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The "New" Beetle



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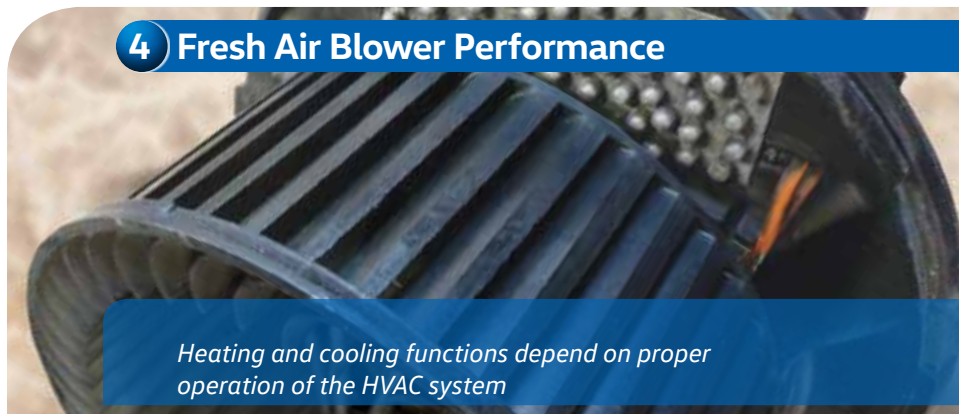
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The VW Beetle is an accessible, fun car. The newest generation pays homage to the original by keeping the unmistakable shape. But its similarities stop there.

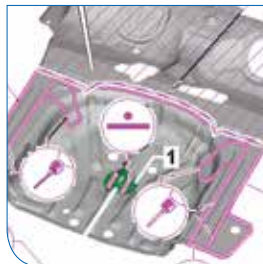
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Dramatization

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Fresh Air Blower Performance

Heating and cooling functions depend on proper operation of the HVAC system





When the temperature begins to rise during warmer months, every shop expects more customers to start coming in with HVAC system problems. These can range from insufficient cooling, fogging issues, and blend door problems, to poor blower motor performance. It is critical to keep the HVAC system working properly in today's Volkswagens, not only for comfort, but for safety reasons as well. As always, check erWin® for repair information on all Volkswagen vehicle repair.

The real workhorse of any automotive climate control system is the blower motor. This single motor must pull air from the exterior of the vehicle into the HVAC casing, past the A/C evaporator, and into the cabin. Depending on the driver's choice, the blower motor may continually be in use while driving. It has a difficult job and, if not functioning properly, may provide little interior cabin airflow.

Volkswagen's Climatronic™ control system can automatically adjust blower settings as well as air distribution flap controls. This helps to ensure comfort through most conditions with minimal input needed by the driver. Extreme ambient temperatures can cause issues that impede safe driving if the HVAC system is not in proper working order. If it is very hot outside, all the windows might fog over. In extreme cold, ice can form on interior windows as well as fogging. These are safety concerns and should be taken seriously, as they can limit visibility.

The blower motor must have a clear, unobstructed intake duct from which to pull in fresh air. If the intake for the blower becomes damaged or blocked, performance can be negatively affected. Most commonly, a very dirty cabin filter or organic plant matter are to blame for intake blockage. This blockage can vary greatly depending on where the vehicle is parked and the time of year.

An issue often neglected by vehicle owners is cleaning out the cowl area of their vehicle. Many motorists are not aware that pollen, dirt, and plant matter may accumulate under the hood. This can eventually lead to a buildup of material that impedes fresh air blower performance. In extreme cases,

Left: Volkswagen blower motors and resistors are assembled together in the casing. The resistor can be damaged quickly by water, and it is recommended that you replace it if the blower motor has been damaged.

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organic matter can clog the cowl drain, causing rain water to overflow into the fresh air intake. This can damage the blower motor and associated components, necessitating replacement.

In certain new model VWs, issues have arisen with water/snow ingress into the blower motor, causing failures. The models affected are the 2011-15 Jetta and Sportwagon, 2012-15 Passat, 2010-14 Golf, 09-15 Tiguan, and 2009-15 CC. On all models affected, updated water deflectors must be installed. Installing these can minimize water and snow ingress into the blower casing. Details can be found in TSB 87 15 15.

On Passat model years 2012-15 the blower casing may take on water/ice through the cowl drain located in the passenger side of the fender liner area. In this case, a modified fender liner as well as an updated water deflector can help to limit water and snow intrusion. Always check for service bulletins when beginning diagnosis of any issue, as they may cover issues you may not be unaware of.

When diagnosing a complaint of poor HVAC system performance, always start with a scan of the vehicle's systems after connecting an auxiliary power supply. Often, faults are stored

in the climate control unit, leading to a quicker diagnosis of issues. If the blower motor is suspected of being faulty, the vehicle will store DTCs, such as 1273-fresh air blower, mechanical fault, static/ sporadic. DTC B10BE07-fresh air blower front-mechanical fault, may also be stored in the climate control unit.

During blower motor diagnosis, it is important to physically inspect the motor itself for damage. Volkswagen has taken great care to protect the blower motor, however damage can still occur. If the motor is difficult to spin, is noisy, or is hitting the support cage surrounding the motor, it should be



Plant matter tends to accumulate in and around underhood drains. These drains must be periodically cleaned and cleared, just like sunroof drains.



The cowl seal is very important in keeping water out of the vehicle as well. These seals can become damaged or pop out of their guide track occasionally. If these seals are not fully seated, rain water can wash directly down the windshield into the air intake. Not good!

replaced. If the car has ingested water through the fresh air intake, the blower motor takes the brunt of the damage.

Water can quickly damage the electrical components as well as the bearing surface on which the motor rides, which can render the motor inoperable or increase noise from the blower motor. This water damage can appear as a green corrosion buildup on connectors and the motor windings. If you must replace the blower motor due to water ingress, it is wise to replace the blower resistor at the

same time, as both reside in the same area and may have been damaged/corroded as well.

Key components in the HVAC system include fuses, resistors, the compressor, the Climatronic control, and the heater core.

Fuses: Always check your fuses when diagnosing an inoperable blower motor in case they may have popped. This can be from a momentary blockage and may not require motor replacement. The fuse position varies from model to model but is most commonly located in either the driver side A pillar fuse block or in the underhood fuse block.

Resistors: The blower motor in Volkswagens requires a resistor to properly modulate speed and air output. If the blower only operates at the high speed setting, it is likely that the resistor has failed, requiring replacement. When the resistor has failed, the blower motor receives full 12v power. This is generally the high speed setting on the control head. This allows limited blower function, aiding in safety for the driver. This feature is a carefully-designed Volkswagen safety feature.

The blower motor resistor rarely fails but, when it does, the symptoms are very apparent. In vehicles with manual or automatic fan settings, one or more of the fan speeds may be inoperable. In certain cases, the blower may not operate at any speed at all. This is when a power probe may come in handy. It is possible to bypass the resistor and test the blower motor directly for operation.

Replacing the resistor is normally a straightforward operation. After removal of the passenger side lower cover, the blower motor and resistor pack are visible and accessible for testing and replacement. Thanks to the work of VW design engineers, few tools and little time are needed to get to this piece of the HVAC system.



As you can see, the inside of the blower casing is not protected. Any water or material that flows into the intake can fall directly into the blower motor.



The blower motor resistor is not serviceable. If damaged, it must be replaced.

Compressor: The A/C compressor also plays a critical role in the climate control system. Its job is to pump the refrigerant at high pressure through the A/C system. Volkswagen strives to increase efficiency and comfort by using variable orifice compressors in their vehicles. This design replaces the old-school compressor clutch that only offered an on/off design. The variable orifice compressor offers many advantages such as cooler temperatures, reduced compressor load on the engine, and improved fuel economy.

Instead of using a clutched pulley, VW compressors have a standard pulley with a built-in breakaway design. This is used to keep the compressor from completely locking up if becomes too hard to turn. Often, a low or empty refrigerant level can cause this. The refrigerant and oil normally act as lubricants, keeping the inside of the compressor spinning smoothly. Without them, overheating of the internals may occur, causing extreme drag.

If the compressor exhibits strange noises or if customers complain of drive belt noise, it is wise to inspect the compressor pulley. Using a stethoscope is a good way to localize strange noises from accessories. Visual inspection is also possible but may be difficult without removing the dust cap on the front of the compressor. Often, when the pulley has separated, bits of material may remain on the bearing surface, creating loud noise as it spins.

The Volkswagen N280 compressor regulator valve controls the internal pressure of the A/C compressor

by regulating an orifice internally and controlling flow. It is activated by the Climatronic control unit to meet cooling needs. The regulator valve is a key component of the compressor, acting similarly to the clutch in an old style A/C system by varying the flow of refrigerant into the system. It is constantly energized and gets lots of use. When failures happen at the compressor, they can usually be traced back to the regulator valve.

When testing the compressor regulator valve, keep in mind that it receives a pwm (pulse width



Fully exposed you can see the damage to the compressor.



After removing the dust cap, most pulley damage is apparent. This compressor was still spinning, although it was noisy.



The electrical connector for the regulator valve is accessible from the bottom of the vehicle. A standard two pin connector, it is easy to access for back probing.

modulated) signal. It operates on a lower voltage (0–5 volts) than battery voltage. Do not test by power probing these units. Damage most likely will occur.

You can back probe the connector at the compressor and check for proper incoming signal voltage. Again, the most common failure point on these units is the valve itself in the compressor. The control valve is not serviceable and, if it is faulty, a new compressor assembly must be fitted.

Climatronic control: The Climatronic control unit is the brain that controls the HVAC system for the car. It sends and receives all inputs. When scanning the vehicle, this control unit houses all of the faults, measuring blocks, and activations needed for diagnosis. Interrogating this unit should be your first step in any climate control diagnosis. When performing a full scan of the vehicle, assure that it is properly connected to a stabilized auxiliary power supply.



When the compressor is not pushing refrigerant, the pressure on both high and low sides of the refrigerant system is relatively equal. This system is either not energized or not operating properly.

Here are common fault codes you may find stored in the control unit.

