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May 2021

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Opening the FCA Security Gateway

In response to threats of hacking, the automaker made it more difficult for locksmiths to service its vehicles.

BY STEVE YOUNG

In July 2015, Wired Magazine published an article entitled, “Hackers Remotely Kill a Jeep on the Highway – With Me in It.” The article described how two hackers gained control over a Jeep Cherokee via the internet. The hackers were able to take over a lot of the vehicle’s functions, including the brakes, transmission, steering, wipers and entertainment system, by using a notebook computer.

The attack, which was arranged, was carried out 10 miles from the vehicle. However, because it was performed over the internet, it could have been carried out from anywhere in the world. (A video of this from inside the vehicle is at: <https://www.wired.com/video/watch/hackers-wireless-jeep-attack-stranded-me-on-a-highway>.)

Naturally, this stunt made the news quickly, but one of the things that wasn’t well-known was that the hackers released onto the internet most of the software that allowed them to hijack the vehicle, timed to coincide with a convention of “black hat” hackers in Las Vegas. The hackers had been working with FCA US (Fiat Chrysler Automobiles) for nine months before the release of the software so FCA could have a software “patch” available to block this type of attack when the Wired story came out.



The DMAX tool from AE Tools & Computers was the first device that allowed locksmiths to “pull” Chrysler PIN numbers directly from the vehicle computer.

As you might imagine, FCA wasn’t happy that the hacking software was released publicly, but it made the patch available to all customers who wanted it. The patch also was integrated into new vehicles that were manufactured after that date.

The main vulnerability of the vehicle was the so-called Uconnect module, which FCA introduced in 2013 and was on hundreds of thousands of vehicles all over the world at the time of the test. The Uconnect module has a built-in cellular PIN connection that runs in the background, and it also can serve as a mobile hotspot.

All that the hacking software required to attack an individual vehicle was the IP address of the Uconnect module. The hackers also demonstrated the ability to scan for vehicles that use this system and, thus, are vulnerable to this type of attack.

The response by FCA to this revelation was interesting. Rather than removing or isolating the vulnerable devices, it doubled down by adding an elaborate firewall system to their vehicles. This was called the Security Gateway and allegedly was designed to thwart a remote hacking attack. In

reality, FCA added yet another layer of wireless devices and equipment to their vehicles, which greatly increased the number of places where a vehicle could be vulnerable to future attacks.

ADVANTAGE FCA

A well-known statement that typically is applied to politics is “you should never let a crisis go to waste.” The idea is that you can gain an advantage for yourself while watchdogs are paying attention to the crisis at hand. FCA used this “crisis” not only to add technology to their vehicles, but also to force owners to have to go back to the dealerships for any service that even was remotely connected to the security system.

It’s no surprise that FCA, like every other auto manufacturer in the world, wants to bring as much service and repair business back to the dealership as possible. But some manufacturers work harder at this than others. For example, you won’t find any so-called factory-trained Ford mechanics at an independent repair shop unless they used to work at a Ford dealership. Ford simply doesn’t offer factory training to mechanics who aren’t Ford employees. Chrysler used to

have extensive training programs for “outside mechanics,” but since Fiat acquired Chrysler, that program essentially has been shut down.

The powers that be at Fiat and Chrysler already were doing everything in their power to make sure that as much business as possible got funneled back to their dealerships. From the time that Chrysler was acquired by Fiat in 2014, FCA has taken many actions that directly affected automotive locksmiths in the United States.

(Editor’s Note: The Merger between FCA and Peugeot S.A. was finalized near the end of 2020. The new corporate entity is Stellantis. As of press time, it was too early to tell what, if any, changes this merger would bring to the U.S. market.)

One of the first things that FCA did was to cut off locksmith access to Chrysler immobilizer codes — known as SKIM (Sentry Key Immobilizer Module) codes or PIN codes. By denying locksmiths access to these codes, FCA hoped to bring most key duplication and origination back to the dealerships. That didn’t work out quite as FCA had planned.

AFTERMARKET SOLUTIONS

Before FCA pulled the plug on the PIN codes, the good folks at AE Tools & Computers had been working on ways to pull the PIN codes directly from the anti-theft module. At a Just Cars event in 2015, Orvis Kline told me that he considered the DMAX tool from AE Tools & Computers to be essential to anyone who wanted to work on Chrysler vehicles.

On his recommendation, I bought one that day, and within a week, I was in total agreement with him. The DMAX allowed me to pull the PIN directly from the vehicle and then add a new key when duplicating a key and in “all keys lost” situations. On most vehicles, I could do all of this through the onboard-diagnostics (OBD) port,



The image on the left is a Chrysler Sentry Key Immobilizer Module (SKIM) removed from a vehicle. This is the heart of the transponder system. The body of the module holds the SKIM circuitry. The attached ring is the antenna that’s mounted around the ignition lock cylinder. The image on the right shows how the SKIM is mounted around the ignition lock. Notice how the antenna ring is mounted around the lock cylinder near the front of the lock. The antenna ring communicates with the transponder in the key and acts as an induction coil to power the transponder.

but on some of the first-generation modules, pulling the PIN required removing the SKIM and connecting directly to a single chip. The DMAX also allowed me to do a lot of troubleshooting and rewrite information in cases where a module had been replaced.

