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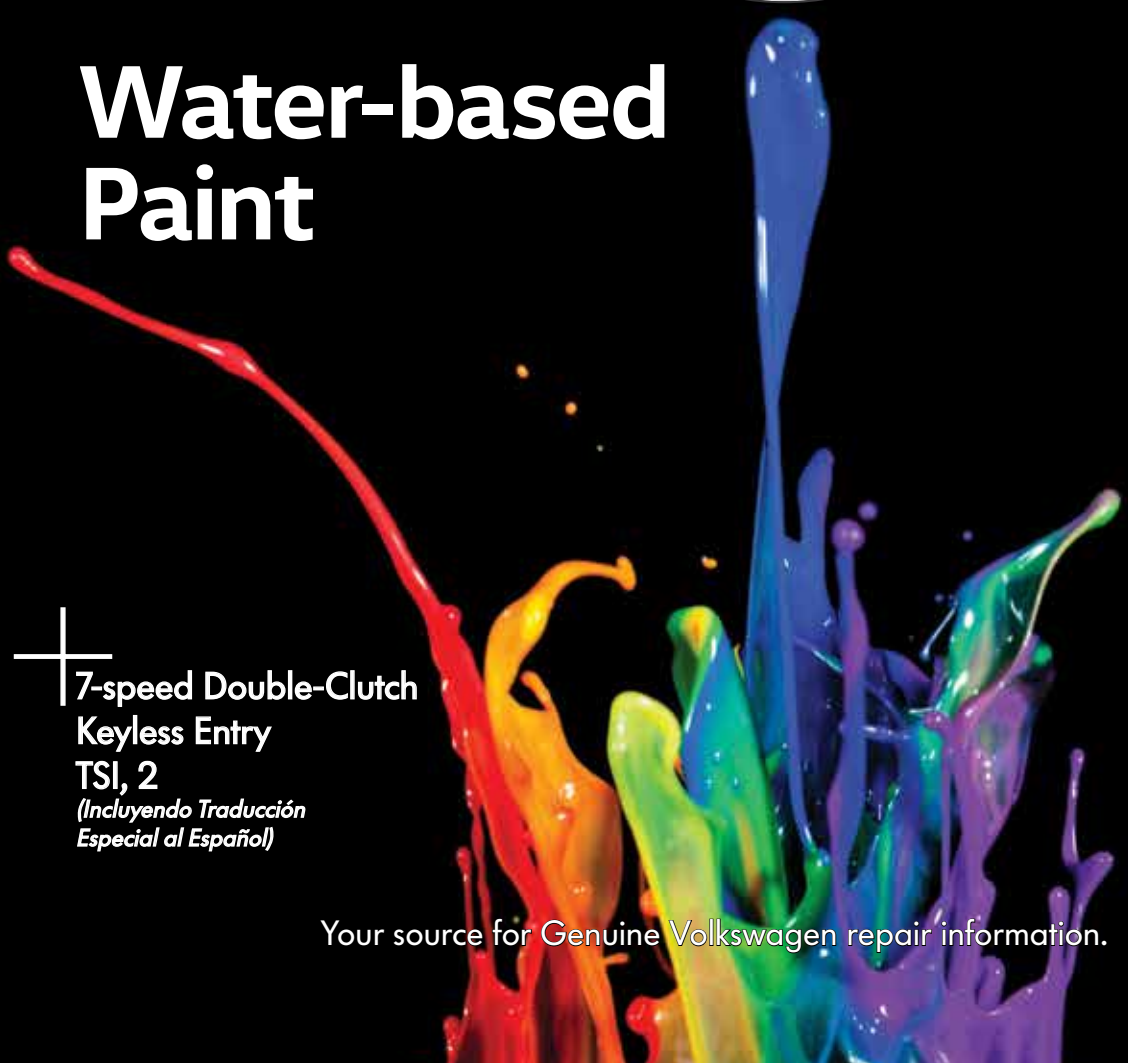
Water-based Paint



