resolution

The Right to Repair Committee outlines the top four reasons it is critical this situation be resolved quickly.

Technology: Vehicles are already using telematics systems to communicate diagnostic and repair data; it is no longer the technology of the future. Additionally, port accessibility is already affecting many independent shops.

Cost: With manufacturers controlling vehicle data, they are also controlling where consumers must bring their cars to get fixed. A study done in 2020, revealed that dealerships are 36.2 percent more expensive, on average, than independent repair shops.

Consumer rights: Vehicle owners have no choice in where to send their cars for repairs if the dealers are the only ones with access to the data needed to make those repairs. MA

ELECTRIFICATION

AUTOMAKERS ASK CONGRESS TO LIFT EV TAX CREDIT CAP

The CEOs of General Motors, Ford Motor, Chrysler-parent Stellantis, and Toyota Motor North America asked Congress on June 13 to lift the cap on the number of electric vehicles that are eligible for a tax credit of up to $7,500.

According to a joint letter first reported by Reuters, the CEOs — GM's Mary Barra, Ford's Jim Farley, Stellantis' Carlos Tavares, and Toyota North America CEO Tetsuo Ogawa — said that they have pledged to invest over $170 billion through 2030 to bolster EV's development, production, and sale.

Currently, the tax credit begins phasing out once a company sells over 200,000 EVs. Both GM and Tesla already hit the cap and are no longer eligible for the consumer tax credits, reported Reuters.

The letter recommends a sunset date for the tax once the EV market is "more mature".

"Eliminating the cap will incentivize consumer adoption of future electrified option," the CEOs wrote.

The letter also stated, "The coming years are critical to the growth of the electric vehicle market and as China and the EU continue to invest heavily in electrification, our domestic policies must work to solidify our global leadership in the automotive industry." MA


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ENVIRONMENT

STELLANTIS TO PAY $300 MILLION IN EMISSIONS FRAUD CASE

Stellantis agreed to plead guilty to criminal conduct and pay $300 million to settle a multi-year emissions fraud probe surrounding vehicles with diesel engines, Reuters reported.

FCA US LLC, now part of Stellantis, has agreed to plead guilty to a criminal conspiracy charge arising from its efforts to evade emissions requirements for more than 100,000 2014 to 2016 Ram pickup trucks and Jeep sport-utility vehicles in its U.S. lineup, the release said.

The plea deal is expected to be unveiled next week.

The plea deal comes just five years after Volkswagen's diesel emissions scandal, now known as Dieselgate. The automaker pleaded guilty to criminal charges affecting nearly 600,000 vehicles in the U.S.

Volkswagen's deception precipitated additional scrutiny that resulted in officials on both sides of the Atlantic cracking down on automakers accused of using illegal software known as defeat devices to dupe government emissions test, the release said.

So far, one FCA employee may face trial for misleading regulators about pollution from the vehicles targeted in the investigation. Last year, the Justice Department disclosed charges against two additional FCA employees in the alleged emissions fraud.

An indictment alleges the employees conspired to install defeat devices in vehicles so they could dupe government emissions tests and then pollute beyond legal limits on roadways, Reuters noted.

FCA has previously resolved related civil allegations while denying it deliberately attempted to cheat on emissions tests. MA

VEHICLE AGE

AVERAGE AGE OF VEHICLES TOPS ALL-TIME HIGH IN THE U.S., SUPPLY SHORTAGE TO BLAME

This year marks the fifth straight year the average age of light vehicles in operation (VIO) in the U.S. has increased, hitting an all-time high, according to a report from S&P Global Mobility.

There are, however, a number of reasons to account for the record high, including a global microchip shortage, supply chain crisis, inventory challenges, and, not to mention, the transportation shift due to the pandemic.

The pandemic drove consumers from public transport and shared mobility to personal mobility and since vehicle owners couldn't upgrade their existing vehicles, the demand for used cars accelerated —boosting vehicle average age further, the report said.

Future outlook

The average age of light VIO in the U.S. is expected to rise through 2022 and 2023, as the pipeline for new vehicle production and sales continues to be weighed down by parts shortages, the report said.

The report also said that with the ongoing Russia-Ukraine crisis remains a potential impact to the new vehicle supply chain in the coming year.

The average age of EVs in the U.S. is 3.8 years of age this year, down from 3.9 last year, and has been hovering between 3 and 4.1 years since 2016.

However, interesting enough, the demand for BEVs over the years, even through the pandemic, has been rising, the report said. MA

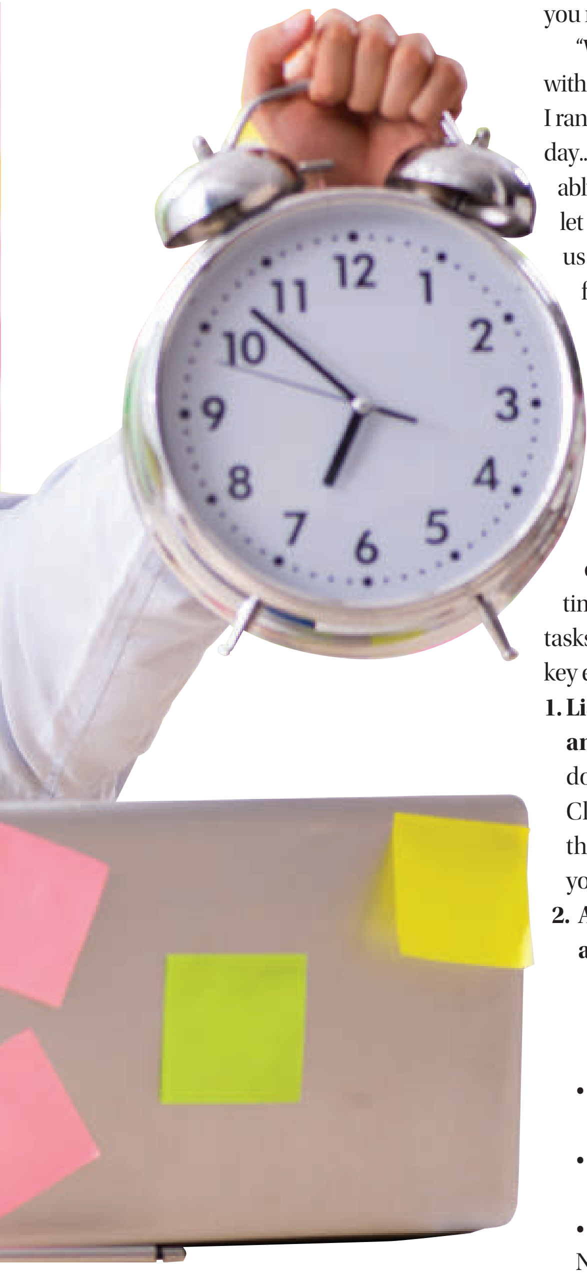
Time-cleaning is the way to producing results

Think strategically about your goals and then choose the best tasks to reach them.

BY LEANNE WILLIAMSON // Contributing Editor

Spring cleaning helps us eliminate all we have collected and hoarded through the winter months. With summer now here, we can use this fresh start to make room for a new strategy called "time-cleaning."

Time-cleaning is the way to produce results. It involves thinking creatively and being honest about what you want to accomplish by being time-focused. No more



linear thinking or drawing lines through your daily task list. Instead, choose the right combination of tasks to reach your goals. So, instead of spending your time on emotionally fulfilling tasks, select tasks that are necessary to move you a step closer toward fulfilling your goals.

When to start time-cleaning

When you notice that the journey to accomplishing your goals seems to be getting further away, it's time to start time-cleaning. You're ready to start time cleaning if you regularly say to yourself:

"Wow, I sure thought I was doing better with my time..." "I meant to get it done, but I ran out of time..." "I need more hours in a day..." or "I am so busy." We have all probably said them at one time or another. So let us start asking questions that will help us get "unstuck" and remove ourselves from the spinning hamster wheel.

How to start time-cleaning

Artist Hans Hofmann said, "The ability to simplify means to eliminate the unnecessary so that the necessary may speak." This wonderful phrase can be the mantra for time-cleaning and getting focused on tasks that achieve results. Here are some key exercises to get you started:

1. **List up to 100 areas of your life, work, and tasks** that drain your energy or don't produce results. Use the "Time Cleaning Worksheet" document for this exercise and add extra lines if you need them.
2. **Answer the following questions about the items on the Top 100 list:**
   - What are you tolerating? What is or is not serving you to meet your goals?
   - What will you stop doing right now? What is non-negotiable?
   - What are you saying "yes" to that you prefer to say "no"?
   - What does excellence look like?

   Now that you've funneled items that serve you, decide which items help you accomplish, delegate, and which to get rid of. Add anything that stays more than three days to a separate "get around to it" list or remove it forever because it was not that important. It was "busy work."
3. **Set your schedule** to effectively execute the tasks that move you toward your goals for the day, week, month, year, and so on. Having action plans in place that focus your time, energy, and attention on result-driven tasks will accomplish the goals you set forth.

Outcomes of time-cleaning

Here are some take-aways when time-cleaning once per month, quarter, or any time you feel an adjustment is due.

- Learn to recognize what you are doing is not working and stop doing it.
- Understand more about the role emotions play in accomplishing work.
- Build self-control and willpower by increasing awareness of how you make and avoid choices.
- Let go of resisting change and appreciate the opportunity of what's possible.
- Realize how to stop your thoughts from being negative and blameful. Instead, move to more positive thoughts such as, "It is what it is. Now, what's next?"
- Gain a sense of personal power from learning to adapt where you spend your time.
- Realize that focusing on trifles will get you stuck — just like quicksand. Enough of it, and you will ruin others around you with your insane focus on the unnecessary mundane tasks.

Perspective for time-cleaning

Be personally accountable for performing time-cleaning when necessary. Great mantras to encourage and motivate you are:

- "If it's to be, it's up to me."
- "If not me, who? If not now, when?"
- "Just do it."
- "I will; I must."

Commit to making a change for the better in managing your time with the right tasks to produce results. This exercise will be challenging and will take serious brainpower. Find a quiet spot and a time of day when you are in your prime working zone. It may take several sittings to complete the exercise. Take your time — accuracy is better than speed.

Be effective and watch for efficacy. During this time, examine what you spend your time on. Remove items that do not serve you or produce the results you want. Remember, your "why" must be strong enough to maintain your commitment to improving your time-cleaning process.

Get ATI's Time Cleaning Worksheet at http://www.ationlinetraining.com/2022-05 for a limited time. It will assist you in performing the challenging time-cleaning exercise. Enjoy the journey!

LEANNE WILLIAMSON, CEC, is an executive coach at ATI and has been coaching for over 16 years. She loves assisting others in the achievement of their personal and business goals. She helps people find the goals and dreams they really want and aids in structuring and implementing a plan to achieve those goals and dreams. ATI's 34 full-time, certified coaches have helped ATI's members earn over $2 billion in return on their coaching investment since ATI was founded.

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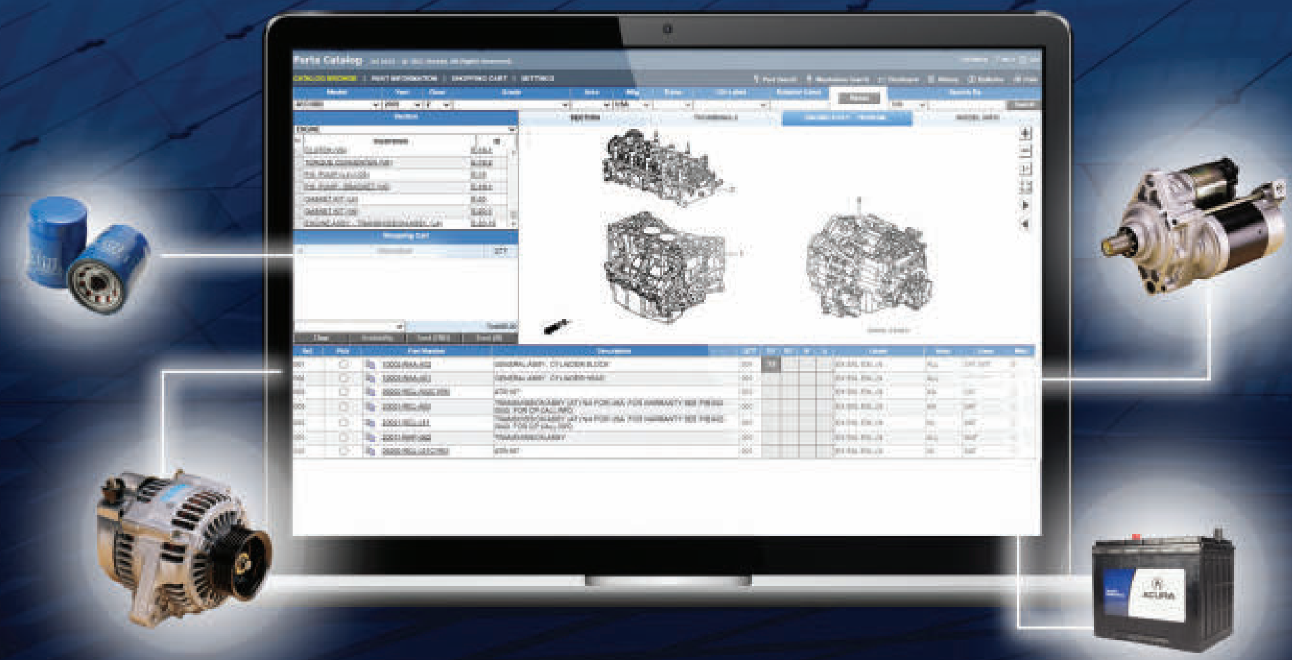

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Plan now for succession before it's needed

What would you do if suddenly you or a key team member got sick or hurt?

BY RICK WHITE // Contributing Editor

If you suddenly couldn't go to the shop for three months, completely cut off from it, would it still be there when you were ready to go back? Please linger on that question. Don't allow yourself to minimize or disregard its impact. I know your inner voice is telling you that you're healthy as an ox, that you're different and nothing bad is going to happen. Because you're right -- until you're not.

What I am talking about is succession planning. For me, there are two scenarios for succession planning. There is a short-term scenario and a walking-away scenario. Shop owners don't like talking about either one because it requires them to admit that something could go sideways. It's hard to plan when your focus is monopolized by putting out fires and just surviving to get to the end of the day, week, or month.

Then suddenly something goes wrong, and you or a key team member gets sick or hurt. Now what?

Instead of having a plan in place for such an event, you or your team react. Many businesses end up out of business due to a lack of succession-planning in the case of illness or injury. This is the short-term scenario.

Instead of waiting until there is an issue, you will need to proactively do the following to mitigate the loss of a key team member:

• **Identify the key members of your team.** Not every team member has the same impact when they leave for an extended time. Your first task is to identify the staff whose extended absence could have a disastrous consequence for the business.

• **Assess their duties and responsibilities.** How much of

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what they do is a documented procedure now and how much they have learned to do on their own? Have them document what they are doing now so the finished document becomes a resource for all who follow in their footsteps.

- **Train someone else to step in if needed.** Before you can train someone, you must make sure that the responsibilities that you want them to take on are something they want to do. Pushing an unwilling participant through this process is like pushing a rope! Once you've established that they have the desire to grow in this area, you need to find out their preferred method of learning. Some people are auditory learners, meaning they learn best when they hear the training. Others are kinesthetic learners meaning they learn when they do it. And finally, there are visual learners, meaning they learn best seeing it done.