My DMAX more than paid for itself in the first six months that I owned it, and I still use it regularly. In fact, on the day I wrote this, I had to make keys for a Chrysler PT Cruiser that, for some reason, wouldn’t communicate with my other tools. The DMAX did the job in seconds. I still don’t know what the problem was with that vehicle, but I don’t really care. The fact that the DMAX got the job done quickly and I was able to move on to the next job was just more evidence of what Kline had said. The DMAX no longer is in production, but the folks at AE Tools still support the tool and provide excellent tech support. (www.aetools.us)

Before long, software to pull Chrysler PIN codes started to appear on many aftermarket programmers, and now the inability to get PIN codes directly from Chrysler isn’t an issue, except on vehicles that have the first-generation SKIMs and vehicles

that have SKREEM modules. FCA has made several changes to the computer architecture to try to prevent locksmiths from pulling the PIN codes, but each time that it makes a change, someone comes up with a way around the changes. It must have been very frustrating to the engineers at FCA.

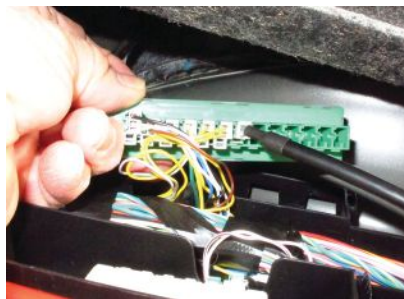
OPENING THE GATEWAY

It probably shouldn’t be a surprise

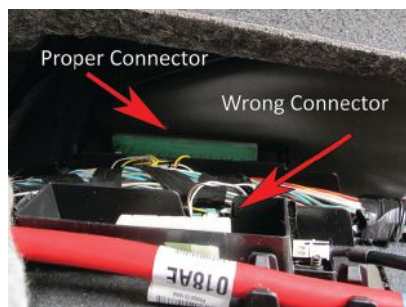


On first-generation SKIMs, it’s necessary to connect directly to one chip on the circuit board to pull the PIN. The board can be removed from the housing by removing the board from the transceiver ring or by cutting or burning a hole in the case. The DMAX tool included a modified soldering iron to burn a hole in the case over the chip that you have to access. If you cut or burn a hole in the case, be sure to cover it afterward with electrical tape or the adhesive discs that came with the DMAX tool.

that when FCA introduced the Security Gateway system, it not only attempted to block hacking attempts, but it also worked to block anyone but the dealer from adding or replacing keys. Soon, the Security Gateway system was used



This is the Star Connector that you must find to connect your programmer to a vehicle. Only Star Connectors that have a green base will allow you to connect to the Secure Gateway.



Two Star Connectors are located in the trunk of a Chrysler 300. The Green Security Gateway Star Connector that you have to attack is positioned so it would be difficult to locate.



The ADC-2012 cable from Advanced Diagnostics USA is designed for use with the Smart Pro when connecting to an RFH module. Because it connects between the OBD-II cable on the programmer and the OBD-II port in the vehicle, it can be used with other tools, as long as the software supports that operation.

on almost all new FCA vehicles.

The Security Gateway isn't a single device or system, but an entirely new level of technology that was added to the CAN bus system. Ironically, the CAN bus, or CAN (Controller Area Network), system was instituted by a federal mandate to stop manufacturers from cutting independent service providers out of servicing new vehicles.

Generally, there are two ways for locksmiths to connect to the Security Gateway on any of the vehicles equipped with it. Probably the easiest and most common way to do the job is to connect to the CAN-Hi and CAN-Lo circuits by way of the so-called Star Connector.

The Star Connector is a multiport connector that might be located almost anywhere in a vehicle. There also might be multiple Star Connectors located in various places in a vehicle. The Security Gateway Star Connectors always are colored green and typically will have several connectors attached to them. You can plug a cable from your programmer into any of the open connectors. If all connectors already have something plugged into them, you can unplug one to connect your tool. Just be sure to plug back in whatever you unplugged after you finish programming. (So far, I have encountered only two Star Connectors that didn't have an open position to plug into.)

The basic Star Connector is used for a lot of other connections in the vehicle wiring, but ONLY the connectors that are part of the Security Gateway will be green. In one case, I came across two Star Connectors that were close to each other, but the Security Gateway connector was somewhat more difficult to see. In fact, I got the feeling that the connectors had been deliberately positioned in such a way to make it difficult to find the correct connector.

The other option is to connect your tool directly to the Radio Frequency

Hub (RFH), which handles many radio-frequency operations in the vehicle, including those used by proximity-fob systems. The RFH module might be located almost anywhere in the vehicle, but in many cases, it might require a lot of effort to access it. This is why you most often will connect to a Star Connector.

The RFH module generally has three cables going into it. The connector that you'll have to disconnect is a 16-pin connector located next to a similar but somewhat smaller connector. (The third cable is located on the opposite side of the module.) Before you can disconnect the cable from the RFH, you'll have to disengage a gray locking clip. This clip locks the connector in place so it can't come loose because of vibration. After the clip has been disengaged, you'll have to depress a plastic spring-tab on the connector to remove the cable.

The cable that you must have to connect to the RFH will have male and female plugs. The male plug is plugged into the RFH to replace the cable that you disconnected. The cable from the vehicle that you disconnected from the RFH then is connected to the female plug on your cable. On the opposite end of your cable, there will be male and female OBD-II plugs. The male plug is connected to the OBD-II port in the vehicle, and the female plug is connected to the normal OBD cable from your programmer.

Because of the way the new RFH cables are designed, they aren't specific to any one machine but generally will work on any programmer that has the proper software installed. Two of these cables are manufactured by Advanced Diagnostics USA and The Diagnostic Box. The Diagnostic Box cable also incorporates a plug for the Star Connector and an extra-long coiled cord between the OBD-II plugs and the RFH plugs.

