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Volume 1 Number 1 Fall / Winter 2009

Cooling System Service
Suspension System
HVAC
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Caution: Vehicle servicing performed by untrained persons could result in serious injury to those persons or others. Information contained in this publication is intended for use by trained, professional auto repair technicians ONLY. This information is provided to inform these technicians of conditions which may occur in some vehicles or to provide information which could assist them in proper servicing of these vehicles.

Properly trained technicians have the equipment, tools, safety instructions, and know-how to perform repairs correctly and safely. If a condition is described, DO NOT assume that a topic covered in these pages automatically applies to your vehicle or that your vehicle has that condition.

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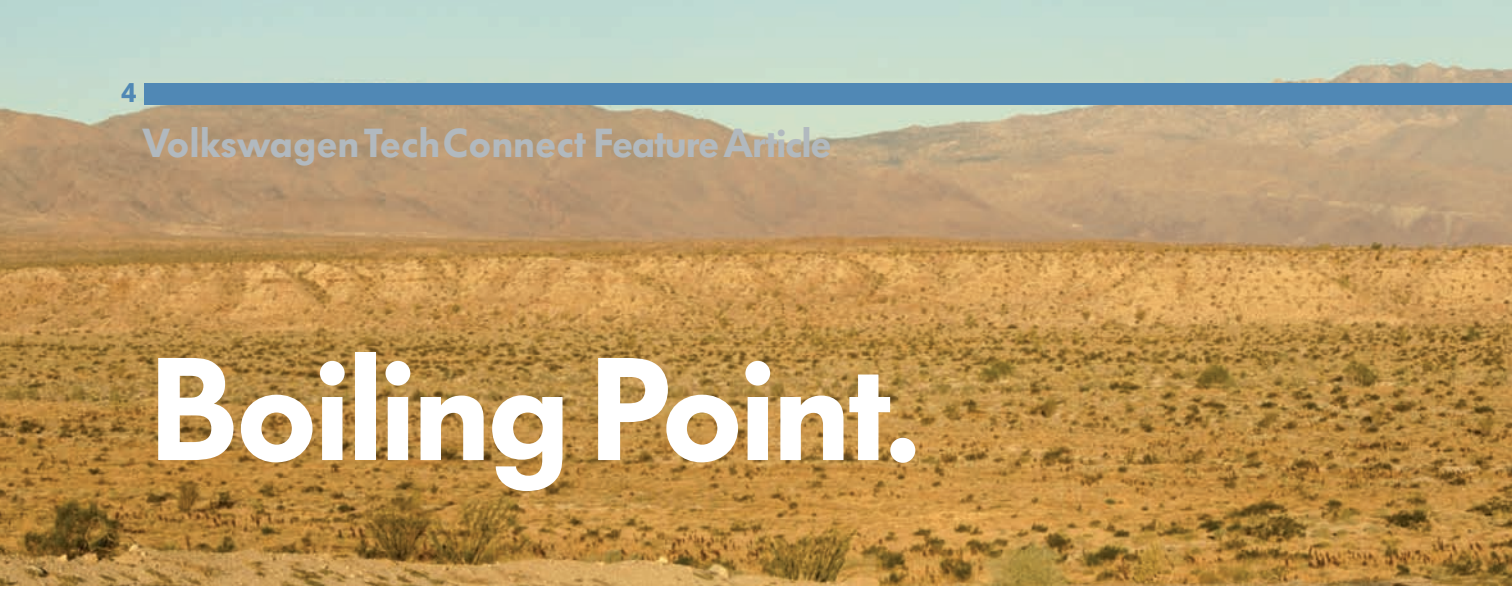


Boiling Point.

In order for any engine to live a long life, it needs to operate in its own temperate zone. Continuous hot running, excessive temperature fluctuations, and overheating incidents all do damage. It's your job to prevent these conditions.

Some of the most common and profitable service work you do is on the cooling system. Either you have the maintenance-conscious customer who has the coolant flushed at factory-recommended intervals, or the careless customer who brings you the vehicle when it's running hot, or has overheated.

In the former case, you just have to make sure you do a thorough flushing job, and refill with the proper mix of O.E. antifreeze and distilled water while making sure that any air is bled out of the system. In the latter case, you'll probably need to diagnose a problem, which can be anything from a bad water pump to a clogged radiator. With the cost of labor time and replacement parts, coupled with the unfortunate fact that your customers are enduring a downturn in the economy, you should be conscious of their budgets and fix the vehicle properly the first time with parts that will last. Cooling systems are nothing new, but here we're going to make sure you have all the basics clear in your mind, and cover some of the special service procedures peculiar to Volkswagen vehicles.

Basics

To begin with, coolant is circulated throughout the engine where it absorbs the waste heat of combustion. It's pumped through the radiator, where it dissipates this heat into the atmosphere, then is returned to the engine to be recirculated.

The basic components that perform this task are the water pump, thermostat, cooling system hoses, radiator, radiator cap, heater core, and, of course, the coolant itself. With so few components in the system, if any one were to fail it would have a major impact on cooling system performance. In addition, with modern high-performance engines, such as turbocharged models, new challenges to the job of keeping things cool have appeared.

On Volkswagens, one specific addition is the auxiliary cooling system pump, which is designed to overcome restrictions from complex piping and complicated cooling system passages, and to get hot coolant to the heater core. Another common addition is an oil cooler, which exchanges heat between the engine oil and the coolant (as you may not have realized, oil not only provides lubrication, but also absorbs heat as it circulates). This helps keep the liquid lubricant's properties from being altered by heat, which prevents the build-up of sludge and varnish.

Cooling system temperatures vary from approximately 300 deg. F. in certain passages to below zero, depending on your location on the planet. One way engineers have managed the problem of

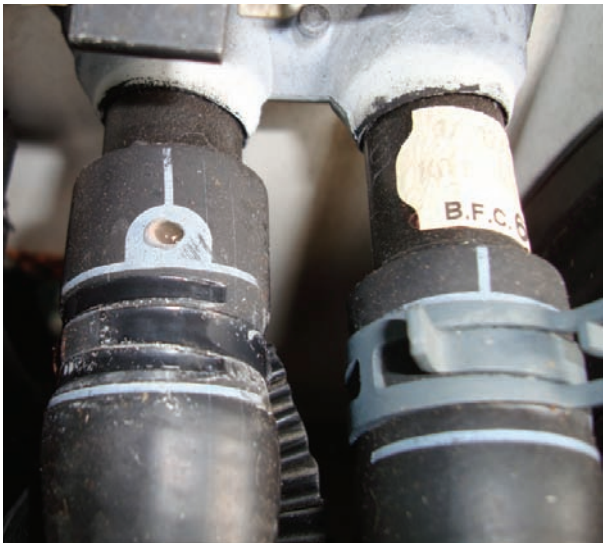
handling this broad range of temperatures is by keeping the system under pressure. If pure water were used as a coolant in an open system (which would naturally be at atmospheric pressure), the boiling point would be 212 deg. F. (100 degrees C.). If the engine exceeded this thermal limit, the water would start to boil off, and would also lose its ability to cool the engine because of bubbles. Sealing the system and adding antifreeze both raise the boiling point so that the engine can run at an efficient, optimum temperature. Cooling systems are pressurized to approximately 15 to 17 psi, depending on the application.

Another piece of the process we need to look at is sealing all the joints that have to withstand expansion and contraction as the engine heats up and cools down.

To control all of these factors, the engine must put out a “normal” amount of heat, and there must be proper coolant circulation, the correct coolant itself, and regulated cooling system pressure.

Roll Call

The heart of the cooling system is the water pump, which takes rotational mechanical energy and converts it into the movement of fluid. In a typical modern Volkswagen, the water pump is driven by the timing belt or chain instead of the accessory drive belt. So, if the belt were to snap there might



Two high points in the system are the heater core hoses. The return hose has a hole that's normally blocked by the heater core pipe. To bleed the air out, remove the clamp and pull the hose off until air escapes and coolant starts to come out, then push the hose on and clamp it.

be other damage to the valves, etc., but at least overheating from lack of water pump drive would be impossible because the engine wouldn't be able to run. On the other hand, this design makes water pump quality even more critical. A seized pump can cause the "T" belt to break, resulting in catastrophic internal engine damage.

Modern water pumps use hybrid construction. They have steel shafts, but either have metal or composite pulleys, and, more importantly, impellers. Plastic impellers are pressed onto the shaft. If the impeller loses its grip, the pulley and shaft will continue to spin, but the impeller will not and coolant flow will be lost.

The thermostat restricts coolant flow until the system reaches normal operating temperature. So, if the thermostat were to stick closed, overheating would result. On the other hand, if the thermostat were to stick open, not only would normal operating temperature never be reached, but the engine would take much longer to warm up. This usually yields a code P0128 on OBD II-equipped vehicles.

The radiator, heater, and bypass hoses are made of fiber-reinforced rubber. With Volkswagen's adoption of the auxiliary coolant pump and remote oil cooler, there are additional lines that over time will need to be serviced. As cooling system hose age they become soft, which eventually results in rupture. This rapid loss of coolant will cause an overheating condition very quickly. If a customer fails to notice it right away, expensive engine damage will be the likely result. You need to be checking all hoses at regular service intervals so you can replace them before they fail.

The radiator is next in line. Coolant is pumped into one tank and moves through the core to the other. Along the way, it gives up its BTU's to the aluminum tubes of the core, which in turn give them up to the atmosphere via the medium of the fins.

Neglected maintenance, or the use of improper antifreeze and hard water can result in blocked core passages. This can lead to an overheating condition may be difficult to diagnose. Another potential cause of reduced heat-exchange efficiency is anything that blocks airflow through the fins, such as leaves or an errant plastic bag.