- 62E, p1582 - Coolant temperature signal
- 4F9, p1273 - Fresh air blower fault
- 1BD, p445 - Loss of refrigerant pressure
- 318, p792 - A/C pressure switch
- 4F7, p1271 - Airflow flap positioning motor
- 332, p818 - Evaporator temperature sensor
- 538, p1336 - CAN-Bus fault

The electric cooling fan is a necessary component of the climate control system. When the refrigerant is forced through the condenser at the front of the vehicle, the vapor is condensed into a liquid. This thermal reaction creates a lot of heat. When the vehicle is moving, air is naturally forced through the condenser where it is cooled. In stop and go traffic the electric fan is especially needed to pull air across the condenser. The electric fan helps dissipate the heat, which can otherwise increase engine coolant temperatures to unsafe levels if left unchecked.



Here you can see a clear pressure drop between the high and low side of the system. The A/C is properly operating with these pressures.

As part of programming, if failure of the electric cooling fan or fan control module occurs or if refrigerant pressure is too high, the A/C system will disable to ensure that the engine coolant level does not reach unsafe levels. This usually triggers a fault code to store in the Climatronic control unit, aiding diagnosis. However the fans report to the engine control unit, not the climate control unit, so electric cooling fan fault codes will be stored there. It is also possible to run activations on the electric fan to test for proper function. If the fan is bad, this will limit the A/C system operation. The Climatronic control unit will store shutoff condition information that can directly identify faulty components.

Heater Core: When driving in cooler ambient temperatures, it becomes necessary to heat the cabin air to more comfortable levels. This is done by using a heater core. The heater core transfers heat from engine coolant to the cabin of the vehicle. The climate control system utilizes the heater core to direct air across the core, warming it for the cabin.

Heater core problems are rare but do occur from time to time. The primary cause of clogged heater cores is lack of coolant changes. Always use only Volkswagen approved coolant with a 50/50 mix with distilled water. This will ensure proper pH level and protection. The distilled water is also necessary to eliminate any minerals or sediment which may be present in tap water. If neglected or topped up due to leaks, the coolant may begin to accumulate a sandy sludgy texture in the cooling system if not changed frequently enough.

If the core becomes internally clogged with material or sediment, it

cannot efficiently transfer heat to the outside of the core. This results in poor heat output, particularly at idle speeds when coolant flow is at its lowest. With poor heat output, particularly in colder climates, this can become a safety issue, creating ice buildup on windows and a cold driver! In dual zone climate systems, a clogged heater core can sometimes only affect one side of the vehicle. This is due to the position and airflow across the core itself.

Using an infrared thermometer, it is possible to determine if the heater core is properly transferring heat. The inlet side should be approximately 20



With a proper working climate control system, vent temps can get quite low! This is very important for drivers in warmer climates and for lowering humidity levels.

VCDS Advanced Measuring Values		
Sample Rate: 0.4		
<input type="checkbox"/> Group UDS requests		
Loc.	Description	Actual
008	Blower voltage; actual value	N/A
009	Blower voltage; specified value	0.0 V
010	Compressor current; specified value	0.000 A
011	Compressor load	0.0 Nm
012	Compressor shut-off condition; last	Shut-off from Engine Control Module (ECM) via CAN
013	Compressor shut-off requirement	A/C off or fan control switch in 0 position
014	Compressor shut-off requirement; antepenultimate	Shut-off from Engine Control Module (ECM) via CAN
015	Compressor shut-off requirement; penultimate	Shut-off from Engine Control Module (ECM) via CAN
018	Coolant fan activation; actual value-MUX Luefters...	9.6 %
019	Coolant fan activation; specified value	0.0 %
020	Coolant temperature	67 °C
021	Counter of compressor switch-offs-Shut-off from ...	2433

These shutoff condition reports are only stored in the Climatronic control unit. Other pertinent faults may be stored in the engine control unit. This is why a full scan is so important when tracking down HVAC problems.

degrees F warmer than the outlet. If both sides are the same temperature, the core is definitely clogged.

If a clogged heater core is suspected, it may be possible to back flush it to increase flow through the core, bringing back sufficient heater performance. This can increase coolant flow enough to increase heater output and allow for more thorough diagnosis of the HVAC system.

A heater core back flush is relatively straightforward operation needing just basic tools. Heater cores have one inlet and one outlet for the coolant to flow through. The first step is to remove both hoses going to the core and re-attach two short sections of rubber hose or old coolant hose. This is used to feed and drain the core as it is flushed. The primary tool for the flush is a standard blow gun with a pressure regulator inline. The regulator is necessary to lower air pressure to safe levels. If too much pressure is used, damage to the heater core can occur. Safe pressure is between 15–20 psi, no higher. Using a mild detergent may help break up deposits in the heater core, but be careful not to use anything too strong. Standard dish detergent works fine.

After soaking the core for 15 minutes, use the blow gun on the outlet side of the heater core. Rapid short bursts of air will force the remaining liquid through the core and out via the inlet of the core. The bursts of air pressure help break up deposits and increase flow. Do not use full shop air pressure, which can cause damage. Repeat these steps if a lot of debris is seen exiting the core. Flow will be increased through the heater core after this procedure. This is not a sure fix and is usually only used to confirm a suspected clogged core, which must then be replaced.

Volkswagen has made it much easier to replace a heater core. 2012-present Passat models, as well as 2011-current Jettas share the same replacement method.

Access to the heater core is from the driver side inner tunnel. After minimal trim removal, the core is readily accessible. This is a far cry from previous generations which required entire dash pad removal. Check erWin® for all Volkswagen vehicle repair.

Vehicle climate control systems are always changing to increase efficiency and comfort. This is why its important to stay up to date. These systems may seem quite complicated, but still rely on basic principles. With a good general understanding of these systems, and proper use of OEM repair procedures, most issues that arise can be quickly diagnosed and repaired. •

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The "New" Beetle

...Sleek, sporty, and fun

The VW Beetle is an accessible, fun car. The current generation pays homage to the original by keeping the unmistakable shape. But its similarities stop there.



All supporting photos courtesy of Redds Automotive Service Center, a Bosch certified repair facility in Annapolis, MD.



In 2012 VW updated the “New” Beetle, originally released in 1998, putting a sleek, modern spin on the iconic design. It has a lower, sleeker roofline and a wider, more aggressive front end. The running boards are reminiscent of the original design as are the wheels, which have an old school style center cap just like the old Beetle. Another interesting addition is the upper glove box, or Kaeferfach, aka “beetle bin.”

Think of the new generation as a Beetle GTI. It is built right alongside Jetta and Golf models on the assembly line, so it shares from the same parts bin as several other VW models. Updated looks and new technology, along with multiple engine and trim options, make the 2016 Beetle widely accepted and sought after.

Other popular options include a panoramic sunroof, Fender® Premium Sound System, upgraded leather interior, and VW Car-Net® App-Connect, which offers compatible smartphone integration.

Early models were available with the 2.5L 5-cylinder engine as the base model offering. Other engine options are the 2.0T, and the 2.0L diesel engine. The base model Beetle also came with a solid rear beam suspension. In 2016, models all receive a multi-link rear suspension design, transforming and upgrading the handling characteristics.

VW also released the updated 1.8T engine in 2015 and later models of this generation. In 2016, all Beetle models will be turbocharged, with either

the 1.8T or 2.0T engine. There are also several transmission offerings: 5-speed manual, 6-speed manual, 6-speed automatic, and the coveted 6-speed direct shift gearbox (DSG®) transmission. The DSG is VW’s dual clutch gearbox. It is a bit of a hybrid, offering manual transmission performance with the ease and simplicity of an automatic. The driver won’t have to worry about the clutch pedal.

Suspension, body

As stated, the 2016 Beetle is a close sibling to the Jetta and Golf bodies and is built right alongside them in VW factories. They share many of the same electrical components as well as suspension and drivetrain pieces. This simplifies the assembly and helps ensure parts availability for the technician.

The overall suspension design, strut front suspension with lower control arms, is relatively unchanged from other models. It was common in previous generations to have strut mount failures. New models have updates, and upper strut mount noise/failure is now extremely uncommon.

The one area in the front suspension that wears is the control arm bushings. These take significant abuse and absorb initial jarring from road surface irregularities. Worn bushings, however, are relatively easy to spot. Visible tears in the rubber and excessive movement in the control arm are indicators of a failed rear control arm bushing.



The front lower bushings also get a lot of use. They provide a twisting dampening force as the vehicle moves up and down over varying road surfaces. Often, if these fail, they make a squeaking sound, very similar to a failed upper strut mount. Don't be fooled! The easiest way to test the front bushings for noise is to first remove the three nuts securing the control arm to the spindle. Once removed, it's easy to move the control arm up and down to listen for abnormal noise or movement.

If control arm replacement is required, steps must be taken to remove the arms properly. Because of the length of the front control arm bolts, it is necessary to lower the subframe to clear the oil pan and transmission case. The subframe with steering rack must be fully supported, preferably by a hydraulic table or lifting table.

Once secured, it is merely a matter of removing the primary subframe bolts as well as the steering gear bolt. It is extremely important not to damage the steering gear by stretching wiring or connections to the unit. Once the subframe is lowered, the bolts can be removed fully and control arms replaced. It is also wise to perform an alignment any time a suspension component has been replaced. Failure to do so may result in premature tire wear and poor vehicle control.

Buying a 2015 or newer turbo model Beetle will get buyers the same multi-link rear suspension design offered in a Jetta GLI. This definitely inspires confidence and sportiness in the handling department. It also allows for rear camber and toe adjustments if necessary. Minimal tools are required for adjustment. A 16mm and 18mm wrench will cover all rear-end adjustments.

Turbo Beetles also come with larger sway bars, front and rear, to help keep the car more level through turns and eliminate excessive body roll. Rounding out the turbo package upgrades is an available differential upgrade. VW calls this the XDS® or electronic differential lock. This system utilizes the ABS system to help limit wheelspin throughout turns. The inside wheel on a turn has less weight over it, allowing it to spin more easily while accelerating. The braking system applies pressure on that wheel in varying degrees to lessen wheelspin,

helping to increase control and handling. This system is designed to lower understeer when cornering and helps to increase stability for the driver, in a variety of road conditions. This system is controlled by the ESC, Electronic Stability Control program.