> ONCE YOU'VE ESTABLISHED THAT THEY HAVE THE DESIRE TO GROW IN THIS AREA, YOU NEED TO FIND OUT THEIR PREFERRED METHOD OF LEARNING.

When you're teaching someone to do something, I highly recommend the EDGE method of teaching. It's a method used and taught by the Scouts of America. If you would like a breakdown of how that teaching model works, go to www.180biz.com/edge and download an in-depth description that will help you incorporate this tool into your business.

- **Monitor their performance and mentor them as needed.** Decide on what you're going to measure and when you're going to give feedback to help them grow. Giving feedback isn't to catch them doing something wrong or make them feel bad. I want you to remember that Wheaties isn't the breakfast of champions, feedback is. Feedback helps you create teachable moments where you or your key team member can mentor the person learning and grow confidence as they go.

Please remember that this process takes time. To be effective, this training may take many months to ingrain in your team member. Once they're fully trained, if something happens, you can rest assured that your business will weather the storm and come out stronger as your team comes together to work as a single unit.

Then there is the walking away succession planning scenario. The lack of succession planning when you're ready to sell your business is so sad. What usually happens is you get to a point where you've had enough and decide you want out, now! Based on the blood, sweat, and tears you've poured into your shop, you feel it's worth a million dollars. I can't tell you how many owners I've seen crushed when they find out what their business is worth, and they're faced with two options. They can either keep working in the business and collecting a paycheck or they can sell it and get a job doing something else because the nest egg they thought they had was never there.

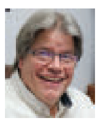
To avoid ever having to deal with this scenario, create a succession plan for retirement. I have several clients I'm working with who are starting to think of a strategy for exiting their business. There are many avenues for making this happen that I will defer to the experts. What I help them do is to construct and execute a plan that creates a sustainable and very profitable business without their daily interaction, because that's when a business is worth the most. For this plan to be successful, it's going to take people, planning, and profit.

You need the right people in the business, serving the right people (your ideal client) who value what the business has to offer, and the right people advising you to maximize what you're doing while helping you avoid the "potholes" of business. These advisors make up what I call your "board of directors."

Once you have the right people in place, you need a plan that takes you from an employee to a business owner. The difference is going from working in the business (usually the glue that keeps the shop in one piece) to owning a business that generates a healthy return without you being there. This is finally the freedom every shop owner dreams of.

Finally, you need profit. Sustained profit. While there are many factors that go into determining the selling price of a business, a rule of thumb I use is adding up the profit on the tax return, adding back in owner salary and perks over four to five years. This is a crucial step, because whoever is looking to buy the shop needs to have enough profit to pay themselves and satisfy the debt load due to the purchase of the business.

I believe every shop owner must make plans for both scenarios to truly have the peace of mind that comes when they know they can provide for their family, as well as for their team and their families. I hope you'll take this subject seriously and act on it because you never know when life is going to knock you or a key team member down. Remember the Scout motto: Be prepared. You'll be glad you did.



RICK WHITE is a business-turnaround and exponential growth expert who helps auto repair shop owners go from struggling to stay open to being recognized as the go-to shops in their market. He helps business owners with average shops transform their shop into the shop of the year in the industry. Currently, he is president of 180BIZ, an auto repair shop training and business coaching company proudly serving the independent auto and truck repair shop owner since 2006. He has also owned multiple successful auto repair shops over the years. White has taught at some of the biggest conferences in the industry across North America, including classes at AAPEX, VISION, ASTE, ATSE, ASA National, and AASP National. Beyond associations, he has conducted training classes for WorldPac and BG. He has been published many times over the years for multiple automotive repair industry publications. Contact him at rick@180biz.com or visit his website at www.180biz.com.

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OPERATIONS

BUCKLE UP:
The only real status quo is change

Hiring specialists to manage any area of the production pipeline inevitably leads to restricting it, creating unnecessary costs and stalling growth.

BY DAVID ROGERS // Contributing Editor

Is the pipeline to your shop flowing?

This production pipeline is what carries customers, vehicles, repair orders, and money into your shop. Keeping this pipeline wide open and flowing is critical for growing your business.

But what is this pipeline, and more importantly, how can you keep it flowing, even when sections of it are constantly changing?

Imagine a pipeline that runs from your community to the front counter at your shop. It flows from customer check-in, back into the bays for inspection and write-up, and to the front again where the customer is advised. Finally, it flows back to the technician for repair, to the advisor for sign-out, and out the door back into the community.

Getting this pipeline to flow without any restrictions is the key to growth. Techs bill more hours, the shop services more vehicles, customers get better service, and the effectiveness of your marketing budget is maximized.

But there's a recent trend across the automotive industry that has been creating bottlenecks in this critical pipeline.

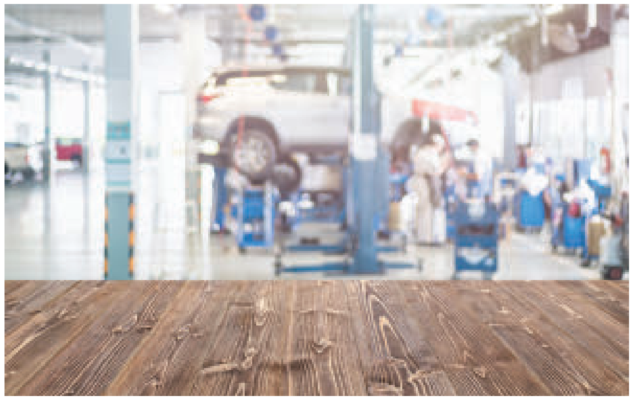
What happens if you have a three-foot diameter pipe running into your shop, but then it narrows to a two-inch diameter pipe during one of the many twists and turns it takes? Your entire pipeline can only flow as fast as your biggest bottleneck allows it to flow.

This is why we need to talk about some dangerous, production-killing ideas that seem like conventional wisdom.

Case in point, it has never been easier to strap together solutions to address every area of the shop. Point of sale system doesn't have a digital vehicle inspection? Just subscribe to one and tack it on! Is that same setup missing a marketing solution? Strap that on, too!

This way of operating is a win for everybody…except the shop owner and their loyal team who get to shoulder all this burden together. The problem with taped-together systems like this is that they always create bottlenecks in the production pipeline because each of these add-on systems demands specialized employees — using specialized equipment to operate them.

The makers of the original point of sale system didn't un-



derstand production or efficiency, so they built it without the major components needed to run a shop. This has created an industry of add-on tools and solutions (that you get to pay extra for) that also don't understand your production or efficiency.

These pieces and parts and fragments of ideas don't ultimately add up to a complete solution. Instead of picturing a rocketship that will take your shop to the stars, picture a tech who needs three computer screens in order to inspect and write up a vehicle. Instead of blazing-fast production, picture service writers spending extra minutes — that add up to extra hours…on tasks that should take seconds.

Here's the hard truth: conventional wisdom hasn't created a new era of record sales and production; it's recreated the dealership model. Hiring specialists to manage parts or estimates or any area of the production pipeline inevitably leads to squeezing down work, restricting the pipeline, creating unnecessary costs, and stalling growth.

This is a dangerous position for shops to be in. It already costs twice as much to do anything compared to a year or two ago. Inflation means that there's a good chance your costs are rising as fast as or faster than your sales. Is it really a good idea to introduce additional overhead and inefficiencies on top of that?

This can feel like an unwinnable situation, I know. If it seems like everyone else is doing these things, could it really be that bad?

That's a big question. If you buy the same software…and settle for the same inefficiencies…and paint your shop the same colors…and send the same advertising…and follow the same "rules," you can just about guarantee you'll wind up in the middle — like most everybody else.

But what if you're different?

What if you got into this business to provide a better alternative to the dealerships and chain stores? What if you have a better warranty and do better inspections and deliver the kind of over-the-top customer service you always wished that other shops had?

You don't want to look and act like everybody else. You should set yourself apart!

If it wasn't already clear, a lot of the conventional wisdom in this industry leads to a production pipeline full of bottlenecks. Not only during the repair, with all the inefficiencies introduced through outdated, strapped together solutions — but also before and after the repair as well.

The easy solution says to paint your shop the same color, send the same marketing, use the same website company, look the same, and act the same as everywhere else. After all, it's what most shops are doing, so how wrong could it be?

This thinking might create the biggest bottleneck in your production pipeline. Because failing to set yourself apart from the competition gives potential customers no way to tell you apart from any other place they can bring their car. And that means you've restricted customers from ever entering your pipeline to begin with.;

There's good news: you don't have to follow the conventional wisdom. You're not obligated to buy the same antiquated systems and inefficient processes and ineffective marketing.;

You can choose to set yourself apart.

It starts with really examining your production pipeline and being honest with yourself. Does your pipeline get squeezed down by inefficient processes and personnel? Does your marketing make you indistinguishable from your competition? These are hard realizations to come to, and the process of ripping out these inefficiencies won't be easy.

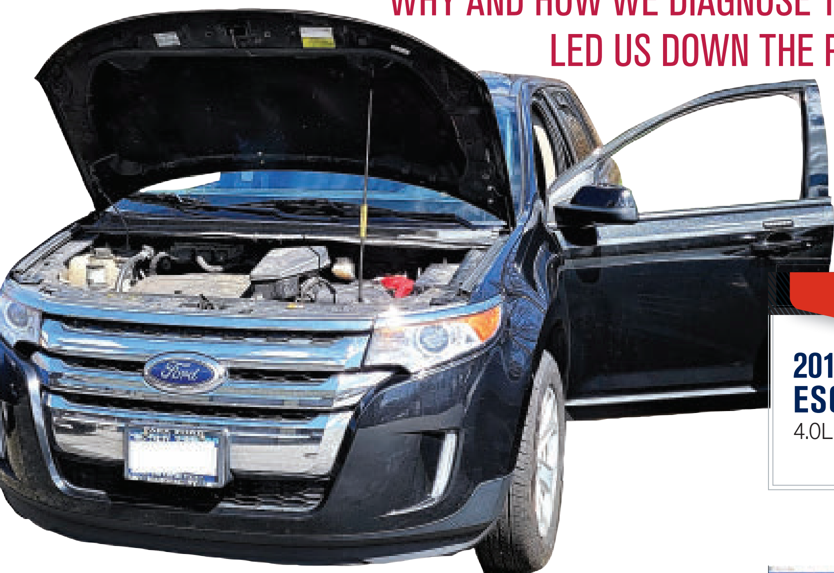
But nothing could be more important…or more worthwhile. When your production pipeline is free of inefficiencies, your shop will attract higher-quality customers, your techs will bill more hours, and your advisors will confidently educate customers to make the right decisions.

In short, you'll create the success your shop deserves! MA

DAVID ROGERS is COO of Keller Bros in Littleton, Colo., and president of Auto Profit Masters. If you believe in operating on these principles but you're struggling to operate successfully, you don't have to endure that struggle alone. Rogers' mission in life is to help owners exactly like you find sustainable success and do the right thing for their own shop, employees, and customers. Reach out to him directly at *coaching@autoprofitmasters.com*.

DIAGNOSTIC STRATEGIES FOR PROBLEM VEHICLES

WHY AND HOW WE DIAGNOSE THE PROBLEM VEHICLES AND WHAT LED US DOWN THE PATH TO REPAIR THEM IS A MATTER OF HAVING A SOLID GAME PLAN.

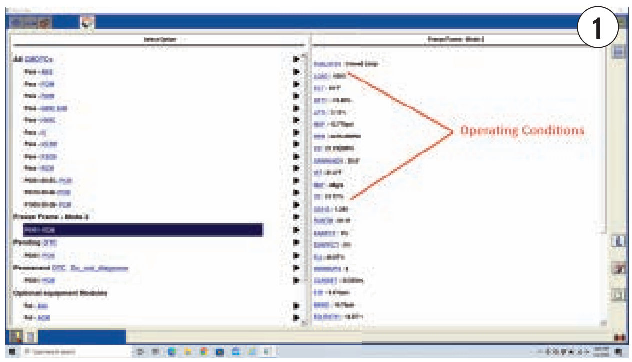


JERRY "G" TRUGLIA // Contributing Editor

VEHICLE

2010 FORD ESCAPE 2.5L
4.0L SOHC

COMPLAINT:
"Running rough, check engine light"

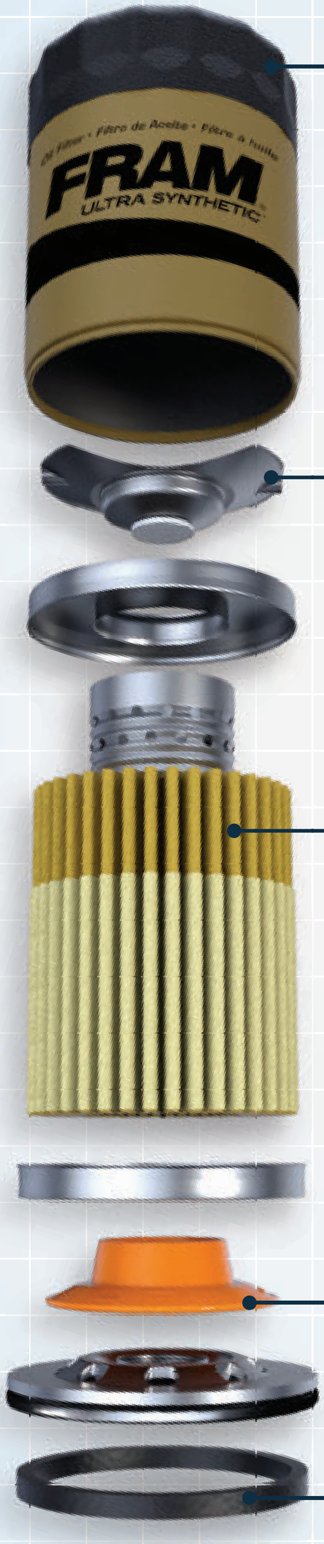


THE FREEZE FRAME DATA OFFERED a clue to how the vehicle was being operated at the time of the failure. this saves time on road-tests to reproduce the symptom of concern.

When faced with a variety of vehicles and the issues they are experiencing, having a solid diagnostic plan of attack will allow for not only a proper diagnosis but also an increase in efficiency. With both of those results combined, the confidence in your diagnostic abilities soars as well.