Volkswagen was one of the first carmakers to adopt "PTR's" (Plastic Tank Radiators) with aluminum cores, and they tend to last a very long time indeed -- that is, given regular maintenance with O.E. antifreeze.

While refilling the V6 cooling system, you should have the bleeder screws open to allow air to escape. This one is mounted on the cooling pipe next to the driver's side cylinder head, toward the front of the engine.

Under Pressure

For some reason, techs tend to overlook the radiator cap, but it's important. It regulates the pressure in the system that keeps the boiling point up, so a leaky cap can indirectly lead to overheating. Its other job is to provide for the physical fact that as coolant heats up, it expands.

Volkswagen vehicles use a pressurized coolant reservoir, so that's where the cap is located instead of on the radiator itself. Regardless, always test this important item when doing maintenance, diagnosis, or repair.

Testing, Testing, Testing...

A pressure test is traditionally the first step in checking out a cooling system (that is, if your visual inspection doesn't reveal an obvious problem). It allows you to pump up the psi without getting the engine hot so you can be safer and more comfortable looking for leakage and soft hoses. Make sure the system will hold rated pressure for at least two minutes. While you're at it, find out if the cap blows off at its specified rating.

Sometimes it's difficult to zero in on a leak. One good way is to add fluorescent dye to the radiator, run the engine for a sufficient time (this can take a while it might even make sense to have the customer bring the car back the next day), then have a look with your UV/black light. Seepage will jump out at you in bright yellow.

You can use your exhaust analyzer to find compression/combustion leaks into the cooling system by picking up a sample above the radiator neck. But it's easy to go too close and get coolant in the probe. A better way is to secure a large plastic bag around the neck with a rubber band, then punch a hole in the bag and insert the probe, keeping it a safe distance from the liquid.

A bleed screw that's harder to find is the one on the rear cooling pipe by the driver's side cylinder head. Without bleeding from this point, you may notice little to no heat in the cabin.

There are also dedicated combustion gas leak detectors. Draw in some air that's been trapped in the reservoir and you'll see the tester's fluid turn from blue to green if excessive CO2 (a byproduct of combustion) is present. An often overlooked step is to drain some coolant out of the system to allow a greater volume of air to build up for a more accurate reading.

If compression is finding its way into the system, the most likely cause is a gap in the head gasket.

When it comes to finding the cause of an overheating problem that's the result of a low-flow situation, the process becomes a little deeper. Is it the water pump, restrictions from deposits, or a bad thermostat?

If you've got enough experience with known-good cars, scanning the system with a non-contact infrared pyrometer can tip you off to restrictions. You do have to know the path of the coolant through the system, however. For example, the pump forces coolant through the block first on the 1.8T, 2.0L and 2.8L engines. The rear coolant pipes divide the hot coolant between the heater core and the radiator. After passing through the radiator, coolant goes to the thermostat and back to the water pump.

Any radiator should exhibit an even temperature drop across the core.

While the engine is idling from a cold start, you can use the coolant temperature sensor/sender for the PCM and the instrument cluster, which is usually mounted in the rear coolant pipes. Using a pyrometer and your scan tool look at how quickly coolant temperature rises at various points. You should be able to determine if there is coolant flow, or a blocked thermostat by checking temperatures at the rear coolant pipes, radiator and return hoses.

Hybrid water pumps can be an issue because of their steel shafts and plastic impellers. The

Here's something that can happen inside an engine that you can't see. The impeller has separated from the shaft and is no longer spinning. An outside view doesn't indicate a failure since the water pump bearing is intact. Watch coolant temperature at the rear of the cylinder head and check to see if it is building up too slowly, which means low circulation.

symptom may seem counter-intuitive: You'll probably see normal temperature at idle, but overheating on the road (just the opposite of what happens when an electric radiator fan stops working). Typically, what's happening is that a loose impeller is still tight enough on the shaft to circulate enough coolant at idle, but when rpm increases, it slips. Rev the engine up and run through the coolant path you're your pyrometer to see where the temperature is increasing and decreasing.

Maintenance

Volkswagen does not specify any particular mileage interval for coolant replacement, but the level should be checked at every service. Because it may be in there for a long time, the only reasonable antifreeze to use is Volkswagen's own as it offers the extensive corrosion protection needed to meet these maintenance requirements. When performing any service work, use O.E. coolant G12, which was pink for years, but is now purple. Any time you're replacing a water pump, hose, etc., it only makes sense to fill the system with fresh antifreeze and distilled water.

Another useful thing available from your Volkswagen dealer's parts department is an acidic cleaner for flushing. Follow the instructions carefully.

Don't underestimate the importance of bleeding the air out of convoluted modern cooling systems. Not only will trapped air ruin the intended flow pattern, thus causing hot spots, but it'll increase corrosion dramatically. Volkswagen has made conmmendable efforts to avoid this situation. Its engineers have provided bleeder screws in logical places and special procedures that make eliminating air easy. Just don't forget to do it.

An acidic cooling system cleaner is available from your local Volkswagen parts department. This can be used to maintain clear passages. You should also stock up on G12 coolant and distilled water.

Volkswagen recommends Castrol

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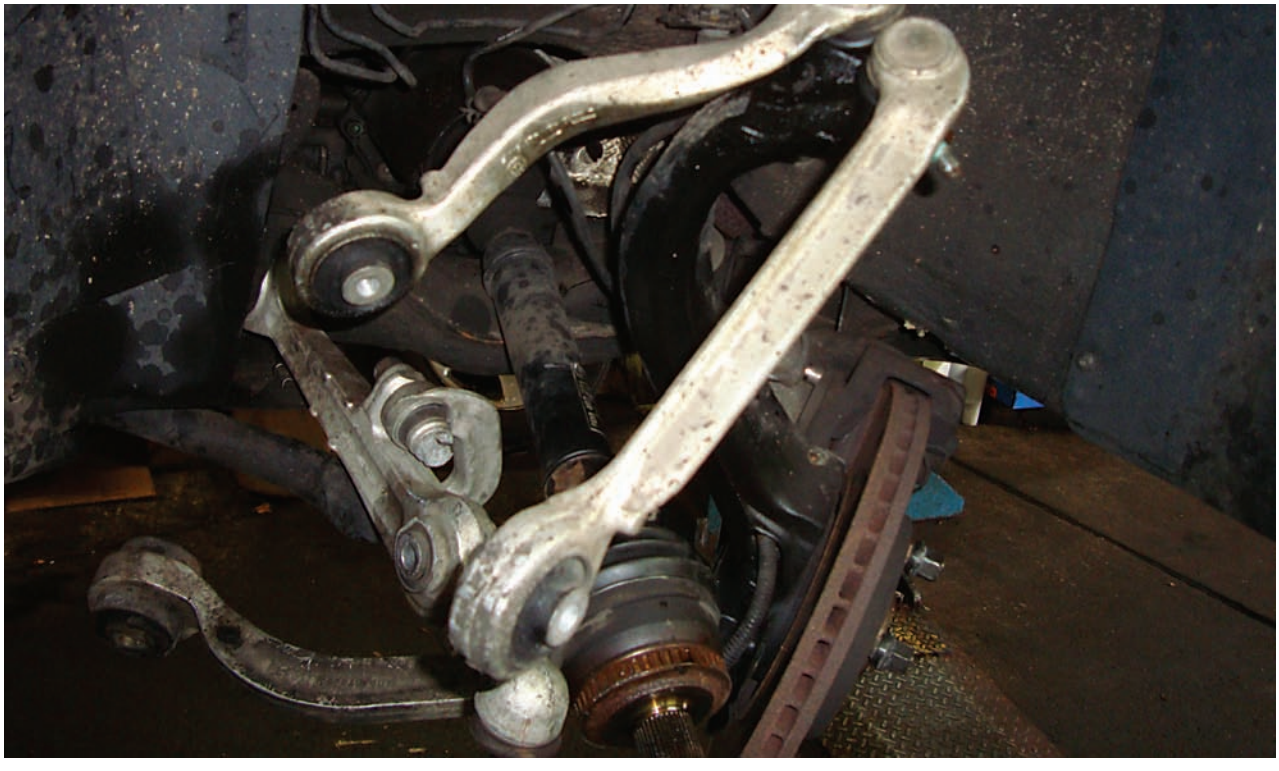
The feeling of control is the single most important factor of the driving experience. It gives the driver confidence in the vehicle's capabilities. Let's help maintain that new car "feel" -- and a happy customer.

Most car owners feel a personal connection with their vehicles. They become familiar with little idiosyncrasies. When the “feel” of the vehicle changes suddenly, they are the first to notice the difference. In other cases, a problem develops more gradually, and the driver becomes accustomed to it without noticing anything different. In the first case, you may have a tough time isolating the cause of the problem since it may be some minor deflection. In the second case, you may find a multitude of problems and have trouble selling the work since the customer believes the vehicle is fine. Either way with these challenges, you need to be able to diagnose various symptoms, commonly referred to as noise, vibration and harshness (NVH).

In the case of a chassis noise, vehicle dynamics come into play. You certainly need to drive the vehicle and duplicate the conditions the customer experiences. Very often the diagnosis is driven by the first step in process, which is the interview with the customer. Sure, you'd like to simply tell them, “We'll handle it,” but good customer interviews not only show your concern, they also get them involved in the process and make them feel you are the right person to do the job. The next step is duplicating the conditions under which the problem occurs and listening and feeling for its effects.

In order to diagnose a handling problem, you should know what type of steering and suspension system you're dealing with. Different manufacturers use different designs, which have different characteristics. Each manufacturer chooses a design that best fits its philosophy. In the case of Volkswagen, the "fun-to-drive" quotient has a high priority, and a MacPherson strut front suspension and a trailing-arm crossmember rear suspension, as used on the Golf and Jetta, fills the bill. Since ’98, the Passat and later Phaeton models use a multilink front suspension that provides the necessary steering



Aluminum links will eventually wear out on high-mileage vehicles. Finding out which link is the problem will require some diagnosis and testing. Using OEM Volkswagen parts will ensure long service.

and suspension articulation to offer even more sophisticated handling characteristics.

