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EDITOR'S NOTE

Follow the process

A set diagnostic process keeps the shop running smoothly.

By Emily Markham, Editor
Emily@VehicleServicePros.com

Vehicles are only getting more complex. Between ADAS, electric vehicles, and all the creature comforts being added and/or updated on today's vehicles, it's easy to get overwhelmed. When a customer brings in their vehicle with an issue that isn't easily resolved, what do you do? Answer: Follow your diagnostic process. Or create one using the steps below and then follow it.

STEP 1 – RECREATE THE CUSTOMER'S CONCERN

Though your first instinct may be to plug in your scan tool and see which DTCs pop up, resist this urge. The first step in your process should always be to recreate the issue your customer is having with their vehicle. This may mean doing a ride-along with them to ensure all the circumstances are the same and you don't get a different result than your customer when doing that final test drive.

STEP 2 – BACK TO BASICS

One of the dangers of not having a set diagnostic process in your shop is that all your technicians may be going about diagnosing a vehicle in different ways. This means they could be glossing over some of the more basic tests and making assumptions about the vehicle, which could lead to a misdiagnosis. By having all your technicians follow the same steps on every vehicle and perform the same tests checking the basic mechanical and electrical standards, you ensure that nothing is overlooked. This also helps when training a new technician because the steps are the same for everyone.

STEP 3 – UPPING THE ANTE

With the basics out of the way, it's time to do some more intrusive tests if necessary. Something along the lines of compression testing or time belt alignment. After completing steps 1 to 3, if you still don't have a diagnosis, it's time to perform some pinpoint tests from the computer to individual components.

Implementing a standard diagnostic process in your shop not only keeps everyone on the same page but also makes it easier to explain to customers what's being done to their vehicle and provide them with any diagnostic test results.

In the following pages, we'll take a closer look at some essential tools every shop should have to aid in their diagnostic processes, how to pick these, and tips, tricks, and new techniques on how to use them. We'll also delve into ADAS and why your shop should consider tapping into this additional revenue stream if you're not already. Lastly, we'll look at some additional diagnostic products to keep in your toolbox.

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DECEMBER 2023

A systematic approach to finding the right scan tool

If you are in the market for a scan tool, there is more to consider than cost.

By Brandon Steckler

Brastock Images | AdobeStock

As a technician in the industry for about 25 years, I have had my hands on many different scan tools. Many of them were factory tools and many more were aftermarket tools. With the ever-changing advancements in technology, I have seen so many new convenient features implemented that make the scan tool even more powerful today.

However, one thing is certain. The scan tool will always serve as a liaison between the technician and the vehicle. Regardless of how much or how little capability the tool features, if it doesn't do what you need it to do, it is not a wise investment.

COST

Obviously, one of the first items to factor in is how much the scan tool is going to cost. There are functional scan tools that can be purchased for under $200. Probably unsurprisingly, the functionality of that tool is likely limited to simple and basic functions, like requests for OBD-II stored DTCs (Mode $03) and perhaps the ability to request a list of completed monitors (Mode $06). Although this data is useful, it certainly won't suffice as the tool to always get the job done, especially for a professional automotive technician. However, a technician needing a simple device to verify that OBD monitors have run to completion would need little more than the capability of a device like this one from Innova (**Figure 1**). The key is to realize the limitation of the device before making the investment.

VEHICLE COVERAGE

Vehicle coverage should be an important factor to consider when choosing a scan tool for obvious reasons. It's true that scan tools have come a very long way and the coverage they now provide is very extensive compared to how they used to. But be aware that certain scan tools shine brightly within certain car lines, and very dimly (or sometimes not at all) with other car lines. It's important to have a scan tool that is going to serve you and your shop well in as many conditions as possible. In other words, choose a tool that is going to give you the most "bang for your buck," and be prepared to add other scan tools that are better suited to specific car lines when called upon.

SCANNING FUNCTIONS

I see the scan tool as a device that should offer us the ability to view data in a fashion that tells a story. With the data arranged properly, we should be able to easily

Figure 1– This scan tool from Innova is very functional for the cost of approximately $200. However, the trade-off for such an inexpensive device is that it serves to provide only basic functions and will not support what is required for professional technicians in most situations.

Photo from Advance Auto Parts

perform a comparison of:

- Inputs
- ECU processing (response/reaction)
- Outputs
- Default/adaptive strategies

Having this ability will allow us to make diagnostic decisions from the driver's seat. What is the takeaway? This technique not only guides you to the next logical test but prevents you from performing a multitude of unnecessary tests, such as this Snap-on MODIS capture **(Figure 2)**. In this instance, a slippage is occurring internally to a transaxle at the main shaft. Did I mention all of this is carried out from the driver's seat and without disassembling a thing?

ADDED FEATURES

Described above are necessities every professional technician needs to consider when purchasing a scan tool. The good news is that almost every scan tool a professional technician will encounter possesses those features. However, those need-to-have features can be complemented by nice-to-have features.

Many scan tools, such as this one from TOPDON, now offer a topological view of the ECUs sharing information on the data bus. This feature is incredibly efficient, as it allows for several time-saving techniques to be carried out. For instance, the tech can see which ECUs are communicating. This is tremendously handy to know when dealing with communication issues. This helps the tech triangulate where a fault is located.

Since the proper data arranged in an adequate format yields diagnostic decisions, better-arranged data may bring a diagnostician to those same conclusions easier and/or more efficiently. By taking the same collected data and arranging it in a different format, a certain pattern may stand out more easily. It's for those same reasons that pie charts, line graphs, and bar graphs exist in many industries. All are a form of comparative measure but each of the charts expresses different characteristics more easily.