Lighting

Updates to the lighting system are also available. Standard halogen headlights or upgraded bi-xenon lighting are available. In 2016 models, LED lighting kits are available for daytime running lights as well as tag lights. All models up to 2016 come with automatic DRLs, when switched to automatic setting. In auto mode, the headlights and tail lights will operate automatically through light sensors with



The front lower bushing helps to control and dampen vertical suspension movement.



no additional input necessary. 2016 models are also available with a coming/leaving home feature, which leaves exterior lighting illuminated for a short time period after parking, assisting owners when exiting the vehicle.

The headlight housings are a bit easier to remove than those in the last generation New Beetle. Removal of the new design is a simple procedure involving swinging a latch downward, which pushes the headlight assembly forward and out. Then, merely disconnect the main plug, and the headlight is removed. This allows for easy bulb replacement access.

Access to the taillight assembly is also fairly simple. Pulling back the fabric cover behind the tail light reveals a large thumb screw. This is the lone securing bolt for the light. Once this thumb screw is removed, gently wiggle the light straight out the back to free it from the body mounting, and disconnect the slide lock electrical connector. During re-installation, always make sure the rubber body seal is intact and installed correctly to help ensure a leak-free installation.

New technology, new issues

It's not uncommon for new technologies in vehicles to bring new issues that must be addressed in service bays. Here are some of the issues found in current Beetle models.



Alignment adjustment points are readily accessible. It's wise to spray bolts with a penetrant to ease movement, particularly in rust-prone areas of the country.

PCV/Breather malfunction

A properly operating crankcase ventilation system is critical to helping maintain a good running engine. A turbo engine complicates and can put more strain on the breather system as well. Unfortunately, positive crankcase ventilation (PCV) issues can be found with many newer engines and can cause a multitude of issues. The most common symptoms of a failing PCV system are a check engine light and high/rough idle. If left long enough, multiple codes will store in the engine computer: random misfire, misfires across all cylinders, idle higher than expected, as well as lean Bank 1 faults. Those are a lot of codes for one faulty component.

A failed breather can also cause increased oil consumption, which is a common complaint with many of the 2.0T engines. The increased crankcase vacuum pulls the oil into the cylinders, burning it. Many owners have reported oil consumption problems, and, by far, the most common cause is the PCV valve.

The easiest diagnostic technique to pinpoint a failed PCV valve is to remove the engine oil filler cap while the engine is running. When the PCV valve fails, the crankcase vacuum becomes so strong that the cap becomes almost impossible to remove. This test takes only seconds and is one of the easiest ways to pinpoint the failed breather. Often a moaning or hissing sound accompanies this action, as air is being pulled in from various seals.

If left for too long and not repaired, the increased vacuum in the engine can damage other components. The most likely to suffer is the rear main seal. The engine will actually pull air through the seal and into the engine. This creates vacuum leaks, and, if left uncorrected, the rear main seal will start to leak externally, both air and oil. A failed rear main seal can cause a lean fault and may be difficult to diagnose. Even with a smoke machine, very close inspection is necessary to verify the leaking rear main seal.

A failed PCV valve is also a large contributor to

oil consumption. Yet again, the suction can pull engine oil past the piston rings, burning it, as well as pulling oil through the induction system, which only worsens carbon buildup in the intake tract.

Timing chains

The 2.5L engines, as well as the late 2.0T powerplants, have timing chains instead of a timing belt setup. This is overall a great system, helping eliminate the need to service and replace the timing components as part of scheduled maintenance.

On the 2.5L 5-cylinder engine, the timing chains are run on the transmission side of the engine. This means that almost any service done to the chains requires transmission removal. The exception to this is when replacing only the upper chain or cam adjuster.

The most common failure on this setup is a stretched chain or worn chain guide components. Another common failure point in this system is the cam adjustment solenoid. This actuates the cam adjuster and may fail, causing cam timing faults that often do not pinpoint the faulty solenoid. It's important to actuate this solenoid as part of diagnosis to verify proper operation.

In the 2.5L engines, many times the adjuster does not fail, it just gets temporarily obstructed by dirt or debris, which can be cleaned. In such cases the solenoid does not need to be replaced. The VW Helpline has instructions for technicians who need them. The helpline is available at 855-828-4016.

The 2.0T shares many of the same issues as the 2.5L for the timing chains. The 2.0T has the timing components on the crank pulley side of the engine, so servicing the components is much easier than on the 2.5L. The 2.0T also has a balance shaft with a multiple chain setup. This setup can be confusing, but every component has a timing mark. Always double and triple check all timing

marks on this engine to verify proper camshaft/crankshaft timing.

The lower timing chain tensioner has been plagued with the most issues on the 2.0T engine, particularly when running low on oil. When this fails, bent valves are the most common result, necessitating a new



The PCV valve is located directly on top of the cylinder head on the 2.0T engine. It is very easy to replace in event of failure.



Here is an example of a rear main seal leak. In this case, the leakage has not yet reached the point to cause unmetered air loss. But if left unresolved, it can become a problem.



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cylinder head or, at the very least, new valves. VW has issued updated lower chain tensioners to help combat the high failure rate, including a ratcheting tensioner design to eliminate chain slack.

The one major common issue with these engines is oil consumption. Timing chain systems rely on a consistent oil pressure supply to run properly. Most chain failures can be directly tied to low oil levels for extended time periods. This is why it is critical to follow proper oil change intervals with the factory-recommended synthetic oil available from your local VW dealership's parts department.

Throttle body, intake

The motor-driven throttle body works hard to keep the engine running, constantly varying its angle to hold a steady idle or drive normally. It also is strained by the volume of air coming through a forced induction engine, as well as carbon buildup, which can affect the ability to hold a steady idle. This is a busy motor, with multiple internal position sensors, as well as a very fast motor to drive the throttle.

If there is a throttle fault, the most common complaint is a check engine light, accompanied by the EPC light on the cluster. In severe cases, the vehicle may have zero throttle input.

The most common DTCs for the throttle body are P545, P0121 and P0221. Always check for service bulletins. In this case VW has released a bulletin, 01 12 14, recommending a re-pin of the throttle connector.

Any time the throttle body is removed or disconnected, adaptation is necessary. Using your scanner, select engine (1) followed by measuring blocks Group 98. Enter basic settings to begin the adaptation. This process takes about 30 seconds and ensures the throttle is properly aligned and ready to go. Always have a stable voltage supply while using a scanner. Low voltage can, and will, cause issues with sensors and many vehicle systems.

The variable intake on newer VW engines is used to increase efficiency and promote better idle characteristics. At idle speed, the internal flaps remain in a closed position. To help the idle, increasing speed and boost allows the flaps to open fully, increasing air flow.

A common failure with the intake manifold is the position sensor. When this fails, the P2015 fault will be stored. There have been many issues with this intake sensor, and VW has also issued bulletins pertaining to

this. Check bulletins! If the position sensor is found to be faulty, the entire manifold must be replaced. And always replace the intake gasket during the process. Just like the throttle, the intake must be re-adapted. With your scanner, select engine (1) group 142, followed by basic settings. This allows the intake to do a full sweep and calibrate runner positions.

Carbon deposits

Some technicians have reported excessive carbon buildup behind the intake valves, particularly in models years 2006, 2007 and 2008. Such deposits can be caused by excessive oil consumption, malfunctioning crankcase breather systems, poor fuel quality, and even by the very nature of direct fuel injection which, by its design, does not have a cleansing action behind the intake valves as would occur on port injected engines. There are several TSBs, including 00-16-02 and 01-16-02 that relate to fuel additives or premium fuel that can help prevent carbon formation.

Here are the steps needed to remove such deposits:

1. Remove intake manifold to expose back of intake valves.
2. Disconnect and remove coils, spark plugs, and place rags over spark plug holes.



The solenoid can be quickly tested for proper operation. The solenoid will also make a clicking sound when operating, which can be felt by hand.

3. Starting with cylinder #1; ensure intake valves are in closed position.
4. Pour approximately 1 oz. of carbon dissolving cleaner behind each intake valve on #1 cylinder. Note: Do not overfill or allow product to reach valve guides.
5. Let cleaner soak then scrub #1 intake valves using a small wire brush, wooden picks, or any other device which will not harm the valve finish.
6. Remove dirty cleaner with Mityvac™ or similar vacuum tool.
7. Repeat cleaning procedure as outlined in steps 3-6 for remaining cylinders.
8. If valves require further cleaning, repeat steps 3-6 for affected cylinders.
9. After all intake valves have been cleaned, crank engine using starter to remove possible residual cleaner in combustion chamber.
10. Reassemble intake system.
11. Road test and verify no DTCs before releasing vehicle.

TSBs

With new technology being introduced, different types of failures and issues have arisen. Examples involve direct injection and electric motor driven components. They increase efficiency and power but have drawbacks as well. As manufacturers deal with these issues and implement fixes, it is up to the repair technician to stay up-to-date and aware of known problems. One of the best ways to educate yourself and help diagnose vehicles is by using Technical Service Bulletins (TSBs). Many common problems are addressed in bulletins and include diagnostic procedures to verify issues. Simply spending a few minutes with a bulletin can save hours of headaches. Use these to your advantage to diagnose and repair vehicles properly. •



Overview of top of 2.0T engine.

VWoA

Wholesale Team Spotlight

Volkswagen has an aggressive wholesale parts program to help make sure we can meet the needs of independent auto repair shops with quality OEM replacement parts at competitive prices and the technical information needed to help you do the job right the first time. In support of that commitment, Volkswagen has assembled a team of five Wholesale Operations Field Specialists to help make your local VW dealership parts department your "go-to" source for all your VW parts needs.

Being in this edition of TechConnect magazine is not my way to be in the spotlight, but rather an opportunity to share my journey and my love for the Volkswagen brand and the automotive industry.



My automotive career began with an opportunity to become an entrepreneur that would require me to give up my position with a large network news source in Atlanta in 1994.

Darrell Wright

With only a love for cars and business I began a career in automotive as a franchised tool distributor. I quickly became national "rookie of the year" and then ranked in the top 5% nationally during my tenure of eight years.

In 2002 I saw an opportunity to provide a superior product and service to the market for local wholesale automotive business. Successfully building this business on the principles of great customer service and a quality product, I marketed it for purchase and the that business continues on today, 14 years later.