The MacPherson strut and trailing arm combination is a solid, trouble-fee design that requires minimal maintenance. Simplicity is the key to its durability, with only a lower ball joint, two lower control arm bushings, tie-rod ends and upper strut tower mounts to wear.

Multiple links offer the engineers tremendous control of wheel alignment as the suspension moves through its range of travel. While the handling is exceptional, the complexity does make the diagnostic process more of a challenge. If a single lower ball joint were to wear out, just replacing it would alleviate the problem. But with two ball joints on multiple links, the task becomes a little more difficult. Considering that your customers are not enjoying a bull market these days, they'll be more inclined to have you identify and only repair the immediate problem, as opposed to replacing all the components in the front or rear suspension at once.

Some diagnostic testing is the same for both designs, such as for wheel bearings. Being front- or four-wheel drive vehicles, the front driveshafts run through sealed unitized bearings. You can check deflection by rocking the wheel at the 12 and 6 o'clock and the 9 and 3 o'clock positions, but more often than not the driver will notice the howl of a bearing in left- or right-hand turns long before you feel looseness on a lift.

The Players Are On The Field

Knowing the components of the front suspension is just as important to the diagnostic process as interviewing the customer. The MacPherson strut design used on the Golf and Jetta has been around for decades. It's simple and inexpensive, using a lower control arm that attaches to a spindle. The upper portion of the spindle is connected to the strut assembly, which functions as both the upper control arm and the spring/shock absorber. A steering rack controls outer tie-rod ends that attach to the spindle. Finally, links connect the lower arm to the anti-sway bar.

The rear suspension is a solid crossmember with trailing arms that house the rear wheel bearings. This is another durable design that rarely needs anything more than the occasional wheel bearing and shock absorber/spring assembly replacement. Shock absorbers help
maintain tire contact with the road over bumpy surfaces, yet they are often overlooked as a means of improving ride and handling. The use of O.E. shocks and struts will give like-new performance throughout the vehicle's life.

With Volkswagen's multi-link suspension systems, there are new players on the field. For example, there are independent ball joints attached to the upper and lower portion of the spindle. These joints allow the rotational axis of the spindle to change positions, creating what is known as "Virtual Center Steering." This engineering

While examining suspension components, check for torn boots on the ball joints, which will allow dirt to enter the socket and accelerate the wear that creates noises and suspension vibration.

This long bolt that mounts the upper ball joint to the spindle is probably the most difficult bolt to remove. Volkswagen does not recommend using heat on any suspension components. Use a penetrating fluid and work the bolt out.

advance enhances low-speed maneuvering through increased articulation of the steering axis, yet still provides steering feedback at highway speeds. It also optimizes the working angle of the constant velocity joints on four-wheel drive systems, and helps reduce bump steer.

Four links attach the spindle to the chassis. The upper two, one forward and one rear, control the travel of the upper portion of the spindle. Two lower arms, again one forward and one rear, control the travel of the lower half of the spindle. Each link has one ball joint at the outer end for mounting in the spindle, and bushings at the inner end to mount to the chassis. The rear suspension has the crossmember-with-trailing-arm design found on the Golf/Jetta, unless it has 4WD. For them, an upper and lower "A"-type control arm is used, but the pick-up points are bushings, not ball joints. This is another sturdy design that usually does not require much work.

The Touareg is a relatively new model with the tried-and-true double "A" arm design. They don't really look like "A" arms anymore, but there are upper and lower arms that attach to the spindle. The upper arm has a single ball joint at the spindle and two bushings to mount to the chassis. The lower arm is similar to the ones found on the Golf and Jetta with two inner bushings and one outer ball joint, which is serviceable and bolts both to the spindle and the lower arm. The upper arm is not serviceable and must be replaced when the ball joint is worn.

Try twisting the bushing either attached or removed. If you can see tears like these of the upper link, this is definitely an issue that requires replacement, and OEM is the way to go.

The Prognosis

As discussed earlier, your first step after interviewing the customer is to road test the vehicle and put it through its paces, with the customer riding along, if possible. To get the whole picture, you should drive the vehicle using every possible combination of maneuvers. This means accelerating while turning the wheel both left and right. Then, do the same while decelerating. In a safe road-test area, you may also want to try this in reverse. You may feel something "give" in the suspension under hard acceleration, but usually what you'll notice are motor mount and driveline issues. Hard braking may also display problems in the front suspension. The goal is to get a feel for the problem through different driving conditions. You may uncover problems that your customer never noticed due to his or her driving style.

If while driving straight, you feel the whole vehicle vibrating, this is probably due to a tire with broken cords, or a bent rim. If the problem is felt in the front end of the vehicle, you have to isolate its location. You should ask yourself these four questions: Do I feel the problem in the brake pedal? In the steering wheel? In the seat of my pants? Or, all of the above? If it's in the brake pedal, you'll want to check for rotors with thickness variation, but other components can also cause this feeling. While braking, lighten up on the pedal and see if the pulsation disappears. If it does, then the rotors are probably not the trouble. If they were, you would still feel the vibration in the steering wheel as well as the brake pedal. If you feel the pulsation more in the steering wheel, and disappears under lighter braking, it's possible that the rear bushings of the lower control arms are torn or worn, allowing the camber and caster to oscillate as they're loaded.

These are just examples of how to approach a steering/suspension/handling problem. You may have your own methods that work for you. Here, we are just offering our own perspective.

Isolation And Testing

At some point, you are going to have to start examining the critical components involved. This is done by stressing the system while looking for unwanted movement or looseness between ball joints and/or bushings. In the case of a ball and socket joint, such as the lower ball joint, it is a good idea is to squeeze it together with a large pair of pliers to see if there is any play, which may cause a noise as the ball joint is stressed while driving, and/or steering alignment angles may change while the vehicle is moving. In this case, examining tire wear patterns can also indicate if there is a front-end problem. An unusual amount of wear on the inner and outer portion of the tire indicates excessive negative and positive camber, respectively. If you notice a “scalloped” pattern, where the trailing edge of the tread has a sharp edge and the leading edge of the tread is worn down, incorrect toe-in or -out is implicated, depending on whether the problem is on the outer edge of the tire, or the inner edge.

With multi-link suspensions, testing ball joints

While servicing these links, it is a good idea to provide some corrosion protection to the metal mating surfaces. This will make future service easier. Clean out the mounting bolts holes first with a wire brush.

is similar. You can try to collapse the ball joint with your big pliers, but in many cases you can just grab the link with your bare hand and try moving it around feeling for a worn ball socket. These systems are made of aluminum links with steel ball socket inserts to provide both strength and light weight. These links tend to wear out faster than conventional control arms, and will probably need to be replaced on high-mileage vehicles.

Bushings are also capable of causing vibration and handling issues. With a visual inspection, you can usually see if the inner mounting point has totally separated from the outer mounting. In the case where the bushing is soft from wear or contamination, or torn, you may only notice the tears by stressing the component. Use a pry bar to exert pressure and examine the bushing. You'll notice how easy it is to move a softened bushing, or you may see cracks in the rubber while it is being stretched into different directions. With soft or cracked bushings, the suspension links deflect more than they should, allowing the spindle to move around and change steering geometry, perhaps even creating vibrations.

When you have replaced the problem suspension part, you are still not finished with the job because the alignment may have changed. It is very important that you perform a wheel alignment on the axle you were working on. It is always a good idea to perform a four-wheel alignment to check for other problems. In the case of a multiple-link suspension system, a "raised-toe" alignment procedure needs to be followed. With a paid subscription to www.erwin.vw.com you can look up proper adjustment procedures and wheel alignment specifications.

In Conclusion

Although Volkswagen has provided durable designs for its suspension systems over the years, there are still parts that wear out and provide a service opportunity. Using Volkswagen factory (O.E.) parts for repair ensures that the vehicle is returned to its original state, which will make your customers happy. Who couldn't use that?

Mobile Comfort Zones.

Whether it's a manual or automatic HVAC system, motorists just want it to work. Every time they get into their vehicles, either from the beach, or the air-conditioned shopping mall, the few minutes it takes to cool the cabin air feel like an eternity. Naturally, they are very appreciative of the service work you perform that keeps them comfortable. So, how can we keep their HVAC system functioning in a cost-effective and profitable manner?

Knowing how Volkswagen systems work, and familiarizing yourself with the various functions and options involved, can help save a tremendous amount of time while you are trying to figure out an issue a customer has brought you.

Volkswagen manual AC systems get their durability from their simplicity. Their similarities from year to year and model to model can make working on them a walk in the park in most instances, providing you are in the know. Electronically temperature-controlled HVAC systems are, of course, more complicated, but they have extensive self-diagnostic features to assist you. Here, we'll look at how the basic manual AC system works, and what to look for when there are problems. We'll also investigate the more sophisticated electronically-controlled systems, and what functions are useful for diagnosis.

Keeping Your Cool

Since early 2000, Volkswagen vehicles have predominantly been sold with manual AC. Despite what you may think, modern manual AC systems don't just rely on lever controls, vacuum switches, and cables. There's plenty of wiring, too.

A happy customer is a comfortable one. You perform essential services to keep them rolling, but one indulgence they really enjoy is climate control. Here's how to keep them as comfortable in their vehicles as they are in their homes.