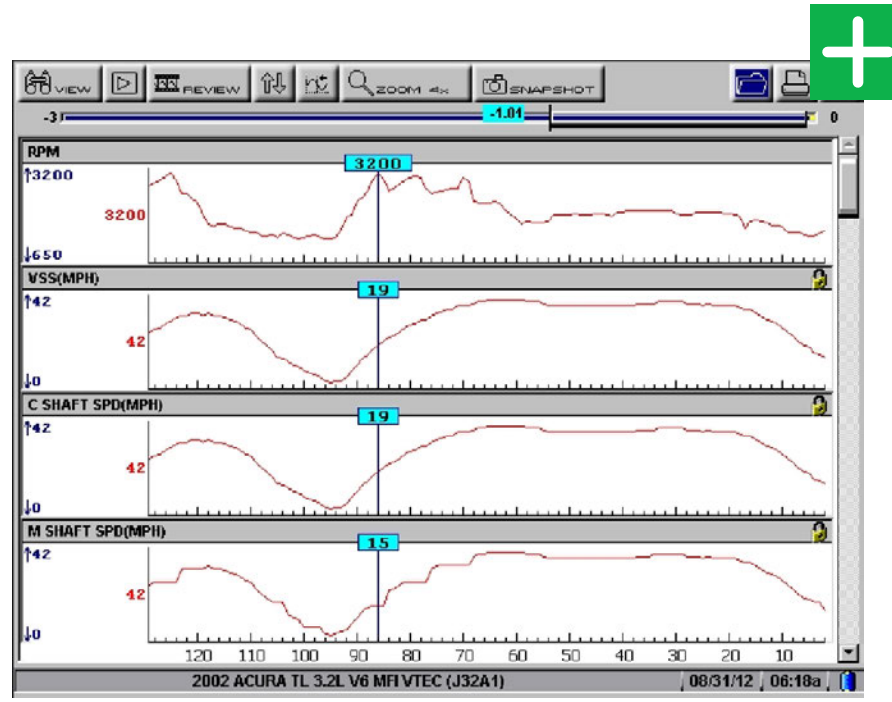

Figure 2– This graphed scan tool data provides insight to an internal transmission slippage occurring within a clutch assembly at the main shaft. This was deduced in only minutes, from the driver's seat and without any disassembly.
Photo courtesy of Brandon Steckler

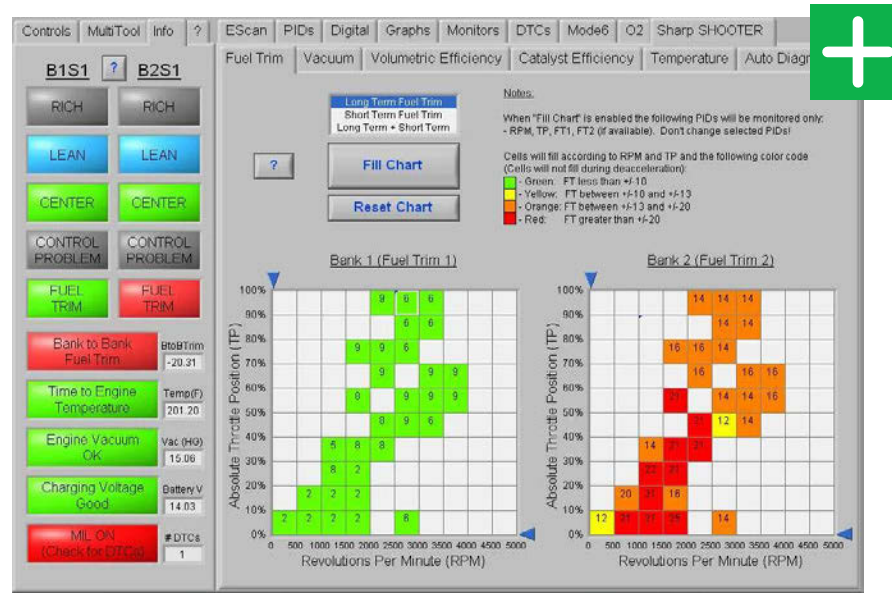

Figure 3– Graphing fuel trim data in color-coded load/rpm cells allows the analyst to see fuel trim trends under all operating conditions simultaneously. This helps identify a surplus or deficiency in fuel supply and under which operating conditions.
Photo courtesy of Brandon Steckler

Some scan tools will feature cellular charts data displaying a value at a cross-reference point of two different criteria. Having the ability to sell all the possible cross-reference points at the same time (along with correlating data) is not just displaying a story...but all the chapters

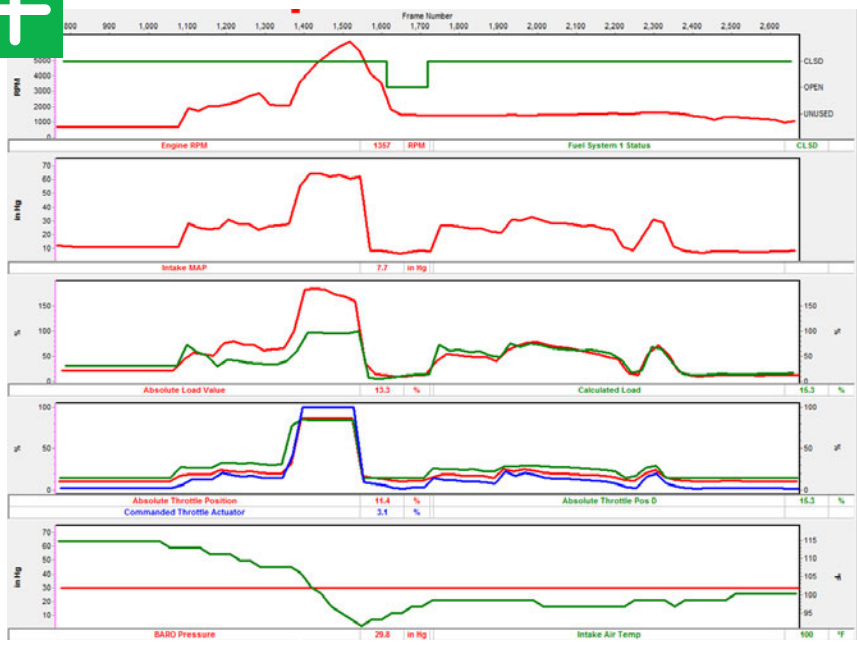

Figure 4– Superimposing line graphs allow an easy-to-compare view of data (like throttle position PIDs) that represents desired and actual positions. If the lines deviate from one another, an underlying fault exists.
Photo courtesy of Brandon Steckler

of the book simultaneously. This is a great chart to discover trends. An example of this would be one from Automotive Test Solutions and their eSCAN ELITE Fuel Trim Chart **(Figure 3)**.