I've learned is stay the course by being open to ideas and a good listener even through lulls in my career and life, as many of us have. I am one of five Wholesale Field Operations Specialists for Volkswagen that share this same passion and commitment to our dealers. In 2015 Volkswagen Wholesale Support and Training was voted Best In Class (#1) on the Carlisle Parts Manager Satisfaction Survey - we believe this is a reflection of our commitment as a brand and as a team to our dealers and their wholesale customers.

Our Wholesale team has extensive experience in logistics, inventory management, communications, finance and dealer relations. We help provide a distinct advantage in sales and marketing with our innovative Customer Relationship Management (CRM) tool for our dealerships. Dealers who are serious about wholesaling actively use CRM to grow their wholesale business and keep in contact with their customers. And these dealers are seeing significant wholesale growth.

After 22 years in the automotive industry I've never looked back and I could not be more proud to work with my Volkswagen team. Being in a career I love has made every day a joy. Let's share ideas and spark the joy and profits together in 2016.

Best,
Darrell Wright
Wholesale Field Operations Specialist – Pacific Region

Industry Outreach Supports Repair Shops, Educates Consumers

Auto makers are working harder than ever to improve access to product information for technicians and consumers alike

Today online resources are everywhere. We perform internet searches on every topic imaginable - it's how we research nearly every decision we make. OEMs realize that online resources are the first choice for consumers and technicians alike and want to provide the OEM resources that the industry needs.

To that end, Volkswagen and other OEMs have made a significant effort to create websites that allow technicians and consumers to access the information they need when they need it. Here is a look into a few of the current projects.

Service Information for Repair Shops

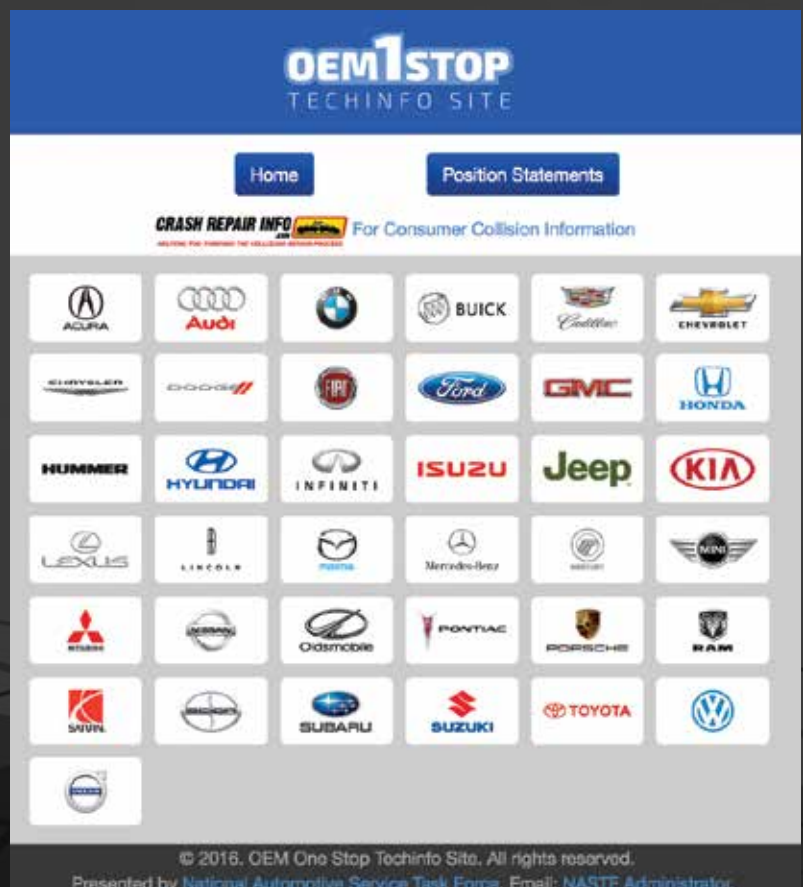
With the growing complexity of electronics and other vehicle systems, technicians and facility owners at independent repair shops are increasingly looking toward the OEMs to provide detailed, easy-to-access technical service and repair information for all brands.

While individual OEMs, including Volkswagen, make extensive service information available to independent service providers, VW and other OEMs recognize the importance of improving access to such information. So several years ago the major OEMs collaborated to create a website that offers direct links to each manufacturer's technical databases from a central location, providing technicians and shop owners "one-stop shopping" where they can go to find the technical information they need.

This web site for technicians and shop owners is www.OEM1stop.com. It is offered by the OEM Collision Repair Roundtable, Inc., and provides links to the collision and mechanical repair information

provided by nearly 40 of the world's leading OEMs, including Volkswagen of course. Just recently added to the site, however, are the position statements of many of those automakers, covering numerous important repair topics, such as wheel reconditioning, clip repairs, aftermarket, salvage and reconditioned parts, and details on choosing and evaluating replacement structural and other collision-related parts, particularly as they relate to warranty and structural integrity.

This area is especially important and interesting, because manufacturers have the opportunity to spell out exactly what types of parts and procedures can and should be performed by independent repair shops





to restore crashworthiness after a collision.

In addition, the newly refreshed OEM1Stop.com now gives OEMs the chance to make their other important repair-related information more easily accessible to technicians as well, such as links to technical repair procedures, repair publications (such as Volkswagen's TechConnect?) and more.

Help for Consumers

Historically consumers have difficulty choosing a collision repair facility. Often, they do not understand the industry or their insurance, and are not sure which shops are trained and qualified to perform repairs to their vehicle. The sophistication of design and manufacture in today's cars make collision repair an even more complex and esoteric process to the average consumer than ever – in this situation, one where the consumer is not fully informed – it becomes critical to provide easy access to the information needed to make an informed choice on where and how to repair their collision damaged vehicle.

Here again, the 12 member companies of the OEM Collision Repair Roundtable, Inc., have banded together to create, and offer to the public, an informative and highly detailed website

providing extensive, non-commercial, consumer-facing information. This web site helps consumers understand their rights when their vehicle is involved in a collision, and to understand the intricacies of working through the collision repair process.

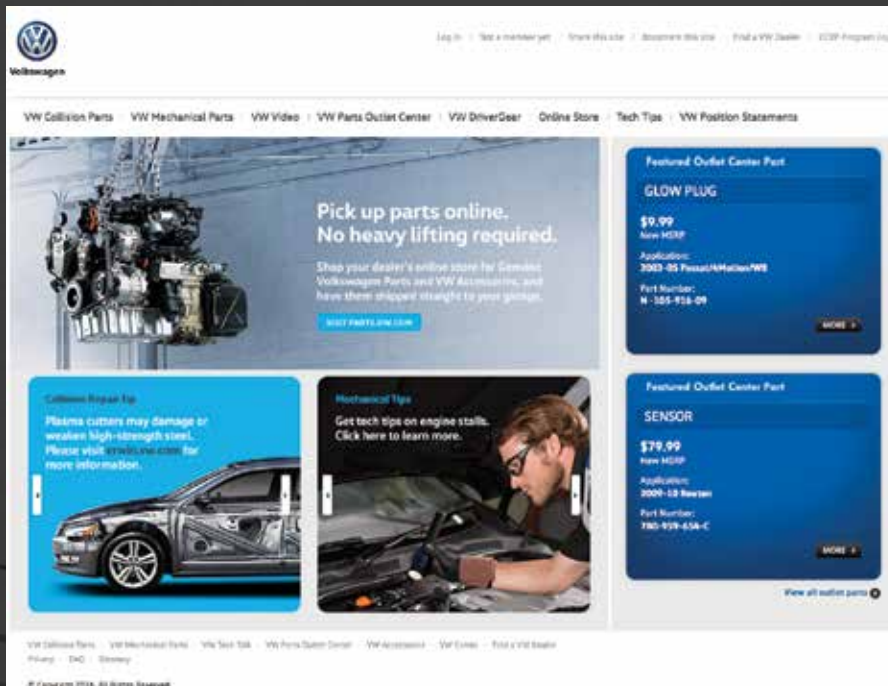
All of this information is collected in an easily accessible website, www.CrashRepairInfo.com. Although it is geared specifically to the motoring public, it also provides important information for repair professionals to pass along to their customers. While sponsored by OEMs, this site is specifically educational and non-commercial with the goal of helping motorists make decisions on how to repair their collision-damaged vehicle.

The website grew out of an effort going back as far as the late 1990's, when OEMs and auto body shops began to recognize and discuss the lack of consumer education about the entire process of having their damaged vehicles repaired. CrashRepairInfo.com addresses key topics of interest to anyone who has had a vehicle involved in a collision.

Topics covered include:

- Your rights as a consumer
- Your insurance coverage
- Choosing the right body shop
- What are crash parts?
- Why insist on OE-quality crash parts?

Each topic is covered in extensive detail – for instance, "What are crash parts?" takes the reader to a page that offers clear and understandable definitions of what constitutes crash parts, what constitutes OEM and aftermarket crash parts, defines Like Kind and Quality (LKQ), and explains what reconditioned and counterfeit parts are. Other pages within the web site provide helpful information to aid the customer in understanding the time required for repairs, along with the process for retrieving their repaired vehicle.



This is a sample of the kind of detailed parts and service information available to technicians and owners of independent repair shops.

The Proof is in the Numbers

Probably the best measure of how well these sites are working lies in the number of people accessing this information. The evidence is powerful. The web site for repair shops, OEM1stop.com, generated just shy of 80,000 site visits last year, and is on track to exceed that number this year. These visits came from nearly 30,000 unique visitors, and more than two-thirds of them were repeat visitors, indicating that they had visited the site and found it so useful that they came back for more.

Overall, since 2010, the number of annual site visits has increased by about 70 percent, and the number of unique visitors has increased by about the same amount.

As for the consumer site CrashRepairInfo.com, the numbers are equally impressive. In 2015 this web site drew nearly 30,000 site visits from more than 20,000 unique visitors — motorists who were looking to educate themselves to be better consumers of collision repairs.

Interestingly, the number of total site visits and the number of unique visitors are both on track to exceed last year's numbers. But it is fascinating and encouraging to note that 84 percent of the visitors so far this year are new visitors. This indicates that

motorists are seeking out this information, likely because they have a need and thirst for information that did not exist last year.