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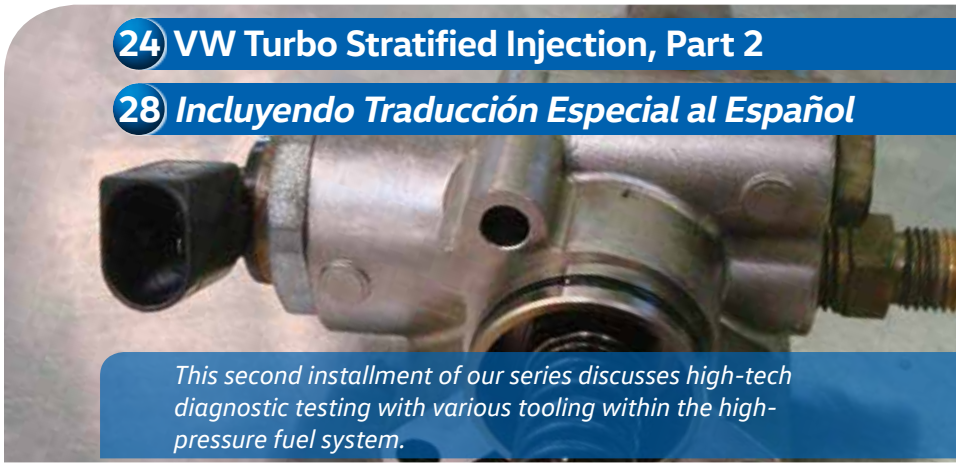

Water-based Paint

Different Can Be Good

Water-based automotive paints mix, spray, and dry differently from solvent-based products. Read on to learn more about key performance differences and how you can get excellent results using water-based coatings.

Photos courtesy of Jim Ellis Collision Center, a Volkswagen Certified Collision Repair Facility in Atlanta, Georgia.

A portable air blower is useful for creating horizontal airflow to generate the air turbulence that speeds evaporation of the solvent in water-based paint. This tree stand blower set is handy for drying vehicle parts such as a bumper or small areas like a quarter panel.

Water-based and solvent-based paint technologies are similar in their core composition. Both contain pigment for color, a binder to form the paint film, and a carrier that transports the pigment and binder through the spray gun onto the surface being painted.

Both paint types typically use similar pigments. Using only the best pigments helps each achieve OE color matching objectives, and helps optimize light refractivity. The binders in both water-based and solvent-based paints are variations of acrylic technology, to give the durability needed for an automotive exterior coating. The key difference is the carrier: solvent or water. When it's water, painters must adjust their mixing, spraying, and drying techniques.

Mixing

For water-based paint, the painter adds water instead of solvent at the mixing step in the process. There are versions of water-based paint that are pre-mixed with water. Consider, however, that if a pre-mixed product gets below 32 deg. F., ice crystals form in the paint, rendering it unusable, even after the ice melts. If your shop is in a part of the country that has very cold winters, and the paint room is not heated 24 hours a day, an overnight cold snap can cause a costly loss of your paint inventory.

The VOC grams per liter on the waterborne product label can be entered into your electronic scale, which will calculate the exact amount of VOCs generated by the quantity of paint that you mix.

The ratio of reducer or thinner to be added to water-based or solvent-based paints differs. You will hear rule-of-thumb guidelines about the mix ratio for water-based product, but the best advice is to always follow the paint manufacturer's mixing instructions. Different paint manufacturers may use different formulas to achieve a given sprayability, color appearance, gloss level, or other key performance factors. Use of anything other than the paint manufacturer's mixing instructions is likely to alter your result.

Spraying

As the water evaporates after spraying water-based paint, latex molecules are attracted to each other, creating a strong chemical bond (polymer chains) as the particles join together. Once the water has fully evaporated, water-based paints are thermoset. The surface is permanent, and the only potential repair is to sand it and re-spray.

Avoiding the need for re-work is easy. Paint manufacturer worksheets spell out step-by-step procedures, such as how to select the spray nozzle opening, set spray pressure and the number of coats, and the way to check the dry layer thickness. Follow the paint manufacturer instructions for these and other painting steps, and you are on the way to a great water-based finish.

Volkswagen-approved paint manufacturers have developed water-based paints that offer outstanding color match to OEM finishes. Study the manufacturer's instructions to help you develop a plan before you begin spraying. For example, for some colors there may be special instructions about selecting a substrate color that is similar to that of the basecoat. There may be tips about how best to apply a pearl or other translucent finish. Following the manufacturer instructions are critical to achieving the desired result.