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On the Dodge Charger and the Dodge Challenger, two connectors are revealed by pulling up the carpet in the trunk next to the wheel well on the passenger side. The green Security Gateway Star Connector is located closer to the wheel well and somewhat more difficult to see.

DIAGNOSTIC ROADMAP

Knowing the locations of the connectors that you will have to plug your cables into is critical information to program FCA vehicles. I put the information that I have into a chart. (See "Security Gateway Access," page S10.) Bear in mind that on almost every FCA vehicle, you'll have a choice of attaching to one of the Star Connectors or to the RFH. In the chart, I listed only the locations of the connectors that I'm aware of. I'll make updated versions of this chart available on my website at www.autolockinfo.com/locksmith.

A few vehicles require some additional explanation.

Dodge Charger and Dodge Challenger

As you might imagine, similar or related vehicles often have the access points in or near the same areas. For instance, the Security Gateway Star Connectors on the Dodge Charger and the Dodge Challenger can be accessed from either the trunk or by removing the glove box. Obviously, if the trunk is full, you might choose to attack the glove box. If the trunk is empty, the connector in the trunk might be the better option.

In the case of attacking the connector below the glove box, you begin by releasing the two stops on the side of the glove box, which will allow you to

tilt it down far enough to pull the glove box out of the dash. This will give you access to the white plastic clip that holds the Security Gateway Star Connector in place. By releasing the tabs and sliding the clip, the Star Connector will drop down into a position where you can access it relatively easily from under the dash.

If you choose to go for the connector in the trunk, you'll have to pull up the carpet on the passenger side at the point where the floor of the trunk meets the rear seatback. Folding the seatback down might provide you with better access to that area. After the carpet has been pulled up, you'll see a white Star Connector, which is NOT the one that you want. If you look toward the wheel well and under a flap of sound-deadening material, you should see the edge of the green Star Connector. After you unclip the connector from the floor of the trunk, it will pull out far enough for you to access it relatively easily.

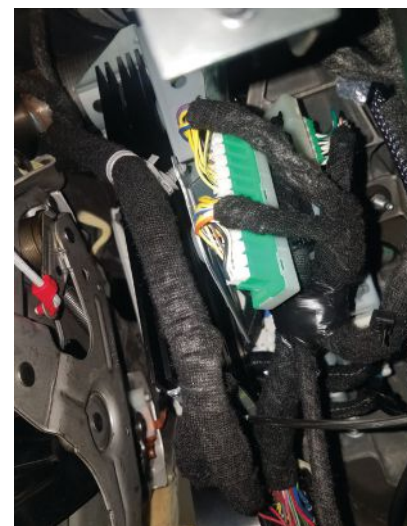
Dodge Durango and Dodge Journey

In the Durango or Journey, one of the Security Gateway Star Connectors is located on the passenger side of the transmission tunnel, behind the forward edge of the plastic trim below the center console. You'll have to pull the top of the plastic trim down and

fold down the carpet where the trim meets the carpet. The green Security Gateway Star Connector then will be visible. It's a tight fit, but you should be able to plug in to one of the ports. If you can't reach the connector, you can use a long pair of forceps to plug in or disconnect the Star Connector and pull it up for better access.

Chrysler Pacifica

The 2017 Pacifica was the first vehicle to get selected portions of the Security Gateway system. There often are programming issues on 2017 models, because some or all of the Security Gateway functions might or might not have been activated, depending on when the vehicle was manufactured. After 2017, Pacificas tend to program more easily, but if you get a 2017 Pacifica, make sure that your machine supports it before you take the job and be prepared for problems. I have had to send two customers back to the dealer after being unable to program a fob. In both cases, the dealer replaced at least one module. The easiest Security Gateway Star Connector to attack on the Pacifica is on the passenger side of the vehicle behind a plastic cover that



On Ram 1500, 2500 and 3500 pickups, the Security Gateway Star Connector is located near the OBD-II port, under the dash on the left side of the steering column.



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- ✓ Supplemental information is also listed at the bottom of each file when necessary to make sure that you have all of the information that you need. The general information at the beginning of each file can also be helpful.
- ✓ Almost all makes and models are listed. If we do not have the parts you need for a specific model we tell you who most likely does have them.



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Model	Year	Model	Part Description
Accord	1994-97	HD103	Coded cylinder Cylinder with steering column lock housing IMPORTANT: READ THE THE CORRECT PARTS F
Accord	1998-02	HD103	Coded cylinder
Accord	2003-12	HO03	Coded cylinder
Accord	2013-17	HO03	Coded cylinder
Civic	1975-79	X51	Complete lock
Civic	1977-80	X71	Coded cylinder 77-80 plug does not push in when turning the key
Civic	1980-81	X71	Coded cylinder 80-81 plug pushes in when turning the key

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can be removed only when the sliding door is open. After the cover is off, the Star Connector is easy to attack.

Ram Pickups

There are two Security Gateway Star Connectors that you can access easily on these vehicles. I normally attack the Star Connector located under the

dash on the driver's side, near the OBD-II port, but sometimes access to it is blocked by wiring harnesses and add-on trailer-towing devices bolted under the dash. If you can't access the connector under the dash, another one is behind the passenger-side kick panel just forward of the door.

Good luck, and if you hear of other locations not noted, let us know. And if Stellantis or any of its divisions makes any changes, we'll let you know. **LSL**

Steve Young has been a locksmith since 1973 and has trained and taught locksmiths since 1988. He is a frequent contributor to Locksmith Ledger.