Also noteworthy is the fact that, in 2016, more than two-thirds of the visitors to CrashRepairInfo.com have accessed the site using either a mobile phone or a tablet. This would seem to suggest that collision repair shops, and even insurers, are directing customers to this web site and that folks are immediately accessing the site on their mobile device. So hats off to the repair shop and insurance industry personnel who are using this site as an educational tool.

The success of these two resources is strong evidence that industry efforts to educate consumers and improve access to technical repair information are bearing fruit. Consumers in growing numbers are making more informed choices and assuring that their damaged vehicles are being repaired to OE levels of appearance and integrity. Shop owners and technicians have better and faster access to manufacturers' technical databases than ever before.

This is truly a win-win-win situation, and is a testament to the commitment of OEMs like Volkswagen to enhance the driving and repair experience for motorists and technicians alike. •



Well-trained technicians can help to decrease cycle time, touch time, and the frequency of supplements overlooked in estimates. Volkswagen supports education and would like to announce that 2016 course fees are waived for all Certified Collision Repair Facilities (CCRFs) and dealership-

owned collision centers enrolling in Collision Training courses at the Volkswagen Academy.

Send all enrollments to Warren Barbee at warren.barbee@vw.com. Seats cannot be reserved so please register early. Feel free to reach out to Ashley Biggs at ashley.biggs@vw.com or 703-364-7642 with any questions you may have.

Volkswagen Academy

Collision Training Schedule - 2016

July 20-21	8:30am - 4:00pm	Volkswagen High Strength Steel (100132)
July 22	8:30am - 4:00pm	Beetle and Beetle Cabriolet (100332)
July 27-28	8:30am - 4:00pm	Volkswagen Collision Welding Technology (100232)
July 29	8:30am - 4:00pm	Volkswagen High Strength Steel (100132)
August 24-25	8:30am - 4:00pm	Jetta Hybrid Collision Repairs (100152)
August 26	8:30am - 4:00pm	Volkswagen High Strength Steel (100132)
August 29-30	8:30am - 4:00pm	Beetle and Beetle Cabriolet (100332)
August 31	8:30am - 4:00pm	Volkswagen Body Alignment (100432)
September 12-13	8:30am - 4:00pm	Volkswagen Structural Repairs (101442)
October 19-21	8:30am - 4:00pm	Volkswagen Welding Expert (100162) – Pilot Course
October 26-27	8:30am - 4:00pm	Volkswagen High Strength Steel (100132)
October 28	8:30am - 4:00pm	The Golf Mk 7 (100142)
November 2	8:30am - 4:00pm	The Golf Mk 7 (100142)
November 3	8:30am - 4:00pm	Beetle and Beetle Cabriolet (100332)
November 4	8:30am - 4:00pm	Jetta Hybrid Collision Repairs (100152)
November 29-30	8:30am - 4:00pm	Volkswagen Body Alignment (100432)
December 1-2	8:30am - 4:00pm	Volkswagen Structural Repairs (101442)
December 7-8	8:30am - 4:00pm	Volkswagen High Strength Steel (100132)
December 9	8:30am - 4:00pm	Beetle and Beetle Cabriolet (100332)

We are currently waiving course fees for our Volkswagen Certified Collision Repair Facilities and Dealer Network – enroll your technicians today!

Course Number	Cost	Course	Duration
100142	\$250	The New Golf Mk 7	1 Day
100332	\$250	Beetle and Beetle Cabriolet	1 Day
100152	\$250	Jetta Hybrid Collision Repairs	1 Day
100232	\$500	Volkswagen Collision Welding Technology	2 Day
100432	\$700	Volkswagen Body Alignment	2 Day
101422	\$700	Volkswagen Structural Repairs	2 Day
100132	\$700	Volkswagen High Strength Steel	2 Day
100162	Pilot	Volkswagen Welding Expert	3 Day

Understanding Volkswagen Driver Assistance Systems

An on-board computer requires 0.25 seconds or less to react to an impending danger. A person only overcomes their surprise and reacts after about a one-second delay.





Today's Volkswagen vehicles are available with many systems to enhance drivers' experiences on the road. Some systems, like windshield wipers, are considered basic. Other systems, like ABS and traction control, are more advanced. But the next level of driver assistance features is here. An on-board computer requires 0.25 seconds or less to react to an impending danger. A person only overcomes their surprise and reacts after about a one-second delay.

These advanced driver assistance systems can not only help alert the driver to an impending collision, but can also intervene to help avoid them altogether. Vehicles can brake to avoid a collision, and can even park itself. It may seem like these features would be reserved for the most high-line cars in the fleet. But even the Golf and Golf SportWagen are available with many of the latest Volkswagen Driver Assistance systems.

Before any type of testing or diagnosis of a system can occur, we must understand how each system works. This is vital when working on new available Driver Assistance systems. If we don't understand how a system should work, we will not be able to properly identify an issue with a system.

Where To Start

When it comes to available Driver Assistance systems, the components vary from system to system. Let's start by identifying each available feature.



Mid-Range Radar Sensor, 2015 Jetta

Automatic Post-Collision Braking

The Automatic Post-Collision Braking system that results in an airbag deployment can automatically brake, slowing the vehicle down after an initial collision. This system is designed to lessen the severity of a secondary impact. Automatic Post-Collision Braking can slow the vehicle to a speed of 6 mph, and can be overridden by accelerating or hard braking.

Available on:

- 2015: Golf, GTI, Golf R, e-Golf, Golf SportWagen, Touareg
- 2016: Golf, GTI, Golf R, e-Golf, Golf SportWagen, Jetta TSI, Jetta GLI/Hybrid, Beetle, Beetle Convertible, Touareg, Passat

Adaptive Cruise Control (ACC)

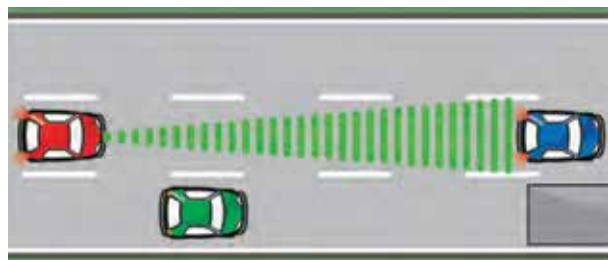
Adaptive Cruise Control functions very much like traditional vehicle cruise control. The speed is set by the driver, and the vehicle is designed to maintain that set speed. A vehicle equipped with ACC can also regulate speed based on the speed of other vehicles ahead. If a vehicle is detected ahead, the car will attempt to keep a consistent set distance from the other vehicle. Adaptive Cruise Control can accelerate on its own to the maximum set speed, and can brake automatically if the vehicle in front slows down.

Available on:

- 2015: Touareg
- 2016: Golf, (manual transmission) GTI (manual transmission), Golf R (manual transmission), Golf SportWagen (manual transmission), Jetta TSI/ TDI (automatic/DSG) Passat (automatic/DSG)

Adaptive Cruise Control (ACC) with Follow to Stop

Much like Adaptive Cruise Control, ACC with Follow to Stop can regulate the vehicle speed. In addition to speed and distance regulation, ACC with Follow to Stop can bring the vehicle to a complete stop in normal traffic flow. Pressing the accelerator pedal, or using the Resume function on the ACC control lever



The ACC system identifies the vehicles in front.

on CC will resume ACC based on the distance from the vehicle in front.

Available on:

- 2015: Touareg
- 2016: Golf, (automatic/DSG), GTI (DSG), Golf SportWagen (automatic/DSG), Touareg

Sensors used:

- Front Long-Range and Mid-Range Radars

Forward Collision Warning

Vehicles with Forward Collision Warning can help to monitor the distance to traffic ahead. The system helps warn the driver of critical front-end collision situations. An audible alert and a visual warning are displayed in the MFI display.

Available on:

- 2015 Golf, GTI, Golf SportWagen, sensor is located below the front grill
- 2015 Jetta, sensor is located behind the Volkswagen logo on grill
- Also available on Passat, Touareg, and CC as a function of Front Assist

Sensors used:

- Front Radar Sensors
- Long-Range and Mid-Range

Autonomous Emergency Braking (Front Assist)

Autonomous Emergency Braking is a system that takes Forward Collision Warning a step further. It can apply the brakes automatically if the sensors detect a potential collision. This is done in two stages. Stage one is a short, jolting braking maneuver. If the driver fails to react to the first alert, Autonomous Emergency Braking can initiate an automatic braking maneuver. This can slow the vehicle down, increasing braking force. However, at speeds below 19 mph there is no warning jolt.

Sensor locations:

- Golf family: below front grill and also has a camera in front of the inside rear view mirror
- Jetta/CC/Passat: behind Volkswagen logo on grill
- Touareg: Adjacent to front fog lights, and camera in front of the interior rear-view mirror.

Available On:

- 2015: Touareg
- 2016: Golf, GTI, Golf R, e-Golf, Golf SportWagen, Jetta TSI, CC VR6, Touareg, Passat

Blind Spot Monitor

Using two radars at the rear of the vehicle, Blind Spot Monitor can alert drivers to vehicles in adjacent lanes. The two sensors constantly scan for traffic in the vehicle's blind spot. The system can scan a range of approximately 65 feet.

LEDs in the side mirrors, or on the mirror housing in the Touareg, alert the driver to any vehicle in the blind spot. If the driver uses the turn signals, the LEDs flash to warn of a dangerous situation.

Available On:

- 2015: Jetta, Beetle, Beetle Convertible
- 2016: Golf, GTI, Golf R, Golf SportWagen, Jetta, Beetle, Beetle Convertible, Passat

Sensors used:

- Rear Radars

Side Assist (Lane Change Assist)

Available only on the 2015 and 2016 Touareg, Side Assist can aid the driver by monitoring traffic behind and next to the vehicle. The rear radar monitors up to a distance of about 230 feet. A series of four indicator lights warn the driver of traffic. As a vehicle gets closer to the Touareg, more lights will illuminate. When an approaching vehicle is very close, all four indicators will be lit.

Rear Traffic Alert

Whether it's a moving object like a passing car, or a stationary object like a trash can, Rear Traffic Alert can warn of objects crossing directly behind the vehicle. Not only that, but radar-based sensors are used to help warn of vehicles approaching from the side when backing up. Rear Traffic Alert can even apply the brakes when the vehicle is in reverse when the radar sensors detect a potential collision with a vehicle approaching from the side, and there is also a warning sound and, if equipped with ParkPilot, a visual warning as well.

