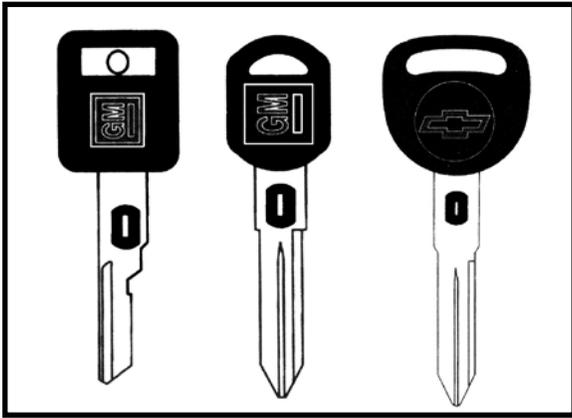


## **VATS Basics**

By Steve Young

### **What is VATS?**

VATS (Vehicle Anti Theft System) was introduced by GM on the 1986 Corvette because the Corvette had become the number one target of car thieves. Corvette thefts dropped so impressively after VATS was implemented that GM expanded the system in 1988 to the Camaro, Firebird, and Cadillac Seville. Before long, VATS was standard equipment on all Cadillac vehicles and on many other Chevrolet, Pontiac, Buick, and Oldsmobile vehicles. As the system was added to more vehicles, GM began using the terms "PASSkey-1" and "PASSkey-2" as more descriptive names for the system. From the locksmith's point of view, there is no functional difference between VATS and PASSkey-1 or PASSkey-2, and most technicians still refer to the system simply as VATS.



The system itself operates on a very simple principal. In addition to the standard side-bar ignition, there is a resistor embedded into the key. When the key is inserted into the lock and turned, an electrical current runs through the resistor. The amount of current drop caused by the resistor is measured by a computer. If the current drop matches the pre-set value stored in memory, the car is allowed to start. If the current drop is higher or lower than the pre-set value, the vehicle will be prevented from starting – even with the correct key – for several minutes. No alarm sounds and the only indication that the vehicle has been disabled is an indicator on the dash.

The time delay feature was the main reason that VATS proved so successful. Studies showed that if a would-be car thief could be slowed down, even for a few minutes, they would look for an easier target. VATS equipped vehicles soon became some of the least stolen vehicles on the road. The insurance companies went from charging a surcharge for owing a Corvette to offering a discount on the Corvette or any other vehicle that was equipped with the VATS system.

### What Vehicles are Equipped with VATS?

VATS was used strictly on GM vehicles, and a list of vehicles is shown in sidebar one along with this article. As you can see, the number of vehicles equipped with the VATS system peaked in the late 1990s, as transponder systems and other anti-theft systems were developed. The last VATS equipped vehicle sold was the Chevrolet Camaro and Pontiac Firebird which were both discontinued after the 2003 model year.

### How do I duplicate a VATS key?

Originally there were fifteen different resistor values chosen for the VATS system. These values are numbered 1 – 15, with the number one key having the least resistance and the number fifteen key having the most resistance. Due to technical problems involving the systems ability to accurately read the very low resistance of the number one key, the number one value was discontinued on new vehicles in the 1989 model year. When the system was implemented on the newer 10-cut locks in 1995, only fourteen values were used on the double-sided keys.

Duplicating a VATS key requires two steps. First you must read the resistance value of the customer's key and then duplicate the cuts on the correct key blank. The resistance value of the key can be determined with a simple volt/ohm meter, but most locksmiths use a device known generically as a VATS interrogator to determine the resistor value of the customer's key. If you chose to use a volt/ohm meter, you will need a conversion chart such as the one shown in sidebar two to convert the ohms reading from the meter into the resistor value for the key. When reading a key this way, you will need to bear in mind that actual reading that you get from the key may vary by as much as 3% from the "Target Value." This variation is built into the system in order to make it easier to operate.

Most VATS Interrogators automatically compensate for the 3% plus or minus variation allowed in the keys and simply give you a numerical value of one through fifteen when the key is inserted into the unit. (We'll discuss VATS interrogators in detail later.) Once you have selected a key blank with the same resistor value as the customer's original, all you have to do is duplicate the key as you would any other GM key.

## How do I originate a VATS key?

Just as in duplicating a VATS key, originating a key involves two steps. First you must determine the mechanical cuts for the key itself, and then you must “interrogate” the vehicle in order to determine the resistor value programmed into that vehicle. After you have both the mechanical cuts and resistance value, you combine the two and cut the key onto the correct blank. After checking to make sure that your key operates the vehicle you are done.