Another example of a unique data arrangement would be merging graphed data to allow a superimposed view of two or more PIDs. A direct and easy–to–view comparison results and offers a quick view of like PIDs that differ from one another. For instance, this one from an old E.A.S.E. scan tool **(Figure 4)**.

For instance, viewing actual and desired camshaft position PIDs is a quick "go/no–go" test of the VVT system's functionality. No need to chase anything else if the two pieces of graphed data remain superimposed throughout the entire operating range of the engine.

BIDIRECTIONAL CONTROLS

The ability to take control of a system's components allows the technician to virtually split a troublesome system in half, offering a "divide and conquer" strategy. Assume for a moment you are faced with a power window concern with the passenger–front window being nonfunctional in the downward position of the master switch.

After viewing a wiring diagram, a logical approach would be to then view data displaying the command status of the right–front power window. Assuming the command was never issued by the ECU, it's logical to verify the input request from the master switch. Regardless if the command was received, one would still like to know if the window functions as designed.

Using the bidirectional controls of the scan tool (like this screen capture from Autel) will bypass the switch input and directly command the ECU to roll the window down **(Figure 8)**. Assuming that window then functioned, the integrity of the entire output side of the power window system has been verified. Again, no need for wasted time disassembling components. The answer was yielded from the driver's seat.

J2534 FUNCTIONALITY

This feature is one that should be particularly considered nowadays; more so if no other such capabilities exist in–house. Locating the source of a fault and properly diagnosing the root cause is important. But if the job can't be completed due to the inability to place software in barren ECU, you are forced to hire expensive outside assistance or pass the job along to a capable shop.

Keep in mind that in several scenarios, even having the ability to upload the appropriate software may not be enough. Some procedures known as post–programming routines may have to be performed (routines like a throttle angle relearn, steering angle sensor relearn, or some security system functions). Some scan tools will allow the software to upload but have no ability to perform certain post–programming routines. This could render a vehicle inoperable until the routine is complete.

A few scan tool providers even offer remote access ability to aid in these programming and post–flash routines. These paid–for sessions can also be used as a teaching guide to help a programming novice progress.

EXPORT FILES

Today, many scan tools offer the ability to save data in a format like a PDF or one that is interactive. This allows for the ability to export. Transferring these stand–alone files will allow the data to be analyzed remotely and offer the same abilities (to a PC) as the actual scan tool offers.

How can this come in handy? Many shops are structured with a shop foreman overseeing productivity, dispatching jobs, and providing technical assistance to other technicians requiring it. With the ability to export files, the diagnostician/shop foreman can remain in an office or at a desk. Any technician can be easily trained to capture data and send files to the shop foreman.

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With a structure like the above implemented, the technicians addressing the vehicles become the shop's eyes and ears. The experienced shop foreman/diagnostician becomes the brain not for one tech, but for any of the technicians in the shop. This can be a temporary or even a permanent solution to preventing inaccurate diagnoses. Reducing the need to have several A-techs on board can also be cost-effective.

These same files can be screen-captured and uploaded to free apps like Microsoft Paint, giving the ability to highlight, annotate, or otherwise call attention to certain characteristics of a particular capture. This same capture now becomes priceless training material to add to your archives or to reference for a new tech trying to enhance their depth of knowledge.

ADAS FUNCTIONALITY

Advanced driver assistance systems (ADAS) are prevalent in virtually all vehicles nowadays. After the repair or replacement of certain components, calibration of certain ADAS subsystems must be carried out. Some of these calibrations are carried out dynamically, requiring them to be driven under certain specific operating conditions. Others are carried out statically, requiring objects and specific targets to be appropriately placed, and then registered by the vehicle's ECU.

In either scenario, the routines or calibrations must be initiated by the scan tool. Displayed here is an example from TOPDON's Phoenix Smart **(Figure 5)**. These are certain factors to consider, especially given the current and growing prevalence of ADAS and the subsystems and components they encompass.

SCAN TOOL SOFTWARE UPDATES

One thing that many shops and individual technicians fail to consider when purchasing a scan tool is the cost to maintain that tool. Without mentioning names, some scan tool software annual upgrades can reach prices nearing $1,000.

It's important to note or inquire about the consequences of not upgrading a tool when new software is available. In other words, will a lacking software upgrade simply omit new features, or will the scan tool performance degrade or cease to function at all?

Many scan tool companies will offer special deals which may include free software upgrades for a year (or maybe several years). Also, keep in mind that scan tools can be found online anywhere you look. It's true that many times a lower cost scan tool found online may appear to be authentic but is not manufactured to function properly in the U.S. You may find yourself dead in the water when it comes time to upgrade the software and have nowhere to turn for technical assistance. Be sure to purchase your scan tool from a reputable source, regardless of the potential savings of purchasing online from an unknown source.

SCAN TOOL SPECIFICATION GUIDE

Of the scan tool features mentioned, they are just a few of many. Don't get yourself overwhelmed; these were merely suggested features to keep in mind to help guide you and your shop to a tool that will be less likely to disappoint.

Understand not one scan tool can do it all. If it could, everyone would own it and it would cost a lot of money. But being sure the tool you choose to go with is based on a decision that considers some of the factors mentioned above is always a wise one.