Available On:

- 2015: Jetta, Beetle, Beetle Convertible
- 2016: Golf, GTI, Golf R, Golf SportWagen, Jetta, Beetle, Beetle Convertible, Passat

Sensors used:

- Rear Radar Sensors

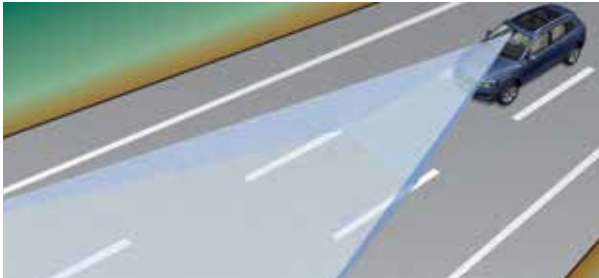
Lane Departure Warning (Lane Assist)

While the system will not relieve the driver from any responsibility, Lane Assist can steer to keep the vehicle within the lanes and provide a visual alert to the driver if the vehicle attempts to change lanes

without the use of a turn signal. The front camera on the windshield identifies lane markings on the road. It processes the signal to determine if the vehicle is staying in the lane or not. Lane Assist can be overridden by the driver at any time. Using the turn signal indicator will also switch Lane Assist to passive mode.

Lane Departure Warning (Lane Assist) — Touareg

The Lane Departure Warning system on the Touareg functions differently than on other Volkswagen models. The Touareg system will not provide active steering intervention. If lane departure is detected, the system can send a signal to vibrate the steering wheel to gain the driver's attention. There is also a visual indication in the multifunction display.



Touareg camera will monitor approximately 260 ft (80 m) ahead

Lane Assist — Golf, GTI, Golf R, Golf SportWagen, CC VR6, Passat

On these models Lane Departure Warning can provide active countersteer measures to help keep the vehicle in the lane. If the vehicle crosses the lane without using a turn signal, visual warning are given asking the driver to take over steering.

Sensors used:

- Multifunction Camera

Park Distance Warning System (ParkPilot)

Volkswagen's ParkPilot uses ultrasonic sensors that can measure the distance from the car's front and rear bumpers to objects near the car. An acoustic and/or visual signal can alert the driver if the vehicle gets too close to an object.

Available On:

- 2015: Golf, GTI, Golf R, e-Golf, Golf SportWagen, Jetta Hybrid, EOS, CC, Touareg
- 2016: Golf, GTI, Golf R, e-Golf, Golf SportWagen, Jetta, EOS, CC VR6, Touareg, Passat

Sensors used:

- Ultrasonic Sensors

Parking Steering Assistant (Park Assist)

Available for the first time on some 2016 models, Park Assist can help steer the car into parallel and perpendicular parking spots in reverse. The Park Assist button is pressed once for parallel parking and twice for perpendicular parking. The driver only needs to operate the accelerator pedal and brake once the gear is selected. Park Assist can automatically steer the vehicle into the parking spot.

While traveling below 25 mph, Park Assist system can scan both left-hand and right-hand sides of the road for parking spots. The driver will stipulate which side of the road he wishes to park on by activating the turn signal. Once a parking spot is identified, the driver will need to shift into reverse and operate the accelerator and brake pedal. The Multi Function Indicator (MFI) display will advise the driver when to switch from reverse to forward, and back into reverse gear.

The system can be deactivated at any time by:

- Turning the steering wheel
- Increasing speed above 4 mph
- Pulling out of a parking space
- Pressing the Park Assist button once

Available on:

- 2016: Golf, GTI, Golf SportWagen, Passat, e-Golf

Sensors used:

- Ultrasonic Sensor

Area View

Area View is a Touareg-only feature. Area View is a 360-degree surrounding monitoring system. It uses four cameras to transmit images of the complete area around the vehicle, into the central display on the center console. The system can create an overall view of the surrounding area from the perspective of a virtual overhead camera. This can be especially helpful for customers aligning their Touareg with a trailer.

Available on:

- 2015, 2016 Touareg

Sensor Overview

Knowing the location and function of the various sensors and cameras used in Volkswagen's Driver Assist systems is very important. Identifying issues with Driver Assist systems may be as simple as a visual inspection. If the vehicle, for example, has a cracked windshield near the front camera, bumpers

damaged, or radars obscured, proper performance may be affected. This can cause erratic behavior in many Driver Assistance systems.

Front Sensors

For 2016, many Volkswagen vehicles have a single mid-range radar sensor. The Touareg has a different system with two long-range radar sensors. These radar sensors are used for the Adaptive Cruise Control (ACC) and/or Front Assist functions.

Mid-Range Sensors

The MRR Distance Regulation Control Module J428 is located at the front center of the vehicle, either behind the VW emblem, or below the VW emblem in the center of the bumper cover.

This is a radar sensor that helps detect vehicles and obstructions in front of the vehicle. It is used differently for different systems. This is also the rear sensor for the RTA and other functions that are located in the bumper corners. It has the following features:

- It has a frequency of 77 GHz

- To help keep ice off at lower temperatures, the MRR has a heater
- Range: Up to 525 ft. (160 m)
- Speed: 0 - 100 mph (0 - 160 km/h)

The MRR sensor is not standard equipment. However, it is used on many 2015 and newer vehicles, with the exception of the Touareg.

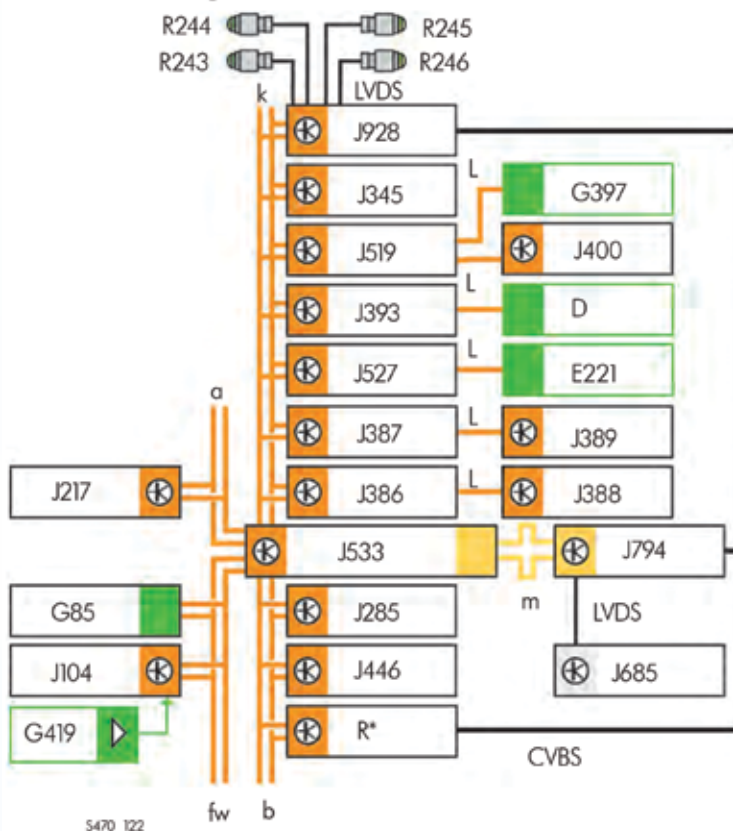
Long-Range Radar (LRR) Sensors

The Touareg uses two long-range radar sensors located next to the fog lamps. They are 3rd Generation radar sensors with the following features:

- Each sensor has four radar antenna units
- They have a frequency of 77 GHz
- To help keep ice off at lower temperatures, the LRR has a heated lens
- Range: Up to 656 ft. (200 m)
- Speed: 0 - 130 mph (0 - 210 km/h)

This generation of dual radar sensors allows the entire width of a three-lane road to be scanned, from as far as 99 feet (30 m) away.

Networking



Key

D	Ignition/Starter Switch
E221	Control Unit in Steering Wheel
G85	Steering Angle Sensor
G397	Rain/Light Recognition Sensor
G419	ESP Sensor Unit
J104	ABS Control Module
J217	Transmission Control Module
J285	Instrument Cluster Control Module
J345	Towing Recognition Control Module
J386	Driver Door Control Module
J387	Front Passenger Door Control Module
J388	Left Rear Door Control Module
J389	Rear Right Door Control Module
J393	Comfort System Central Control Module
J400	Wiper Motor Control Module
J446	Parking Aid Control Module
J519	Vehicle Electrical System Control Module
J527	Steering Column Electronics Control Module
J533	Data Bus Onboard Diagnostic Interface
J685	Front Information Display Control Head
J794	Information Electronics Control Module 1
J928	Peripheral Camera Control Module
R243	Front Peripheral Camera
R244	Left Peripheral Camera
R245	Right Peripheral Camera
R246	Rear Peripheral Camera
a	Powertrain CAN-Bus
b	Infotainment CAN-Bus
fw	Chassis CAN-Bus
k	Convenience CAN-Bus
L	LIN-Bus
m	MOST Data Bus

Touareg Driver Assistance Front Camera.

The Distance Regulation Control Module J428 is the master, and it is located inboard of the right fog lamp. Distance Regulation Control Module 2 J850 is the slave and is located inboard of the left fog lamp.

Multifunctional Front Camera

This camera can detect vehicles that may also be visible to the front radar system by using an actual camera to monitor the area in front of the vehicle. It confirms that a vehicle is there through sensor fusion to improve performance in critical situations.

The camera monitors the area in front of the vehicle when stationary, preparing for a restart of the ACC system. It can also support front assist features, as well as detect lane markings for lane departure warning (Lane Assist).

Front Camera (except Touareg)

The front camera is located on the inside of the windshield, in front of the rear view mirror. Driver Assistance Systems Front Camera R242 provides image information to the following driver assist systems including Lane Departure Warning (Lane Assist) and ACC with Front Assist.

The front camera can detect a variety of objects, such as vehicles and lane markers. The position of any detected object is captured by the camera, then transferred to the Distance Regulation Control Module J428. J428 compares the camera object data with the data of objects detected and mapped using radar.