Security Gateway Access

Most FCA vehicles that use the Security Gateway system have two or more Star Connectors from which the vehicle may be programmed. This chart lists only the points that I have found to be the most accessible.

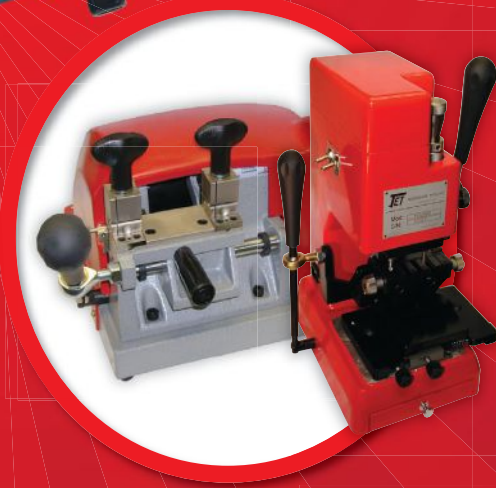
Most FCA vehicles have an RFH module and one or more security gateway Star Connectors (always green in color). Depending on individual vehicle options, some connectors might be accessible. Many RFH modules are located between the headliner and the roof near the center of the vehicle, which makes them difficult to access.

Not all FCA vehicles are equipped with the Uconnect system and, thus, require the Security Gateway system to prevent hacking. Those vehicles are listed as NA – Not Applicable.

Make	Model	Model Year(s)	RFH Location	Star Connector Location
Chrysler	300	2018–2021		Trunk on passenger side near seatback below mat
Chrysler	Pacifica	2018–2021		Behind passenger side sliding door, remove plastic access panel
Chrysler	Voyager	2020–2021		Behind passenger side sliding door, remove plastic access panel
Dodge	Challenger	2018		Below glove box, might have to remove glove box door
Dodge	Challenger	2019–2021		Trunk on passenger side near seatback below mat
Dodge	Charger	2018		Below glove box, might have to remove glove box door
Dodge	Charger	2019–2021		Trunk on passenger side near seatback below mat
Dodge	Durango	2020–2021		Passenger side below center console, pull down carpet to expose
Dodge	Grand Caravan	2017–2020	NA	NA
Dodge	Journey	2017–2021		Passenger side below center console, pull down carpet to expose
Jeep	Cherokee	2019–2021		Below glove box
Jeep	Compass	2017–2021	Between roof and headliner at the rear	
Jeep	Gladiator	2020–2021		Behind glove box, left side
Jeep	Grand Cherokee	2018–2021		Passenger side below center console, pull down carpet to expose
Jeep	Renegade	2018–2021	Between roof and headliner at the rear	
Jeep	Wrangler	2018–2021		Behind glove box, left side
RAM	1500, 2500, 3500	2017–2021		Under dash to the left of the steering column
RAM	Promaster	2017–2021	NA	NA
RAM	Promaster City	2014–2019	NA	NA

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Automotive Tools: New Arrivals

Despite ongoing production issues, new products aimed at helping locksmiths have hit the shelves.

BY MO ALI

hands on. If a particular system or vehicle is inaccessible, then the engineers must wait until the opportunity presents itself. Because of COVID-19, traditional collaborative efforts were limited to video conference calls, and the prevention of travel, specifically international travel, created a scenario of “hurry up and wait.”

Some of you might be staring at that XHorse Mini OBD Tool you were so excited about purchasing when it was announced in late 2019. If you make car keys in 2021 and you don't own at least one of XHorse's VVDI Key Tools, you're doing something wrong. The Mini OBD Tool was made available for U.S. consumption in May 2020. I only can imagine that XHorse intended to push the hardware out while simultaneously populating it with the data necessary for security professionals to create keys. Because of the aforementioned problems, it didn't work out that way.

Still, manufacturers continue to issue new products aimed at helping to make the job easier for the automotive locksmith. Here are a few that recently hit the shelves.

XHORSE MINI PROG

The VVDI Prog has been one of the most prolific EEPROM and chip reading and writing tools to date. If you do any EEPROM work, you undoubtedly have



The AutoProPAD G2
by XToolsUSA

Manufacturing for the locksmith industry is a complicated animal. Unlike other disciplines, where technological advancements in hardware determine the success of a tool, locksmiths generally care more about how any tool will serve them, rather than its physical composition.

This might be an oversimplification, but when it comes to key programmers, there typically are two primary efforts involved. The first is to design hardware and create a software platform that will drive the data exchange between the machine and the vehicle. The second is to populate that hardware with the necessary information to communicate with the various years, makes and models of the world.

Manufacturing took a significant hit in 2020. Production lines that weren't shuttered were forced to endure modifications that would encourage

social distancing in scenarios that typically saw people working elbow to elbow. Outfitting factory workers in appropriate protective equipment also increased costs and potentially reduced the dexterity required to assemble small components, dramatically slowing production lines. Many of those obstacles gradually were overcome.

Unfortunately, no bandage could be slapped over the travel restrictions that defined 2020, and therein lies the problem. Have you ever considered how the various key programmers acquire the necessary information? The primary method is to reverse-engineer the data by physically connecting to a vehicle and documenting the conversation during the key-programming process.

Data engineers fly all around the world, documenting the various immobilizer datasets of all the years, makes and models they can get their



The XHorse Mini Prog

one in your arsenal. The original Prog was sort of a clunky mess of boards and wires that required computer connectivity to function. XHorse somehow managed to compress the entire functionality of the Prog down to the smallest, most convenient form factor possible — a wand. And, yes, this wand makes magic.

