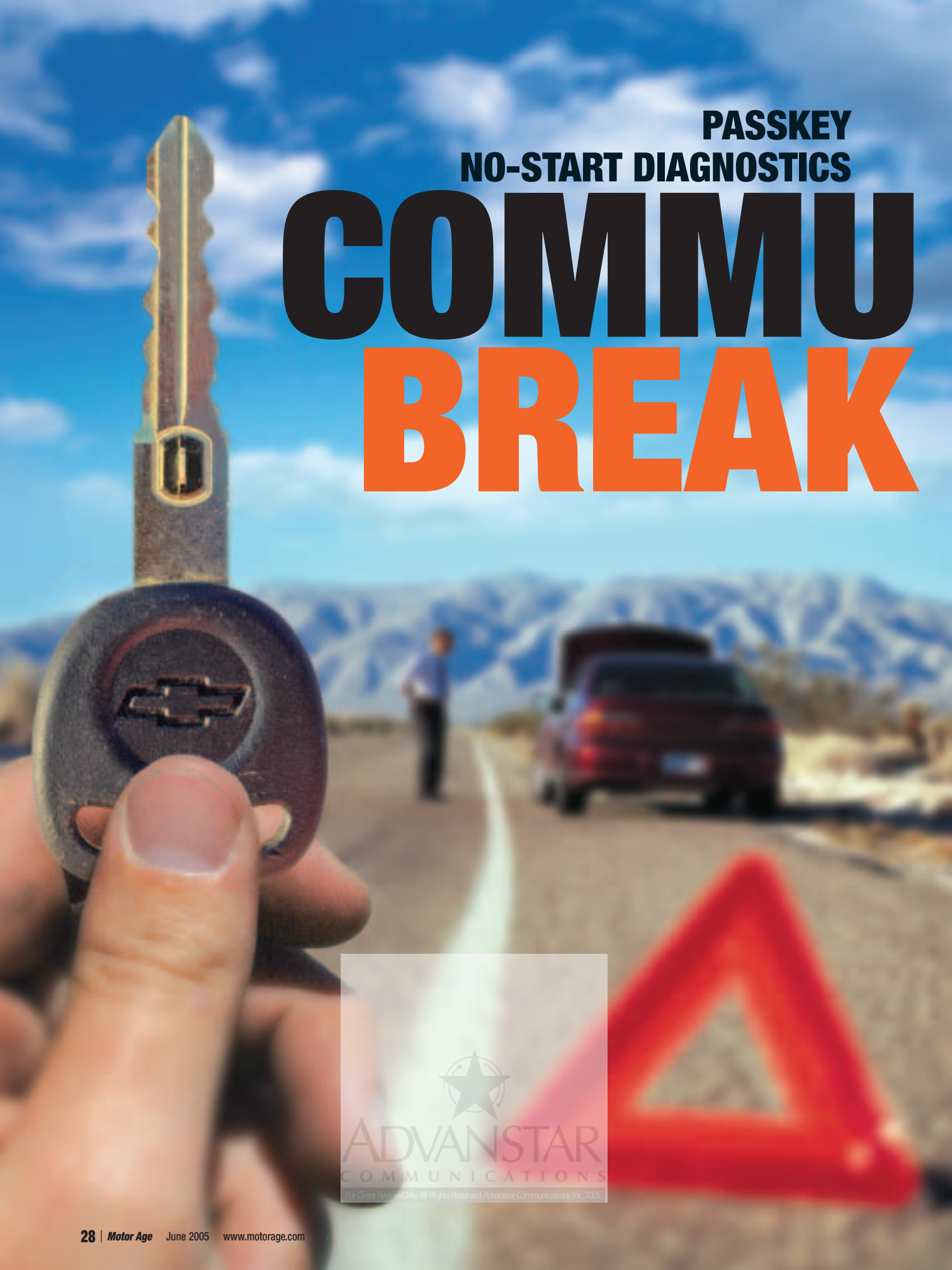


**PASSKEY
NO-START DIAGNOSTICS**

COMMUNICATING BREAK



COMMUNICATION DOWN

When the engine in a GM vehicle won't start, better check the vehicle's Passkey system. Are you ready to tackle a vehicle that's been told not to start?