Use only primer that is approved for water-based paint systems. Each primer has a different "tooth," or ability to grip the surface.

Once you have selected and applied the appropriate primer, observe the recommended flash-off time. If you apply the basecoat before the primer has dried, it may lead to a reduction of gloss and degradation of color.

Flash-off between the basecoat and clear coat typically involves raising booth temperature to

approximately 176 deg. F. until the paint has skinned over. However, the vehicle body temperature must be reduced back down to 104 deg. F. before the clear coat can be applied. If the body is too hot, the clear coat will dry before it has time to completely flow-out, resulting in the always undesirable "orange peel."

Different color substrate? Consider using a tinting primer or sealer. Worried that a color may not cover well? Don't. Technological advancements have come a long way since the introduction of water-based paints, and today's products offer excellent coverage. Don't make the mistake of spraying heavily to compensate for an assumption of low coverage. Also, don't spray too wet in an attempt to get two-coat coverage in less time. The moisture in an excessively heavy coat may not evaporate fully before you spray the next coat, and can lead to blistering and adhesion problems.

Instead, thin the paint per the paint manufacturer's mixing instructions. Spray a thin first coat for adhesion, flash-off, then apply up to two finish coats, depending on the product. If after drying you have a problem, sand and re-paint.

Solvent cures differently than water-based paints

The solvent in oil-based paints contains a variety of chemical agents that cure at different rates. This allows the solvent to vaporize evenly, and helps give the cured paint a uniform film thickness and smooth surface finish.

Differences in formulation of paints alters their chemical properties and performance, and makes compatibility between paint products a big question mark. To optimize the results of your job, use products from within the same brand, including primer, filler, distilled water, hardener, tints, topcoats, and clears.

It also means that solvent-based paints tend to dry with a minimal amount of adjustment of conditions in the booth. You could add heat to the booth on really cold days, but with solvent-based paints, most of your decision-making is done after choosing the correct reducer and spray gun settings.

Water is simple

Water-based paint contains only 10% solvent, versus up to 75% in solvent-based coatings. Of course, you still can compensate for different booth temperatures by adding slower or faster thinner/reducer, just as you did with solvent-based paints.

But water is simple. Unlike solvent, it has no built-in chemical agents to help manage its vaporization rate. So, you have to manage evaporation as part of the painting process.

Water that has not completely evaporated before you spray the next color or clear coat can become trapped under the acrylic latex as the paint or clear coat dries. This causes swelling or blistering of the coatings above the trapped moisture, or worse, loss of adhesion between layers in the paint film.

The higher solids content of water-based paint requires a different atomization rate than solvent-based paint in order to flow out and form a smooth finish. The letters "WSB" on this HVLP spray gun tip stand for "water solvent borne." It alerts you that this air cap, fluid tip and needle provide the correct atomization to give water-based paint the desired flow characteristics.

To prevent topcoat/clear coat swelling or blistering, allow time for water to evaporate after each step. If you must wet sand to remove a problem, allow approximately two hours at 68 deg. F. for water to evaporate. Your paint technical data sheet will tell you how much time to allow for flash-off between basecoat, additional coats, and clear. If in doubt, you can use a non-contact infrared thermometer to check whether the basecoat is dry enough to spray the next coat.

First, take a temperature reading of an area not in the freshly-repaired panel, for use as a baseline measurement. Next, measure and record the temperature of the just-painted panel. As water evaporates from the film, the panel will cool measurably. Check the temperature of the new paint every five minutes, until it has warmed back up enough to match the temperature of the panel that you did not paint. When a freshly-painted panel is as warm as nearby unrepaired areas, you can feel comfortable that enough water has evaporated to make it safe to spray the next coat.

Refer to the manufacturer's paint data sheet, and always follow the manufacturer's film thickness instructions.

Just add air

Given the same booth temperature, humidity, and air movement, water-based paint may take longer than solvent-based product to flash off, or to dry enough to spray a topcoat over your base. If it is also a high-humidity day, you may need not only to select a fast reducer when mixing the paint, but also to increase airflow in the booth during the drying stage. In a market area that often gets afternoon rain showers during the summer, experienced painters schedule water-based spraying for the morning whenever possible.