Manual AC systems are called that these days because there is no computer-controlled feedback to adjust cabin temperature. The passengers simply set a temperature and the system puts out what it can to achieve it. Some electrical inputs are used to protect compressor operation. There is an ambient temperature sensor, a refrigerant pressure sensor, and coolant temperature sensor to make sure conditions are right to turn it on. Starting in the early 2000 model year, a cooling fan control unit monitors all these sensor inputs and manages the compressor clutch circuit as well as the cooling fans.

With a manual system, all of these inputs need to be working properly to activate the compressor. If any input were to fail, the compressor clutch circuit would open. Without a control unit with self-diagnostic capability, this means each input has to be checked using pin voltages. Whether you want to check the voltage signals at the cooling fan control unit, or each individual sensor, is up to you. The control unit is usually mounted on the driver's side front frame rail. On a New Beetle, that would be under the battery tray, not all that easy to get to. Some cooling fan control units have strip-type fuses secured to the top, some do not, depending on the application.

Testing Input

Consider a 2002 Jetta VR6 with manual AC. Its coolant fan control unit has two connectors, one

This is an ambient air temperature sensor found on an automatic climate control system, and is not to be confused with the ambient air temperature switch found on manual system. This sensor will only flag a code and affect temperature control. It will not suspend compressor operation.

four-pin, and a larger 14-pin. On the four-pin connector, you have the relay's power supplies, a 6.0 millimeter solid Red in pin #1, and a 2.5millimeter R/Wtracer in pin #3. They should have battery voltage at all times. In pin #2 (a 2.5 millimeter R/W tracer) is the power supply out of the relay for low-speed fan operation. The final 6.0 millimeter R/W tracer is the power supply output for the high-speed fan.

The 14-pin connector is where the internal relays get activated, not only for the cooling fan, but also for the AC compressor clutch. Pin #6 is a Brown ground wire, and constant battery voltage comes in on pin #4, a R/Gr tracer. Power from the ignition switch comes in on in pin #9, usually a Bk/Bl tracer.

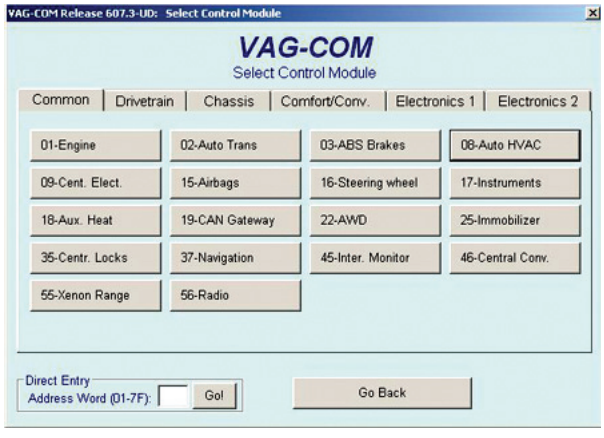
In order for the compressor to turn on, inputs are needed. The first check is on pin #8, a Bl/R tracer. When the AC button is pressed and the blower is commanded on, you should see battery voltage. Next, look at pin #2, a W wire. This is an unusual signal in that it is a five-volt square wave created by the refrigerant pressure sensor. The duty cycle of the signal will change with the refrigerant charge. This is to indicate if the charge is too low or too high to turn on/off and damage the compressor.

Another signal that may inhibit compressor activation is that of the ambient temperature switch. Test for voltage between pins #5 (Bl/R) and #14 (Gn/Bl). If the signal indicates the air temperature is too low, it will not allow the compressor to run. Check these inputs to the cooling fan control unit whenever the compressor clutch won't engage.

A Brief Description of Climate Control

The phrase "Automatic Climate Control" means that after setting the temperature in the cabin, an electronic unit monitors both outside and cabin temperature conditions and uses a programmed plan for how best to achieve and maintain the chosen setting. These settings vary from full defrost heat to MAX AC. Once a temperature is set, the control unit will automatically manipulate mode doors, temperature blend doors, and the recirculation door. There are manual overrides the passengers can select to control the mode doors' position, cabin air recirculation, and AC compressor operation. Since the electronics are overseeing system operation, Volkswagen has implemented the same self-diagnostic features found in other onboard control units.

The famous three dials of the Volkswagen HVAC system tell us when the AC button is pushed and the blower motor is turned on. The switch provides voltage to pin #8 on the cooling fan control unit indicating that AC has been requested.



As you can see, there are many "address words" for all of the possible self-diagnostic systems on the vehicle. Select address word 08 – HVAC and you can talk to an automatic climate control system (not a manual system).

You may not realize what your current scan tool is capable of. You may not even realize how much useful information you have at your fingertips. You should hone your skills, reduce your diagnostic time and maybe get ahead of the "cost-effective diagnosis" game.

Volkswagen/Audi Automatic Climate Controlled Systems are endowed with similar self-diagnostic features to powertrain control systems. While the scan-based diagnostic features in the Auto-HVAC systems are extensive, the interface is proprietary, so without knowing what you are looking for it will be difficult to interpret the data being displayed. So how does this work?

For those of you familiar with VAG scan-based diagnostics, this will be a review. For those not familiar with it, welcome to the future. VAG is the factory proprietary scan tool for Volkswagen and Audi vehicles. If you purchase the European bundle for your aftermarket scan tool, you should be able to display this "factory" software, which allows you to communicate with all of the various control units in the vehicle. Each control unit is programmed to use the same software architecture, so what we're about to describe will work on ABS, as well as SRS.

On the side of the cooling fan control unit, the pins are identified with their functions. You may be able to use them for testing once you learn what they are. Note that both strip and ATC fuses can be blown and prevent AC and cooling fan operation.

You can enter the self-diagnostic feature with your scan tool by simply picking the address word you need. So, what's an address word? With the factory scan tool, a series of numbers is used to identify the various systems we can enter. These numbers are called "address words" in your technical literature.

Functions

Each system has its own address word. On the Volkswagen/Audi factory tester, you need to know what address word represents each system. Aftermarket diagnostic tools give the address word as well as a description of the system. In the case of automatic climate control, the address word is 08 (Auto – HVAC). Once you've selected the system, you will now be asked to select what function you would like to perform. You have numerous choices:

- Function 01 identifies the control unit.
- Function 2 is for pulling codes.
- Function 3 is for actuation mode.
- Function 4 provides 'basic settings."
- Function 5 clears codes.
- Function 6 ends communication with the control unit.
- Function 7 allows you to code the control unit to the particular car it is in.
- Function 8 is for reading data.

There are a few other functions to choose from, but we are going to focus on the most important ones.

Starting with function 01, you will see that this merely identifies the control unit in the vehicle as well as its version coding. This information is useful if you feel the coding may have been changed in error, or a used control unit was installed and may not match the requirements of communicating with all of the other various control units in the vehicle. Each control unit is programmed to use the same software architecture, so what we're about to describe will work on ABS as well as SRS. You can enter the self-diagnostic

feature with your scan tool by simply picking the address word.

Providing the control unit is the proper one, you can correct coding if necessary. Function 02 is pretty self-explanatory. Auto-HVAC units are capable of self-diagnosis, and can identify faults in one or more components. These components are either sensor inputs, or actuator outputs. In the case of actuator outputs, you don't always have to access the component and start our testing there. The other option is scan tool activation.

Function 03 is the mode in which you can take advantage of the scan tool and request that the HVAC control unit activate various outputs. You can listen for the activation, and/or perform electrical testing on the component being activated.

This allows you to verify that the control unit's driver is capable of turning on any component in which you may suspect a fault.

Moving along to function 04, this is referred to as "Basic Settings." In general, this provides a "reset" or 're-sync" of computer-controlled features. The automatic climate control system needs to know the positions of the various temperature and mode doors in order to manipulate them if a change is requested by the occupant, or sensed by a temperature sensor. "Basic Settings" runs the control unit through the re-learn process, but more on this later.

Function 05 simply clears codes, and once you are done communicating with the HVAC control unit, you need to shut down this communication by selecting Function 06. This prevents corruption of software in the unit. Function 07 allows you to change the version coding, which is a way for you to tailor the control unit to the vehicle it is in. Vehicles come with more than one option. Each control unit must be made aware of these options in order to perform properly. This comes in especially handy when installing used parts. Although the replacement control unit may have the same part number, the coding must be changed to accommodate the requirements of the vehicle being repaired.

Finally, Function 08 (sometimes referred to as data blocks, or measuring blocks) allows you to look at data, such as a temperature sensor reading, or actuator position. The tricky part is that these data blocks are also identified with numbers and are displayed in blocks of four. You must look up in a table what the data blocks indicate for each display group.

Here are your options once you have selected an address word. In 08, you can select "Basic Settings," enter "000," and the system will run through the initialization process. This should be performed after every mode door and temperature blend door replacement.

Reset

Once you have pulled codes, diagnosed a problem, and done a repair, you may need to reset the climate control system, especially if a mode door motor was replaced. This can be achieved through the "Basic Settings" feature. You will be prompted to enter a three-digit code. Leave the code "000" in the display and enter this mode. The positions of the doors are recorded, and they will then cycle to their respective end stops. Now, the control unit knows what the maximum and minimum positions are for each mode/blend door. When it needs to make a temperature adjustment as a result of changing conditions, it can make the correct change. Without knowing the proper position of the doors, it will make the wrong adjustment and output the wrong temperature.

Knowing the system helps cut down on wasted diagnostic time, and can make you money on all but the most difficult problems. You will end up with fewer comebacks, less stress, and a cool, happy customer ●

Controlled Chaos.

In an accident, anything can happen. That's why it's called an accident. Supplemental Restraint Systems coupled with seatbelts control the chaos to an admirable extent. Now all we have to do is put it back together.