BY JACQUES GORDON, TECHNICAL EDITOR

Since the mid-'80s, General Motors (GM) has used three different theft deterrent systems, but they are all passive, meaning its activation is automatic. It's operated by communication between a control unit and the ignition key through the ignition switch. If the switch is vandalized, if it's operated with the wrong key or if the Class 2 communication link is disrupted, the engine won't start.

Any time the theft-deterrent system causes an unwanted no-start, chances are it's a simple communication breakdown. To find it, you need to understand how the system detects theft and how it prevents engine starting. What you will find here is information about GM's Passkey I and Passkey II theft deterrent systems, along with a few tips provided by our Troubleshooting Editor Roy Ripple.

We've concentrated on these systems because Roy tells us these are the systems that generate the most help requests. He also says the problem is usually just a faulty connection,

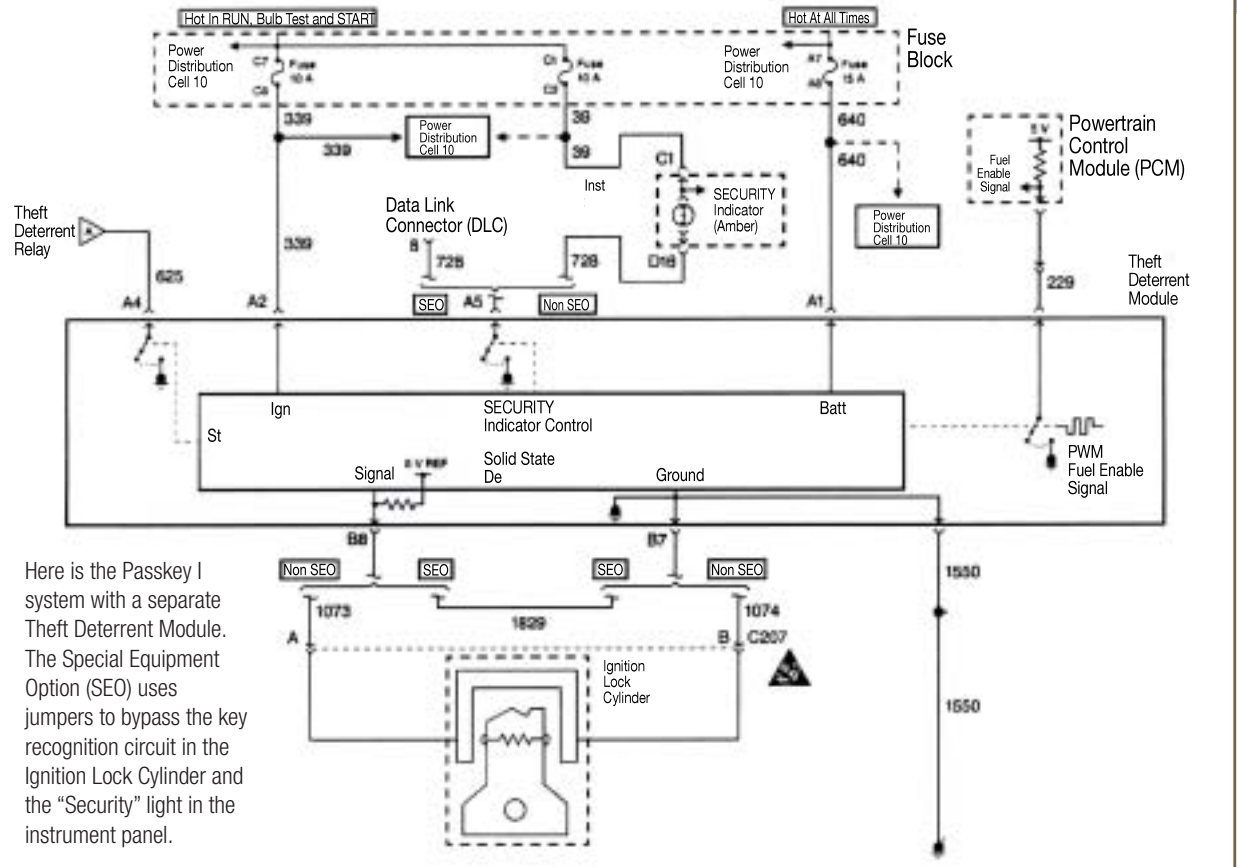
botched accessory installation or even just a worn out key or ignition lock cylinder. These can be easy to troubleshoot, because all you need is a wiring diagram, a DVOM and knowledge of how the system is supposed to work.