The process of determining the mechanical cuts is the same as with any other GM vehicle. If you are able to obtain the key code for the car, you will occasionally be able to get the resistor values as well – but don't count on it. If you are lucky enough to get the resistor value it will usually be given as a two character code which is also shown in sidebar two. On some of the later 10-cut ignitions, this resistor code is stamped onto the lock along with the code as shown.

You can also pull the wheel and get the code number off of the ignition lock if you are unable to get the code any other way. However, beginning in 1995, GM stopped putting key codes on the ignition locks of VATS vehicles. These vehicles can be decoded by using a scope to read the numbers stamped on the tumblers inside the lock. Since all replacement locks now have the numbers stamped on the tumblers, it is always a good idea to look into the lock with a scope before pulling the steering wheel, just in case the lock has been replaced at some time.

Another important factor in generating a mechanical key involves airbags. Most VATS vehicles that use the single sided key are also equipped with airbags. It is very important that you understand how to deal with a GM airbag steering column before you start. All airbag disassembly requires that you disconnect the battery while you are working on the system. The VATS system can only be interrogated when the battery is connected. Re-connecting the battery while the airbag is not in place will generate a fault code in the car's computer that may require a diagnostic tool such as the Tech-II in order to clear. Always do all of the mechanical work on an airbag column before you begin the interrogation.

Interrogating a VATS system is basically the process of trying each resistor value until you find the value that allows the car to start. If money were no object, you could cut fifteen keys for the car, and try them one at a time until you found the one that works. Obviously, that method would be wasteful and cost prohibitive, so most people use a VATS interrogator. All VATS interrogators allow you to try all fifteen values without wasting VATS keys. You will still have to make a “mechanical” key that will turn the ignition lock, but does not have a resistor. The key blank that is most often used as a mechanical key on the single sided system is the Ilco P1098AV or an equivalent blank. For the double sided system any 10-cut blank that does not have a rubber head can be used.

Once you have a mechanical key made, you will have to connect the interrogator to the computer in the car in order to feed it the resistor values, one at a time until you find the one that starts the car. Because of the time delay factor, you will have to wait a period of time between starting attempts, since even the correct key will not start the car during the delay period. There are three different ways of connecting an interrogator to the car, and the choice of the connection method is determined by the vehicle, the equipment you have, and the preference of the user.

## Connecting the interrogator

In the beginning, all interrogators had to connect to the wiring under the dash. The VATS wire can usually be found easily under the dash after removing the knee bolster. Once the wire has been located, the wire from the interrogator is connected to matching connectors on the VATS wire. Some interrogators only have one connector and it is attached to the wire that leads away from the steering column. The connectors will only fit one way so there is no danger of connecting the interrogator to the wrong wire. Connecting under the dash is the most reliable way to connect your interrogator because it eliminates any potential problems in the wiring to the lock and in the lock itself. If a vehicle starts when the interrogator is connected under the dash but not when the key is used in the ignition that usually indicates that the lock needs to be replaced.



In 1990, GM changed the wiring on some of the VATS vehicles, particularly on the Cadillacs, so that it went to the large “bulkhead connector” as shown in photo three, that all of the other steering column wiring runs through. A large bulky adaptor is required in order to connect to these vehicles under the dash. The bulkhead connector became known as the “48-pin connector” by locksmiths, and the adaptor is usually called a 48-pin adaptor. Using the 48-pin adaptor is awkward at best, which is why several different companies have introduced systems to connect through the ignition lock rather than below the dash.



The systems that connect through the ignition lock fall into two types – ones that use disposable plastic keys and ones that fit over the head of the mechanical key. Shown is a typical plastic key and the next photo shows the TT4002 VATS ByPass adaptor. The plastic keys can only be used once because they have to be cut to fit the vehicle. Car should always be used when using a plastic key to make sure that all burrs have been removed so that they do not come off and jam the ignition. Because the plastic keys are actual keys, different keys are required for the single sided system and the double sided system.