There has been research done across the industry to help narrow down the decision-making process for you. Information pertaining to many different scan tools can be found in the annual *Professional Tool and Equipment News (PTEN)* Scan Tool Spec Guide supplement. This comparative chart allows one to easily compare one scan tool to the rest with all the factors mentioned above (and many more). Keeping this information in mind when shopping for a scan tool will likely put one in your hand that will serve you and your shop well.

Figure 5– Advance driver assistance systems (ADAS) prevalent in today's vehicles will be further implemented with time. Calibration of these systems will be required with even some of the most basic repairs we see in the shop on a daily basis. Scan tool functionality must support these required calibrations.
Photo courtesy of Brandon Steckler

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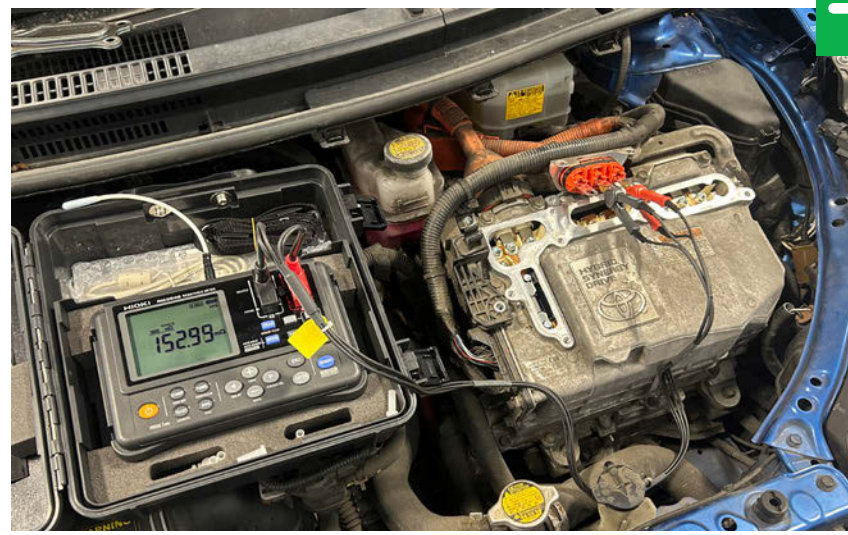
Old tools, new tricks

With the increase of electric vehicles pending, the need for a milliohmmeter may be in your shop's future.

By Jack Rosebro

It's been more than 20 years since some of us first started using milliohmmeters in hybrid and EV repair, generally to measure phase-to-phase resistances of motor-generators on first-generation Prius hybrids and the vehicles that came after it. Briefly, a milliohmmeter is a precision ohmmeter that can measure very small resistances in the thousandths of ohms (milliohms), and in some cases, millionths of ohms (microohms), as we will see. It does this, in part, by (1) employing four-wire Kelvin leads, which use two wires per lead to separate test voltage and test current, and by (2) generating a higher current than the average DVOM. It's a tool that might not be used regularly, but when you need to measure resistances of less than an ohm, and measure them precisely, nothing else will do.



Hioki 3548 showing 152.99 milliohms of U-to-V phase resistances on a 2013 Toyota Prius C.
Photo courtesy of Jack Rosebro

USEFUL FEATURES IN A MILLIOHMMETER

These days, there are many milliohmmeters to choose from. In this article, I'll discuss functions to look for when choosing one, using the Hioki 3548 milliohmmeter as well as the relatively new laptop-based Pico MT03 milliohmmeter as examples.

Note: Milliohmmeters are often used to measure resistances of high-voltage components after the components have been de-energized. Care must be taken to follow all safety protocols as directed by the OEM before measuring.

Three features come to mind when I think of what I need in a milliohmmeter:

1. ACCURACY

The Hioki is accurate to ±0.08 milliohms; the Pico is accurate to ±0.5% ±100µΩ. Both of these meters are accurate enough for our automotive needs.

2. BATTERY-OPERATED

Some milliohmmeters are designed to be used for bench-testing components, rather than on-the-car testing. They run on 120V and usually require an extension cord to reach the vehicle. Battery-operated milliohmmeters, on the other hand, are portable as well as generally built to be more sturdy and resistant to damage than bench units.

3. AMBIENT TEMPERATURE SENSOR

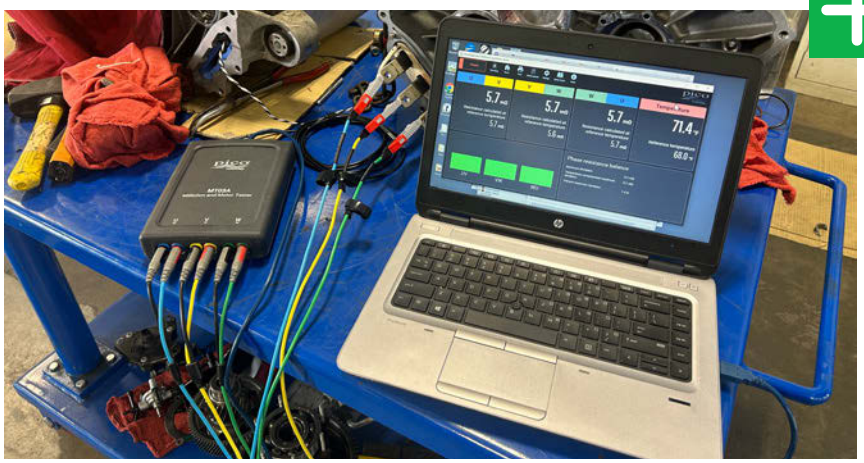
Component resistance specifications in the milliohm range typically refer to resistance at a given reference temperature, usually 68 degrees F. If the component being tested is not at the reference temperature – and it probably isn't – the measurement reading must be adjusted for ambient temperature, using a rather cumbersome equation that can sometimes be found in service information, if it is used. This creates a potential for error if the calculation is made incorrectly. Both the Hioki milliohmmeter and the Pico milliohmmeter come with ambient temperature sensors. These sensors, along with some circuitry, enable the meters to compensate for temperature during testing and to calculate the resistance that would be present if the resistance had been measured with the component at the reference temperature. Let the machine do the math.