2010 Ford Escape 2.5L

- Our first problem vehicle has 130,767 miles on the clock along with an illuminated MIL. After interviewing the vehicle owner, we were informed that the vehicle started running rough, followed by the check engine light coming on when she was driving up a hill. We performed a visual inspection and noticed that the ignition coil had burn marks and rainbow-colored markings on the sides of them. We continued our plan by connecting the Ford IDS. We scanned for DTC: **P0301 "Misfire on cylinder #1"**
- P0316 "Misfire on startup"
- P052B "Cam start intake, camshaft position timing over retarded bank 1"
- With the data at hand, it was time to review the freeze frame information and see if we could come up with any clues that would help us with a diagnostic strategy. The freeze-frame data indicated the ECT temperature was 50 degrees F, rpm was 2,279, TP 31 percent, VSS was 21 mph, and the load was 100 percent **(Figure 1).** That information informs us that this misfire happened when the engine was cold, part-throttle as the vehicle was pulling a hill (noted by the 100 percent load value). This confirmed what the vehicle owner told me during the interview. Now I had to make a game plan and come up with a test plan, solution, and repair. One of the first and most important steps after checking the bat-



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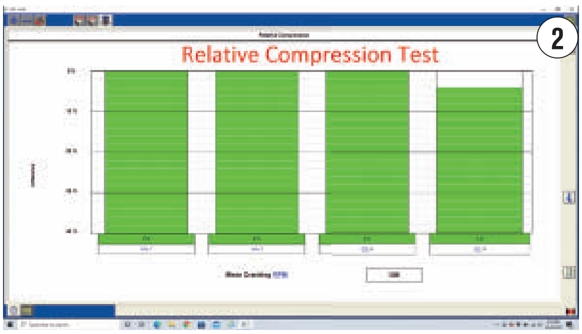
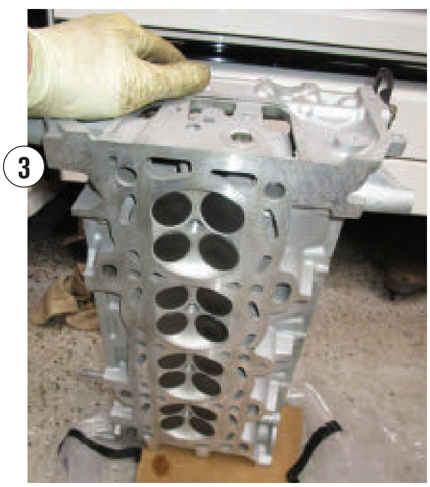
tery, starter, and alternator is to check if the problem is a mechanical issue. Ford made it easy to check mechanical conditions using their relative compression test. We performed the test, and the results did not indicate a problem **(Figure 2)**. Our next step was to perform a power balance test. The results confirmed that a misfire was present. Logically, we followed this test by performing a manual injector balance test that cleared the fuel system of any issues. The next logical deduction was a fault due to an ignition system problem. We repaired the ignition system, which included



THE RELATIVE COMPRESSION TEST QUICKLY determines if a mechanical fault is present in one or more cylinders.

replacing the original spark plugs and ignition coils. After the parts were replaced, the engine ran smooth and strong, along with no MIL illumination on our test drive. We checked DTCs, scan data PIDs, and Mode 6, and all passed the test. It seemed that the vehicle was now repaired so we billed it out and sent the owner on her way. Unfortunately, that was not the last time we were going to see this vehicle for a rough running issue. It was an "Oh, no!" moment when the vehicle returned with the same complaint of rough running and an illuminated MIL. With egg on our faces, we had to check for DTCs and recheck the work we performed. Being the techs with dirty faces, my colleague and I had to make a new game plan and find out what was the cause of the rough running engine. Our new direction led our investigation a bit deeper; we researched in Identifix and found the exact DTC P0301 and P0316 that had recommendations for replacing spark plugs and ignition coils as some of the top fixes. Since we had already found those defective parts and replaced them, we had to move on. The next test we performed was a visual inspection inside the cylinders using a video scope that did not provide a definitive answer to a valve or cylinder problem. What next? Compression test dry, wet, followed by a cylinder leak down test that was marginal. Our next move was to perform an in-cylinder pressure transducer test that has never failed us. The results were very minor when we compared the number 1 misfiring cylinder to the other cylinders, but enough to recommend the removal of the cylinder head. The vehicle owner took my suggestion to remove the cylinder head and send it to the machine shop. The machine shop test found that the intake valve on the number 1 cylinder had a slight issue. They suggested we replace all



THE CYLINDER HEAD was sent to the machine shop for inspection, and issues with valves/seats were present and corrected.

the valves since they have seen issues with this cylinder head. This machine shop does all the work for us and the local Ford dealer. Feeling confident that this was going to fix our problem, we ordered all the parts from Ford to go along with the reconditioned cylinder head **(Figure 3).** The install job included the reconditioned head, new timing chains, tensioner, head bolts, crankshaft bolt, VVT cam phaser, and VVT solenoid. We torqued every fastener to spec followed by an engine start. Thinking we had this engine issue fixed was a mistake, since the MIL was back on after our test drive. Even though we performed and checked every special procedure using all the special tools to align and lock the crank and camshafts, we still had a problem. This was one of those, "What the heck?" moments. We no longer had a problem with a number 1 misfire, but we had other issues:

- **P0016 "Crankshaft position correlation bank 1 Sensor 1"**
- **P052B "Cam start intake A camshaft position timing over-retarded, bank 1."**

My colleague had to remove the valve cover and timing cover and install all the engine lock tools and install the crankshaft alignment tool, only to find everything was on the money **(Figure 4).** He called me over to make sure he was not missing anything — he wasn't. We even checked the screen in the cylinder head oil passage, and it looked good (but we replaced it just in case, since it was inexpensive). We followed that up by pouring the ATS 505 CRO oil pour-in treatment into the engine and running it before draining the oil. We concluded since there was no longer an issue with any DTCs that there must have been something in the oil passages. The engine was running smooth and did not exhibit any more codes or issues, so we shipped it.

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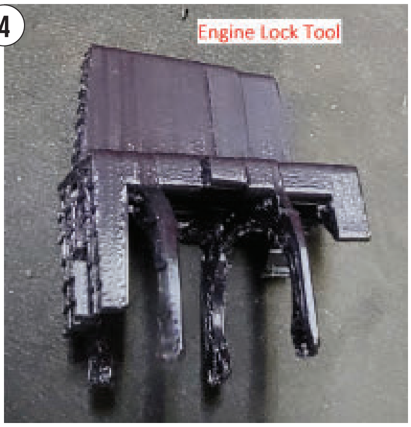


COMMON ON TODAY'S VEHICLES, special tools are required to maintain the position of the camshaft(s) and crankshaft during timing component service and repair.

2014 Ford Edge 3.5L

Our next vehicle came in with a recommendation from another shop that usually diagnoses their own problem vehicles for their customers. This one was going to be a bit different since it was an intermittent parasitic drain. When we first received the vehicle, we found a high draw that lasted for one hour after the key was off. The high draw was most likely a result of the NVLD (natural vacuum leak detection) system that is normal until it goes to sleep. After one hour, the draw dropped down to 50-60 mA then later went up over 1 amp. We tested all the fuses for a draw, performing the VD (voltage drop) fuse method at all the underdash fuse boxes and underhood fuse box.

The results were nothing out of the normal range; no VD. We even pulled fuses and relays that could not be reached with the voltmeter, but there was no change. We looked up TSBs and common issues for this year's make and model, finding that the rear window motors are a common issue for intermittent high current draw. We proceeded to use our thermal imager and though there was some draw, we removed the rear trim panels to access the motors to double-check. Since that was not the source of the draw, we had to move on.

During our search for the problem, we discovered two add-on aftermarket modules under the dash. Thinking we hit pay dirt finding these aftermarket modules, we unplugged them just to rule them out, but there was no change. Next, we parked the vehicle inside (overnight) so we could check it in the morning when the vehicle was cold and all the computers were asleep. The vehicle was checked on five different days with no excessive draw from anywhere. We know that the other shop said that it was intermittent, but this was a real kicker.

On the sixth morning, the vehicle started and was driven out of the bay and parked, then we tried to restart it, only to hear clicking from the solenoid. We tested the battery, and it failed the test, so we charged the battery and retested it. The battery test indicated another fail on the new battery that the other shop had installed. We called the shop to inform them of the defective battery, so they sent us a new replacement that we installed.

Knowing that the replacement battery was not going to solve the problem, we still had to continue our search for the drain. Starting with a new battery was still an important step before moving on. We drove the vehicle, making sure we turned on all the accessories and parked it in the bay overnight to monitor the current draw.

The next morning, we struck out again since we did not find any draw. The second night we got a hit! We found an intermittent 2-amp draw that lasted 15 seconds and reoccurred every 10-15 minutes. Unable to pinpoint what circuit the 2-amp draw was coming from we, had to keep searching. One night while parking the vehicle, we noticed the PRNDL lights remaining on after the vehicle was parked. Using a thermal camera along with the Fluke i30s low current amp clamp (connected at the battery), we discovered a 300 mA draw.

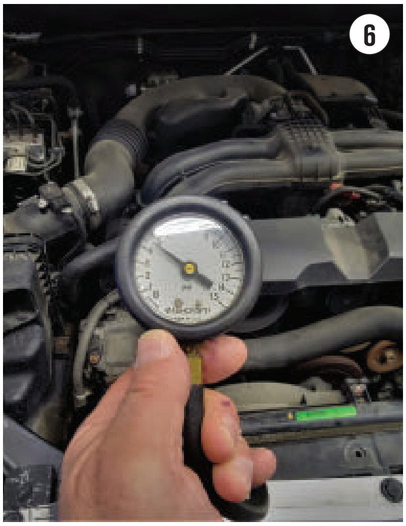
Our next step was to remove the instrument cluster fuse to check at what level the draw was. With the fuse removed, the draw went down to the acceptable level of 50 mA. We did a bit more research on the system and found the shifter has a redundant park switch that can fail **(Figure 5).** We decided to bypass the switch and let the vehicle sit for two days. The result was the battery never went dead.

Since we were confident we solved the parasitic draw on this Edge (that had us on the edge), we recommended a Ford shifter assembly. We found another odd thing; the aftermarket remote start module was causing the dash to light up if the lock button on the fob was clicked twice. We kept the vehicle another few days with the remote system installed to make sure it did not cause a draw.

From experience, we thought it would be better to remove the system since we have seen many problems with add-on systems. We left the vehicle owner a message concerning the removal of the remote system and did not hear back from him for a

5

A DEFECTIVE SWITCH was the root cause of the parasitic drain.



few days. With the system connected for over a week, there were no issues found. Since the owner's daughter was driving the vehicle to college (far away), he took our suggestion and had us remove the system. This Ford was a difficult problem since it was intermittently draining the battery down. I am happy to report that it has been over four months without a problem on this Edge. We used our game plan and made modifications to come up with a solution to the parasitic draw problem.

2013 Subaru Outback 2.5L

This vehicle, with 178,350 miles, was towed in as a no-start. The engine cranked but would not start. Using our "game plan," we checked for air, fuel, spark, and exhaust backpressure. The engine had two out of the four in the good range. The cranking vacuum was an issue (since it was not at a bouncing 3" to 4" while cranking), and the exhaust back pressure was not under a half-pound while cranking. This led us to remove the air-fuel sensor and install a backpressure gauge (which displayed a high reading). As I always say in my classes, "You can't get five pounds of dew out of a one-pound bag." Or in this case, 4.5 pounds **(Figure 6).**

A CRANKING VACUUM TEST is a great way to infer engine breathability and uncover restrictions.

The excessive back pressure was the result of not one, but two defective catalytic converters. The front converter had come apart and blasted pieces of debris into the second converter, which broke that substrate. We were very surprised since we had replaced both converters not all that long ago, due to a defective air-fuel ratio sensor that was out of range. The defective sensor caused the converters to overheat, preventing the vehicle from being driven over 60 mph. The cause of the low power complaint was high backpressure, which caused the loss of power on this Subaru.

Our solution for this problem was to install a new air-fuel sensor and two new Subaru OE converters at 165,008 miles (that was only 13,000 or so miles on the converters before our current problem occurred). There is no way (even if there was an abundant amount of fuel being dumped) that the converters should have had this issue.

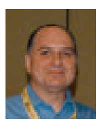
The problem was not fuel or sensor related but rather a defect in the reduction (first) catalytic converter. The problem with this converter was due to a matting issue that protects the converter substrate from being moved around. Maybe you have never seen or noticed catalytic converter matting but I can assure you that all converters have this matting **(Figure 7)**.

SURROUNDING THE SUBSTRATE is the matting, which is a vibration insulator. If the matting becomes displaced, it can become restrictive and prevent the engine from preforming correctly.

When there is an issue with a broken converter substrate that has no external shell damage, the problem is most likely due to matting. The first converter was so badly damaged that it broke my backpressure gauge, blocking it with fine powder and broken substrate from the same converter. The broken pieces went into the second converter and destroyed it.

After our discovery, we called the dealer, who informed us they would warrant both converters without any questions. When they arrived, we only received the front converter and were told that the other converter had to be replaced at the dealership. After both converters were installed, the engine ran fine.

A few months after that problem, the customer called us saying they were losing power again. We had them come in to check it out and found that the problem was not an engine or exhaust issue but rather a transmission problem. The Subaru owner decided that enough was enough and made a deal with the dealership, and traded it in for a new one. MA



JERRY "G" TRUGLIA, is an automotive instructor and author whose work with the U.S. Environmental Protection Agency, Society of Automotive Engineers, National Automotive Service Task Force, Council of Advanced Automotive Trainers, *Motor Age* and *Motor Age* Training, *PTEN*, and the not-for-profit Technicians Service Training has made him nationally recognized in the automotive repair industry. G. is an ASE World Class Triple Master Technician Auto, Truck & School Bus, L1, L3, F1, A9, X1 C1.

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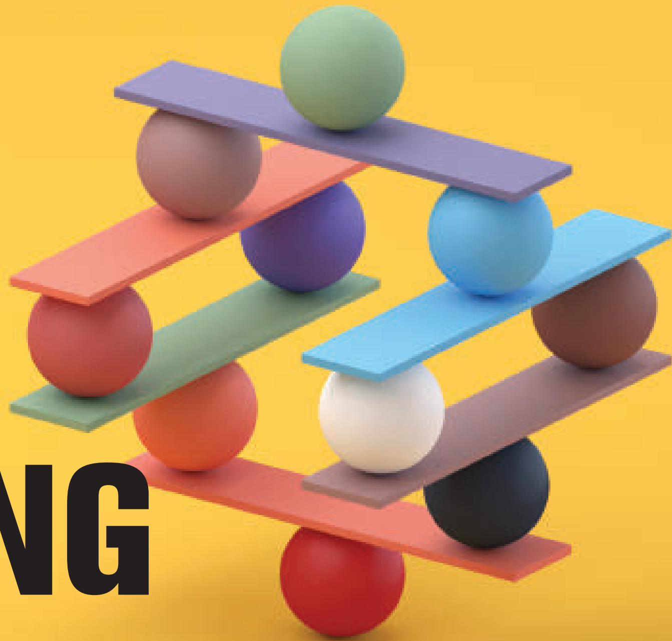

THAT 'BIG JOB' YOU'VE BEEN WORKING ON ALL WEEK IS FINALLY PUT BACK TOGETHER. HOW CONFIDENT ARE YOU TO TURN THAT IGNITION KEY?

BY BRIAN CULOTTA // Contributing Editor

VEHICLE INFORMATION

2003 FORD EXPLORER
4.0L SOHC

COMPLAINT:
"Thumping noise under all driving conditions"

What an emotional moment for a technician. We've all been in these shoes before: We're near the finish line, but we realize that there are two possible outcomes ahead of us. Either we cross that finish line with our arms up in the air and everything is perfect, or it's not and we trip on that pothole we didn't see. The latter can be the most frightening thing for a tech after a lengthy repair. We remembered everything, right?

It's go time! We've built up the courage. We've pumped ourselves up and now we're 100 percent confident everything is going to be just fine. (Who am I kidding?) OK, truth be told, we are not so sure. Anyway, it's time to finally rip the Band-Aid off and deal with what lies ahead.