OPERATING STRATEGY

The Vehicle Anti Theft System (VATS) was first installed on the 1985 Corvette. The Personal Anti-theft Security System (PASSkey) replaced VATS in 1988, and while there are some differences, VATS and Passkey I and II all work the same way. There is no radio communication involved; the system merely looks for the ignition key's unique electronic signature. Passkey III and the newer Passlock systems were introduced in 1998, but the earlier systems weren't completely phased out until 2003. The easiest way to tell the difference is by the appearance of the key.

The older Passkey systems all have a pellet imbedded in the ignition key that communicates with the Theft Deterrent Module (TDM). On VATS and Passkey I, the TDM is hidden deep in the dashboard. On Passkey II, the TDM is built into the Body Control Module (BCM). The key's visible pellet is a resistor, and you can read its value by touching meter probes to the contacts on either side of the pellet. With the key in the ignition, the pellet touches contacts in the lock cylinder. These contacts are wired to the TDM, which reads the value of the resistor to identify the key. If the resistance is correct, the TDM sends a pulse-width modulated signal to the PCM, which then enables the fuel injectors. The TDM also operates the Theft Deterrent Relay (TDR) that allows power to reach the starter solenoid when the key is turned to the START position.

If the TDM doesn't recognize the key pellet, it decides a



theft attempt is in progress and it will go into anti-theft mode. In this mode, the TDM will:

- Turn on the "Security" warning light on the instrument panel.
- Prevent starter operation by not turning on the Theft Deterrent Relay.
- Send a signal to the PCM telling it to disable the fuel injectors.
- Disable the key recognition circuit for three minutes.

This last point is important to people who own more than one GM vehicle. With multiple GM keys on the same key ring, accidentally inserting the wrong key in the ignition will prevent start-up, and the TDM waits three minutes before it will read the key circuit again. Also notice that the PCM is looking for a specific "go" or "no-go" signal from the TDM before it will decide whether or not to operate the injectors. The absence of a go signal is not a valid no-go signal, and vice versa.

If the TDM decides a theft attempt is in progress when the engine is already running, it will not stop the engine, but it will turn on the "Security" light and enter anti-theft mode at the next key cycle.

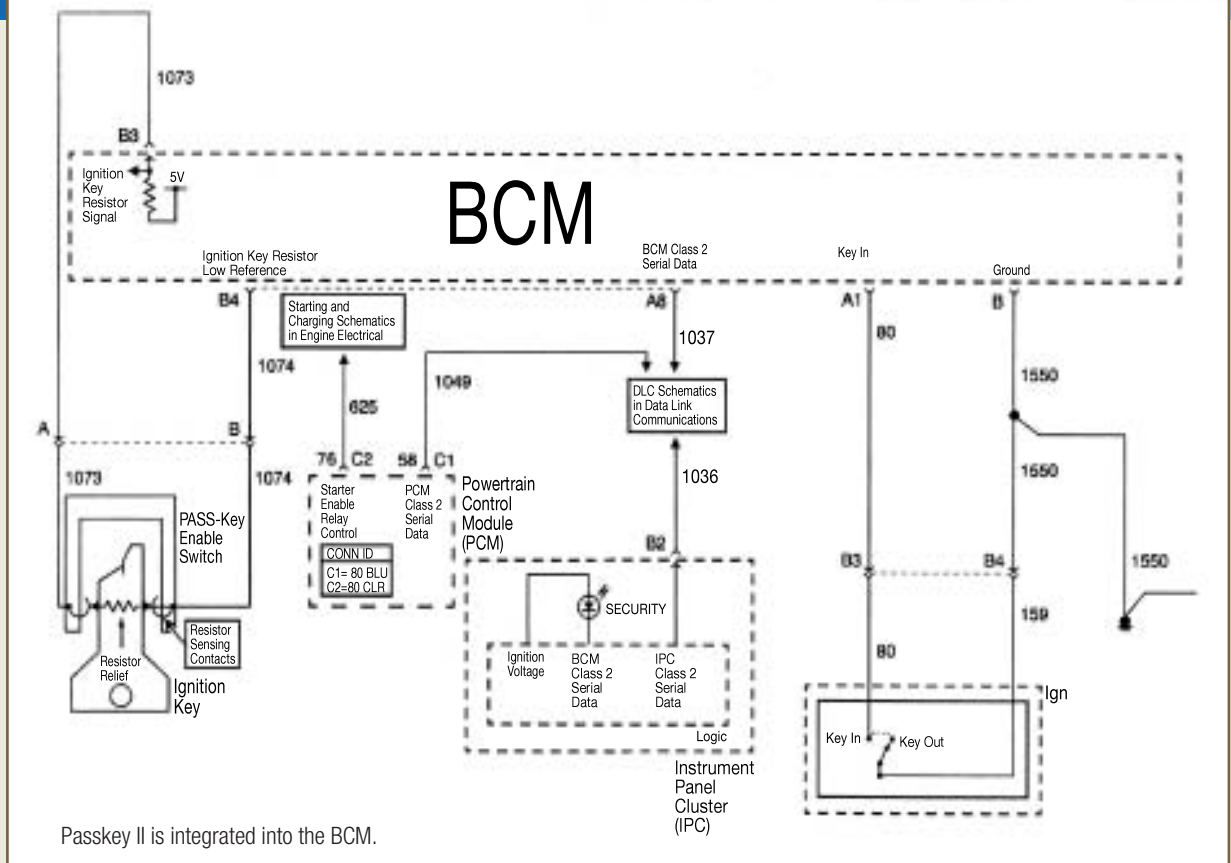
If the starter is operated without the key in the lock cylinder, such as with a remote starter switch, the TDM will interpret that as a theft attempt. Likewise, if there is a short to power or ground in the key recognition cir-