Airbags

Of the many safety features that have come along over the past few decades, the airbag is among the most technologically advanced. Modern airbag systems have crash sensors placed throughout the vehicle that signal the SRS control unit about how severe the impact is and from what direction it's coming, and also where passengers are sitting. The computer then performs a symphony of electrical commands that retract the appropriate safety belts and deploy the necessary airbags. All this happens in under 50 milliseconds -- absolutely amazing.

After the mishap, the vehicle is brought into your shop and you have to put it all back together. The most important part of this effort is that it must function as the vehicle was engineered to do before the accident. Your shop's liability is on the line. It's critical that you know what Volkswagen expects to be done in this situation, exactly. Being the manufacturer/distributor, the company is the final word on the vehicle. We need to dot our "I"'s and cross our "T"'s, and make sure the airbag control unit is still up to its potentially life-saving task. Also, the wiring must be intact so that it is still capable of sending and receiving signals to and from the sensors, safety belt retractors,and airbag squibs. Here, we'll review the procedures that will help you get the job done right.

First Things First

As just mentioned, any body shop must know the factory-recommended procedure for repairing the airbag system, which will reduce your liability in any future issues with this particular vehicle. With insurance companies offering warranties on the service work performed, the burden is on you to do the work according to the pronouncements of the manufacturer, in this case Volkswagen.

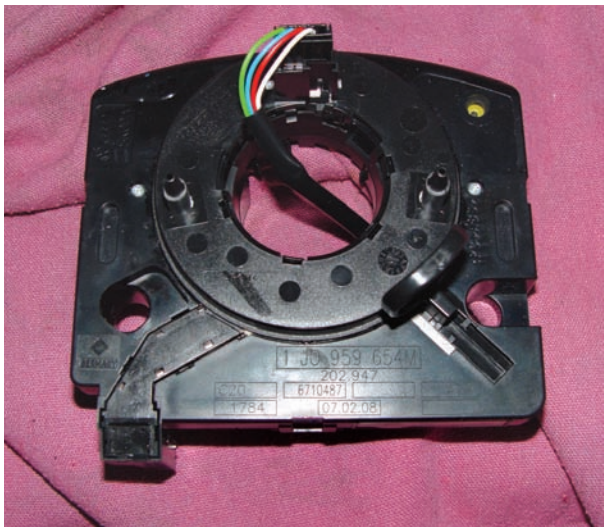
Well, what are the factory-recommended procedures? First, you have to look at the type of accident that occurred. If it was not severe enough for airbag deployment, all that's required of you is to repair the body damage, but you'll also need to check the airbag control unit for any codes. If the vehicle is a 2004 or earlier, you will need to replace the control unit if the vehicle experienced a front impact with airbag deployment. On 2005 and later vehicles, replacing the control unit is not required, but is recommended, particularly if it has diagnostic trouble codes.

The brain of the airbag system is the control unit, which is usually mounted underneath the dash panel, in front of the center console. You can access the connector and start checking wiring if damaged parts have been replaced, but you still have an airbag warning light on.

Each time the ignition key is cycled, the airbag module goes through a self-check in which it monitors circuit and component integrity to make sure the system will function during a possible future accident. Big note: Before starting any service work, the technician must disconnect the battery ground cable. On older vehicles, a brief waiting period is recommend before starting a repair. On late-model Volkswagens no waiting-time is required. Use www.erwin.vw.com to determine the proper procedure for your specific vehicle. These procedures prevent any accidental deployment of airbags or safety belt tensioners.

You are required to address any DTC's you find, and, most importantly, you must check and replace any pyrotechnic safety belt that may have deployed as a result of the accident. In order for an airbag to do its job, the vehicle's occupants should be in the seated position. A loose safety belt will not work as effectively as a tight one. As pyrotechnic safety belts deploy, they reduce slack in the safety belt, therefore improving safety.

Even though the accident may not have been severe enough to deploy the airbags, it may still have fired the safety belts. The automatic tensioning device is part of the safety belt assembly



The clock spring maintains the electrical connection between the airbag control unit and steering wheel-mounted airbag no matter what the position of the steering wheel. When a deployment has occurred, it must be replaced with the airbag.

mounted in the door "B" pillar. You should never allow your techs to remove these units with an impact gun, for their own safety. Also, when doing any welding on the vehicle, make sure the temperature does not exceed 100 deg. C around the pyrotechnics to avoid accidental firing.

If the accident was severe enough for airbag deployment, more extensive work must be performed. Obviously, you must replace any airbags that have deployed with new units that have the proper interior color coding. You do not have to replace airbags that have not deployed unless there is physical damage to them. In the case of a passenger's side airbag deployment, you also have to replace the instrument panel carrier, or frame, because it may have deformed or become weaker as a result of the incident. If the driver's side airbag has deployed, the steering wheel slip rings and clock spring must also be replaced. They have been stressed and may not work after having had firing voltage passed through them.

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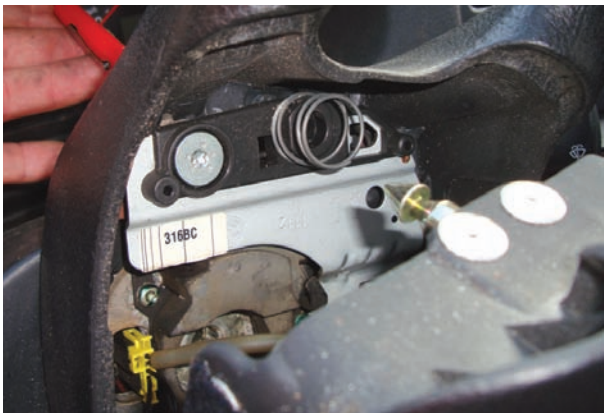


Removing an airbag sometimes involves that you have a "feel" for the vehicle. While placing a small screwdriver down a blind hole, you need to feel for the spring and pry upwards moving the spring in. This releases the pin for airbag removal.

Side airbags, particularly the curtain type, need some special attention. The interior trim can be used up to six times (quite a bad driving history). If any of the interior trim was damaged in the accident, even slightly, however, it must be replaced so that under another deployment it breaks away in a predictable manner. If it's cracked, or any clips are broken, it may break away improperly and hurt vehicle occupants.

The control unit may have to be replaced depending on the year of production. It will have to be replaced if there is physical damage, or a DTC for an internal failure. You may want to support this replacement recommendation with a printout of DTC's from your scan tool, or from the repair shop to which you've farmed out the work.

The safety belts will have to be checked if they have fired their automatic tensioning devices, and for physical damage as well. First, look at the safety belt material. There cannot be any holes, tears, or over-stretching. The nature of the weave allows the material to stretch as it absorbs some of the force the human body exerts upon it. This dissipates some of the inertia of impact. Second, in addition to pyrotechnic devices on safety belts, there are also inertia locks in their reels. You should tug on the safety belt as fast as you can and the belt should lock. If not, you must replace it. After the repair, road test the vehicle in a clear and safe area between 10 and 15 mph and do a panic stop. The belts should lock up and keep you in an upright seated position.

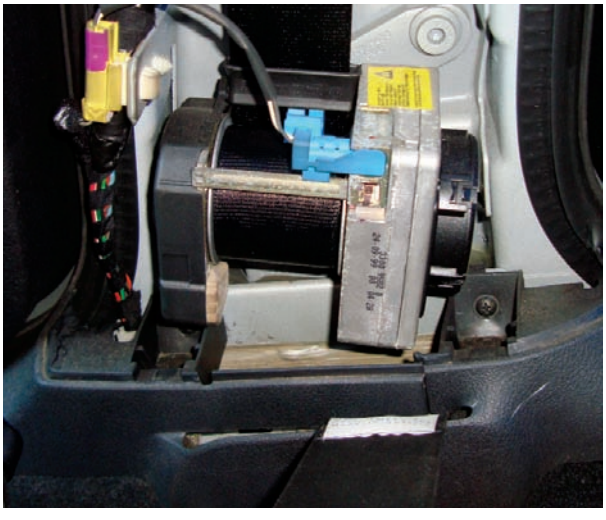
Any undeployed airbag or safety belt pyrotechnic tensioner must be fired before it is discarded. Using an external heat source is dangerous. For proper disposal procedures, refer to www.erwin.vw.com.

Also remember that when servicing any airbag, particularly for the driver's steering wheel and passenger's side units, keep the deployment side up.

The Diagnosis

If you've completed the repair, but still have an illuminated airbag warning light, you should pull the DTC's and diagnose the problem. In the odd chance that you don't see any codes, try going into the instrument cluster module and pulling and clearing codes there. If the warning light still comes on, you should have a code in the airbag system.

If the control unit was replaced, it will need to be coded properly. First, you must "log-in" to the control unit with the five-digit service code number, then enter the "Coding" feature with the proper five-digit code for the specific vehicle you are working on. This can be handled through your Volkswagen parts supplier and/or service department. Volkswagen strongly recommends that you only use new OEM-supplied parts for

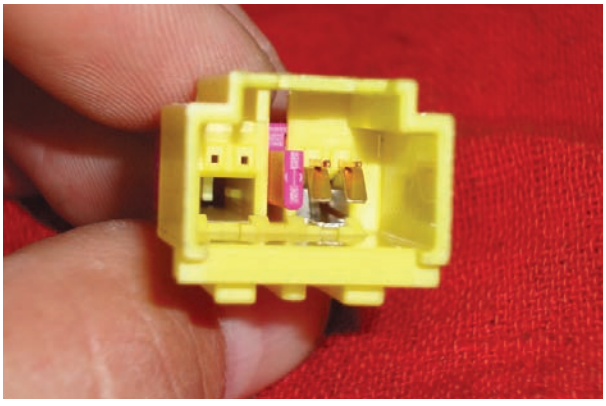


The pyrotechnic safety belt tensioner gets fired just like an airbag, but the controlled explosion tightens down on the safety belt. Inertia locks also stop belt movement under sudden deceleration. These belts can deploy when the airbags have not, and replacement is required.

each component of the airbag system. Used parts are out of the question. In the case of an airbag control unit, the coding numbers are specific to the vehicle. If the end-of-line programming for the control module does not match the airbag equipment, then you cannot trust the codes you are seeing. If you see a code for "Seat Occupancy Detection," but cannot find one in the passenger's seat, the airbag control unit end-of-line programming is wrong (possible used part?). The end-of-line programming indicates to the control unit what options are on this vehicle. If the programming is wrong, it will not accept the login PIN because it will look for those options, and when it does not find them will flag a DTC for incorrect equipment. Since an airbag control unit can only be coded once, you need to stay away from used parts.