The customer's concern

The offending suspect today, a 2003 Ford Explorer with a 4.0L SOHC (single overhead cam) engine, is an older vehicle, but it had an interesting outcome. The customer's concern was that there was a thumping noise heard under any driving conditions.

Right away as diagnostic technicians, our minds jump to conclusions and we're assuming there is a suspension/tire noise. But first, we need to duplicate the customer's concern (test drive time!) My co-worker, Dennis, gets in the vehicle to begin his diagnosis. Right away, a loud tapping sound is heard under the hood of the vehicle. It's loud and it doesn't sound very good. The vehicle is brought into the bay to pinpoint this noise. Without a doubt, there is a mechanical engine tapping

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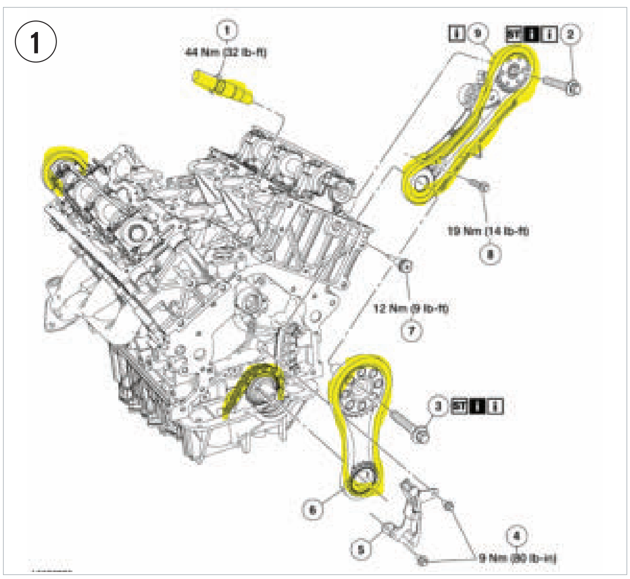
noise coming from the driver's side valvetrain area. We suspect a crankcase ventilation baffle (in the valve cover) has broken loose and is resting/tapping on the camshaft.

Before any further testing or teardown is performed, we contact the customer to interrogate them a little further (to be 100 percent sure this noise is what they are concerned with). Remember, in the beginning, we were thinking there may be a suspension issue, right? The last thing we want to do is fix a noise they have been dealing with for years and it not be the noise they are concerned with. Often, it can be helpful to test drive with the client to have them point out the exact noise before we begin. Unfortunately, we didn't get that opportunity, so we decided to have a detailed conversation with them instead.

The customer agrees with what we are relaying to them. "Yes! The noise is always a thumping sound under the hood." Great! We're confident everyone is on the same page. We then explain to the customer our suspicions (a mechanical failure within the engine is causing the issue) and advise them that further tear down is needed to pinpoint the cause and correction. We need to begin by removing a valve cover to inspect, and the customer approves.

The hunt is on!

Upon removal of the valve cover, we do not see any issues with the valve cover itself or any obvious rocker arm/camshaft issues. We decide to crank the engine over (ignition disabled) with the valve cover removed to inspect the movement of the valve train components. Right away, we notice the front timing chain tensioner arm is banging against the chain **(Figure 1)**. The tensioner itself has completely failed and the plastic guide is moving around. This valve train setup is not a



COURTESY OF ALLDATA

GAINING ACCESS TO THE REAR TIMING COMPONENTS of this engine requires removal of the engine assembly.

simple design, nor is it a simple repair. There are a total of four chains, including one in the back of the engine that requires engine removal to replace.

Now, I am in northeast Ohio and directly in the heart of the Snowbelt (the Rust Belt). Vehicles tend to deteriorate significantly faster in my area in comparison to what my friends in the south see. For a vehicle to require this extensive of a repair, it would only make sense that it be in good condition before the decision to move further. Turns out, this vehicle is in great condition and worth the investment. The customer decides to proceed with the repair.

There are special valvetrain alignment tools required to replace the chains on this vehicle **(Figure 2).** We order the timing chain tool kit and begin teardown. During the removal of the harmonic balancer, we find out there is damage to the outer ring where the belt would ride **(Figure 3)**. A new harmonic balancer is ordered to be installed during reassembly.

ON TODAY'S VEHICLES, IT'S COMMON to need holding fixtures during retiming of the camshaft and crankshaft.

After we get the front engine cover off, we notice more carnage. The balance shaft chain (the lowest chain in Figure 1) also has broken timing chain guides. The broken pieces are sitting at the bottom of the oil pan.

Now, this is a typical repair for these engines and frankly, any overhead cam engine. These things just happen, and we see this frequently in our service centers. Dennis is chugging away and replacing these chains without an issue, up until it is time to use our new timing chain tool kit.

THE AREA INDICATED BY THE RED ARROW was damaged, and the harmonic balancer required replacement.

Square peg, round hole

Dennis calls me over to get my opinion on an issue he has noticed. The top left "Y" shaped tool (in the tool kit) is designed to lock into the crankshaft position sensor exciter ring while having its "leg" aligned with the oil pan sealing surface of the block. With everything in place, the tool is about a fraction of an inch away from the block. (Something is wrong!)

Dennis has read the repair procedure in the service manual countless times and returned to the car, scratching his head. Every step is being followed correctly; however, we still are having alignment issues. I review his steps

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and cannot find anything he has missed. (Now what?)

Dennis, rightfully so, chooses a new aftermarket harmonic balancer to use during the installation of the timing chains on this vehicle. I would have done the same thing. I ask him to try the original balancer, just to see how it aligns with the timing chain alignment tools and new chain set. Everything aligns perfectly!

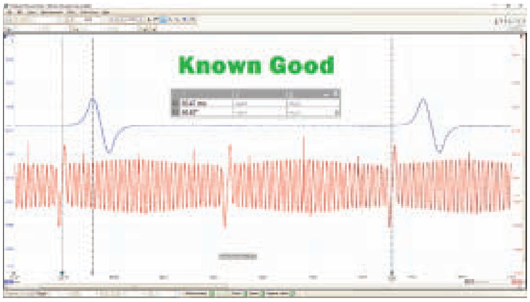
We end up putting both new and old harmonic balancers on the workbench and confirm the alignment of the crankshaft position sensor exciter ring is incorrect on the new balancer. The original balancer exciter ring is cast into the center sleeve of the balancer.

There is no way for the original balancer exciter ring to shift, as the exciter ring is part of the center sleeve. The new aftermarket balancer's exciter ring is pressed onto the center sleeve of the balancer, and unfortunately has been installed a few degrees off from where it should be. Easy enough to fix, we order another one!

The second time's the charm, or is it?

The second aftermarket harmonic balancer is in the same position as the first! Possibly, the manufacturer has an issue with the alignment procedure of the exciter ring. We've tried two now, and we're not about to strike out on a third. A genuine Ford harmonic balancer is ordered. Its exciter ring alignment is exactly that of the original. Alright! Let's move on.

The rest of the timing chain replacement process goes as smoothly as possible. No other issues to be had, other than the extensive repair at hand. At the beginning of this article, I highlighted the anxiety some of us technicians face when it's finally time to start up this vehicle. We're back to that part of the story, as the time has come!



5

A KNOWN GOOD CAPTURE OFFERS a visual reference to compare acquisitions to those derived from the suspect-vehicle being addressed.

Dennis gets in the vehicle, grabs that ignition key, closes his eyes, says a prayer to the Ford gods, and hopes for the best. The vehicle cranks and just like that, it runs! The cooling system is then bled, fluid levels checked, remaining plastic trim pieces are installed, tire pressure checked, etc. The engine is running beautifully, and the vehicle is ready for its maiden voyage. You thought it was over, didn't you? We've only just begun.

Dennis gets no further than 30 feet out of the door, and the engine is running terribly. There are noticeable misfires and eventually, a check engine light is illuminated. That sinking feeling sets in (there's that "pothole" we didn't see). Immediately, one's mind is racing for any possibility of a simple fix. "Maybe I didn't seat a spark plug wire in completely." Something quick and easy would be perfect right now.

The saga continues

A scan tool is used to retrieve trouble codes, and we find a P0320 – "Ignition Engine Speed Input Circuit Malfunction" **(Figure 4).** We notice the misfire "feels" as if it's not cylinder-specific. The engine idles well but does not want to accelerate smoothly.

A power-balance scan tool function is performed and matches our suspicions of this "misfire" not being cylinder-specific. The power balance graphic is all over the place and lacks a cylinder-specific diagnostic direction. (Not a loose spark plug wire, unfortunately).

We have a crankshaft position sensor-related fault code on a vehicle we had just replaced the timing chains on, so let's confirm the cam timing is correct. I decide to perform a cam-crank correlation test. This process requires the use of a digital storage oscilloscope and having access to a known-good waveform. Luckily, I was able to find a known-good waveform fairly quickly by browsing my archives **(Figure 5)**.

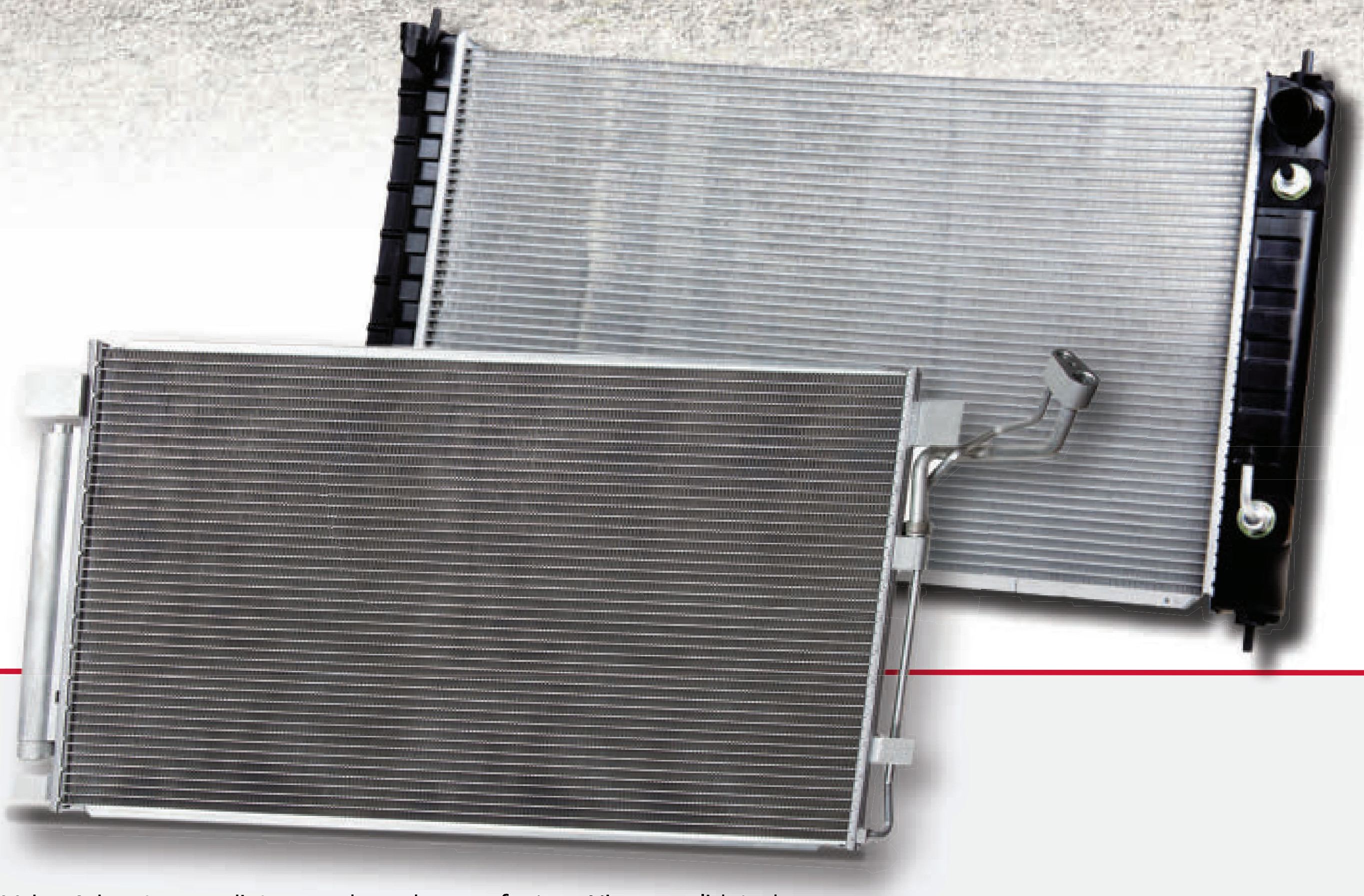
Using PicoScope's rotational rulers I can quickly measure (in degrees) the distance the camshaft position (CMP) sensor pulse is from the crankshaft position (CKP) sensors sync pulse. I line up the 720-degree reference marks on the CKP, and then make a quick measurement of the positioning of the CMP. This is a very fast and effective method of proving valve train timing integrity. It sure beats pulling off that timing cover again!

I do the same procedure on the vehicle we have in our bay **(Figure 6)**. There are 66 degrees of crankshaft rotation between the CKP sync and the first pulse of the CMP, on both captures.

P0320 - Ignition Engine Speed Input Circuit Malfunction	The ignition engine speed sensor input signal to PCM is continuously monitored. The test fails when the signal indicates that two successive erratic profile ignition pickup (PIP) pulses have occurred.	• Loose wires/connectors. • Arcing secondary ignition components (coil, wires and plugs) • On board transmitter (2-way radio)	The DTC indicates that two successive erratic PIP pulses occurred.

4

CODE SET CRITERIA is very important to reference, early into a diagnosis. Often, lots of time can be saved from the valuable clues described here.



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[2]Based on Independent Repair Facility's purchases from your local authorized dealership. IRF must be enrolled In the Parts Rewards program to be eligible. Available to one qualified repair facility employee per Independent Repair Facility. For official program rules and eligibility, see "Terms and Conditions" at **NissanUSAPartsRewards.com**. Program rules are subject to change.

This proves there is not an incorrectly timed valve train assembly.

So now what!? Let's look again at the information in the code description. It states that this test fails when two successive, erratic profile ignition pickup (PIP) pulses have occurred. Let's look at that capture. I am going to zoom out a bit to see if something "erratic" happens over a longer period

At a first glance, I am not seeing something that jumps out at me as being erratic, but I do notice a small "bump" in the rising edge of the CKP's missing tooth pulse. Let's get a closer look at that. I create a "reference waveform" in the PicoScope software so I can add my suspect CKP signal to my known good. This enables me to have a single-window direct comparison of the two signals. This can be easier to identify subtle differences between the two captures **(Figure 7).**

What can cause this "disturbance" we are seeing? Both the CMP and CKP on this vehicle are VR- (variable reluctance) style sensors. A variable reluctance sensor consists of a permanent magnet with a pole piece surrounded by a coil of wire. This sensor simply generates an analog voltage output signal as a ferrous metal material passes across the tip of the sensor. With that, only something ferrous (magnetic) can be in the "missing tooth" section of the exciter ring. Maybe a piece of debris fell into the exciter ring during re-assembly? Let's take a closer look.

THIS DEFORMITY IS THE CAUSE of the anomaly seen in the previous CKP signal lab scope trace.