Tip: Keep in mind that a milliohmmeter's ambient temperature sensor (if equipped) measures ambient temperature, not component temperature. If the component being measured has not cooled sufficiently, your readings will be high, as heat increases electrical resistance. Toyota specifies, for example, that low-ohms measurements be made only after the vehicle has been turned off for at least eight hours.

TAKING READINGS WITH A MILLIOHMMETER

In the automotive service world, milliohmmeters are most commonly used to measure and compare phase-to-phase resistances of three-phase stator windings, as used in hybrid, plug-in hybrid, and electric vehicles. Such measurements can range from a few milliohms to several hundred milliohms.

Milliohmmeter leads are typically equipped with alligator-type leads, with a twist: rather than gaining a good connection by biting into the test point, the quality of the electrical connection to the test point is often more dependent on the amount of contact area between the leads' jaws and the test point. Quality milliohmmeter leads are typically gold-plated to inhibit corrosion and reduce the likelihood of unwanted resistance in the leads themselves. Sometimes it takes a bit of fiddling to get a stable reading; cleaning the stator winding terminal ends with isopropyl alcohol may help. It may also help to twist the leads as with communication



Pico MT03 is being used to measure phase-to-phase drive motor resistances on a 2013 Toyota RAV4EV.
Photo courtesy of Jack Rosebro

lines, to reduce line capacitance.

Note, however, that unstable readings can also be caused by loose motor–generator cables, which can set performance DTCs, and/or prevent a motor–generator from operating. Check fastener torque at both ends of the cable (inverter side and transaxle side), and don't trust resistance readings until they become stable.

HIOKI RM 3548 MILLIOHMMETER

The Hioki 3548 milliohmmeter is a popular resistance meter designed for automotive use. It's the tool that both Toyota and Tesla specify for their service centers. Hioki also offers a range of leads for specialized resistance measurements, in addition to the standard L2107 alligator–clip leads which come with the RM 3548.

PICO MT03 MILLIOHMMETER

The Pico MT03 is a relatively new product that uses a laptop to display test results. Test results are easy to print or send as a digital file. The MT03 is also unique in that all three phase–to–phase resistances of a stator winding can be tested at the same time, instead of individually. Results are easy to see, with resistance readings for each phase pair displayed on the laptop along with green or red indicators that act as "go–no go" or "pass–fail" gauges.

Which meter is best? It's close enough to be a matter of personal preference. The MT03 leads have less contact area than the Hioki's, and may take a little more care to stabilize the reading, but it's not a dealbreaker. On the plus side, many technicians prefer the MT03, citing its ability to measure all three phases of a motor–generator at once, as well as the graphically displayed results which can be easily saved to share with the customer. The Hioki 3548 can also save measurements; however, readings must be saved to the meter and then uploaded to a PC.

USING A MILLIOHMMETER TO ESTIMATE APPLIED FASTENER TORQUE

In the shop, we apply torque to bolts and measure that torque to create the clamping loads required by the OEM. While a torque reading is not a direct measurement of the strength of the clamping load, the torque applied correlates with the required clamping load.

Alligator clip leads are used when measuring phase-to-phase motor-generator resistances. Pin probes are used to measure the resistance of bolted connections, including ground points.
Photo courtesy of Jack Rosebro

Another way to "measure" bolt torque, if the vehicle manufacturer provides a specification, is to measure the electrical resistance of the bolted connection, for example between the bolt head and HV busbar. Such measurements test the limits of milliohmmeters, as the resistance specification is often much less than one milliohm, and may be stated in micro–ohms (μΩ), or millionths of ohms.

Why would this kind of measurement be useful? Well, most hybrid and electric vehicles have multiple high–voltage bolted connections. Correct torque of these connections is essential to maintaining the integrity of the connection as high–voltage current flows through it. Incorrect torque can produce heat that is easily enough to melt copper or aluminum and lead to component failure or worse.

A common diagnostic step when tracking down high–voltage circuit issues is confirming proper torque so as to rule out an issue caused by an incorrectly torqued high–voltage connection. If the vehicle manufacturer provides resistance specifications, such connections can be tested using a milliohmmeter with pin–type probes, such as the Hioki rather than alligator clips.

This kind of measurement is especially useful when bolted HV connections use single–use bolts that must be replaced if they are loosened, such as high–voltage connections in many Tesla vehicles. Keep in mind that getting an accurate measurement can be a challenge, and may only be possible if (1) the connection surfaces are first cleaned with isopropyl alcohol, and/or (2) the user presses down on the pin probes to ensure that they are getting a sufficient bite into the area under test. If the meter's readings are unstable, the measurement is invalid.

Most OEMs do not yet require measurements in the micro–ohm range, but with the increased uptake of electric vehicles, they may become more common in the future. We shall see.

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Are you calibrating ADAS-equipped vehicles?

Add a new revenue stream for this essential service.

By Ross Colket

Photo courtesy of Snap-on

When it comes to today's vehicles, why wouldn't you plan on investing in your future? I recently attended a TechNet meeting representing approximately 60 to 80 shops. I sat on a panel with three other shop owners who are currently performing advanced driver assistance systems (ADAS) calibrations. To my surprise, of all those shops represented, not one of them performs ADAS calibrations.

We have a unique business model in that we service a larger-sized glass shop in the area and eight body shops. The glass company is very progressive in that it does a lot of insurance work. As a result of this, the insurance companies will not compensate the shop without proof of calibration and proof that no trouble codes in any of the ADAS systems remain. I also find the chain body shops to be more progressive and understanding of ADAS because of their relationship with the training and education organization Inter-Industry Conference on Auto Collision Repair (I-CAR). Keep in mind, I deal directly with the body shops and not through the insurance company (much less stress and no runaround). As a result, this now accounts for one-third of my business.