To rev up water-based paint evaporation, add more airflow. You can reduce a high humidity level by increasing booth temperature, but only up to your tolerance for heat while you work. Higher temperature will help, but not as much as increased air flow.

We do not want just more of the same downdraft flow. You need turbulent air, and that requires air flowing in multiple directions. The air around the vehicle in a downdraft booth gets saturated with moisture from evaporation. You can reduce that saturation by introducing additional airflow from a different direction than the laminar, or downdraft flow. The cross-flow pushes moisture out of the immediate area around the vehicle, and increases the amount of fresh oxygen molecules that come in contact with the paint film, making it easier to wick out moisture.

Portable and stationary air blowers, and infrared or regular heaters all are acceptable drying equipment.

Store and mix water-based paints only in plastic or inner-coated tin containers to avoid corrosion contamination problems.

Houston, Vegas, Seattle, Denver

It would be nice if ambient conditions in the booth were always perfect: not too wet, not too dry. Because temperature and humidity can vary greatly, even in the same booth and day, painters have to be able to adjust paint mixing formulas for ambient conditions.

Never fear — the learning curve for mastering how to match additives to the climate conditions and the paint product is not too steep. Every Volkswagen-approved paint manufacturer offers training. After training and a few days of practice, painters are ready for prime time.

You can compensate for climate conditions at the mixing stage by including viscosity adjuster additives. Some are good for partial repairs, others for complete panel re-spray. Always consider temperature, humidity, and whether the job involves re-spraying a small area or the full panel, before deciding which additive is best for your repair.

The list of OE-approved reducer and hardener additives differs for different water-based paint product, e.g., two-part or three-part systems, solid color, or pearl/effects finishes, etc., but you must make the appropriate decisions to adapt the paint to temperature and humidity conditions in the booth. Each Volkswagen-approved paint manufacturer provides all of these options and more in a chart format that lets you see the choices side-by-side, so decision-making is easy. Check the climate chart in the paint manual to identify which reducer is best for a given set of in-booth environmental conditions.

Is It Dry Yet?

Water-based paint formulations typically contain more solids – 20% versus 15% pigment, metallic, or pearlescent particles in solvent-based coatings. The higher solids content of water-based paint offers very good hiding power. Once you master the application process, you should enjoy a significant reduction in both the amount of paint required and in labor time per job.

With the proper air flow, some water-based paint dries faster than solvent-based. The big benefit can be faster flash times, which leads to shorter cycle time and higher booth throughput. Painters must pay more attention however, to details that affect how the pigment flakes settle in the paint film. Chief among these are how wet you spray, and how you manage the amount of time it takes for the paint to dry.

Paint gets some of its color from metallic flakes or pearls in the cured film. Gravity makes the flakes tend to turn from a horizontal to a vertical orientation as they sink in the paint film. Before the paint is completely dry, the flake has flattened, or "floped" into a horizontal position.

As ambient light reflects through the pigment and out of the paint film, it lightens the appearance of the color. If the flake settles at an angle that does not reflect light as the paint manufacturer intended, the color will not match the rest of the vehicle. For example, if the desired position is horizontal, but the flake settles in a more vertical angle, it will reflect less light out. An observer will see darker areas where the flakes are more vertical, and lighter color where the flop is more horizontal or flat.

Some pearl finishes feature a spherical particle instead of a flat flake. A sphere reflects the same amount of light when seen from any angle, so there is no vertical or horizontal orientation issue to consider. Still, color appearance is affected by drying time. The depth the pearl has reached when the film is dry determines the amount of light that is reflected out of the paint film. Pearl particles that dry in the middle of the film will reflect more light and make the color appear brighter than pearls that settle at the bottom.

Controlling the flop

With both flake and pearl particles, you control the color appearance by managing the rate of evaporation so that the color flakes are at the preferred angle and desired depth in the film by the time the paint has dried. In the case of pearl finishes, proper mixing and drying results in the pigment pearls all settling at the desired depth in the film. This gives the repaired panel a consistent color depth or saturation, so it has the same tone from edge to edge.

The paint manufacturer knows the correct amount of drying time to lock the flakes in at the desired depth and angle. Refer to the water-based paint application instructions from Volkswagen (or the paint data sheets) for details for the paint you plan to use.