With the proper coded airbag module, you can then go about diagnosing the problem. In the case of an airbag circuit code, you have to follow strict diagnostic procedures to prevent accidental deployment. Never pierce or back-probe the wiring in the airbag firing or sensor circuit while the system has power. These wires are a safety Yellow/Orange color so you can tell them apart from other vehicle wiring. You can disconnect the battery and perform resistance checks, but the airbags and safety belt tensioners must be unplugged from their harnesses. Although testing the wiring can lead to a proper diagnosis, it may be time-consuming to access the control unit and each individual airbag. Special service tool VAG 5056 can be installed in place of any airbag in the system, and it substitutes a known-good resistance value. You can then use the self-diagnostic features of your VAG 5052 to see if any codes were set with the airbag simulator tool.

If a low circuit resistance code were to set, you can push a button on the VAG 5056 and see if a high circuit resistance code was set. If not, then the wires are either shorted together or open, and the airbag wiring harness should be replaced. If you are going to test wiring manually with a meter, you must first remove the static charge from your body. You can do this by touching a ground source such as metal piping. You then have to disconnect the battery ground cable, unplug the airbag control unit, unplug the airbag circuit or crash sensor you want to test, and additionally you should move any shorting bars within the connectors out of the way.



In each connection of the airbag system, there are shorting bars that connect the two wires. This prevents a differential in voltage that may cause accidental deployment. Shorting bars must be temporarily moved out of the way to test the wiring.

These bars connect the two wires to prevent differing voltages from touching the wiring while the connector is unplugged. With the wiring shorted together, whatever voltage ends up on one wire will end up on the other, preventing the possibility of a power and ground source being available. After moving the shorting bars, you can set your digital multimeter (DMM) for a resistance test. You can test for continuity between the airbag control unit and the offending airbag or sensor on each wire. Also, check for continuity between each wire and ground -- there should be none.

If the control unit is unplugged, you can reconnect the battery and check for voltage on each of these wires. Since the wiring is disconnected at the control unit and airbag or sensor, these wires should not have positive voltage or ground. With the key on, check each wire for voltage. It should not have any.

Wiring damage can be repaired if the problem area is found, but it must be a proper repair. No butt connectors can be used. Volkswagen requires that any repairs be carried out with their 1978 wiring repair kit with the ancillary 1978 airbag kit. Refer to www.erwin.vw.com for proper procedures for wiring repair. If it is feasible financially, replacing the harness should be your first choice. Reconnect all components, attach the battery ground lead, cycle the ignition key on, and allow the system to perform a self-diagnosis. Once the airbag warning light stays out and there are no codes, you have a complete repair. ●

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Savannah
Vaden Volkswagen
912.629.6989

Snellville
Dwight Harrison Volkswagen
770.979.2000

Union City
Heritage Volkswagen
770.774.0758

Valdosta
Pipkin's Motors, Inc.
229.242.9920

Hawaii

Honolulu
Cutters Ala Moana Volkswagen
808.564.9184

Waipahu
Tony Volkswagen
808.680.7170

Idaho

Boise
Boise Volkswagen
208.377.5400

Idaho Falls
Wackerli Volkswagen
208.524.1500

Twin Falls
Con Paulos Volkswagen
208.733.2954

Illinois

Bensenville
Larry Roesch VW
630.860.0400

Chicago
City Volkswagen
773.794.7850

Chicago
Fletcher Jones Volkswagen
312.628.4900

Countryside
Autobarn Volkswagen
708.352.1100

Crystal Lake
Anderson Volkswagen
815.455.4330

Dixon
Dixon Volkswagen
815.288.3366

Downers Grove
Pugi Volkswagen
630.971.4111

Evanston
The Autobarn Volkswagen
847.570.3081

Glenview
Jennings Volkswagen
847.729.3500

Gurnee
Gurnee Volkswagen
847.855.1500

Highland Park
North Shore Volkswagen
847.433.6656

Joliet
D'Arcy Volkswagen
815.725.5200

Libertyville
Liberty Import Center
847.680.1290

Mt. Prospect
The Autobarn VW
847.767.6552

Naperville
Bill Jacobs Volkswagen
800.519.4879

Normal
Sud's Volkswagen
309.454.1101

Oak Lawn
Mike Haggerty Volkswagen
708.425.8989

O'Fallon
Auffenberg Volkswagen
618.624.2277

Orland Park
Volkswagen of Orland Park
708.428.5000

Ottawa
Sierra Volkswagen
815.433.1666

Peoria
Sud's Volkswagen
309.243.1101

Rockford
Lou Bachrodt Volkswagen
815.332.3000

Schaumburg
Fox Valley Volkswagen
847.839.8101

Springfield
Green On Dirksen
217.523.3643

Urbana
O'Brien Volkswagen
217.367.1222

West Chicago
Fox Valley Volkswagen
630.818.4181

Indiana

Bloomington
Royal Volkswagen
812.332.9251

Clarksville
Clapp Volkswgen
812.948.1541

Evansville
D.Patrick, Inc.
812.473.6500

Fort Wayne
Vorderman Volkswagen
260.489.7900

Greenwood
Dreyer & Reinbold
317.885.4800

Indianapolis
Tom Wood Volkswagen
317.848.8888

Indianapolis
Falcone Volkswagen
317.263.0002

Lafayette
Mike Raisor Imports
765.448.4582

Merrillville
Team Volkswagen
888.805.3689

Mishawaka
Gurley Leep Imports
574.254.7130

Iowa

Cedar Falls
Dick Witham Volkswagen
319.277.8123

Davenport
Volkswagen of Quad Cities
563.386.1511

Iowa City
Carousel Motors
319.354.2550

Johnston
Lithia Volkswagen of Des Moines
515.253.0333

Marion
Volkswagen of Cedar Rapids
319.447.1200

Mason City
Schukei Volkswagen
641.423.5402

Kansas

Lawrence
Jim Clark Motors
785.843.3055

Topeka
Sunflower Motors
785.266.8480

Wichita
Steven Volkswagen
316.681.1211

Kentucky

Florence
Kerry Volkswagen
859.746.3634

Lexington
Don Jacobs Volkswagen
859.260.2621

Louisville
Bachman Volkswagen
502.493.2920

Louisville
Neil Huffman Volkswagen
502.448.6666

Louisiana

Baton Rouge
Southpoint Volkswagen
225.291.6000

Bossier City
Moffitt Volkswagen
318.746.2175

Mandeville
Northshore Volkswagen
985.626.1067

Metairie
Walker Volkswagen
504.465.2000

Maine

Auburn
Rowe Volkswagen
207.786.0336

Augusta
O'Connor Volkswagen
207.622.6336

Bangor
Darling's, Inc.
207.941.1330

Brunswick
Morong Brunswick
207.725.4323

Falmouth
Morong Falmouth Volkswagen
207.781.4020

Saco
Prime Volkswagen
207.283.2900

Waterville
Thompson Volkswagen
207.873.0777

Maryland

Annapolis
Fitzgerald Automall
410.224.3480

Baltimore
Heritage Volkswagen Parkville
410.661.3400

Baltimore
Russel Volkswagen
410.744.2300

Cockeysville
Volkswagen of Hunt Valley
410.666.7777

College Park
DARCARS Volkswagen
301.441.8000

Fallston
Cook Volkswagen
410.877.1500

Frederick
Fitzgerald Volkswagen
301.696.9200

Gaithersburg
King Volkswagen
301.948.3330

Hagerstown
Sharrett Volkswagen
301.739.7700

Laurel
Ourisman Volkswagen
800.288.6985

Owings Mills
Heritage Volkswagen
410.581.6696

Pasadena
Antwerpen Volkswagen
410.760.6300

Rockville
Congressional Volkswagen
301.340.7668

Waldorf
Waldorf Volkswagen
301.843.8950

Massachusetts

Auburn
Patrick Motors
508.832.8883

Bedford
Minuteman Volkswagen
781.275.8006

Beverly
North Shore Volkswagen
978.927.6000

Volkswagen Dealers Listing

*Authorized Wholesale Mechanical Dealers shown in blue.