I encourage you to investigate becoming an ADAS-equipped shop. Early ADAS systems are now 23 years old. It is strange to think, but in another two years, ADAS vehicles will literally be classics. If you are equipped to service and repair/calibrate ADAS, you won't have to send your customers down the road. I have several shops in the area that send their customers to me for programming, R-1234yf, and/or ADAS. More than once I have had those customers continue to come back to me because they know our capabilities.

INFORMATION RESOURCES

In terms of training, more and more sources are coming online to provide hands-on training. Autel just built a training center in New York where they offer a two-day course. Once you get the basic concept of performing the calibrations, it really does become quite easy. Understand that you are either working with a distance sensor or a camera. Yes, there are different styles of distance sensors, but the reality is, any one is just a distance sensor.

Diagnosing a system is just like diagnosing an engine issue. The best part of working with ADAS is that most of the sensors are usually either four- or six-wire sensors – a voltage and ground supply, and two or four network wires. As long as you have an oscilloscope to check for communication, and a scan tool to see if the sensor is reporting on the network and to check for any trouble codes, you're all set.

The information sources of ALLDATA, Mitchell 1, I-CAR, and Direct-Hit have come a long way in making OEM information much more accessible. Mitchell 1 and ALLDATA have a special section devoted to ADAS. Yes, on the newer cars, you are sometimes going to have to log onto the OEM's website, but those instances are few and far between.

One of the things I have found interesting is that Audi will often list in the labor guide that calibration is required. Several of their models not only will require an alignment after replacing a clutch or transmission, but they will also need a forward-looking camera calibration. Autel has a great website for ➲

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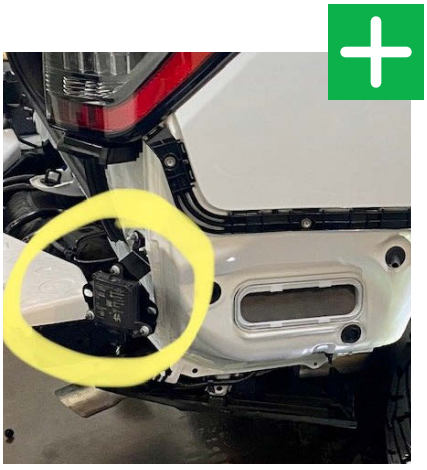
looking up targets and placement of the targets at autel.com/us/adas-setup-reverse-lookup-guide/. That site has a ton of good information on ADAS tooling as well as a return-on-investment calculator. Another good place to get information has been Facebook groups on ADAS. Most of the time, I sit back and watch the conversations and can distinguish which users are helpful and have good quality information to add.

THE BEST TOOLS ARE THE ONES THAT WORK FOR YOUR SHOP

When it does come time for you to purchase the equipment, I strongly encourage you to do your homework on who you purchase from. I am sure from the article that you can tell I am an Autel guy. They were one of the first to market with a complete solution and have been doing it the longest. Also, keep in mind they are the factory tool for all the Stellantis divisions. I have found their technical support team for ADAS to be very helpful at times.



Toyota blind spot sensor.

Photo courtesy of Ross Colket

Another item you will want to take into consideration is you can buy the mobile equipment or equipment that uses cameras to get the correct frame placement. I am a strong believer in the camera equipment. When you get a vehicle that won't calibrate after a repair, the first thing you are going to question is your measurements of where the target is placed. When I first started doing the calibrations, I had such a car that I kept rechecking and rechecking. As it turned out, it was a distorted windshield.

CAUSES OF SOME COMMON FAULTS

If you are unable to calibrate a vehicle, there are many things that can cause that. With blind spot monitors, the body can be damaged under the radar sensor, the bracket can be bent, or the sensor can be

installed backwards. The sensor itself can be damaged from the impact, but typically, you will have no communication with the module. If the wiring is damaged, that is simple enough to repair. When you have a blind spot sensor that does not calibrate, the first thing you want to do is get the bumper off. I have had many guys tell me there was no damage around the blind spot sensor. Sure enough, as soon as the bumper comes off, I see it right away.

For a front radar sensor problem, make sure the correct emblem is installed. The emblems used with radar sensors are made of a different material and are very expensive as a result. Other typical radar sensor faults are similar to those of blind spot sensors. One difference that you will see with the radar sensor is that some are mechanically adjustable, and some are adjusted electronically during the calibration.

Forward-facing cameras can have a mount positioned incorrectly during manufacturing, or the glass can be distorted from when it was manufactured. We have seen the glass dusty in front of the camera, and the glass guys did not catch it. We did have one customer come in from the glass shop who wanted his windshield replaced, but the camera would not communicate. We offered to diagnose it for him, but he refused. I was impressed by the glass shop; they turned him away.

If you are concerned about replacing the sensors and needing to perform programming, don't be. We do all our GM and Ford programing in-house. For other vehicles, we utilize Autel's Remote Expert Service, which is remote programming through the internet. We have had great results with it, so I feel completely comfortable that we have a total solution. Also, some of the sensors are just plug-and-play.

By not moving forward with ADAS, you are setting a bad standard for the industry and opening yourself up to potential litigation. Really, if you think about it, you are doing a disservice to your customer. Even seemingly simple repairs can require calibration. For example, if you install a new radiator or condenser on a car equipped with a front radar sensor, and you touch that sensor, that vehicle needs to be calibrated.

Equipping the shop to handle ADAS repair and calibration solutions may seem like a big expensive undertaking, but the return on investment is huge. To gear up for ADAS doesn't cost...it pays!

A step-by-step guide with expert insights on mastering ADAS tech recalibration

As vehicles become more complex and interconnected, the ability to perform accurate and thorough diagnostic scans will remain a cornerstone of effective maintenance and repair practices.