Not too hot, not too cold

You cannot guarantee that your booth will always be in the ideal "Goldilocks" range of temperature, humidity, and air flow to support the perfect paint curing result. You can however, control your painting technique to compensate for the impact of weather variations on finish quality.

Follow paint manufacturer instructions about selection of primers and sealers, and how to adjust spraying times between coats to compensate for the different evaporation rates of various water-based paints. The benefits are many. You can achieve the desired final appearance with water-based in less time than with solvent-based paints. You can enjoy a high level of color match. Thanks to the bonding of molecules in latex paints, you will produce a durable long-term finish. And that's better than a bowl of porridge any day. •

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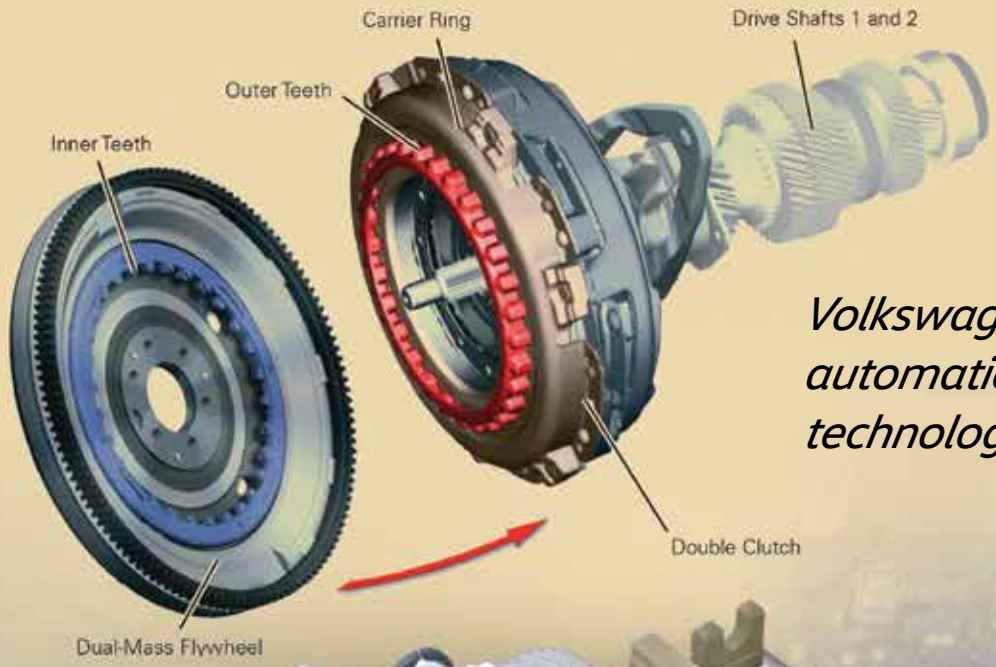
7 Speed Double-Clutch Transmission



Volkswagen's seven-speed automatic transmission is a technological wonder

You may recall having read in a previous issue of Volkswagen TechConnect about the six-speed automatic transmission used in a variety of Volkswagen models. But many technicians are not aware that, for several years, VW has also offered a seven-speed automatic transmission, which is technologically quite different from its six-speed brother.

To date, this seven-speed engineering wonder has only been used in the Jetta Hybrid, and, frankly, it's unlikely that you'll be seeing many of these hybrid vehicles in your repair bays for automatic transmission repair. However, the technology and innovation in these gearboxes is fascinating, and most technicians with any degree of curiosity will be intrigued by its inner workings. So even though you may not get involved in servicing one for years, we're confident you'll find that its design and function make for interesting reading.

To begin with, this seven-speed is officially designated DQ-200-7F, with the "200" referring to the torque rating of 200 Nm, the "7" referring to the number of forward speeds, and the "F" designating front wheel drive. This transmission is designated OAG. The design and function of this gearbox are especially well-suited to the operating envelope of the hybrid propulsion system, although it may find its way into other models with other powerplants in the future since the additional gear ratio can contribute to improved fuel economy and driveability along with reduced exhaust emissions.

The area shown in color represents the equivalent of the two "cluster" gearsets riding on separate, but concentric, drive shafts. Above and below are the two assemblies that serve as the equivalent of traditional mainshafts with free-wheeling gears and synchronizer assemblies.