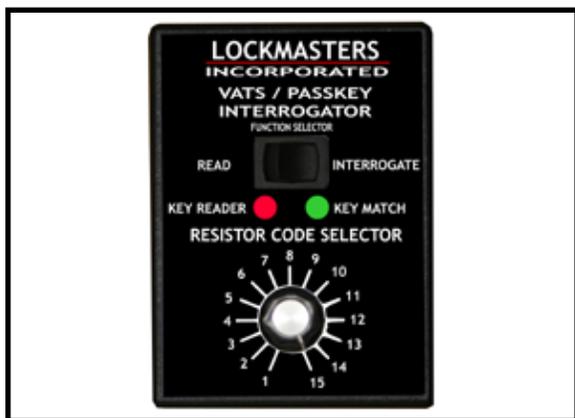
The TT4002 VATS ByPass adaptor has a boot that will fit over the head of either a single sided key or a double sided key. Once the boot is in place, the key and the adaptor are inserted into the ignition lock. The connector on the other end of the ByPass adaptor is identical to the connector found under the dash, so any interrogator will plug into the ByPass adaptor. Once the ByPass adaptor is connected to the interrogator and the key is turned in the ignition the interrogation can begin. The chief advantage of the TT4002 VATS ByPass adaptor is that it is reusable and that it will work on both single sided and double sided systems.



## How does an interrogator work?

The original VATS interrogator was manufactured by Kent-Moore, which at the time manufactured most of GM's special tools. Since these tools were not readily available to locksmiths, other manufacturers developed and marketed similar tools to accomplish the same job. My favorite interrogator, the Tech-Train 4004A, is shown in this photo. All interrogators, regardless of who manufactures them, include a selector switch that will allow you to pass the electrical current from the car through any one of the fifteen resistor values. When properly connected to the car, the electrical current that would normally flow through the key is re-directed to the interrogator's built-in resistors and then flows back to the computer in the car. The interrogator acts as the resistor pellet in the key so that when the proper value is selected the car will start and run.

The process of interrogation is simply attempting to start the vehicle with one resistor value after the other until the vehicle starts, pausing between each value for the duration of the time delay. Some interrogators have a built-in timer that signals you when four minutes have elapsed. I never use one of these timers (the TT-4004A doesn't have a timer) because I know that there has never been a vehicle built with a four minute delay. In the original information sent to the dealers it is clearly stated that the time delay is "two minutes plus." In my research, I've proven that a three minute wait is all that is necessary on any VATS system except for the one used on the 1990 Corvette – more on that later. It appears to me that the original interrogator, which was designed for use by Chevrolet mechanics, who charge by the hour, had a four minute timer because four minute timers were available cheaply. Other manufacturers followed suit just because the original unit had a four minute timer.



The Tech-Train 4004A interrogator has been out of production for several years, but it will be going back on the market early in 2008. Tech-Train was purchased by Lockmasters, Inc. in 2003 and has taken the original TT4004A interrogator, improved it and will soon be offering it along with the TT4002 VATS ByPass adaptor and a DVD on the VATS system. The new Tech-Train / Lockmasters interrogator is shown in this photo. The Tech-Train / Lockmasters interrogator is a rugged unit that boasts the best warranty in the business. For more information on the Tech-Train / Lockmasters interrogator contact Lockmasters, Inc. at **(800) 654-0637** or at [www.lockmasters.com](http://www.lockmasters.com).

## Learning how to understand what the VATS system is saying

The VATS system can only communicate with you by way of a light on the dash or in some cases a text display on the dash. If you want to be successful, you need to learn how to interpret what the VATS system is trying to tell you. The light on the dash that the VATS system uses is usually called the "Security Light" because it usually says "SECURITY." On some cars it may say "ANTI-THEFT" or just "THEFT." If you know how to interpret the security light you can tell a lot about what the VATS system is doing and save yourself a lot of time and trouble. Below is a simple guide to reading the security light.

**If the light does not come on** – This means that the system is not working. The problem may be a bad connection, bad wiring or a bad module, but until you get the security light to come on you are wasting your time attempting to interrogate the vehicle.

**If the light comes on and stays on as long as the ignition is turned on** – This means that the VATS system is working and it read the resistor value you tried, but rejected the starting attempt because you did not use the correct value. When you see this response, you need to turn the switch off and wait at least three minutes before you try another value.

**If the light comes on briefly and then turns off** – This indicates normal operation with the correct key. The car should now start. If the car does not start, it is not because of the VATS system; begin looking for after-market alarms or other problems.

**If the light blinks** – This usually indicates that the vehicle has a factory alarm system and that the door is open. If closing the door causes the light to stop blinking, continue. On some vehicles however, a blinking light with the door closed means the same as when the light does not come on – see above.