cuit, it is interpreted as a theft attempt. This can happen if the wiring in the steering column is damaged during theft, repair or installation of electronic accessories.

Either way, if the correct key is not in the ignition switch when the key recognition circuit fails, the TDM will turn on the "Security" light and enter anti-theft mode. If the correct key *is* in the cylinder and that circuit fails while the engine is running, this is considered a malfunction, not a theft attempt. The "Security" light may turn on to warn of a system malfunction, but even if it doesn't, a key recognition circuit failure with the proper key in the lock will cause the TDM to enter what GM calls a "fail-enable" mode. Essentially, the theft-deterrent system goes offline and the engine will start and run with any key that turns the lock.

KEYS

In the original VATS system, the key's resistor pellet and the TDM were programmed together at the factory. In the Passkey systems, the TDM will memorize the resistance of the first key inserted into the lock. There are 15 different resistance ranges or codes, and all are available as key blanks from GM dealerships. Within each range, the actual resistance may be more than 100 ohms different from the resistor's nominal code value, and even though a TDM will memorize the resistance of



the first key inserted into the lock, it will recognize a key pellet in the same resistance range. Whether the TDM is a separate unit or built into the BCM, that key resistance range memory cannot be reprogrammed. The resistance range of that first key is what it will look for every time.

There are three ways to get that resistance range number. One is to look at the car's original invoice. Another is to insert the key into GM's special Passkey troubleshooting tool, the J35628A Interrogator Tester, which will display the key's range number directly. If neither of these options are available, you can read the key pellet's resistance with a DVOM. With that reading, the dealer parts department can look up the resistance on a chart and supply the correct blank.

TESTING

A Tech II or Mastertech scan tool can read all the circuits in the Passkey system. The most common failure is simple wear and tear of the ignition key itself or the lock cylinder contacts. It's a good idea to have all copies of the key available for testing, because if the vehicle is driven with the same ignition key most of the time, the repair may be a simple matter of replacing a key that has worn out resistor pellet contacts.

If the system doesn't recognize any of the keys, and if your scan tool can't display Passkey codes, you'll need

to "undress" the steering column and find the ignition lock cylinder connector to test the key recognition circuit. If someone has already been into the steering column before, check the lock cylinder wiring carefully for damage. Roy advises that the second most common Passkey problem is pinched wires in the key recognition circuit, almost always caused by reassembling the steering column improperly after some other repair.

With the lock cylinder connector unplugged, measure resistance in the circuit with a key inserted and in the OFF position. It should match the resistance of the key pellet itself. Try wiggling the wires and the key in the cylinder. If resistance changes, the wiring is damaged or the key or lock cylinder contacts are worn and should be replaced. A heavy load swinging on the key ring has been known to cause problems with these contacts. Be aware that the TDM sends a 5-volt reference through this circuit at all times, so it's important to unplug the connector before testing the lock cylinder circuit.