The differences from the six-speed are many, beyond the addition of an additional forward speed. The gear ratios are different, the gear stacks are set up in a unique way, the seven-speed operates on much higher hydraulic pressure, and it also uses a dry double-clutch arrangement, as opposed to the six-speed DSG transmission, which uses a double wet multi-plate clutch setup, similar to the clutches in a conventional automatic transmission.

Modular construction is new

The Volkswagen seven-speed features a modular design, with the clutch, the transmission unit itself, and the Mechatronic electronic control system each designed as separate modules. In addition, the unit is divided into three separate control/operating systems – hydraulic, electronic, and mechanical. This transmission is air-cooled, not water-cooled, and the transmission fluid is promoted as a lifetime fill, with no routine fluid changes specified.

In effect, the seven-speed automatic transmission is essentially two manual transmissions, each with its own clutch operated interactively by the Mechatronic electronic control system. The clutches are concentric and adjacent. They are dry clutches not unlike those found in a conventional manual transmission. Engagement of the clutches is smooth and seamless, yet firm, all controlled by the Mechatronic unit.

This transmission uses a dual-mass flywheel with both internal and external gear teeth. The external teeth, as you would expect, serve as a ring gear that's engaged by the pinion of the starter motor. The internal teeth of the dual-mass flywheel are positioned to provide power to the two dry clutches by way of external gear teeth on the double-clutch carrier ring.

Now, envision a traditional manual transmission, in which an input shaft directly drives a cluster gear engaging various speed gears that free-wheel about a mainshaft. Gears are selected by way of synchronizer assemblies that firmly connect, one at a time, the speed gears to the mainshaft, which then directs power to the driveshaft and on to the drive wheels.

The Volkswagen seven-speed works in a surprisingly similar fashion, except that it has two "mainshafts" on opposite sides of what serves as a cluster gear, both of which have gears in constant mesh with those on the cluster.

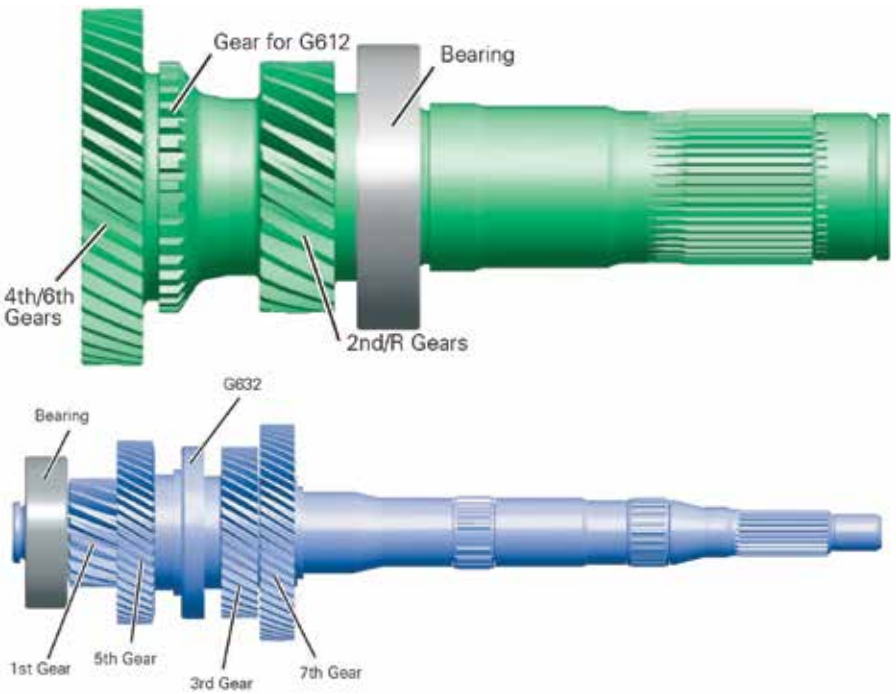
The cluster is actually two sets of gears, in-line, that ride in fixed positions on two concentric drive shafts. Each shaft is splined to one of the two clutch discs, so power may flow through one drive shaft and gears, or may flow through the other drive shaft and gears, depending on which clutch disc is engaged at any given time.