“If these tools get any smaller, I’ll be able to service BMW from the back of a Vespa.” Says Brandon Tucker of Expert Key Solutions in Warrior, Alabama.

The Mini Prog, aside from its modified form factor, marks the

introduction of XHorse’s cloud-storage service. After a key-programming file has been extracted from a vehicle’s computer, the Mini Prog automatically uploads the file to the cloud (assuming you have an active Wi-Fi connection) where it then can be manipulated instantly through your computer by using XHorse’s proprietary software.

XHorse also made available several optional solder-free adapters, which will give you the ability to tackle BMW Car Access and front electronic module systems, as well as servicing Porsche, Land Rover, Volvo, Honda and Kia vehicles.

XHORSE KEY TOOL PLUS

XHorse recognized that the automotive locksmith was transitioning to tablet-based devices and decided that it was time to bring an all-in-one entry to market that could compete with the onboard-diagnostic (OBD) key-programming tablets that are becoming the norm. I imagine that when this machine is fleshed out, it will become a solid contender in the key-programming game. Unfortunately, it was met with a lukewarm reception



The XHorse Key Tool Plus

upon release because of the perils of development during COVID.

The idea here was to create a tablet that would combine the functions of the Mini OBD Tool, VVDI2, VVDIMB, VVDI BIM and VVDI PROG, with room left to expand capabilities as necessary. It also includes the same functions as the VVDI Key Tool, such as remote generating, cloning and transponder detection, as well as programming functions for VW and Audi, BMW and Mercedes Benz. You even can control the key-cutting functions of the XHorse Dolphin through the integrated app.

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The complete AutoProPad G2 Turbo line

designed tablets we've handled, regardless of function. The craftsmanship is superb, and its core functions, particularly those of the Key Tool Plus, really shine on this enhanced platform. XHorse intends to populate the machine with immobilizer and OBD key-programming data for as many makes and models it can get its hands on as soon as international travel restrictions are lifted.

If you have the other EEPROM machines that comprise this tablet, you're probably in no rush to pick this tablet up until some details can be ironed out. For example, there are several paid EEPROM functions on the device (for online EEPROM calculations), but there is no way to purchase the tokens required to access those servers. It seems like a simple enough thing to work out, but it hadn't happened as of press time.

XTOOLUSA AUTOPROPAD G2, AUTOPROPAD G2 TURBO

The G2 series picks up exactly where the previous AutoProPAD left off, with solid hardware and user interface upgrades. The previous generation was built on architecture that was approaching nearly a decade in age. As newer immobilizer systems emerged that required features such as EEPROM, direct module flashing and online calculations, it was becoming painfully

obvious that upgraded hardware was necessary.

Enter the AutoProPAD G2 and G2 Turbo, which boast larger batteries, more onboard data storage and memory, and a screaming-fast new processor, all packed inside a newly designed rugged aluminum body. These upgrades undoubtedly will allow the machine to grow with the ambitions of the manufacturer.

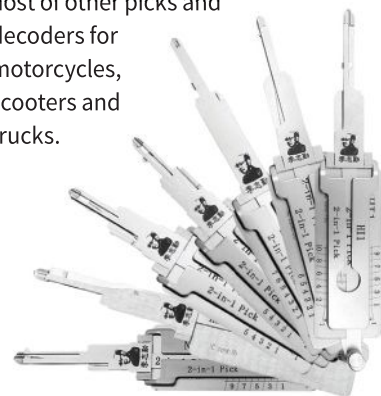
What are those ambitions exactly? The Turbo model features the KC501, an advanced EEPROM device that should make fast work of European makes and models that largely were inaccessible to the previous generation. When used in tandem with the AutoProPAD G2 Turbo, the KC501 will provides locksmiths with access to the Mercedes third-generation immobilizer (add key and all keys lost), Mercedes FEM/BDC key learning, MQB key programming, BMW EWS2, EWS3 and EWS4 key programming and Land Rover 2015 and newer. It also will bypass the 16-minute wait for Toyota/Lexus/Scion, among other features.

The Turbo is for the discerning locksmith who isn't afraid to tear apart vehicles to pull BIN files directly from vehicle computers and write them to the appropriate keys. The AutoProPAD G2 is the continuation of the AutoProPAD FULL line and contains decent enough EEPROM hardware for those who dabble in Toyota, Honda

and Chrysler from the early 2000s and who understand that the PIN can't be pulled by OBD on a 2005 Chrysler Pacifica. Otherwise, the OBD key-programming functions are exactly what one would expect from an AutoProPAD but in a completely upgraded package.

ORIGINAL LISHI NSN14 NISSAN VEHICLES, H50 & H51 FORD VEHICLES AND MORE

If COVID-19 was responsible for stagnating tool development, the folks at Original Lishi didn't get the memo. The tools listed here represent only a small portion of the development that Original Lishi was responsible for over the past year. Not listed are a host of other picks and decoders for motorcycles, scooters and trucks.



The latest Original Lishi 2-in-1 tools include models for Kawasaki motorcycles, Kymco scooters and Nissan and Ford vehicles.

If you're locksmithing in any capacity in 2021 and you don't own a single Original Lishi tool, you might want to consider picking up a couple, grabbing some practice locks (old door locks and ignitions from a junkyard), throwing the locks in a vise and finding out what all the hype is all about. The fewer locks you have to drill out means faster turnaround times for lockouts and service calls. **LSL**

Mo Ali is vice president of product development for American Key Supply and has more than 20 years of experience as an automotive electrician and a locksmith.