**If the light comes on and stays lit even after the ignition is turned off** – This feature is not found on many cars, but when you do find it you are in luck. The security light on these vehicles acts as a timer for you. When the light goes off, it is time to try the next value.

## VATS Tips and Tricks

The 1990 Corvette was the first vehicle to have the VATS function built into the main computer module (CCM). Initially this unit featured a variable time delay, but the feature was phased out before the end of the model year. On these vehicles, the time delay was slightly less than three minutes for the first four starting attempts within sixty minutes. After that the delay was increased to ten minutes per starting attempt.

VATS vehicles that have a manual transmission will not start, even with the correct key, unless the clutch pedal is depressed. This is why I don't even try to start these vehicles. I just watch the security light and when I find the value that causes the light to go out, I then start the vehicle.

The VATS system can control the ignition, starter, and fuel pump on any given vehicle. All of the systems that are controlled by the VATS system are disabled when the ignition is turned off. When the VATS system detects the proper key, it activates these systems. When the VATS system detects an improper starting attempt these systems are already disabled the only thing activated by the incorrect starting attempt is the time delay on the VATS module itself.

Only turn the key in the ignition once per starting attempt. On some cars, turning the key more than once will add time to the delay period. The maximum delay period if you turn the key repeatedly is about ten minutes.

The heart of the VATS system is the ability of the computer to read a precise voltage drop. If the battery is discharged, the voltage going through the key will be reduced and the computer will never be able to get a correct reading. Always make sure that the battery is fully charged before you start an interrogation. If necessary hook up jumper cables or use a jump box to make sure you have full voltage.

Compiled by Jerry Levine

The following chart is a list by model year of the General Motors vehicles that have been and are equipped with the Vehicle Anti-Theft System. To provide additional information, the single sided keys are indicated with the letter "S", double sided keys are indicated by the letter "DS", and large bow double sided keys are indicated by the letters "DL". The number "48" following the key identifier indicates the use of the forty-eight pin connector.

MAKE/MODEL	Model Years																				
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Buick Century												DS									
Buick LeSabre							S48														
Buick Park Avenue					S48																
Buick Reatta					S	S	S	S	S	S	S	S	S	S							
Buick Regal					S	S	S	S	S	S	S	S	S	S	DS						
Buick Riviera					S	S	S	S	S	DS48											
Buick Roadmaster									S	S	S										
Cadillac Allante				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Cadillac Brougham								S48													
Cadillac DeVille					S48	DS48															
Cadillac Concours								S48	DS48												
Cadillac Eldorado				S	S	S	S	S48	DS48												
Cadillac Seville				S	S	S	S	S48	DS48												
Chevrolet Camaro				S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Chevrolet Caprice									S	S	S	S	S	S	S	S	S	S	S	S	S
Chevrolet Corvette									S	S	S	S	S	S	S	S	S	S	S	S	S
Chevrolet Impala									S	S	S	S	S	S	S	S	S	S	S	S	S
Chevrolet Lumina									S	S	S	S	S	S	S	S	S	S	S	S	S
Chevrolet Monte Carlo									S	S	S	S	S	S	S	S	S	S	S	S	S
Oldsmobile Aurora										D48											
Oldsmobile Cutlass*									S	S	S	S	S	S	S	S	S	S	S	S	S
Oldsmobile 88									S48												
Oldsmobile 98									S48												
Oldsmobile Toronado									S	S	S	S	S	S	S	S	S	S	S	S	S
*not including the Cutlass Ciera models																					
Pontiac Bonneville										S48											
Pontiac Firebird GTA																					
Pontiac Firebird																					
Pontiac Grand Prix																					

<b>Resistor # (1%)</b>	<b>Code</b>	<b>Ohms Value</b>
1 MF1/4DC4020F	NONE	402
2 MF1/4DC5230F	CN	523
3 MF1/4DC6810F	FW	681
4 MF1/4DC8870F	GP	887
5 MF1/4DC1131F	KA	1130
6 MF1/4DC1471F	N5	1470
7 MF1/4DC1871F	UN	1870
8 MF1/4DC2371F	XB	2370
9 MF1/4DC3011F	GA	3010
10 MF1/4DC3741F	NP	3740
11 MF1/4DC4751F	FY	4750
12 MF1/4DC6041F	C5	6040
13 MF1/4DC7501F	XY	7500
14 MF1/4DC9531F	KB	9530
15 MF1/4DC1182F	UW	11800