Braintree
Quirk Volkswagen
877.972.7875

Brockton
Paul Clark, Inc.
508.587.9040

Fairhaven
Alden Volkswagen
508.999.3300

Fall River
Mattie Imports
508.678.5555

Hanover
South Shore Volkswagen
781.829.3300

Hyannis
Tracy Volkswagen
508.775.3049

Lawrence
Commonwealth Volkswagen
978.685.3400

Medford
Colonial Volkswagen
781.475.5200

North Attleboro
Volkswagen of North Attleboro
508.695.7131

Northampton
Dana Automotive
413.586.7250

Norwood
Volkswagen Gallery
781.762.6820

Pittsfield
Flynn Volkswagen
413.443.4702

Tewksbury
Atamian Volkswagen
978.851.4356

Watertown
Boston Volkswagen
617.783.1300

Wellesley
Wellesley Volkswagen
781.237.3553

West Springfield
Fathers & Sons, Inc.
413.785.1631

Westborough
Colonial Volkswagen
508.366.8383

Michigan

Ann Arbor
Howard Cooper Volkswagen
734.761.3200

Bay City
Thelen Volkswagen
989.684.2980

Escanaba
Halbinsel Volkswagen
906.789.9650

Farmington Hills
Suburban VW
248.471.0800

Grand Rapids
Betten Imports
616.475.9533

Grand Rapids
Gezon Volkswagen
616.361.7361

Holland
Crown Volkswagen
616.393.0400

Kalamazoo
Maple Hill Volkswagen
269.342.6600

Lansing
Williams Volkswagen
517.484.1341

Livonia
Ralph Thayer Volkswagen
734.425.5400

Monroe
Elite Volkswagen
734.242.3900

Muskegon
My Auto Import Center
231.799.2886

Rochester Hills
Fox Volkswagen
248.656.0400

Southgate
Melton Motors
734.283.2600

Sterling Heights
Vyletel Volkswagen
586.977.2800

Traverse City
Traverse City Volkswagen
231.946.5540

Troy
Suburban Volkswagen
248.357.1717

Minnesota

Albert Lea
Dave Syverson VW
507.373.1438

Brainerd
Auto Import
218.829.3307

Burnsville
Burnsville Volkswagen
952.895.4371

Inver Grove Heights
Inver Grove Volkswagen
651.357.1700

Mankato
Mankato Volkswagen
507.625.5641

Maplewood
Schmelz Countryside Volkswagen
651.484.8441

Rochester
Rochester Motors
507.282.9468

Saint Cloud
Eich Motor Company
320.258.2678

Saint Louis Park
Luther West Side Volkswagen
952.374.0700

Mississippi

D'Iberville
Mandal Volkswagen
228.392.1515

Jackson
Volkswagen of Jackson
601.987.9090

Missouri

Ballwin
The Dean Team of Ballwin
636.227.0100

Gladstone
Northtowne Volkswagen
816.468.2275

Hazelwood
Bommarito Volkswagen
314.731.7777

Kansas City
Molle Volkswagen
816.941.9500

Kirkwood
The Dean Team of Kirkwood
314.966.0303

Springfield
Volkswagen of Springfield
417.866.6000

St Louis
Suntrup Volkswagen
314.892.8200

St. Peters
Bommarito Volkswagen
636.928.2300

Montana

Bozeman
Volkswagen of Bozeman
406.586.1771

Great Falls
Pierce's Volkswagen
406.761.3305

Missoula
4 Seasons Volkswagen
406.728.2510

Whitefish
DePratu Volkswagen
406.863.2511

Nebraska

La Vista
Performance Volkswagen
402.502.8671

Lincoln
Schworer Volkswagen
402.435.3300

Omaha
Stan Olsen Auto Center
402.397.8200

Nevada

Henderson
Findlay Volkswagen
702.558.6600

Las Vegas
Desert Volkswagen
702.942.4000

Reno
Lithia Volkswagen of Reno
775.852.3300

New Hampshire

Gilford
Lakes Region Volkswagen
603.524.4717

Greenland
Seacoast Volkswagen
603.436.6900

Keene
Noyes Volkswagen
603.357.7220

Lebanon
Miller Volkswagen
603.448.6363

Manchester
Manchester Volkswagen
603.625.4400

Nashua
Tulley Volkswagen
603.888.0550

Rochester
Beranger Volkswagen
603.332.6242

New Jersey

Berndardsville
Bernardsville Volkswagen
908.766.4628

Burlington
Burlington Volkswagen
609.386.0174

Cape May Court House
Burke Brothers, Inc.
609.465.6000

Cherry Hill
Cherry Hill Volkswagen
856.665.5370

Clifton
Gensinger Motors
973.778.8500

Edison
Reydel Volkswagen
732.287.2828

Englewood Cliffs
East Coast Volkswagen
201.568.0053

Fairlawn
Jack Daniels Motors
201.703.1925

Flemington
Flemington Volkswagen
800.216.5124

Freehold
Volkswagen of Freehold
732.339.6900

Hamilton Square
Hamilton Volkswagen
609.587.7600

Lyndhurst
Three County Volkswagen
800.645.6566

Monroeville
Avis Volkswagen
856.358.8103

Neptune
World Volkswagen
732.922.1500

Newton
Newton Motorsports
973.383.2626

Pleasantville
Atlantic Volkswagen
609.646.8600

Pompton Plains
Crestmont Volkswagen
973.839.4000

Princeton
Princeton Volkswagen
609.921.6401

Ramsey
Joe Heidt Motors Corp.
201.327.2900

Rockaway
Trend Motors
973.625.0100

Roselle
Linden Volkswagen
908.486.3977

Shrewsbury
Shrewsbury Motors
800.662.3140

Somerville
Millennium Volkswagen
908.685.1033

Summit
Douglas Motors
908.277.3300

Turnersville
Prestige Volkswagen
856.629.9200

New Mexico

Albuquerque
University Volkswagen
505.761.1900

Las Cruces
Sisbarro Autoworld
575.524.3561

Santa Fe
Premier Motorcars
505.471.7007

New York

Amherst
Northtown Volkswagen
716.836.4600

Amityville
Legend Volkswagen
631.691.7700

Bayside
Bayside Volkswagen
516.482.3346

Binghamton
Empire Volkswagen
607.772.0700

Bowmansville
Schmitts Garage
716.683.3343

Bronx
Big Apple Volkswagen
718.920.1404

Brooklyn
Kings Volkswagen
718.646.6700

Brooklyn
Open Road Volkswagen
718.748.3400

Cicero
Burdick Volkswagen
315.699.2661

East Rochester
Vincent Volkswagen
585.586.2225

Fayetteville
Romano Volkswagen
315.637.4491

Glenmont
Capital Cities Imported Cars
518.463.3141

Hicksville
Platinum Volkswagen
516.250.6168

Huntington Station
Habberstad Volkswagen
631.470.8100

Ithaca
Maguire Automotive
607.257.1515

Kingston
Heart Volkswagen
845.336.6600

Latham
Martin Nemer Volkswagen
518.785.5581

Lynbrook
Sunrise Volkswagen
516.596.5970

Marcy
Paolozzi's Car World
315.736.8291

Middletown
Compass Volkswagen
845.344.4440

Mohegan Lake
Mohegan Lake Motors
914.528.8076

Volkswagen Dealers Listing

*Authorized Wholesale Mechanical Dealers shown in blue.