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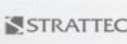


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Get with the Program on Ford

The carmaker's changing protocols and modules can lead to headaches for locksmiths.

BY MATTHEW SKUNDRICH

The changes in programming with regard to Chrysler vehicles are well-known. Less known are Ford's network changes. The changes have evolved so much that, in my opinion, Ford's networks now surpass those of other domestic and Asian manufacturers and come just short of the those designed by European automakers.

Before jumping into tools and protocols, by which vehicle modules communicate either with other modules or with scan tools, I want to discuss the onboard diagnostics (OBD) port, now known as OBD-II, and what some of the 16 slots control. (See diagram, page S18.) Not all Fords have all 16 slots filled. Depending on the year and other factors, they might not have all the applicable networks.

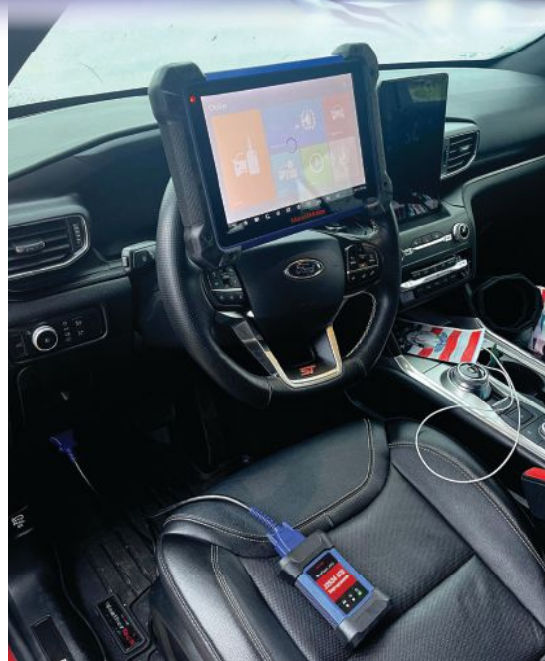
Although each vehicle manufacturer may make the OBD port as it sees fit, some requirements are standard. These are known as the SAE standards, for SAE International. Pin 16 is always constant battery power. This is direct from the battery, with only a fuse protecting the circuit. Pin 4 is always a ground to the chassis, and pin 5 is a signal ground. The only common network across all vehicles is the Control Area Network or CAN. If the vehicle has CAN, communication will take place on pins 6 and 14.

THE OLD DAYS

Ford's first tool was the New Generation Star (NGS). This tool started as an OBD-I tool and advanced to OBD-II. The giant capital-T-shaped tool is unmistakable. It used the same PCMCIA cards (software memory cards) as the Tech2. Many seasoned locksmiths got one of these, because it was the only machine for a long time to perform passive anti-theft systems (PATS) functions. It was slow and had a small screen.

The tool worked well on the Standard Corporate Protocol (SCP) network. This network is known as J1850PWM in the SAE world. SCP used pins 2 and 10. This network was well-designed and ahead of anything else at the time. It was a two-wire network that allowed serial communication to the modules. It worked a lot like CAN. If one leg of the network was broken, the network would continue to communicate. However, the data rate was just 41.6 kilobits per second (kbps). To put the system's slowness in perspective, dial-up internet speed was 56 kbps.

Naturally, programming pre-CAN Ford keys or modules was hampered by computer and internet speed. Ford made the switch to CAN from 2003 to 2007. The reason so many newer programming tools struggle with this



Autel

Programming a Ford vehicle can be a challenge because of the increased security measures.

system is because they're too fast for the Pre-CAN system to handle.

The only odd part about the SCP network setup is the Flash EEPROM Programming Signal (FEPS), which is pin 13 on the OBD-II port. It's nothing more than an 18-volt signal to the powertrain control module (PCM) to allow the module to accept the new programming. The FEPS circuit continued to be the Ford PCM programming system for years after. Even as Ford advanced through various CAN styles, FEPS remained. So, if you get a FEPS error when trying to program a PCM, it often is an error between the J2534 tool on pin 13 and the PCM.

However, a problem arose when CAN came around, because NGS couldn't handle CAN. To account for that, the Vehicle Communication Module tool (VCM I) was created with a cradle to help with CAN on the NGS.

In 2004, Ford then moved to its Integrated Diagnostic System (IDS) with the VCM I. This software now is being phased out. The IDS had 95 percent of the function coverage. The only missing coverage was air suspension in



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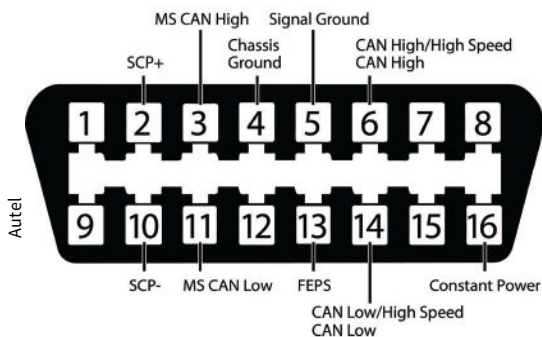
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This diagram shows the 16 slots in the Ford OBD-II port.

was the introduction of the gateway module. No, this is NOT like Chrysler, not yet at least. Ford went to a gateway, because it required more than two networks, and the data link connector (DLC) port was filled by rules.

The key is read by the transceiver, which then sends the information directly to the PCM.

As we entered the CAN era, the PATS module now was in the instrument cluster or with the PCM. This means that when you program a PCM vehicle, you only have to perform a module sync. You don't have to do anything with the keys. If you work with the anti-theft module or cluster, then you have to have two keys.