By Duane "Doc" Watson, Scott McKinney

As new vehicle innovations, including ADAS technology, become more prevalent, so too will the need for diagnostic scan tools with advanced capabilities. The importance of performing a diagnostic scan cannot be understated and is excellent for establishing a baseline of the vehicle's condition and identifying the problem areas that need to be diagnosed and repaired.

In this article, we'll walk through the step-by-step process of performing a diagnostic scan and leading into a dynamic recalibration of an ADAS system.

Photo courtesy of Bosch Diagnostics

STEP 1: CONNECTING TO THE VEHICLE

Let's set the stage and say that a customer comes into the shop saying the lane-keeping assist on their 2019 Chevrolet Equinox isn't working properly and would like your shop to take a look at fixing the issue.

At first glance, this may seem like a standard job since this Equinox will most likely need a dynamic recalibration to repair the issue. However, it's important to perform a pre-scan to be thorough and check for any other issues that may be hiding in the vehicle.

To start, the technician will need to connect to the wireless vehicle communication interface (VCI) into the vehicle's OBD-II connection port. The VCI will show the technician that the power is on, the quality of the connection to the vehicle, and the wireless connection to the scan tool. A wireless VCI is important to allow the technician to have mobility throughout the shop and work comfortably.

At this point, you will only need to turn on the vehicle electronics and leave the engine off until a later point in the scanning process.

STEP 2: IDENTIFYING THE VEHICLE

Once the VCI is plugged into the vehicle and wirelessly connected to the scan tool, you'll want to identify the make and model of the vehicle on your tool. Vehicles newer than 2005-2006 model years have mode 9 pre-installed on the vehicle's onboard computer system.

Simply put, mode 9 identifies the vehicle by VIN number and sends that information to the scan tool. If a technician is working on a vehicle older than 2005, or a specially built vehicle (police cars, cabs, etc.), they can identify the vehicle by manually entering the vehicle's information.

STEP 3: PRE-SCAN AND IDENTIFYING CODES

A pre-scan is the first step in actually diagnosing the vehicle's issues, and it should be run on all modules to ensure all issues in the vehicle can be properly identified.

This process, while seeming unnecessary on the surface given we're only fixing the lane-keeping assist, is important to make sure all the modules exist on the vehicle and are communicating. Too often, technicians will run into a problem while diagnosing an issue with ADAS ➲

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PWM Tip

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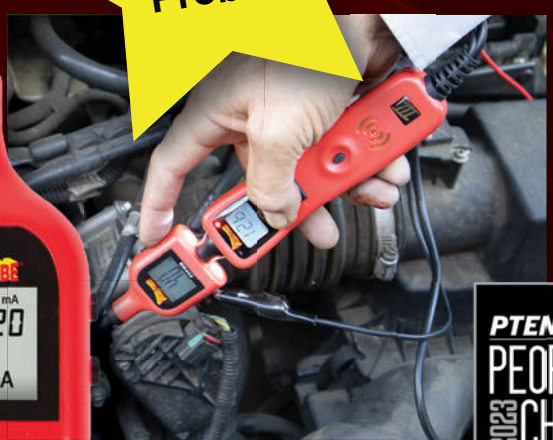

AMP Tip

Measure DC current when applying power or ground!

For more information visit VehicleServicePros.com/10095293

technology simply because that technology does not exist on the car.

You'll want to become familiar with how your tool indicates communication with a module and whether or not there are remaining codes. By simplifying this process, the scan tool allows the technician to focus on their expertise without needing to worry about analyzing data and making high-level calculations. Fast and efficient diagnostic scans lead to efficient repairs.

In the case of the 2019 Chevrolet Equinox, the only module that's coming back with DTC codes is related to the lane-keeping assist, informing the technician that a recalibration will need to be done.

STEP 4 – DYNAMIC RECALIBRATION

A dynamic recalibration, or moving recalibration, is performed on most domestic vehicles and will require the technician to follow manufacturer-specific directions which can be found on their scan tool.

The first step in dynamic recalibration is to put the vehicle into a learn mode and take it for a test drive. Depending on the manufacturer, the scan tool will instruct the technician to seek out specific road characteristics including lane markings, guard rails, and more. From there, the AI system in the scan tool will take all of those inputs into account and calibrate the lane-keeping assist.

STEP 5 – THE POST-SCAN

Once the recalibration is complete and all systems are working correctly, the technician should run a post-scan of all systems to ensure any issues with the vehicle have been addressed. Not only does this help the technician further show their work, but it also gives them and their customers peace of mind in knowing the vehicle is back to 100 percent of the OE specifications.

IN CONCLUSION

As the automotive industry continues to evolve, the need for advanced diagnostic scan tools becomes increasingly evident. These tools can empower technicians to confidently identify a vehicle's status and resolve issues efficiently. The ability to perform accurate and thorough diagnostic scans will remain a cornerstone of effective maintenance and repair practices, ensuring both vehicle safety and customer satisfaction in an ever-changing automotive landscape.

FEATURES A 12" TOUCHSCREEN

The **Thinkcar Platinum S12** includes features such as dynamic ADAS calibration, multimeter, oscilloscope, TPMS communication, 12" touchscreen, and guided diagnostic processes for select vehicles at no extra charge. The Android-based scan tool is also compatible with Thinkcar static calibration systems and includes step-by-step instructions with illustrations. It supports CAN FD and offers 34 maintenance functions, auto VIN scan, topology mapping, and bidirectional communication. Includes THINKDIAG 3 VCI and two years of software updates.

For more information visit VehicleServicePros.com/53042719

MORE THAN 40 SERVICE/ MAINTENANCE TASKS

The **Autel MaxiCheck MX900** is an 8" touchscreen all-systems scan tool and service tablet, compatible with U.S., Asian, and European vehicles, 1996 and newer. The corded tablet can read and erase codes, view freeze frame and, view and graph live data, and perform bidirectional active tests and special functions. The MX900 is also a full-featured service tablet with more than 40 service and maintenance tasks, including brake bleed, oil and service light resets, battery registration, DPF regen, and electronic parking brake and steering angle resets. The MX900 runs on Android 11 and is powered by 1.8 GHZ processor and comes with one year of free software updates.