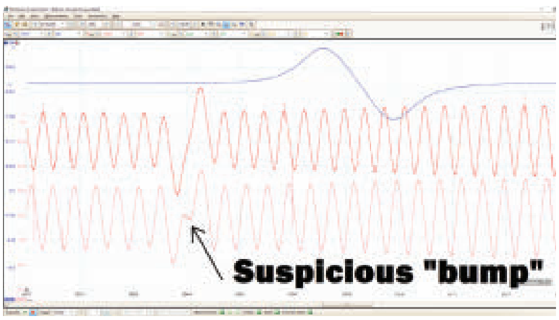
Target acquired

Fortunately, for this vehicle, the exciter ring is exposed on the exterior of the harmonic balancer and can be easily seen without any disassembly. I ask Dennis to hop in the vehicle and "bump it over" until the exciter ring's missing tooth is exposed. I see the outer portion of the exciter ring that includes a "partial tooth" in the missing tooth section of this exciter ring **(Figure 8)**. Is that enough to cause our issue? In the back of my head, I remember a post on social media for a similar scenario, but this was years ago (I can't find it, of course). Remember, this is a direct-from-Ford, "OEM" harmonic balancer. This exciter ring is not the same design as the original exciter ring. Let's look at the original once again. We do some further investigation and notice the Dayco brand harmonic balancer CKP exciter ring matches the design of the original; however, we cannot get one for multiple days.

Pursuing a hypothesis

After discussions with Ford and our internal management, we decide to see if removing just enough of the "partial tooth" (with a small Dremel tool) could cause this disturbance to go away. Sure enough, with just s bit of that tooth removed, our current CKP signal matches our known-good signal, exactly, and the vehicle runs like new! All symptoms are completely gone; no trouble codes are set after multiple test drives! It's time to call the customer and let them know their vehicle is ready to go.

As a technician, it's situations like this that can keep you up at night. This vehicle is nearly two decades old. It's tough to digest that "bumps in the road" like this still exist in the parts industry on a vehicle of this age. By now, "they" should have it figured out, right? Multiple issues in this story, both aftermarket and OEM, brought us in directions we wish didn't exist. Hey, if it were easy, everyone would do it!



6

THE INFORMATION GAINED FROM THIS CAPTURE (when compared to the known-good) yields proof of a timing signal shift without disassembling the engine.

7

IN THE LOWER SCOPE TRACE, an anomaly is visible and is the cause for the driveability symptoms present. The cause of the anomaly must be investigated further, which requires inspection of the CKP reluctor.

BRIAN CULOTTA is a graduate of the Universal Technical Institute in Chicago, Illinois. After graduating, he started working for an independent car dealership as a lead technician for seven years. He then moved to a new job at an independent repair shop where he stayed for three years. He now works at Dave's Auto Care in Willoughby, Ohio, as the shop foreman and ASE Master L1, L3 technician.

HOT TOPICS

Get ready for the electric future with the BendPak EV2400SL

Automotive executives believe electric vehicles will account for more than half their sales by 2030. Some estimates place the number of electric vehicles in the U.S. over the next eight years at more than 25 million, or just over 8 percent of all vehicles in operation. You may think this isn't relevant if you don't work on Tesla cars, but traditional OEMs and startups are also rolling out new EVs, including electric versions of the popular Ford F-150 and Chevrolet Silverado pickup trucks.

If you want to continue working on the cars, trucks and vans of the future, you need to prepare now. Thankfully, vehicle equipment leader BendPak is ready to help.

BendPak's new **EV2400SL EV battery pack and powertrain lifting system** helps technicians safely and efficiently remove, service and install heavy electric vehicle battery packs from a wide range of electric vehicles. And thanks to an innovative design that supports a full line of available accessories, it also doubles as a powertrain lift for internal combustion vehicles, making it a versatile choice throughout the shop right away.

"While electric vehicles are hot right now, the majority of vehicles on the road will continue to use internal combustion powertrains for a long time to come," says Jeff Kritzer, BendPak executive vice president. "That's why we're designing equipment that maximizes return on investment by supporting service on both electric and gas vehicles."

The EV2400SL is compact and portable with oversized urethane casters to provide low rolling resistance and unparalleled maneuverability around the shop. Equipped with proprietary zero-throw casters on all four corners, the platform can be moved easily in any direction. Adjustable screw jacks on each corner provide effortless pitch and roll adjustments for more precise alignment of high-voltage batteries, engine and drivetrain assemblies, fuel tanks and more. Once in place, a foot-operated single-action tandem floor lock prevents inadvertent rolling and creates a stable workspace.

Like the electric vehicles it supports, the EV2400SL lifting system is battery-powered. It uses a maintenance-free 12-volt deep-cycle battery featuring proprietary, high-density grid technology precisely engineered to deliver outstanding performance. A fully automatic three-stage battery charger offers connect-and-forget operation to protect against overcharging.

With a press of the button on the pendant controller, the EV2400SL elevates to more than 6 feet in less than 20 seconds. It supports 2,400 lbs. on its oversized 40-inch by 60-inch cushioned platform. Sixteen recessed mounting anchors in the platform tabletop accommodate a variety of modular fixtures, adapters and accessories that can be added, repositioned or removed as needed to handle engines, transmissions, gas tanks, transaxle assemblies and more. An optional side-shift deck uses a ball transfer system to allow the table to move side-to-side for additional adjustability and precise alignment.

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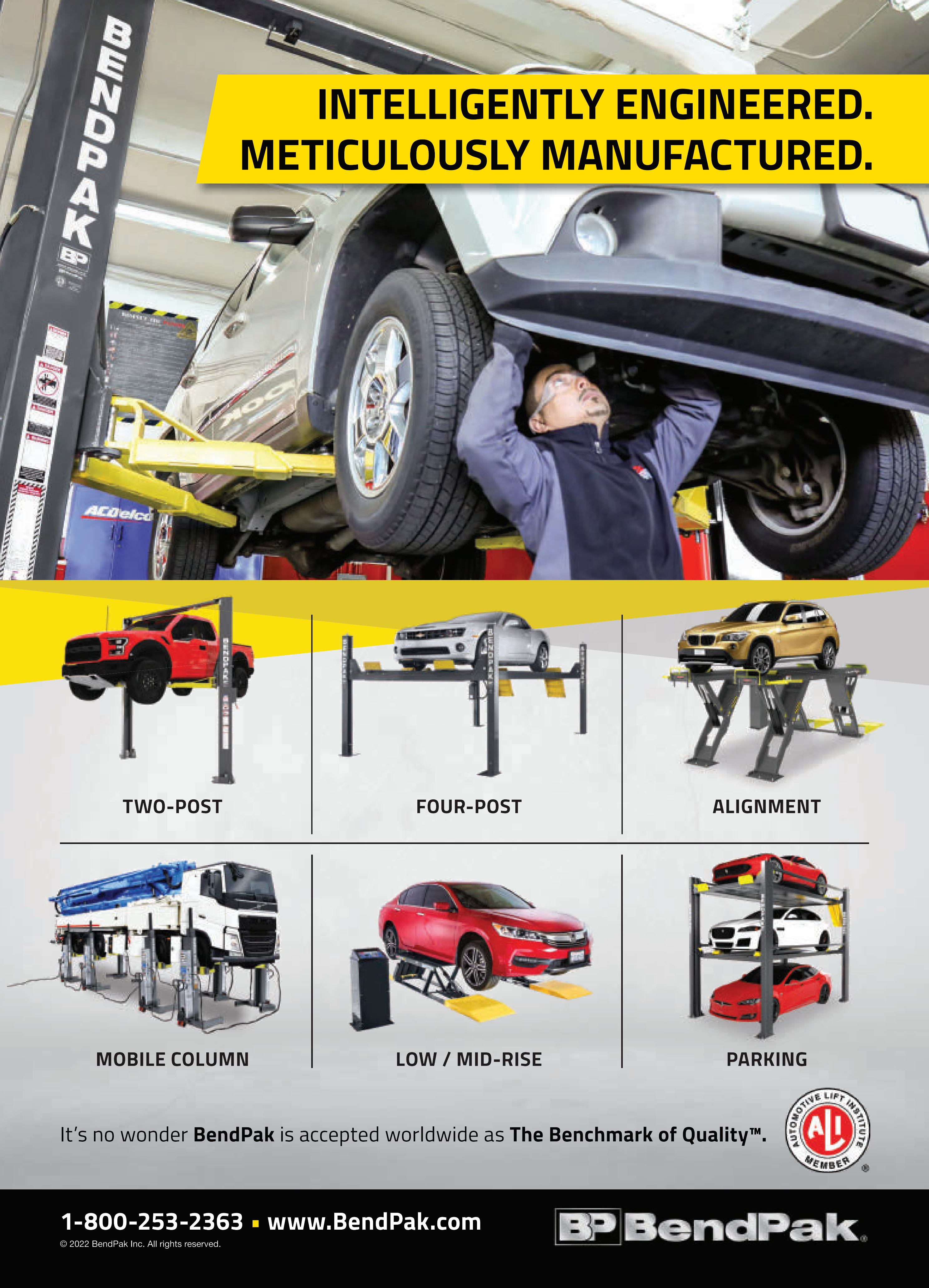
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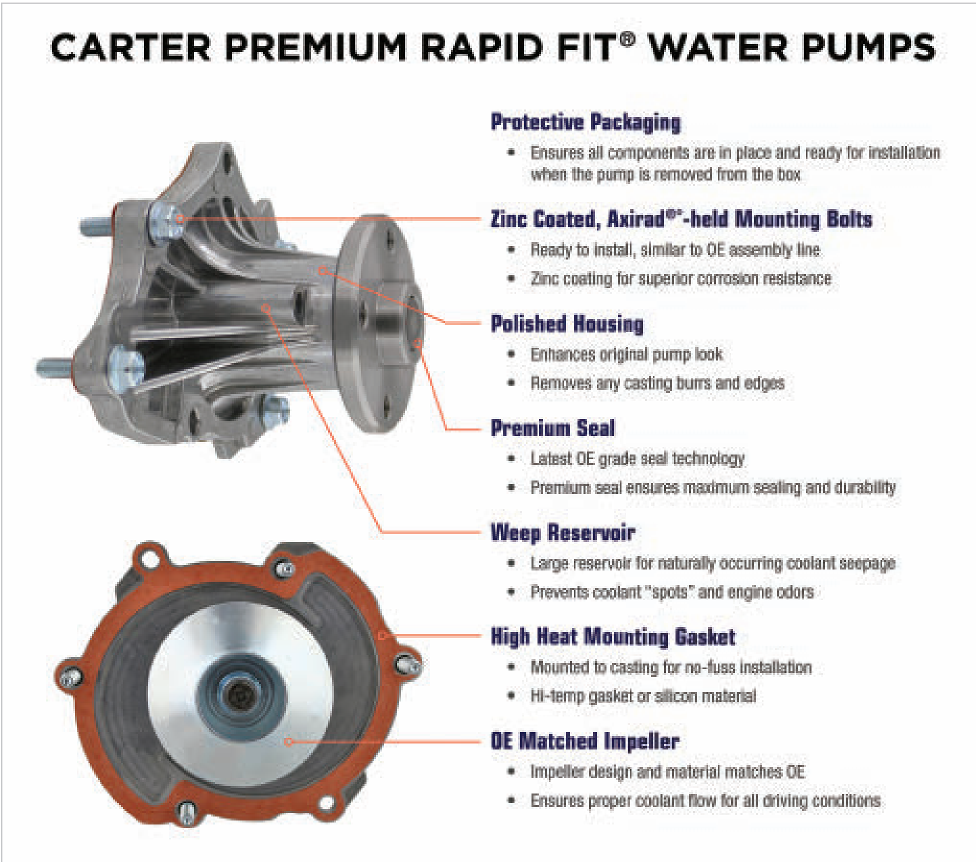
Carter's full line of water pumps provide over 95% coverage of domestic and import vehicles in operation including mechanical and electrical auxiliary water pumps. These pumps use better quality components and are always new, never remanufactured. Engineered in the US to OE quality standards for performance and durability; Carter facilities are equipped with best-in-class resources such as; in-house engineering, manufacturing and testing. These resources allow Carter to test and approve 100% before the parts leave the facility. Carter also offers a warranty to provide added peace of mind.



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In addition to Carter's standard water pump, Carter is setting a new standard with the addition of the Rapid Fit™ Water Pumps. Pioneered with the service professional in mind, Carter's exclusive selection of patent pending Premium Rapid Fit™ Water Pumps feature pre-mounted components including; pre-adhered gasket and recessed holes with pre-installed bolts to deliver time-saving installation. Protective packaging ensures all components are in place and ready for installation when the pump is removed from the box.

Carter Resource Portal

Carter's refreshed website and new domain — www.CarterEngineered.com — delivers another asset providing technical resources and service bulletins. This robust information portal has been designed for individuals who want to learn more about Carter's complete line of engineered pumps, locate the right parts for a repair, search for technical and installation information and understand Carter's commitment to engineering and product development.

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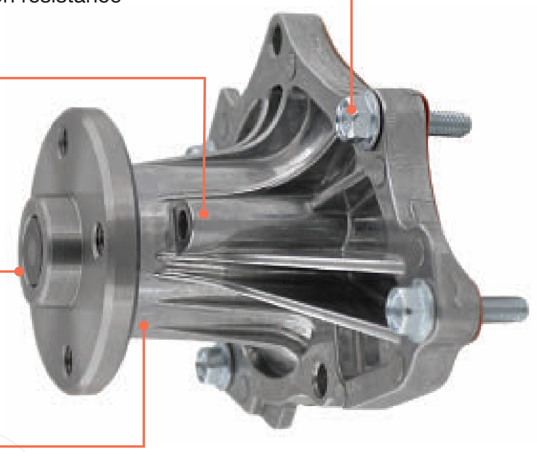

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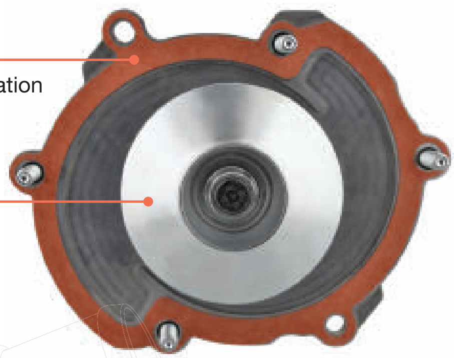

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*Axi-Rad® is a GM patented thermoplastic retainer manufactured by Forest City Technologies.

Centric Premium Friction, Rotors are Built to Fit

Centric Parts is a leading manufacturer and supplier of replacement brake components for import and domestic vehicles. Centric's reputation for quality among technicians, distributors and retailers is the result of years of hard work from a stellar team of engineers and product specialists as well as a manufacturing process that is second to none.

Centric friction and rotors cover virtually every vehicle on the road and are the premium quality brake products that technicians need to do the job right the first time.

Posi Quiet® Brake Pads

Posi Quiet Premium Disc Brake Pads are offered as three unique friction types to best fit the performance levels expected by the end user – semi-met, ceramic and extended wear. The pads are manufactured using the same positive molding technology as original equipment (OE) suppliers. They are precision-manufactured to ensure even pad wear and consistent braking throughout the life of the pad. Posi Quiet brake pads utilize a multi-layer premium shim construction that focuses on premium noise abatement and vibration damping. All Posi Quiet friction materials are scorched, which raises the initial cold effectiveness of the material, stabilizing friction levels without break-in and providing consistent performance across the entire operating range. Posi Quiet brake pads also include application-specific hardware featuring stainless steel abutment clips, retaining clips, as well as other attaching hardware to match OE form, fit and function.