A PCM requires only a parameter reset, which is a module sync. Each module has a unique ID, and the anti-theft module learns these so the vehicle can't be stolen through a simple swap out of the vehicle computer. The system requires two keys to be programmed to the anti-theft module. So, if the customer were to lose a key, you could add a single key, and the vehicle would start. If a used cluster (which is the PATS module) were installed, a key must be added, and the module would require a parameter reset.

When the cluster and PCM don't communicate, the mileage is displayed as dashes. The ECM being offline from the cluster will cause the anti-theft light to blink, which indicates an immobilizer error. Many assume it's a key problem — it isn't. Remember, the anti-theft system is in the instrument panel cluster (IPC) module, and because of the module sync, we have to have a PCM, IPC module and a proper key for a happy immobilizer system.

Although the key isn't in the ECM, it still is necessary to satisfy the anti-theft module. I often see a failed PCM relay as the root cause of the problem. When the relay doesn't latch on, the PCM doesn't get power and, thus, can't communicate with the rest of the modules in the vehicle. This is where the Autel MaxiIM IM608 can be used to perform a scan and troubleshoot the problem. Access the IMMO function, and the tablet

2004 and earlier, which requires NGS and a special cable to connect.

One of the biggest advantages of the CAN is how fault-tolerant it is. Almost all CAN modules are in parallel, instead of series. Parallel means that if a module were unplugged or it died, the rest of the network would continue to operate. Another advantage is that CAN's developer, Bosch, continues to improve the network. Bosch made advances that took the original protocol to a speed of 125 kbps.

MOVING FORWARD

The next step Ford took was to eliminate the clutter. By this, I mean Ford added another CAN to allow critical modules to talk with each other faster. The basics of how the modules communicate is this: A module sends a request for information. Then, every module responds in order, either answering the request or making a request from a different module.

Ford's medium-speed CAN changed a few things, including putting the body-control and powertrain systems on separate networks. Meanwhile, the development of high-speed CAN increased network speed to 1 megabit per second — three times faster than original CAN. Body-control systems use medium-speed CAN, while critical systems use high-speed CAN.

Around the time of this network development (2008), Ford replaced the VCM I with the VCM II — same software, better hardware.

The last major network change

To circumvent these rules, Ford turned the DLC into the gateway. The gateway has 24 wires as inputs from the vehicle, which the gateway translates to the 16-pin port DLC. This allows for up to nine different CANs. Ford knew it would want these additional networks for safety features, such as front radar, lane departure and blind-spot detection.

However, when a scan tool is connected to the vehicle, it isn't connecting to the network, so the tool has access only to the data the gateway wants your tool to have. This makes diagnosing the network problems without the Ford special breakout box exceedingly difficult.

You might wonder why we're explaining the networks. The first reason is to help you to learn something you might not have known about networks. The second is because when Ford makes a network change, it also seems to make a PATS change.

Let's start with the first network system, SCP. In SCP networks, all the security is in the PCM. This was a simple system with a PATS transceiver and the engine control module (ECM).



Autel's IM608 and XP400 Pro

will display the PCM as unable to communicate. While the PCM is offline, the anti-theft system will display as nonfunctioning.

THE ROAD AHEAD

The next generation is the current gateway generation, which moved security from the cluster to the body control module (BCM). Now, when a BCM is replaced, it has to be programmed and reset; two new keys have to be programmed; the tire-pressure monitor system has to be relearned; and then, a BCM self-test has to be performed to wrap up programming. The vehicle dome light will blink until all these steps are completed.

The BCM is one of the most complex



Ford's VCM3

modules in a Ford vehicle. The nice part is, Ford has made only small changes recently. And it ditched the 600-second wait in favor of entering one's National Automotive Service Task Force Vehicle Security Credentials (formerly known as the locksmith identifier passcode). This is a game-changer. I perform a lot of parameter resets, and those 10 minutes add up.

The last major change is seen in the brand's newest vehicles and systems. The Ford Diagnostic and Repair System was introduced in 2018.

However, in 2020, Ford had a new problem: The VCM II no longer was fast enough, so Ford released the VCM3.

Although almost everything is the same, the tool's CAN-FD (Flexible Data-Rate) protocol makes high-speed CAN look like dialup. Ford wanted a faster network for the numerous modules it added to its latest vehicles.

That's where we are now. The development of Ford vehicle communication networks and the effect this has had on key and immobilizer programming simply can't be addressed in one article. I look forward to discussing the advancements of Ford and other vehicle manufacturers further in an upcoming issue. **LSL**

Matthew Skundrich is the owner of Mobile Advanced Diagnostics & Programming in Orlando, Florida. He has worked as an automotive diagnostician for more than 15 years.

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Ilco Update: Keys & Key Management



MYKEYS Pro app and computer interface

Two apps are aimed at helping locksmiths and consumers, while two new releases add to the company's Look-Alike line of remotes.

It should come as no surprise that with respect to new products, Ilco has keys on its mind.

The automotive arm of dor-makaba not only continues to release new aftermarket remotes by the dozen in regular installments, but it also now has two mobile apps aimed at helping locksmiths and customers keep track of their keys. Both apps, available for Apple iOS and Google Android devices, should benefit locksmiths, says Todd Adams, product manager of automotive for North America at Kaba Ilco.