Front camera R242 also has a built in heating element. The Window Defogger for Front Sensor System Z113 prevents the part of the windscreen directly in front of the camera from misting up or icing over.

Camera Control Module J852 and camera R242 are incorporated into the same module. J852 sends information via the extended CAN bus to be used by the lane departure warning system.

Front Camera — Touareg

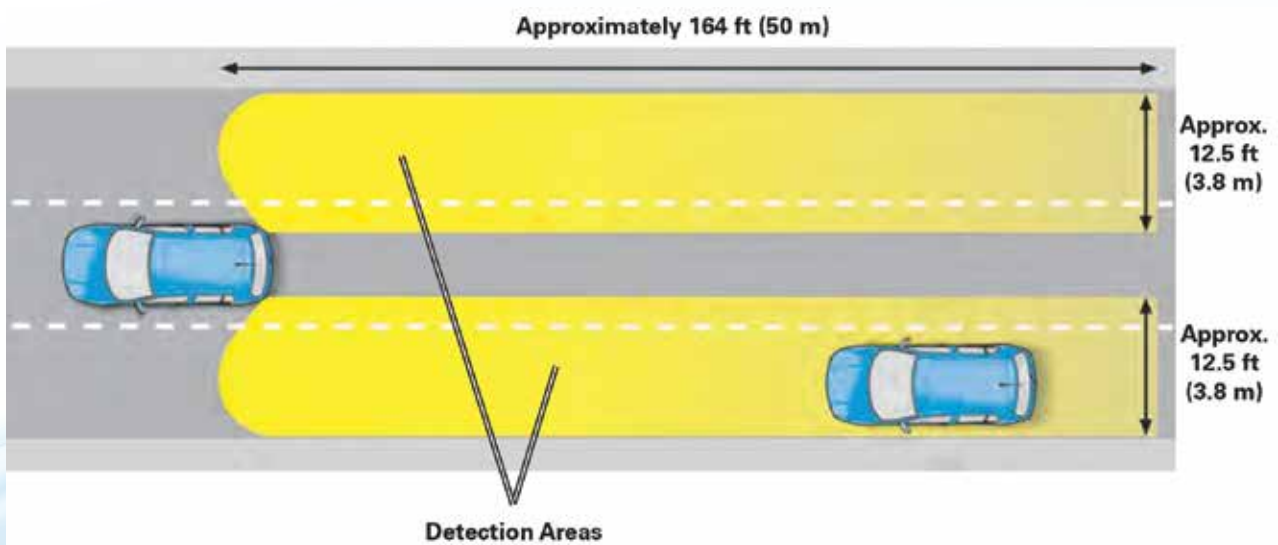
The front camera for the Touareg is similar to other front camera systems. It is integrated into the mirror base and has the following features:

- It is a color camera with 1024 x 512 resolution
- The range can be up to 2624 ft. (800 m)
- The horizontal opening angle is 42 degrees and the vertical angle is 21 degrees

If the Touareg has ACC, there are additional components and image processing. The Image Processing Control Module J851 is used to process the images received by J852 Camera Control Module.

Signals are sent along the fast FlexRay Data Bus, supplying information to control modules J428 Distance Regulation Control Module and J850 Distance Regulation Control Module 2.

To calculate the dive angle of the vehicle about the Y-axis with greater speed and safety, the camera control module has a Pitch Rate Sensor G752, which is connected via the Extended CAN.



The illustration above shows the sensor monitoring area on a straight road. On winding roads, the Blind Spot Monitor operates up to a minimum curve radius of about 558 feet. If the curve radius is below the 558 feet limit, the system switches to a deactivated state since the radar beams being transmitted can no longer scan the full rear monitoring area.

Rear Radar Sensors

Some vehicles have Blind Spot Monitor and Rear Traffic Alert. These systems have two radar sensors behind the rear bumper that scan traffic behind the vehicle.

The area monitored (on each side of the vehicle) includes the side and rear. The side area extends from the rear corner of the vehicle to about the level of the B-pillar.

For vehicles equipped with Rear Traffic Alert, radar sensors can measure the distance and the speed difference between the vehicle and an approaching object and use this to calculate the time until a possible collision ("Time to Collision").

Technical Radar Data and System Limitations

- Detection angle of the radar sensors is approximately 110 degrees
- Detection area is approximately 65 ft. (20 m) range
- Speed range for own vehicle from 1-7.5 mph (1-12 km/h)
- Speed range for the detected vehicle > 2.5 mph (4 km/h)
- Reverse gear must be engaged

Warning Sounds

- An acoustic warning from the dash panel insert, if Park Distance Control is not installed
- Beeping noise, if Park Distance Control is installed
- Automatic braking does not occur if the brake pedal is being pressed

6-Channel Ultrasound Sensors

For vehicles with Park Assist, two 6-channel ultrasound systems are used to monitor close range objects. This allows for assisted parallel and perpendicular parking.

Special Tools and Related Repairs

The number of vehicle equipped with Driver Assistance features is on the rise. With this rise, a shift in repair processes comes right along with it. A repair that was once a quick and easy job now may require radar or camera calibration. If an earlier Volkswagen was put into service position (alternate language here perhaps?), proper bumper cover alignment was for cosmetics.

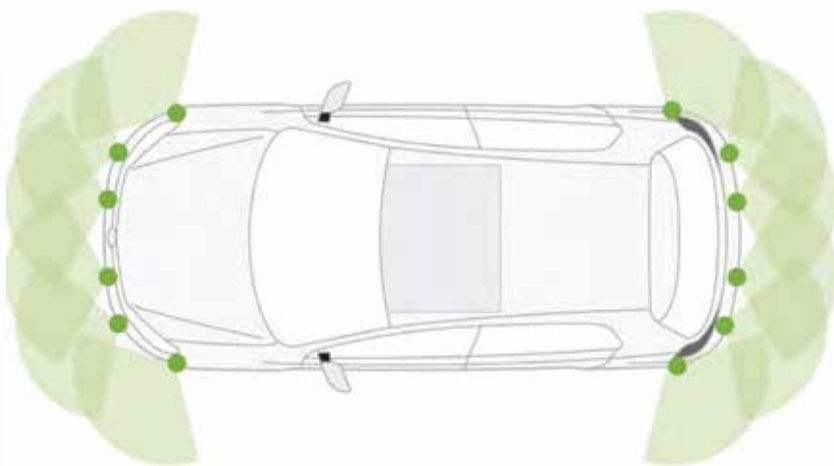
Now forward radar sensors must be realigned in addition to the bumper alignment.

Calibration of the forward radar sensor is required if any of the following occur:

- Rear axle toe setting has been adjusted (thrust angle)
- The Distance Regulation Control Module J428 has been removed and reinstalled
- The front bumper support has been removed and installed
- The front bumper support has become loose or has been moved
- The misalignment angle is greater than -0.8° to $+0.8^\circ$ (see below)
- The vehicle has been brought into the service position
- When performing an alignment

There are also some special tools required to service Driver Assist systems.

- VAS 6262 - Hunter Alignment Machine
- VAS 6430/3 - Basic set for calibration of VW vehicles with the ACC laser unit
- VAS 6190/2 - ACC Adjuster
- T10113 or T20 Driver
- VAS 6430/4 - Calibration Board For Lane Guard System
- HUN2018351 - Radar alignment kit
- VAS Scan Tool W/ODIS Service
- VAS 6350/4 - Calibration Tool - Lane Change Calibration Tool
- VAS 6350/2 - Calibration Tool - Spacing Laser
- VAS 6350 - Reversing Camera Calibration Tool
- VAS 6350/6 - Peripheral Camera Calibration Device •



This semi-automatic parking system allows for perpendicular parking (spaces 90 degrees to the lane) and parallel parking on the right or left of the lane. It will not only help the driver park the vehicle, but can also be used to get the vehicle out of parking spots.



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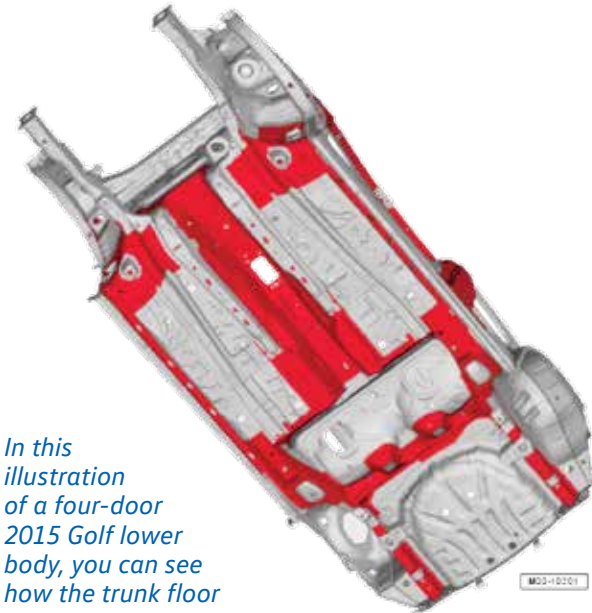
2015 Golf trunk floor replacement

To help minimize potential weakening of adjacent panels, reinforcements, corrosion protection, and other critical body elements, Volkswagen recommends partial replacement of the Golf luggage compartment (trunk) floor pan if it has received collision damage. Here you'll find detailed examples of steps in the sectioning and replacement procedures for a 2015 Golf.

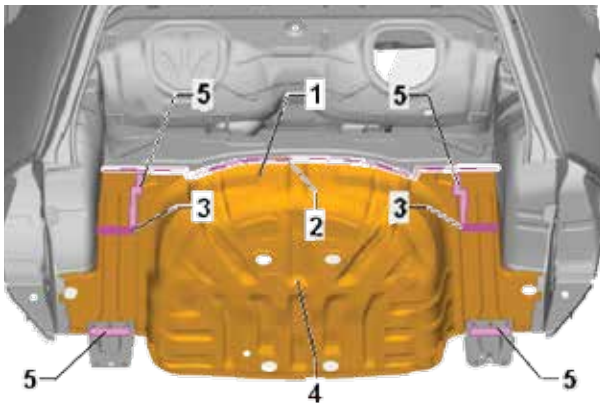




Volkswagen allows partial replacement of the trunk floor on the 2015 and newer Golf. There are specific OEM-required procedures to help restore the Golf trunk floor to pre-collision condition. It's not complicated.