For more information visit VehicleServicePros.com/53061037

PERFORMS BIDIRECTIONAL ACTIVE TESTS

The **Innova Electronics SDS Tech**, No. SDS50, is designed to be an all-in-one OBD-II diagnostics plus OEM diagnostics tool for professional technicians seeking advanced powertrain diagnostics. Its drop-tested 5" touchscreen is ideal for shop environments and its technician-designed interface focuses on speed and navigation. In addition, the tablet is equipped with bidirectional active tests and special functions to access the engine, transmission, anti-lock brakes, and TPMS control modules for Ford, GM, Toyota, Fiat/Chrysler, Honda, Nissan, and Hyundai/Kia. Also included are workshop tools with access to 16 of the most popular resets, relearns, routines, calibrations, and vehicle inspections, such as oil maintenance reset, battery reset, EPB reset, TPMS relearn, ABS bleeding, transmission reset, and more.

For more information visit VehicleServicePros.com/53066746

PROVIDES COVERAGE FOR OVER 85 BRANDS

The **Xtooltech USA XT70W Smart Diagnostic System** is based on an Android 10 operating system and features a 7" LCD display. It supports automotive diagnostics for a full module system, including ECU version information, fault codes, live data, and freeze frames. The XT70W has 30+ common special functions such as throttle matching, ABS bleed, maintenance light reset, EPB test, SAS, BMS, injector coding, DPF regeneration, and TPMS reset. It offers 98 percent vehicle coverage on more than 85 brands and 10,000 cars.

For more information visit VehicleServicePros.com/53072239

ACCESS TO LIVE DIAGNOSTICS ASSISTANCE

The **Opus IVS CarDAQ-Pro** is an all-in-one Pass-Thru device for multiple vehicle brands. Users can either use their own OEM subscriptions to employ CarDAQ-Pro as a J2534 Pass-Thru device or they can use it like a RAP Kit and have Opus do the programming for them. The device offers access to live diagnostics assistance, including non-programming requirements through IVS 360 Support. Additional features include DoIp, Can FD, and Toolbox3 for OEM application descriptions, video tutorials, and the latest J2534 news, as well as, access to OEM key codes, PIN numbers, and immobilizer reset information to enable locksmith and vehicle security for multiple brands in-house.

For more information visit VehicleServicePros.com/53063596

DIAGNOSES INCONSISTENT CELL VOLTAGE

The **Launch Tech USA ELB300 EV Battery Pack Cell Equalizer** is a battery maintenance diagnostic tool for EV batteries and technology. The ELB300 diagnoses numerous issues including inconsistent cell voltage, and individual battery cell capacity variances. It is designed for new energy batteries such as lithium iron phosphate, ternary lithium, and lithium manganate, and can quickly solve the cruising range degradation caused by the difference in cell capacity due to inconsistent cell voltages. It features a 7" LCD touchscreen, has Bluetooth and Wi-Fi capabilities, and is easy to carry and transport.

For more information visit VehicleServicePros.com/53070329

USES ANY SMARTPHONE

The **TOPDON TopScan** is a pocket-sized tool designed to turn any smartphone into a professional-grade scanner. TopScan is capable of reading and clearing fault codes for over 60 different vehicle makes across American, Asian, and European vehicles as well as offers advanced diagnostics and bidirectional control through the user's phone. With TopScan, users can access eight maintenance services, AutoVIN technology, vehicle performance testing, and a repair data library. Additionally, it offers Bluetooth connectivity and multilingual support, includes feedback functions, and can test emissions easily with a one-click I/M ready button that generates a testing report.

For more information visit VehicleServicePros.com/53042797

PERFORMS DPF RESETS AND REGENS

The **CanDo HD Mobile II** transforms a smartphone, iOS or Android, into a Class 4-8 code scanner that can read and clear trouble codes, log live data, and perform DPF resets and regens for Detroit, Cummins, Paccar, Mack/Volvo, International, Isuzu, and Hino. It also has Caterpillar on- and off-highway coverage, as well as can work on OBD-II engine diagnostics for passenger cars and light trucks. The VCI comes with six, nine, 16-pin, and CAT connectors and has free updates.

For more information visit VehicleServicePros.com/53056941

HAS ONBOARD MICRO AIR COMPRESSOR

The **Smoke Pro Air** from **Redline Detection** comes with its own onboard micro air compressor, eliminating the need to connect to air lines or inert gas. By eliminating the need for shop air or inert gas tanks, technicians can quickly diagnose, locate, and repair leaks anywhere, anytime. Smoke Pro Air improves the accuracy of repairs and eliminates comebacks by verifying that difficult-to-find component leaks are repaired accurately the first time, the company says.

For more information visit VehicleServicePros.com/53063594

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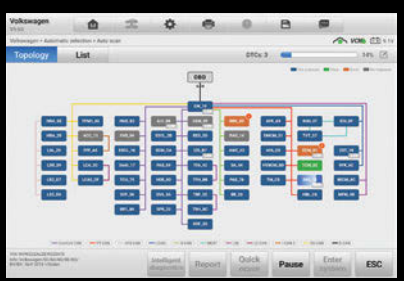
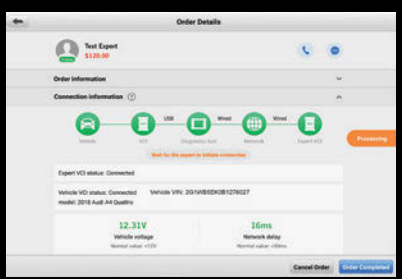
*Additional software and hardware purchases necessary



TOPOLOGY



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