Centric Premium Brake Pads

Centric Premium Brake Pads are a reliable choice for the everyday driver that needs a brand that they can trust. Product offerings include semi-met and ceramic, and feature slots, chamfers and designs that match the original equipment. All Centric Premium Brake Pads come installation-ready with application specific hardware, including stainless abutment clips and retaining clips, where applicable.

Centric Premium Rotors

Centric Premium Brake Rotors are built to original equipment specifications using OE production processes and are manufactured to meet QS and ISO quality system standards. Centric Premium Rotors utilize an ecologically safe paint that provides long-lasting corrosion protection without all the harmful biproducts.

Centric Parts provides the quality braking components that professional technicians depend on in the service bay. It can be said, "There's quality, and then there is Centric quality"

For more information about Centric Parts, visit: www.centricparts.com.

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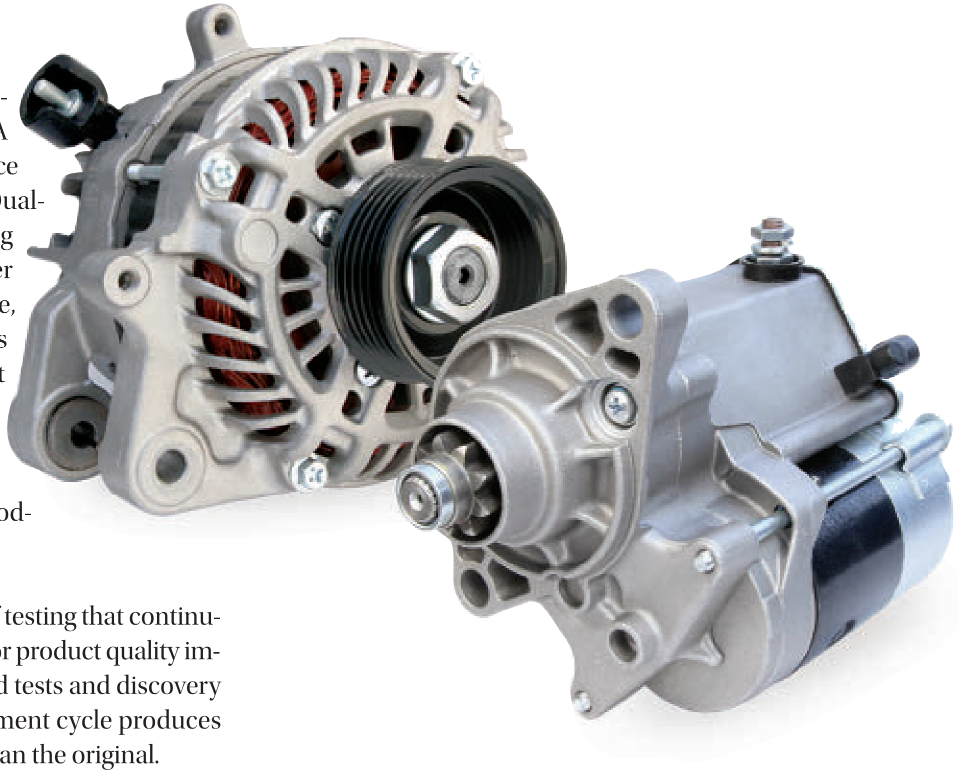
HOT TOPICS

Quality - Built to Last



Quality-Built to Last isn't just a catchphrase; it's the foundation of the MPA company culture and is the driving force behind our products and services. Quality parts start with quality engineering and quality manufacturing. With over 50 years of road-tested performance, MPA's dedication to durability drives every decision we make. Quality-Built to Last is the guiding principle across all operations and is reflected in our continuous improvement philosophy that drives ongoing advances and product enhancements.

MPA leverages an ongoing cycle of testing that continually reveals additional opportunities for product quality improvements through a series of staged tests and discovery processes. This continuous improvement cycle produces replacement parts that work better than the original.

All Quality-Built Starters and Alternators are built-to-last in advanced manufacturing facilities to exacting standards that ensure each Quality-Built part will perform just like, or better than the original. Quality-Built Starters and Alternators are engineered, manufactured to the highest quality and performance standards, and subjected to the most rigorous reliability testing in the business.

MPA's remanufacturing processes are unique to each specific part; a proprietary database of product specification documents, build and testing information are all delivered digitally to the remanufacturing cells for each part being assembled and tested:

- All cores are 100% disassembled
- Components are cleaned, remanufactured, and tested
- New replacement components are combined with refurbished parts

We subject all remanufactured components to rigorous multi-phase testing to ensure durability:

- Individual component lots are 100% ISA (Initial Sample Approval) tested for compliance with specs, functionality, and durability before they reach the factory floor
- Subassemblies are 100% tested for performance on specialized equipment before final assembly
- Completed units are 100% End-of-Line tested across a wide range of operating requirements using proprietary, computer-controlled testers

Engineered component upgrades and manufacturing improvements extend service life:

- Innovative drip protectors
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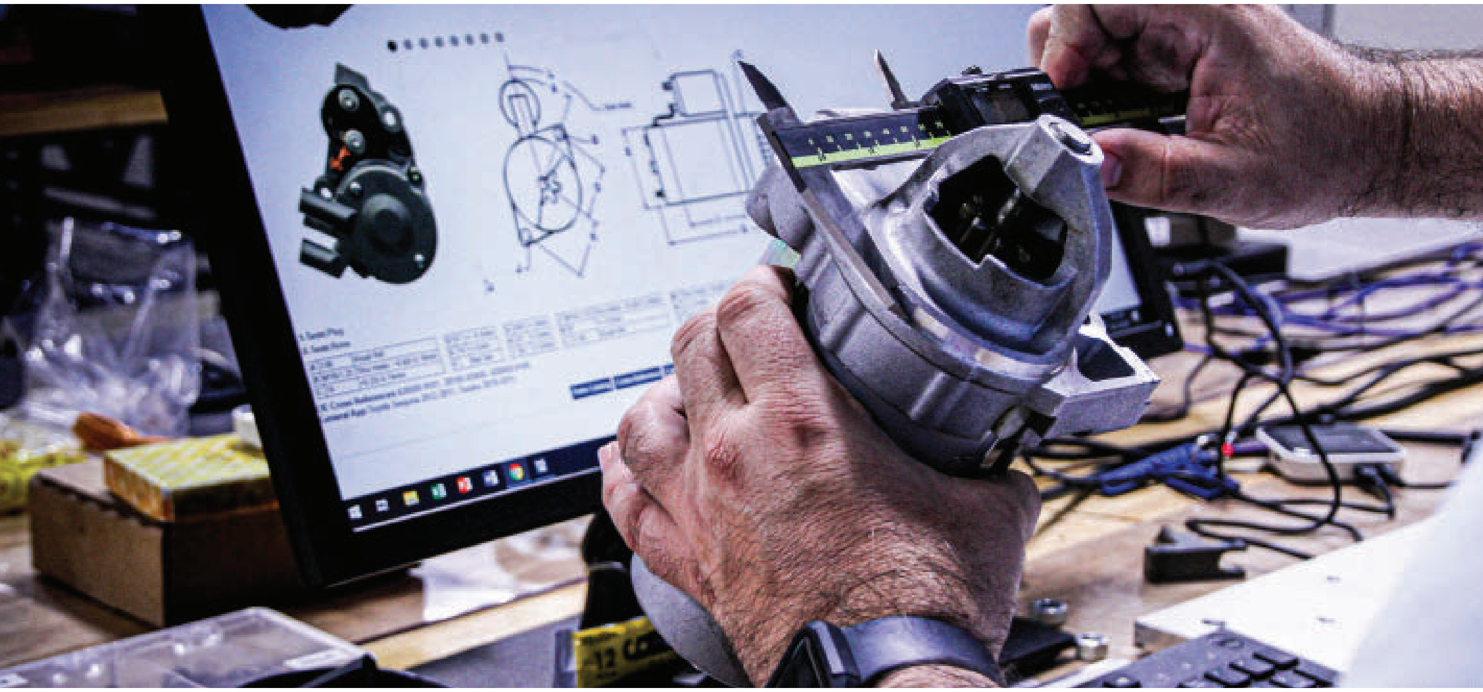
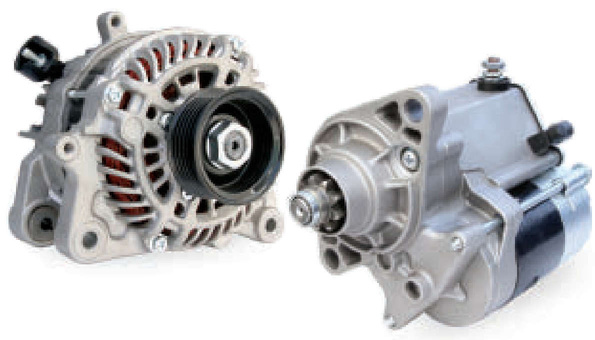


MPA's product engineering and remanufacturing process refinements ensure that every Quality-Built part we produce meets original equipment build specs and delivers dependable performance right out of the box.



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HOT TOPICS

Take your hybrid electric vehicles (HEVs) and battery electric vehicles (BEVs) diagnostics to the next level

BY: DAVE BARDEN – POWER PROBE®'S SENIOR MANAGER OF TRAINING AND DIAGNOSTICS

When I began testing the new Power Probe VT750LCD, I was somewhat unfamiliar with two-pole voltage testers and what made them different than a multimeter. The VT750LCD is a simple, compact CATIII/1000V voltage tester. It just does not have all the ranges and test modes a traditional meter has, which in some situations makes it a simpler, easier to use tool.

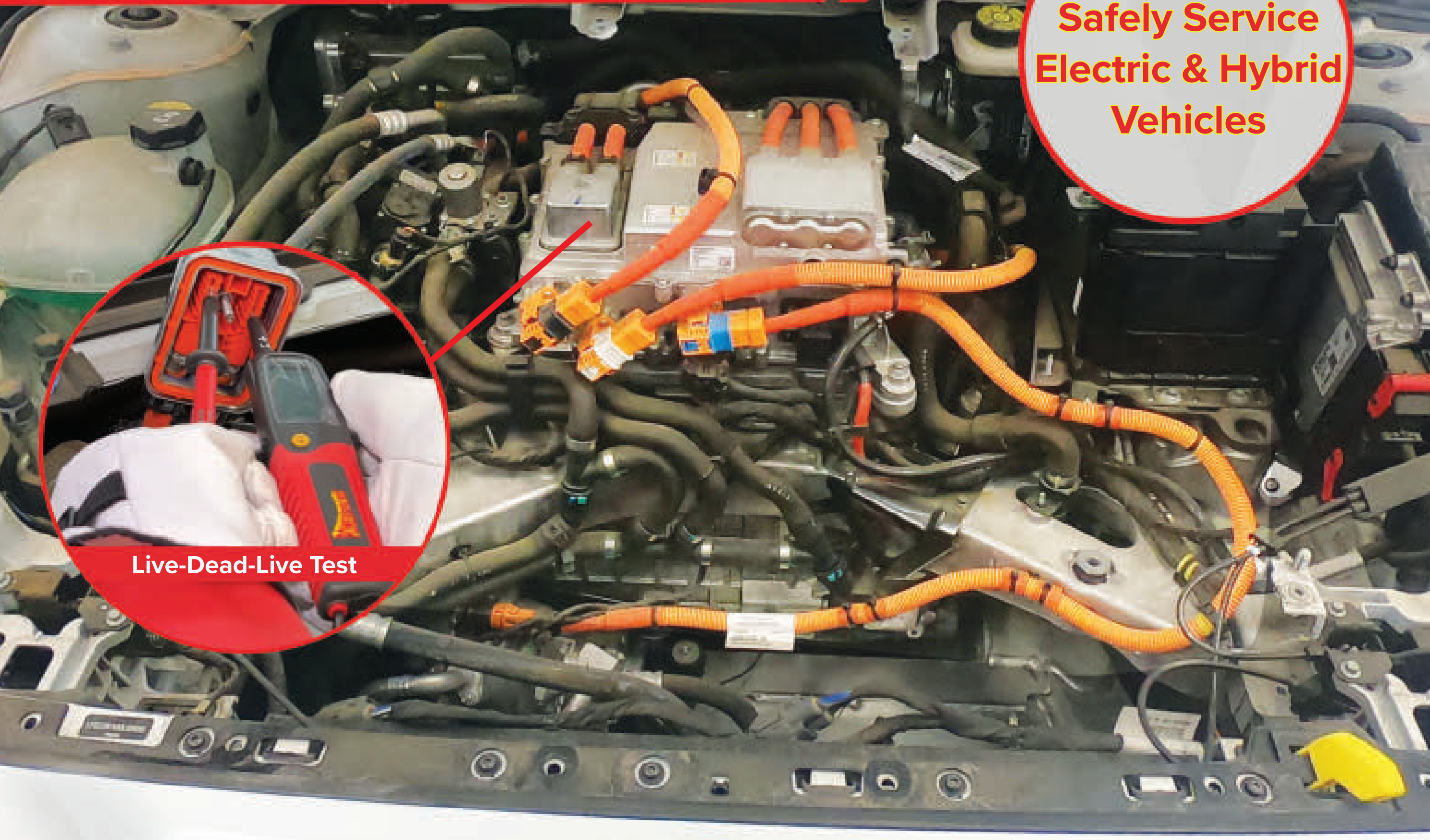
After attending a recent industry training, I learned that this is exactly the kind of tool needed when servicing hybrid electric vehicles (HEVs) and battery electric vehicles (BEVs) because of its simplicity.

A critical step when working around the vehicle's high-voltage system is verifying that the main battery is truly disconnected and the system capacitors are completely discharged so it is safe to work around. Doing this test with a typical multimeter, while possible, has some inherent risks that can be reduced or eliminated when using a two-pole voltage tester.

1. The VT750LCD is safety-rated at 1000V CATIII, pretty much the highest rating, typically only found in more expensive meters. When working around very high voltages, this reduces the risk that the meter itself or its leads are any possible source of arcs or shorting. The VT750LCD probes also have retracting insulators around the probe test points. This helps prevent accidental shorts between the probes or surrounding objects.
2. The VT750LCD has only one fixed probe on the tool's housing with the second (two-pole) on a short lead. Most multimeters have removable leads with different connections for different test modes. There is a risk that a user could plug in the leads incorrectly and get a false reading. Most multimeters also have a large selector dial with many different test modes and can also be accidently set in the wrong mode. Having a tool with fixed probes and no mode selection vastly reduces these risks.
3. Most multimeters are battery-powered. When their batteries get low, many meters may not respond or measure correctly, even though the display is still showing. The VT750LCD does not need a battery to work. It will turn on and measure accurately when any voltage above 12V is being probed, even if the internal battery is removed. You can be 100-percent sure that if the VT750LCD does not indicate voltage, there is no voltage or risk.
4. The VT750LCD will also indicate the presence of voltage above 100V using only the main body probe (no need to use the second lead/probe) by tone and display.

These may be limited risks when testing with a multimeter, but when the stakes can quite literally be your life, it is best to use the safest tool possible. The Power Probe VT750LCD is a tool purposely built for this application - to provide 100-percent reliable and safe voltage checks.