The MYKEYS Pro app, which is under the auspices of Kaba Ilco brands Silca and Advanced Diagnostics as well as Ilco, is geared toward locksmiths, and Adams calls it “the backbone of everything Smart Pro,” referring to the company's well-known automotive key programmer that uses MYKEYS Pro as its database. The database of key-programming information for more than 5,000 vehicles has been a free part of the MYKEYS Pro app for registered users since the app's release. However, by the time you read this, it also should include access to Ilco's catalog of informational videos for a nominal subscription fee. Adams says a subscriber should be able to access about 1,000 videos by the time the subscription goes live.

The second app, MYKEYS Safe, is meant for consumers, but locksmiths could benefit from it by participating in

the Safe program. How it works: Consumers use the app to find a participating locksmith and have the locksmith scan their key information, where it's stored in Ilco's cloud server. Then, if the consumer were to lose their keys, the app would connect them with a nearby participating locksmith. (It doesn't have to be the same locksmith who scanned the keys.) The locksmith would receive a code to the key information, which allows them to cut and program a new key without having to have the original in their possession.

“It's like a referral service,” Adams says, adding that mechanical as well as electronic information can be included. The locksmith never sees the key data; instead, it goes straight to an Ilco Futura Pro key machine.

REMOTES LINEUP EXPANDS

As for the keys themselves, Ilco has added 109 aftermarket models in the past year, nearly all for their Look-Alike line of remotes that are meant to resemble the original equipment. The latest releases, in January and March 2021, included:

- Twenty-nine models for Chrysler (three-, four-, five-, six- and seven-button versions), covering several Chrysler, Dodge and Jeep brand vehicles, including the 2011–2018 Chrysler 300, the 2015–2018 Dodge Challenger and the 2014–2019 Jeep

Grand Cherokee. Among the new models are 17 so-called pod remotes that cover a range of Chrysler, Dodge and Jeep vehicles and even the 2009–2012 Volkswagen Routan.

- Nine models for Nissan (three-, four- and five-button versions), including a four-button model and a five-button model that cover the 2019–2020 Infiniti QX60. Other remotes cover several 2019–2020 Nissan makes, including the Altima, Rogue, Sentra and Versa.
- Eight four-button models for General Motors, which cover a range of vehicles from 1998 to 2009 for all current GM brands and a few no longer in use, such as Oldsmobile, Pontiac and Saturn.
- One four-button model for Acura, covering the 1997–1999 CL and 1996–2001 Integra.
- One four-button model for Mazda, covering the 2004–2008 RX-8.
- One three-button model for Toyota, covering the 2018–2020 C-HR.

Only one of the new remotes is a remote headed key — a three-button model for the Nissan Rogue has a flip key head — and it doesn't require the use of a laser-key cutter, as do some Ilco Look-Alike models.

All of the new Chrysler and Nissan remotes have a transponder. Also, seven of the GM models allow for on-board programming (OBP), although not for

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Automotive Locksmithing 2021

PRX-CHRY-7B1 for certain models of Chrysler Pacifica and Voyager

every vehicle covered by the particular remote. Vehicles that can use OBP-capable remotes don't require an expensive programming tool to service. The new remotes for Acura and Mazda also allow for OBP.

Adams says Ilco's Look-Alike line now has more than 300 SKUs, and all can be viewed at ilcolookalike.com.

"It's been helpful in helping locksmiths to ID remotes," he says of the website, which was launched November 2019. "There are so many variations now that selecting the right key really depends on the trim [level] of the vehicle." He says the website allows



FLIP-NIS-3B2 flip key for Nissan Rogue models

locksmiths to cross-reference original-equipment manufacturer information with the proper SKU and look up Federal Communications Commission transmission data.

NEW PROGRAMMING

As for fellow automotive brand Advanced Diagnostics, Adams says 2021 should include a number of software releases for the Smart Pro programmer, although he couldn't be more specific about arrival times. That's because of the complexity of the work, which can result in varied releases, he says.

As this issue went to press, the most



RKE-GM-4B22 for older model GM vehicles, including Oldsmobile and Pontiac

recent release was an update for the company's Toyota 2020 software and for Hyundai/Kia for 2019-2021 models in September 2020, but Adams says locksmiths can expect several new releases. Software that covers Mazda vehicles might be out by the time you read this, with Mercedes-Benz possible in the early summer and perhaps even a release for the 2021 Ford F-150.

"That's a big one," he says of the F-150, "because that's the biggest selling vehicle in America every year."

For more information, go to ilcolookalike.com and www.adusa.us. LSL



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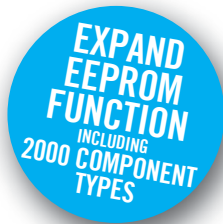
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- READ IMMO PASSWORD, ADD KEY/ALL KEY LOST UP TO 2020



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- ADD KEY/ALL KEY LOST UP TO 2019

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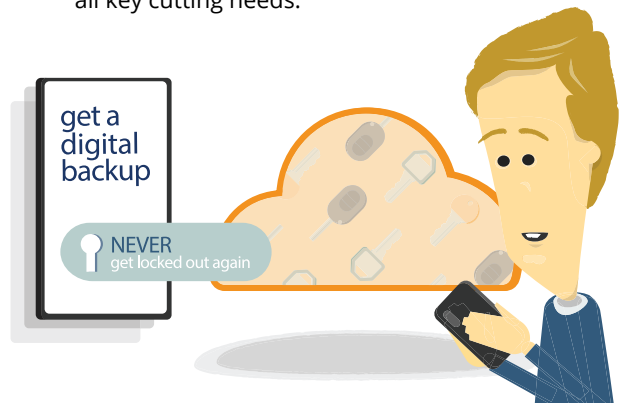
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