LOST KEYS

If you have none of the original keys for the car, there are two options. One is to use the Interrogator Tester tool, which plugs into the key recognition circuit between the lock cylinder and the TDM and simulates the key pellet's resistance. Using any key that will turn in

the ignition, set the Interrogator Tester to simulate one of the 15 resistor ranges and attempt to start the engine. Each wrong guess and unsuccessful starting attempt will cause the TDM to go into anti-theft mode. It will reset after three minutes so you can set the tester to a different range and try again. It's a tedious process, but it will get the car on the road with no new parts other than the correct key blank.

Without this tool, and without knowing the original key's resistance range, the only way to start the car without any of the original keys is to replace the TDM. On Passkey I models, the TDM is a separate control unit buried deep in the dashboard along with the Theft Deterrent Relay. On Passkey II models, it's part of the BCM and can't be replaced separately.

Remember, the first time a new TDM or BCM is powered up, it permanently memorizes the resistance of the first key in the lock. Sometimes there are good reasons for permanently disabling the Passkey system so the key pellet's resistance doesn't matter. Without replacing the TDM, this can only be done if you know the original key pellet's resistance. Soldering a jumper wire with the correct resistor into the key recognition circuit will make the TDM "think" the key is always in the ignition.

If you're replacing the TDM, the system can be disabled by simply installing a jumper wire in the key recognition circuit. This bypasses the new TDM's programming function and allows any mechanically correct key to start the vehicle. In fact, before the Passkey III system was introduced, this was how vehicles were built without a Passkey system. The same PCM was installed in vehicles sold with or without Passkey, but the PCM won't operate the injectors without a signal from the TDM. A non-programmed TDM will provide that signal, but it also will turn on the "Security" light on the instrument panel to warn of what it considers a theft deterrent system malfunction. GM just bypassed the key recognition circuit and eliminated the "Security" light from the panel.

So if you're eliminating a Passkey system, a diagram of the TDM or BCM connector will show where to jumper the key recognition circuit. It's safer to solder a resistor into the jumper instead of just leaving a new TDM unprogrammed and leave the "Security" light connected. This way, if the engine ever fails to start and the "Security" light is on, you'll know where to look first.

PROGRAMMING

Just as a new TDM is programmed by the first key pellet it reads, a new PCM or TDM/BCM learns the fuel system go/no-go commands at the first start-up. If a PCM is replaced, the new unit will automatically learn the correct commands from the original BCM. If a new BCM is installed, it will learn the correct commands from the original PCM. However if either control unit was ever used in another vehicle, they must be reprogrammed

PASSKEY SYSTEM CODES


B2957	key recognition circuit voltage invalid (may be shorted)
B2958	key recognition circuit voltage invalid (may be grounded)
B2960	key recognition valid but incorrect (wrong resistance range)
B3031	BCM does not have a valid key pellet resistance in memory
B3094	BCM did not receive a "powertrain status" message from PCM within one minute of KOEO
P1626	fuel enable signal missing or incorrect (can be set with KOER)
P1630	PCM ready to learn security password from TDM or BCM (new PCM)
P1631	BCM indicates theft attempt, PCM has entered anti-theft mode

together. There is a 30-minute programming procedure that does not require a scan tool.

1. Turn the ignition switch to START, then release it to the ON position (the engine will not start).
2. The "Security" light should be ON. After 10 minutes, it should turn OFF.
3. Turn the ignition switch OFF and after five seconds, repeat steps 1 and 2.

When this procedure has been done three times, turn the ignition switch OFF. The control units will exchange the correct commands during the next start-up attempt.

If programming is not completed correctly, either there will be no theft protection or the system will lock in anti-theft mode and the engine won't start. Try the programming procedure again. Note that this will not reprogram key recognition, only the information transmitted on the Class 2 data link.

As you can see, the key to the Passkey system is just that: the ignition key. The control unit makes all its decisions based on the state of the key recognition circuit. While the vehicle may have additional security and alarms, only the Passkey system will prevent starting. Unless there's a communication problem between the TDM or BCM and the PCM, all you need for troubleshooting the Passkey system is a DVOM, a wiring diagram, and a good understanding of how the system works. 

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