Power Probe Two-Pole Tester VT750LCD



VT750LCD
Two-Pole Advantage

- Safety Rated at 1000V CATIII
- Built for Electric and Hybrid Vehicles
- Automatically Selects the Correct Voltage Range
- Second Lead (2-pole) on a Short Lead
- Does Not Need a Battery to Work
- Retracting Insulators Around the Probe Test Points
- One Fixed Probe on the Tool's Housing
- Live-Dead-Live Test is Reliable and Safe

Specification	
ACV Measurement Range	1V~750V
DCV Measurement Range	±12V~750V
Resistance Measurement Range	0Ω~2000Ω
Frequency Measurement Range	30Hz~999Hz
Continuity Beeper	≤600KΩ beep on
Diode Test Range	0.3V~0.9V
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With three product lines – Element3™, Raybestos R-Line and Specialty – professional technicians can select the right parts needed for their customer's brake repair.

'The Best in Brakes™' makes it easy!

Raybestos Element3 Line – Premium Line Enhanced for Ultimate Performance

The Raybestos Element3 line starts with The Best in Brakes and adds enhanced product features to deliver exceptional performance. This innovative offering with upgraded product attributes for increased performance and a longer life provides a full selection of components for complete braking coverage, including EHT™ Enhanced Hybrid Technology friction formulations, coated rotors, new plated brake calipers, shoes and OE-matched hydraulics.

Raybestos R-Line – Superior Stopping Power

The Raybestos R-Line provides a reliable solution for everyday driving. Offered in easy-to-match packaging, technicians can quickly select ceramic or semi-metallic brake pads, OE-matched professional grade rotors and drums, reman plated and non-plated calipers and wheel hubs for a complete brake job.

Specialty Friction and Rotors – Full Line Coverage for Critical Target Categories

Bringing together innovation and superior engineering, Raybestos specifically designed these specialty brake pads and rotors with application-specific formulas and full-line coverage for critical target categories. Special product features such as mechanical retention system backing plates, enhanced metallurgy rotors and custom designs allow for exceptional performance in high-temperature and severe duty situations across significant niche markets, including Police, School Bus, Truck & Medium Duty, Performance and Air Disc.

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Ultra-premium Raybestos® Element3™ brake pads feature enhanced hybrid technology and provide ultimate everyday stopping power no matter what vehicle you drive.

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HOT TOPICS

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Then Dan-Am Air is for you!

Dan-Am Air is lightweight, aircraft grade, powder coated aluminum, which provides clean, dry air up to 232 psi. The reinforced composite Nylon fittings have dual seals, which rest on un-scraped pipe, providing a leak free guarantee. Our Press-to-Connect fittings feature a full bore design for turbulence free air delivery. This quick, instant connection eliminates the need to thread, solder or glue, accounting for far less installation times than traditional copper or black pipe.

Designed with simplicity in mind, DAA allows you to do-it-yourself. Measure, cut, de-burr, then simply Press-to-Connect, equaling lower installation times and cost. All fittings arrive pre-torqued for immediate assembly and pressurization, as well as being interchangeable, allowing for ease of future addition or expansion. "This "Press-to-Connect" subject tends to be the most misunderstood instructions in the DAA system. We have all been taught since we were young, to loosen a given item, put it together, then tighten it back up, right? That is wrong with Dan-Am Air. DO NOT loosen fitting caps before installation. It really is as simple as push the fitting onto the pipe until it bottoms out. Done. Stop. Move on. The only reason to loosen a fitting cap, is to remove the fitting from the pipe. Loosening the cap relieves the pressure on the grip ring, allowing you to gently back out the pipe. To reuse any given fitting, simply re-torque the fitting cap to factory specs (line the arrows up, see figure 1), and "Press-to-Connect". As each cap is individual to its fitting, the arrows are either solid, or hollow respectively. Fitting caps are NOT interchangeable.

We stock a large array of threaded connectors and adapters, allowing Dan-Am Air to be integrated into existing systems without compromising performance, making DAA perfect for upgrade or expansion projects.

DAA also allows you to take your investment with you in the case of relocation, as all components are reusable.

Watch our YouTube video on how to install a DanAmAir fitting

Product design and support is readily available from Dan-Am Company. They also have all products on hand and ready to ship, as well as in-house support for quotes and general information.

Dan-Am Co., is the Exclusive Importer of SATA Products for the US and Puerto Rico. Anywhere you can purchase SATA Products, also has access to our Dan-Am lines as well, including Dan-Am Air.

Please visit our Website at www.danamair.com, as well as our Facebook page www.facebook.com/danamaluminumairline for recent install pics, comments etc. Both of these have proven to be valuable resources for customers to understand exactly what can be accomplished with SATA and Dan-Am Air combined.

SATA German Engineering DanAmAir®

SATA/DanAmAir

Brad Gravenhof has been in the automotive industry for over 30 years and serves as DanAm Company's Sales and Technical Dan-Am Air Specialist.

Sellars is creating a higher standard for shop towel performance

Sellars TOOLBOX® shop towels are known for their absorbency, softness, and toughness. As one of only two manufacturers of double re-crepe (DRC) shop towels, Sellars has a unique position to reimagine and redefine what is both possible and practical. This was evident when it became the first manufacturer to produce DRC shop towels made with 40 percent post-consumer recycled fibers.

Far too often, higher costs and lower standards are the norm for environmentally friendly products. There's no tradeoff for sustainability here. Not only are TOOLBOX shop towels environmentally friendly, extremely absorbent, and strong, but they also meet the EPA comprehensive procurement guidelines, which provides facilities the opportunity to earn credits in several LEED-EB (Existing Building) O&M categories.

TOOLBOX Z400 shop towels are available in a wide variety of put-ups including interfold pop-up boxes, center pull boxes, jumbo rolls, and Sellars' patented Big Grip® dispensers and Big Grip® dispenser refills.

But the story doesn't end there. Sellars recycles the excess DRC shop towel waste to create a highly absorbent and extremely consistent core material for their DuraSoak and Ever-Soak General Purpose Absorbents. With the infusion of a compatible absorbent DRC shop towel component, they're able to offer sustainability, price stability, and up to 85 percent more absorbency than the leading competitor's comparable meltblown sorbents.

See for yourself what sustainable Sellars shop towels have to offer at shoptowels.work. Free sample sheets are available on the site.

SELLARS

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To learn more about TOOLBOX® Shop Towels, visit ShowTowels.work
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HOT TOPICS

Actually, *do* try this at home

It's a short step from alignments to ADAS

It's becoming a sort of a chicken-or-the-egg thing: If you're doing alignments, ADAS calibrations logically follow. Since these systems require straight wheels, if you're doing ADAS calibrations, you're likely starting with an alignment.

The good news is you don't need to figure out which came first.

You just need to know where to turn for help.

Already an expert at alignments, you can also become one at calibrations with Hunter Engineering's premium, full-diagnostic scan tool, ADASLink®.

Here's why you should.

Advanced driver-assistance systems, or ADAS, has spent the last year redrawing the face of the automotive service industry. Estimated as a $27 billion market in 2021, a recent study predicts a rise to as high as $75 billion in 2030. Even if some shops would prefer to avoid ADAS work going forward, the market may not allow it.

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For more information, visit www.launchtechusa.com.

TECHNICAL

THE ABCs OF ADAS

MANY TECHS ARE STILL APPREHENSIVE ABOUT ADAS, BUT BREAKING DOWN WHICH SYSTEMS ARE A PART OF THIS CLASSIFICATION WILL HELP EASE THE APPREHENSION.

BY BRANDON STECKLER **//** Technical Editor

When it comes to ADAS (advanced driver assistance systems), the first things that likely come to mind for most technicians and consumers are radar cruise control and lane watch. But ADAS is much more than that. As the name indicates, it is a system.

These systems are made up of subsystems of individual components, and not every vehicle is configured the same. Rather than getting overwhelmed with the ins and outs of ADAS, we can visit it one component at a time. Hopefully, I can dispel some of the myths that keep a lot of us at bay.

The pieces of the ADAS puzzle

ADAS is a series of subsystems that work together to ensure the driver and occupants of the vehicle, as well as the other vehicles and pedestrians nearby, can operate safely together on our network of roads and highways.

ADAS' implementation led to far fewer accident-related injuries and far more lives spared. Its safety is from the combination of the onboard ECUs' (electronic control units) processing power, as well as the speed (or baud rate) of the networks in which the data is shared that allows the reaction time (to a potential safety issue) to be far swifter than that of human beings.

So, it's a no-brainer that NHTSA (the National Highway Traffic Safety Administration) has mandated that all new vehicles possess certain subsystems of ADAS. And as these systems continue to become more prevalent, the everyday jobs we have performed for decades will now require ADAS system calibration to operate safely — and you are the one to be held responsible for that calibration, regardless of how you choose to handle it.

So, the question is, "*Why are so many of us hesitant to get involved in the diagnosis, repair, and calibration of ADAS?*" After all, it can no longer be avoided. Why continue to farm out the calibrations to dealerships and mobile technicians? It is not only possible to do in-house (in most situations) but can also be a phenomenal source of revenue.

ADAS simply takes a level of understanding. If we can determine the different subsystems available that make up ADAS, identify each of the components that make up these subsystems, and learn how each of those components function, we should have a much better understanding of how to address ADAS challenges as they arise. Keep in mind that any ADAS subsystem is designed to supplement and assist drivers, not replace them. If the calibration is not proper, the response from the ADAS systems will not be, either.

ADAS uses a combination of different systems, and these combinations vary from vehicle to vehicle. These are some of the components that provide input to ADAS' subsystems that make up ADAS: image processsing cameras, lidar, radar, ultrasonic sensors, and electromagnetic sensors.

Image processing cameras

These cameras serve as the "eyes" of the ADAS subsystems **(Figure 1)**. They provide input to the lane departure warning subsystems or lane keep assist (LKA), helping keep the vehicle on its intended path between the painted lines on the road. These cameras also provide input to assist in parking the vehicle and preventing contact between two vehicles or other stationary objects. They can even begin to recognize road signs and such, giving the system some artificial intelligence.

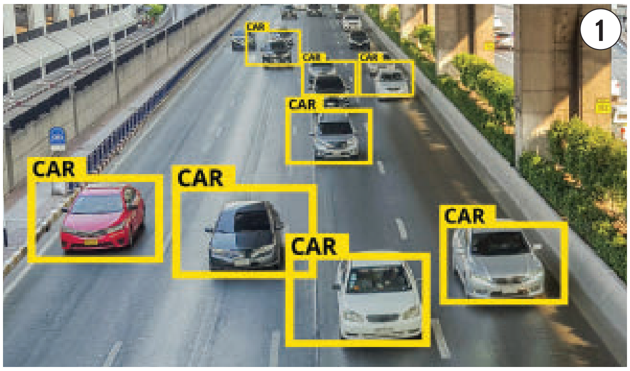


IMAGE PROCESSING CAMERAS are the eyes of the vehicle and provide input for the functionality of a few ADAS systems.

Light detection and ranging (lidar):

These systems use pulsed laser light to illuminate an object in its path and measure the distance **(Figure 2)**. The interpretation of this pulsed laser light is seen by the processing computer as a 3-D image. It's this technology that allows autonomous vehicle features to function without driver input. This system is what assists in collision avoidance and is known as braking mitigation, meaning if the vehicle got too close to one in front of it, the vehicle could apply the hydraulic brakes, increasing the distance between the two vehicles and/or reducing the rate of approach.

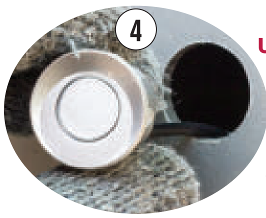
Radio detection and ranging (radar):

This system detects objects using radio waves. It can accurately detect the range, angle, and/or velocity of objects by interpreting these casted radio waves **(Figure 3)**. These systems work to provide similar detecting capabilities as the cameras but allow for cross-traffic alerts. For instance, if a child were fetching a ball that rolled into the street, the short or medium-range radar system would detect him/her and alert the driver. These radar systems provide blind spot detection, alerting the driver to a possible collision if a lane change were to occur at an inappropriate time. The short/medium-range radar system will also help prevent rear-end collisions in parking lots and the like during reversing.

LIDAR (OR LIGHT DETECTION AND RANGING SYSTEMS) are similar to night-vision. The interpretation of this pulsed laser light is seen by the processing computer as a 3-D image.

RADAR (OR RADIO DETECTION AND RANGING SYSTEMS) emit sound waves and bounce them off of objects nearby. The time it takes for the sound to return is used determine proximity.

Another version is long-range radar, ideal for systems such as adaptive cruise control (ACC), which allows the vehicle to slow when approaching the vehicle ahead of it too rapidly. This system maintains a safe distance (selectable by the driver) from the vehicle ahead and can even resume the chosen speed/distance after stopping at a traffic light.



ULTRASONIC PROXIMITY SENSORS are used to aid in parking assist systems. As a foreign object nears the sensor, a high-frequency sound wave detects it. The system responds to driver with an audible warning of proximity.

Ultrasound

Using ultrasonic proximity sensors, the distance can be detected between the vehicle and objects within close proximity, allowing the vehicle to get close to other vehicles during parking maneuvers but without contact **(Figure 4)**. These sensors emit higher frequency noise (undetectable to the human ear and at a speed of over 340 meters per second!) and listen for the echo to return. As the detected object nears the vehicle, an audible warning is sent to the driver. The closer the object becomes, the more rapid the audible warning becomes. Just prior to contact, the tone becomes steady, alerting the driver to stop approaching. These sensors can be found in both the front and rear of the vehicle. It's this same technology that we see implemented in vehicles with liftgates that allow opening without contact (waving your foot in the path of the sensor's view).

Electromagnetic parking sensor

These are similar to the ultrasonic sensor but function differently. The input from these sensors will not only allow for an audible

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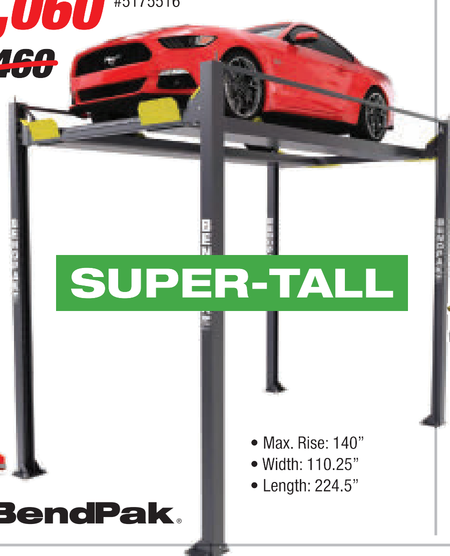

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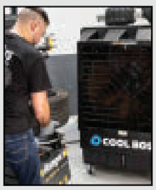

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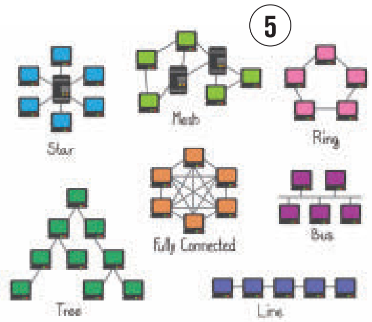
warning (when a detected object is within close proximity) but can also provide brake mitigation.