Nyack
Palisades Volkswagen
845.689.3536

Oneonta
Oneonta Volkswagen
607.432.8100

Orchard Park
Volkswagen of Orchard Park
716.662.5500

Pleasantville
Prestige Imports
914.769.5100

Queensbury
Garvey Volkswagen
518.793.3488

Rensselaer
Cooley Motors
518.283.2902

Riverhead
Riverhead Bay Motors
631.727.4000

Rochester
Dorschel Volkswagen
585.475.1711

Rome
Volkswagen of Rome
315.337.8900

Sayville
Donaldson
631.567.6400

Schenectady
Langan Motorcar Corporation
518.374.9161

St. James
Smithtown Volkswagen
631.724.6600

Wappingers Falls
Hudson Valley Volkswagen
845.298.2365

Watertown
F.X. Caprara Volkswagen
315.788.7400

Woodside
Koeppel Volkswagen
718.728.8111

North Carolina

Asheville
Deal of Asheville
828.232.4000

Burlington
Maxwell Volkswagen
336.227.2727

Cary
Leith Volkswagen
919.297.1640

Charlotte
Carolina Volkswagen
704.537.2336

Charlotte
Volkswagen South
704.552.6500

Durham
Southern States Volkswagen
919.255.8033

Fayetteville
Valley Auto World
910.867.7000

Goldsboro
Frema Motors
919.778.1010

Greensboro
Flow Motors
336.856.9050

Greenville
Joe Pecheles Volkswagen
252.756.1135

Hickory
Volkswagen of Hickory
828.304.9111

Huntersville
Keffer Volkswagen
704.766.2121

Jacksonville
National Volkswagen
910.938.1417

Raleigh
Southern States Volkswagen
919.828.0901

Wilmington
Bob King Volkswagen
910.392.3889

Winston-Salem
Flow Motors
336.761.3698

North Dakota

Fargo
Valley Imports
877.212.1792

Ohio

Akron
Dave Walter
330.434.8989

Amherst
Spitzer Volkswagen
440.984.4014

Bedford
Ganley Volkswagen
440.439.3444

Canton
Kempthorn Volkswagen
330.452.6511

Cincinnati
Northland Volkswagen
513.531.5513

Cincinnati
Northgate Volkswagen
513.385.1818

Columbus
Byers Imports
614.552.5497

Columbus
Hatfield Volkswagen
800.898.7136

Columbus
Byers Imports
614.864.5180

Dayton
Evans Volkswagen
937.890.5323

Dayton
White.Allen Euro Auto Grp
937.291.6000

Dublin
Midwestern Auto Group
614.553.5247

Fairfield
Fairfield Volkswagen
513.874.3740

Loveland
Kings Volkswagen
513.677.4989

Medina
Medina World Cars
330.725.4901

Mentor
Classic Volkswagen
440.205.6500

North Olmsted
Ganley Westside Imports
440.734.2000

Perrysburg
Ed Schmidt Volkswagen
419.874.4331

Springfield
Bill Marine Auto Center
937.325.7091

Steubenville
Sunset Motors
740.264.1696

Willoughby Hills
Fred.Vincent Volkswagen
440.944.8700

Wooster
Performance Volkswagen
330.264.1113

Youngstown
Stadium Volkswagen
330.726.8948

Oklahoma

Oklahoma City
Cable Volkswagen
405.787.0433

Tulsa
Green Country Volkswagen
918.712.8989

Oregon

Beaverton
Herzog-Meier Volkswagen
503.372.3298

Bend
Carrera Motors
541.382.1711

Corvallis
Jack Scoville
541.753.1694

Eugene
Sheppard Motors
541.343.8811

Gladstone
Armstrong Volkswagen
503.656.2924

McMinnville
Mac Volkswagen
503.472.4657

Medford
Lithia Volkswagen
541.774.7500

Portland
Rey Reece's Friday Volkswagen
503.255.1014

Salem
Volkswagen of Salem
503.581.1421

Pennsylvania

Allentown
Faulkner-Ciocca Volkswagen
610.797.6330

Ardmore
Piazza Volkswagen
610.896.4853

Butler
Mikan Volkswagen
724.287.476

Chadds Ford
Garnet Volkswagen
610.361.8500

Colmar
North Penn Imports
800.887.2111

Danville
Jack Metzer Volkswagen
570.275.2212

Devon
Fred Beans Volkswagen
888.857.3799

Dubois
Central Volkswagen
814.583.5121

Easton
Young Volkswagen
610.253.6244

Edgemont
Y B H Sales & Service
610.356.3493

Erie
New Motors
800.352.1052

Feasterville
Colonial Volkswagen
215.355.8800

Greensburg
Sendell Motors
724.837.1600

Harrisburg
Victory Volkswagen
717.561.2870

Hollidaysburg
Fiore Volkswagen
814.695.5533

Kingston
Wyoming Valley Motors
570.288.7411

Lancaster
Autohaus Lancaster
717.299.2801

Langhorne
Volkswagen Langhorne
215.741.4100

Lebanon
H.A. Boyd, Inc.
717.273.9385

Leesport
Vision Volkswagen
610.777.6501

McMurray
Three Rivers Volkswagen
724.941.6100

Mechanicsburg
Cumberland Valley Motors
717.697.9448

Monroeville
Day Volkswagen
724.327.4900

Montoursville
Fairfield Volkswagen
570.368.8121

Moon Twp
Day Apollo, Inc.
412.264.9222

New Kensington
Hillcrest Volkswagen
724.335.9847

Norristown
Jim Wynn Volkswagen
610.539.4622

Orwigsburg
J. Bertolet
570.366.0501

Philadelphia
Northeast Volkswagen
215.824.0800

Pittsburgh
Rohrich Volkswagen
412.344.3600

Scranton
Kelly Volkswagen
570.347.5656

State College
Volkswagen State College
814.237.0368

Warrington
Holbert's Volkswagen
215.343.1600

Wexford
Billco Motors
724.940.1000

Whitehall
Gilboy Volkswagen
610.434.2953

York
York Volkswagen
717.755.1015

Puerto Rico

San Juan
Euroclass Motors
787.782.4039

Rhode Island

East Providence
Scott Volkswagen
401.438.5555

Wakefield
Speedcraft Volkswagen
401.783.3304

West Warwick
Fiore Volkswagen
401.823.6033

South Carolina

Columbia
Wray Volkswagen
800.424.8018

Greenville
Steve White Volkswagen
864.288.8300

Mount Pleasant
Low Country Volkswagen
843.881.8555

Myrtle Beach
East Coast Volkswagen
843.215.6500

North Charleston
Stokes Volkswagen
843.207.5553

Spartanburg
Vic Bailey Volkswagen
864.585.2492

Sumter
Goodwin Volkswagen
803.469.2595

South Dakota

Rapid City
Liberty Volkswagen
605.718.1000

Sioux Falls
Graham Automotive
605.336.3655

Volkswagen Dealers Listing

*Authorized Wholesale Mechanical Dealers shown in blue.

Tennessee

Bristol
Wallace Volkswagen
423.764.1145

Chattanooga
Village Volkswagen
423.855.4981

Clarksville
Gary Mathews North
931.552.1111

Franklin
Hallmark VW at Cool Springs
615.236.3200

Johnson City
Wallace Volkswagen
423.952.0888

Kingsport
Fairway Volkswagen
423.578.3600

Knoxville
Harper Volkswagen
865.691.0393

Madison
Hallmark Volkswagen
615.859.3200

Memphis
Gossett Volkswagen
901.388.8989

Memphis
Gossett VW of Germantown
901.333.8989

Murfreesboro
Southeast Signature Motors
615.898.0700

Texas

Abilene
Sterling Volkswagen
325.673.4663

Arlington
Randy Hiley Volkswagen
817.575.6100

Austin
Maund Automotive Group
512.458.1111

Brownsville
Payne Volkswagen
956.350.4488

Bryan
Garlyn Shelton Imports
979.776.7600

Corpus Christi
Volkswagen of Corpus Christi
361.653.8400

Dallas
Boardwalk VW Park Cities
214.561.8071

El Paso
Hoy-Fox Automotive Market
915.778.5341

Fort Worth
Autobahn Motorcars
817.390.3762

Garland
Rusty Wallis Volkswagen
214.349.5559

Georgetown
Hewlett Volkswagen
512.681.3500

Houston
Archer Volkswagen
713.272.1700

Houston
West Houston Volkswagen
281.675.8274

Houston
Clear Lake Volkswagen
281.848.5500

Houston
DeMontrond Automotive Grp
281.872.7200

Houston
Momentum Volkswagen
713.596.3300

Houston
Momentum VW Jersey Village
281.925.5000

Irving
Metro Volkswagen
972.256.1102

Killeen
Automax Volkswagen
254.699.2629

Lewisville
Lewisville Volkswagen
972.538.0551

Longview
Gorman.McCracken Volkswagen
903.753.8657

Lubbock
Gene Messer Volkswagen
806.793.8844

Mission
Payne Mission
956.584.6300

Richardson
Boardwalk Volkswagen
214.453.5000

San Antonio
Ancira Volkswagen
210.681.2300

San Antonio
Rod East Volkswagen
210.828.1201

Temple
Garlyn Shelton Volkswagen
254.773.4634

Tyler
Crown Motor Company
903.581.7688

Wichita Falls
Herb Easley Motors
940.723.6631

Utah

Layton
Cutrubus Motors Volkswagen
801.544.5878

Orem
Ken Garff Motors
800.324.6725

Salt Lake City
Strong Volkswagen
801.433.2269

South Jordan
Volkswagen SouthTowne
801.676.6409

Vermont

Barre
Walker Volkswagen
802.223.3434

Manchester Center
Hand Volkswagen
802.362.1754

Rutland
Kinney Motors
802.775.6900

South Burlington
Volkswagen South Burlington
802.658.1130

Virginia

Alexandria
Alexandria Volkswagen
703.684.8888

Charlottesville
Flow Volkswagen
434.296.4147

Chesapeake
Greenbrier Volkswagen
757.424.4689

Fairfax
Fairfax Imports
703.273.6700

Fredericksburg
Bill Britt Volkswagen
540.898.1600

Lynchburg
Terry Volkswagen
434.239.2601

Newport News
Casey Volkswagen
757.988.1200

Richmond
Brown's Volkswagen
804.379.7283

Richmond
West Broad Volkswagen
804.270.9000

Roanoke
First Team Volkswagen
540.366.4830

Springfield
Volkswagen Springfield
703.451.2380

Staunton
Rule, Inc.
540.886.2357

Sterling
Lindsay Volkswagen of Dulles
703.880.8160

Vienna
Stohlman Volkswagen
703.287.4115

Virginia Beach
Checkered Flag Volkswagen
757.687.3465

Winchester
Miller Volkswagen
540.869.5000

Woodbridge
Karen Radley Volkswagen
703.550.0202

Washington

Auburn
Auburn Volkswagen
800.827.2787

Bellevue
Chaplin's Bellevue Volkswagen
800.962.0822

Bellingham
Roger Jobs Volkswagen
360.734.5230

Bremerton
Parr Volkswagen
360.377.3855

Burlington
KarMart Volkswagen
360.757.0815

Edmonds
Campbell-Nelson Volkswagen
206.625.9185

Everett
Pignataro Volkswagen
425.348.3141

Kennewick
Overturf Motor Company
509.586.3185

Oak Harbor
Whidbey Island Auto Group
360.675.2218

Olympia
Hanson Motors
360.943.2120

Port Angeles
Dan Wilder Volkswagen
360.452.9268

Seattle
Carter Volkswagen
800.428.8211

Seattle
University Volkswagen
206.634.3322

Spokane
Appleway Imorts
509.892.2243

Tacoma
Robert Larsons Autohaus
253.671.6420

Vancouver
Hannah Volkswagen
360.314.0492

Yakima
Steve Hahn Performance VW
509.248.4700

West Virginia

Barboursville
Moses Volkswagen
304.736.5226

Clarksburg
Star Motor Company
304.623.7827

Parkersburg
Larry Simmons
304.485.5451

South Charleston
Joe Holland Volkswagen
304.744.1561

Wheeling
Wheeling Automotive
304.242.7313

Wisconsin

Appleton
Volkswagen Appleton
920.749.3232

Brookfield
Hall Volkswagen
262.782.5300

Eau Claire
Car City Volkswagen
715.830.1111

Franklin
Boucher Volkswagen
414.525.4044

Green Bay
Broadway Imports
800.236.2819

Janesville
Frank Boucher Volkswagen
608.757.6150

La Crosse
Bob Burg Volkswagen
608.782.8808

Madison
Zimbrick Volkswagen
608.443.5781

Menomonee Falls
Ernie Von Schledorn VW
262.253.8977

Middleton
Zimbrick Volkswagen
608.836.7777

Milwaukee
Concours, Inc.
414.290.1400

Racine
Frank Boucher Volkswagen
262.886.2886

Sheboygan
Motorville, Inc.
920.457.8844

Stevens Point
Scaffidi Motors
715.344.4100

Wausau
Kocourek Wausau Imports
715.359.0303

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