In this illustration of a four-door 2015 Golf lower body, you can see how the trunk floor pan (bottom of the illustration) attachment to the rear crossmember, frame rails, and rear cross panel (not shown) completes the enclosure and helps support the structural rigidity of the lower rear end.



Right: Volkswagen allows a separating cut at the dashed pink line (2) across the front end of the spare tire well (1). On each side there is a cavity containing a molded structural foam insert at (3), which you must inspect and replace if necessary. There is bonding adhesive joining the trunk floor to the frame rail and to the end plate or bumper impact bar bracket at (5), which must be replaced during floor pan reassembly. The spare tire retaining bracket (not shown) is mounted at (4).]

You'll cut the replacement floor pan at a VW-recommended separating line, substitute MIG/MAG plug welds where factory spot welds are in inaccessible locations, and replace some factory-applied adhesive with MIG/MAG plug weld seam welding.

The trunk floor pan is joined to the rear frame rails, the rear crossmember, and the rear cross panel. Proper location of a sectioning cut and repair is critical to maintaining structural integrity in the event of a future rear end collision.

Other engineering design factors make cut location critical. For example, corrugation patterns in the 2015 Golf trunk floor are computer optimized to improve sheet metal rigidity, which in turn reduces the amount of sound insulation needed. Smart. Consequently, the cut location is in the one area of the floor pan that is relatively flat and corrugation-free from side to side. See erWin® for exact cut location details. Don't second guess them.

Sectioning the trunk floor pan

You should already have removed the rear cross panel (rear body panel), as any damage that is significant enough to require floor pan replacement has likely also destroyed the cross panel. Make a separating cut in the existing trunk floor pan, along the front edge of the spare tire well. Do not cut deeper than the panel thickness, to avoid damaging the crossmember reinforcement under the floor pan.

Note that the replacement trunk floor component does not include a new retaining bracket for the spare tire. Separate the old retaining bracket so you can re-use it on the replacement trunk floor. Remove any adhesive and sand down to bare metal the areas to be welded. Refer to erWin® or ElsaPro for weld-through primer instructions.

Replace some factory spot welds with MIG/MAG plug welds

The trunk floor pan is joined to the rear substructure during factory production using spot welds and structural adhesive. Drill out spot welds from the spare tire well portion of the floor pan where it meets the crossmember, frame rails, and the supports that extend down along the vertical wall of the tire well on each side. Separate the adhesive bonded edges and discard the old floor pan.

Remove any residual adhesive from the exposed rail, crossmember, and spare tire well support

surfaces. The adhesive applied at the factory will be replaced with a MIG/MAG (gas-shielded continuous arc) plug weld seam. One exception is the bumper support bracket at the end of the frame rail. There, new two-part body adhesive (part number D 180 003 M2) will replace the factory adhesive on both sides of the bracket. The adhesive mixing tip assembly includes a connecting piece (part number D 002 003) and static mix (part number D 002 001), and is included in the two-part adhesive kit part number D 180 003 M2).

Clean away any corrosion and dirt, and sand down to bare metal the areas to be welded. Do not apply weld-through primer when weld bonding.

Transfer the separating cut to the new trunk floor pan. You will place the part of the replacement floor pan that is nearest the back seat area so that it overlaps the cut end of what remains of the old trunk floor.

The cut edge is too far in for even the longest spot welder clamping arms, hence the MIG/MAG plug welds. Where the floor meets the rear cross panel, easy access allows resistance spot welds.

Foam matters

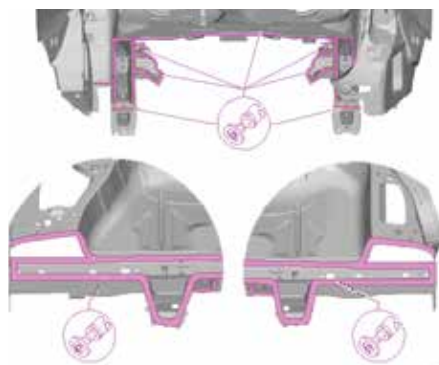
Structural foam inserts (SFIs) reduce the transfer of road noise, vibration and harshness (NVH) into the passenger compartment. It is almost magical how computer modeling has helped Volkswagen

engineers select the ideal location, size, and amount of structural foam inserts to maximize NVH reduction while minimizing added weight and bulk. There is one molded structural foam insert on each side of the spare tire well, in cavities between the rear longitudinal member (frame rail) and the floor pan.

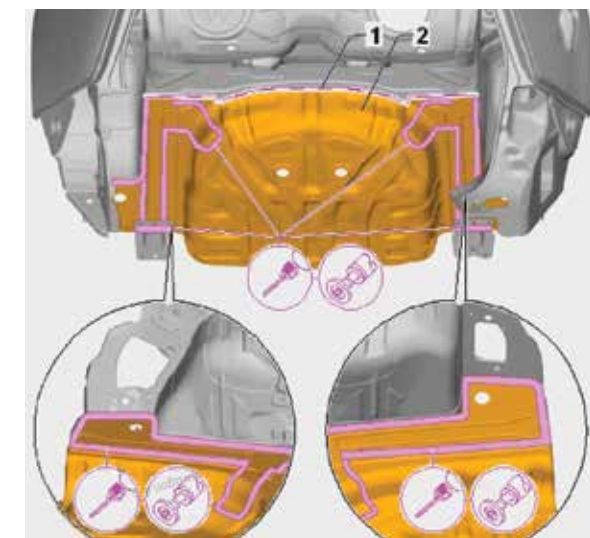
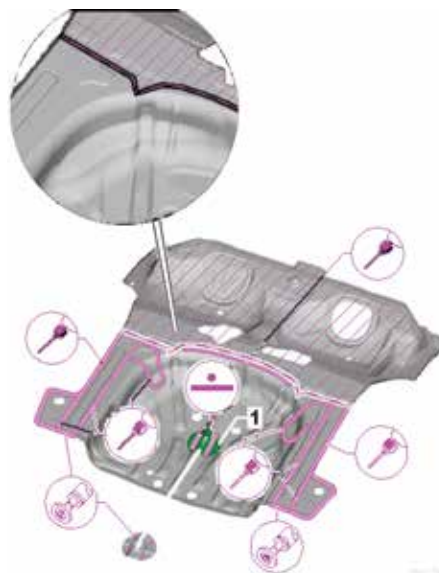
Inspect the existing molded foam insert to make sure that it has not lost its shape or flattened out. If it is in good condition, save and reuse it when you install the replacement floor pan. If not, cut out a replacement insert from a universal molded foam closeout panel (part number 000 864 663).

Remove any old foam material and adhesive still stuck to metal surfaces prior to installing the new or reusable foam insert. Make sure that each cavity is clean and then apply corrosion protection. Attach

After disposing of the floor pan, completely remove adhesive remains and grind welding surfaces down to bare metal.



Transfer the separating cut to the new trunk floor pan, then cut and remove the shaded area. Drill or punch 7 mm diameter holes for the MIG/MAG plug weld seam. Sand welding surfaces down to bare metal, and lightly grind the areas which will not be welded. Weld the spare tire retaining bracket (1) to the trunk floor using a straight line spot weld seam on each side of the bracket.



When making the separating cut (1) at the front of the spare tire well (2), be careful not to cut into the reinforcement below. Drill out any spot welds where the pan joined the frame rails, the reinforcement under the front of the spare tire well, and the sidewall support area for the tire well. Then remove the pan from the vehicle.

the bottom of the foam insert to the cavity using butyl sealing cord (part number AKL 450 005 05) or two-part filler foam (part number D 506 KD1 A3). Then apply butyl sealing cord or two-part filler foam to the top of the insert.

Do not substitute alternative bonding agents. For example, hot melt adhesive can bond, but does not have good sealing properties. Butyl tape (AKL 450 005 05) or the Volkswagen-approved two-part filler foam (D 506 KD1 A3) offer both adhesive and sealing capabilities. Similarly, some adhesives solidify when



Apply two-part body adhesive (D 180 003 M2) to the side of the bumper bracket facing the rear seat. Fit the replacement floor pan with the vehicle secured to an alignment bracket set on a frame bench, or while it is standing on its wheels.



Weld the left and right side front (straight portion) of the floor pan front overlap using MIG/MAG continuous seam welds. Using a MIG/MAG plug weld seam, weld the curved front (1), the vertical reinforcements that drop down to support the spare tire well sides as they curve toward the front, and the sides above the frame rail. Weld the ends of each side using a straight-line spot weld seam.

completely cured, which weakens the NVH reduction benefit in this application. Volkswagen-approved butyl tape (AKL 450 005 05) or two-part filler foams (D 506 KD1 A3) never harden.

Two-part filler foam (D 506 KD1 A3) cures within 25 minutes, so do not apply it until you are ready to install the new floor pan. Do not perform any gas-shielded welding within 15 mm of areas containing structural foam inserts.

The right adhesive

Structural components, body panels, roof, glass, and other automotive parts may each call for a different formulation in areas where adhesive bonding is required. Volkswagen engineers have tested and validated which adhesive formulations best provide the joint strength and long-term durability on a given metal type and thickness.

Apply two-part Volkswagen body adhesive (D 180 003 M2) to the forward-facing side of the bumper bracket, above the frame rail. Position the replacement floor pan and check fit using frame bench attachments.

Install the new floor pan within 90 minutes. Position the new panel making sure not to lift it up, as lifting will create air bubbles and weaken the bond. Make adjustments to the panel fit by sliding, not lifting.

Overlap

Lay the replacement floor pan so that its front overlaps the portion of the old floor pan that remains after you have completed your separating cut. The overlap must be wide enough to allow room at the cut end for new MIG/MAG plug welds with a diameter of 7 mm.

Use MIG/MAG plug welds everywhere except at the connection between the floor pan and the rear cross panel (rear body panel), where you will use resistance spot welding.

For each welding area and type, it is wise to practice on scrap pieces of the same gauge, and using the same welding angle (horizontal, vertical, or overhead) as the repair will require. Do destructive testing on your scrap welds. When you see good weld penetration, you'll know you've got the heat and wire speed settings just right.

Follow the VW-approved repair procedures, and restoring the Golf trunk floor to OEM standards is not complicated at all. •

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