Each one of these systems can offer either a passive response to the driver (a simple audible or haptic warning, such as the vibration of the steering wheel or the driver's seat frame,) or an active response (a corrective action), such as steering correction or braking mitigation. Sometimes the vehicle allows for a selectable response or even for the system to be turned off entirely.

A true network

Each of those components can be associated with more than one system. We refer to that as *sensor fusion*. This is possible because the information is communicated between multiple ECUs on the network, sensor fusion becomes possible, allowing for shared responsibility **(Figure 5)**. For instance, combining images from forward-facing cameras, backup cameras (and possibly others) allow for an around-the-vehicle view and even gives the vehicle the ability to display an image (to the driver) that seemingly sees straight through a towed trailer or uses inputs from both the lidar and forward-facing camera to determine the need for braking mitigation. This same sensor fusion also allows for seemingly magical autonomous parallel parking, appear. Another example would be for the wheel speed sensors, yaw sensor, steering angle sensor, front camera input and GPS to allow for proper compensation of the active headlamps at the appropriate time, preventing blinding of an oncoming car/driver and increasing illumination in the direction the steering wheel is turned (input from the steering angle sensor).



NETWORK TOPOLOGY is important to understand when dealing with any system communicating data to other ECUs. the topology mapping will allow you to understand the configuration and comes in handy during communication faults.

Sensors provide the inputs, and the processed inputs allow the ADAS to make decisions about the appropriate output. Inputs like the ones below are used to operate and monitor the active responses:

- Instrument panel cluster (serving as a gateway)
- Throttle position sensor (for speed control)
- Wheel speed sensors (to detect wheel slip during braking mitigation and acceleration for ACC)
- Yaw sensors/accelerometers (to prevent loss of control during active responses)
- Steering angle sensor (monitoring the actual and feedback for active responses like LKA)
- Brake pedal position sensor (to determine driver's intent to stop)

Mastering the basics

All the components of all the ADAS subsystems need just a few things to function properly: an adequate voltage supply, ground supply, ignition voltage supply, and a means to communicate with the other nodes on the networks. This is no different than analyzing any other computerized system you were faced with in the past. It simply requires access to service information so you can understand how the vehicle you are addressing is configured.

Once that is known, research to determine what subsystem the subject vehicle has. There are two forms of ADAS calibration, static and dynamic. Some vehicles' systems require one or the other. Some require either of the two, and some require both. Do the research ahead of time. Having the proper tooling and access to software is what it takes to complete the job correctly and on the first visit.

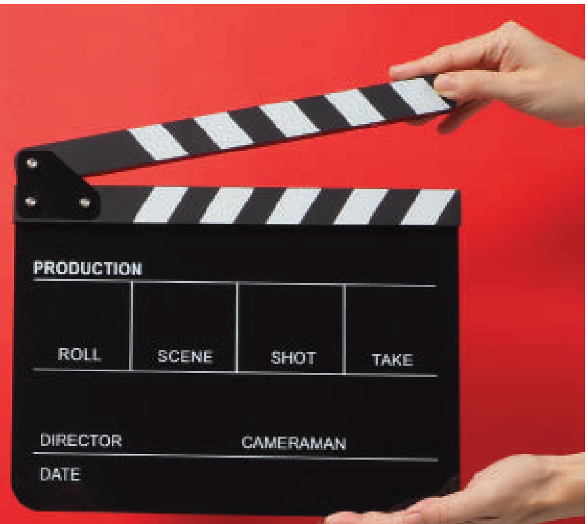
Capitalizing on the technology

Many mobile technicians provide service to area shops. Some have created ADAS supercenters with the necessary space, calibration equipment, lighting, and software to calibrate for most auto manufacturers.They are profitable not only because they are properly equipped and can efficiently complete the jobs they encounter; much of it comes from local collision repair shops. They have an alignment rack dedicted to ADAS work and adequate parking for upcoming jobs. This makes for a streamlined and profitable business within a business.

Of course, I'm not here to convince anyone how to run their business. However, I would like to instill some confidence. Venturing into ADAS may seem expensive, but we've been down this road more than once. If you consider that every vehicle that requires alignment will require an ADAS calibration (assuming it is equipped with radar), it should be clear that with only a few calibrations per month, the ADAS calibration system will pay for itself in a short amount of time. And by 2025, all light duty passenger vehicles up to 10,000 lbs GVW will be required to have automatic emergency braking, which makes the return on investment huge. But don't take my word for it. Do your own research on the available systems. Figure out how many alignments you currently do per month. Reach out to local collision repair facilities. After all, they must be getting the calibrations completed somewhere; why couldn't it be in your new ADAS supercenter? Trust me, ADAS is only going to become more prevalent as time passes. Jump on the train while it's passing you; don't wait until it's gone. MA

BRANDON STECKLER is the technical editor of *Motor Age* magazine. He holds multiple ASE certifications. He is an active instructor and provides telephone and live technical support, as well as private training, for technicians all across the world.

THE TIMES, THEY ARE A-CHANGIN'



NEW VIDEO RESOURCES AND EVENTS AVAILABLE NOW WITH MORE TO COME!

BY PETE MEIER // Contributing Editor

Since the official announcement that the Endeavor Business Media's Vehicle Repair Group had named Brandon Steckler as technical editor, I've been fielding questions asking whether I was still with *Motor Age*. And to be frank, I am honored that so many of you have found my tenure as technical editor beneficial to your shops and you, personally. I've always said that I am blessed to be able to try and help my fellow technicians keep up with the rapidly changing technology you face daily, and to bring you relative content in each issue of the magazine.

Yes, I'm still here and I now have a more expanded role working with our sister publications, *ABRN* and *PTEN* on the digital side of our business. Most of you know that I've been creating a variety of videos hosted on our *Motor Age* YouTube channel **(Figure 1)**. If you weren't aware (what, you're not paying attention?), I encourage you to look us up and subscribe to the channel. You won't find vehicle-specific videos, but you will find training resources that will help you handle diagnostics and repair on numerous OEMs. After all, I'd rather show you how to fish than just hand you a fish (to somewhat quote an old saying)!

These efforts, along with the duties of overseeing the print technical content, just got to be too much work for one man to handle. Enter our new guy, Brandon Steckler. I first met Steckler when he filled in for a trainer, Jim Morton. It only took a few minutes of seeing him teach to realize that Steckler was a young man to watch, and I thought even then that he would make a great successor when the time came. He, too, comes from a wrench-turning background and he understands, as I do, what it takes to make living

THE TRAINER VIDEO SERIES was the first to debut on YouTube over a decade ago, with 125 episodes produced…so far!

in the business we chose. But it wasn't just his presence in the classroom or his work resume that impressed me; it was his sincere desire to help technicians face the challenges of today and tomorrow. If you are on any of the Facebook groups he frequents or has ever had the opportunity to meet him in person, you know exactly what I mean.

And that, my friends, is the number-one requirement for stepping into the shoes of the technical editor for this publication, and it is my honor to hand over the keys to the print side to him while I focus on new projects that I hope will take us — and you — to the next level of professionalism.

Video resources you may not know about

There is no question that video is king. It is estimated that over 90 percent of internet use is spent on watching videos — from streaming feature-length films, to watching kittens and puppies at play. We are spending more and more time engrossed in our phones and many of us use video search to help us when faced with a new challenge in the shop.

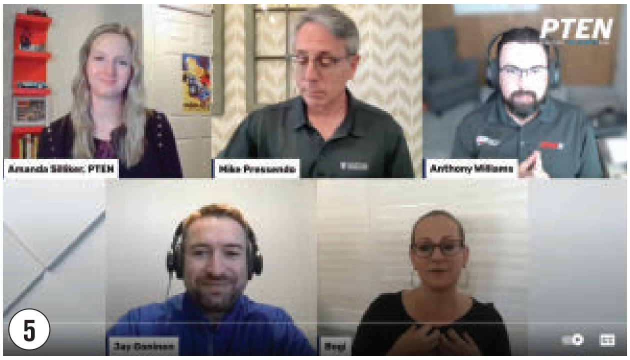
Again, I'm not going to get into many videos that are vehicle-specific for the reasons stated earlier. What I intend to do is provide you with professional-level content you can use to increase your skillsets and those of your fellow technicians. Much of what we currently offer can be used, for example, as a group "lunch and learn," to watch with your team and discuss afterward.

Educators tell me they assign our videos to their students as homework, for review in class the next day, and even some nationally known trainers ask to use our content in their own presentations, to illustrate what they are teaching more effectively. While I try to be entertaining in these vid-

THE INDUSTRY IS CHANGING in more ways than just technology and we want to keep you informed of the news that impacts your livelihood.

SOMETIMES IT'S JUST GOOD TO HEAR what others think, as we did in the three-hour long live stream hosted at the NWACA expo.

EVENT COVERAGE AND THE STORIES BEHIND THEM are also important news, providing you with insights on the resources you may not be aware of — and may just help you run a more profitable business.



IT'S NOT JUST PETE YOU'LL BE SEEING MORE OF — other editors on the team will be hosting videos of their own, like this one featuring Amanda Silliker in a discussion with several industry notables.

eos, I first want to be informative. I hope you'll feel that I am achieving that aim and please let me know if I miss the mark or if you want me to take on a topic you haven't seen.

Even if you are aware of our YouTube efforts, many of you still don't know — or take advantage of — the free, sponsored webinars we do eight times a year now with G. Jerry Truglia and his Technicians Service Training (TST) team. These are live, in the shop, and on the car, presentations that allow you to interact with us in as close to real-time as we can make it, and as close to a "hands-on" feel as we can get. Sure, some of the topics seem "basic" but don't let that fool you! Even in these modest webcasts, I'll assure you that you will leave knowing something you didn't know before. Follow us on Facebook, Instagram, LinkedIn, or YouTube. As I post the event notices, there is plenty of time for you to reserve your seat. You may not be able to attend the live event, but you can always access the recordings in your Motor Age Training account.

News and event coverage

Today, I am working to broaden our news and event coverage. Many of these videos are streamed live on-site and then recorded for viewing at your leisure. Recently, I've had some great conversations regarding the pending Right to Equitable and Professional Auto Industry Repair (REPAIR) Act (H.R. 6570) with ACA's Bill Hanvey and AASA's Paul McCarthy **(Figure 2).** I've shared a motivational keynote address by Gary Smith at the recent NWACA ATE event **(Figure 3**). I've interviewed with Advance executives at the WORLDPAC STX 2022 event **(Figure 4)**, and even carried out a walk-thru of the trade show at this past March's VISION Hi-Tech Training and Expo in Overland Park, Kan., with plenty more to come **(Figure 5)**. A new video podcast is in the planning stages, so keep an eye out for that. You will be able to watch it on any of our social media pages and hopefully be able to listen to it on your favorite podcast service soon. And be sure not to miss my class on three steps to successful electrical troubleshooting, just one of the classes at Motor Age Training's all-day ACCELERATE event Oct. 15 in Rosemont, Ill. Go to accelerate-conference.com for more info.

But that's not all, folks!

Not only have my own efforts been kicked into overdrive, but you'll also start seeing more and more of our editorial staff in front of a camera, as well as behind the keyboard. Our own editorial director, Amanda Silliker, has hosted a few shows herself and is an amazing talent; and Steckler has been known to make a video or two himself. All this means that we are doing even more to honor our mission of "advancing the automotive service professional." MA

PETE MEIER is the director of training for the Vehicle Repair Group with Endeavor Business Media. He is an ASE certified Master Technician with over 35 years of practical experience as a technician and educator, covering a wide variety of makes and models. He began writing for *Motor Age* as a contributor in 2006 and joined the magazine full time as technical editor in 2010. He believes in the mission of the magazine to "advance the automotive professional" and provides resources to working techs around the country through print, social media, and YouTube. He spearheads the *Motor Age* YouTube channel, delivering essential training videos for technicians at all levels.

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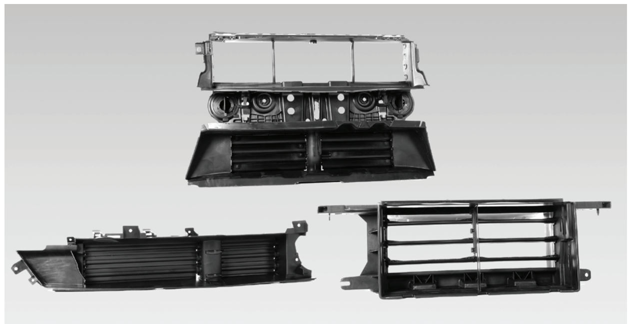

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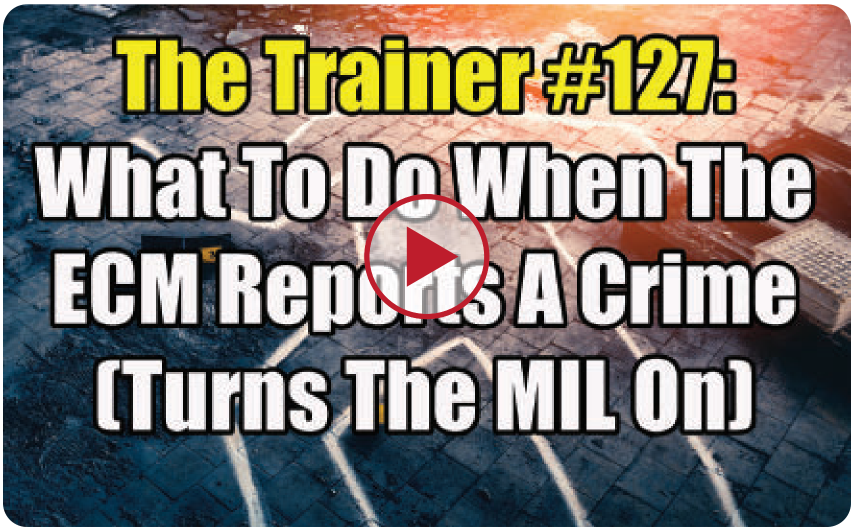
MARKETPLACE

AD INDEX

THE TRAINER #127: WHAT TO DO WHEN THE ECM REPORTS A CRIME (TURNS THE MIL ON)

PETE MEIER // Director of Training



Diagnosing the cause of an illuminated MIL – or more commonly known as the Check Engine Light – is comparable to what investigators do to catch a criminal. It starts with someone reporting that a crime has been committed. For us, that can be the customer concern and/or the Engine Control Module. One makes a phone call; the other turns on the MIL light.

Then an investigation begins. That's us – we're the detectives assigned to the case!

In the case of a criminal investigation, detectives are taught that there are two elements to consider, the investigative tasks and investigative thinking.

Investigative tasks relate to identifying physical evidence, gathering information, evidence collection, evidence protection, witness interviewing, and suspect interviewing and interrogation.

Investigative thinking, just like our own diagnostic thinking process, is aimed at analyzing the information collected, developing theories of what happened, the way an event occurred, and establishing reasonable grounds to believe. Those reasonable grounds to believe will identify suspects and lead to arrest and charges. Investigative thinking is the process of analyzing evidence and information, considering alternate possibilities to establish the way an event occurred and to determine if they are reasonable.

Isn't that true for us as well? We have to analyze the information we collect and, based on that information, perform the appropriate tests to begin narrowing down the pool of suspects – adjusting as we go – until we ultimately identify THE ONE AND ONLY cause of the fault.

Join Pete in this month's edition of The Trainer to see the concepts in action!

To learn more about the tools used in today's video, be sure to visit www.Autel.com.

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