The additional gearset and shaft shown at the top provide opposite direction rotation for reverse gear, as well as a provision for a locking "park" mechanism.

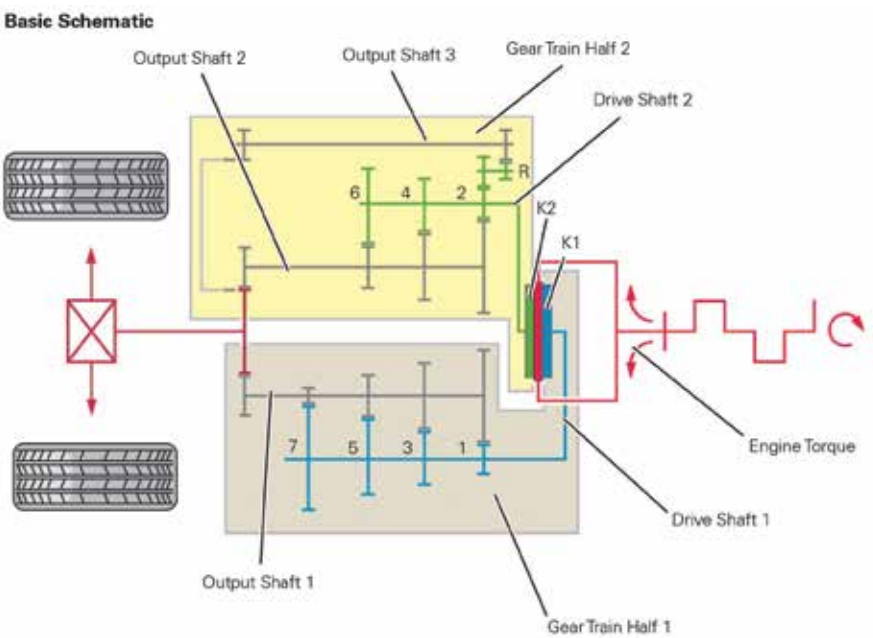
The gears on driveshaft 2, shown in green, provide power to the lower mainshaft/gearset assembly that forms a separate gear train incorporating second gear, as well as a common gear driving fourth gear on the lower gearset and sixth gear on the upper gearset, along with the clutch for this unit. The gear which drives second gear on the lower gearset also drives a compound gearset on the upper shaft which, in turn, drives the reverse gear. The gears affixed to driveshaft 1, shown in blue, power first and third gears on the lower shaft, and fifth and seventh gears on the upper shaft. This drive shaft arrangement allows for a compact drive unit that accommodates the eight (seven plus reverse) gears within this transaxle.

Each of the gearsets on driveshafts 1 and 2 and the reverse driveshaft are then connected to their own output shaft. So, there are actually three output shafts within the transmission assembly. All three engage the differential ring gear in different clock positions around the circumference of the ring gear.

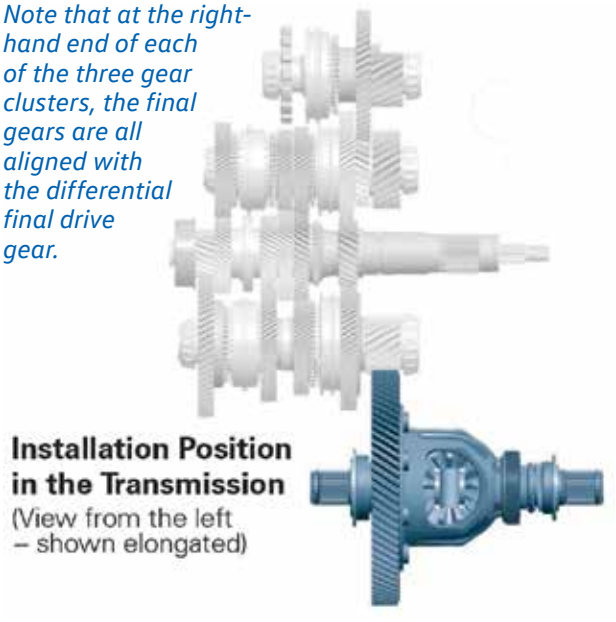
So, in effect, you have three separate pinion gears in mesh with a single differential ring gear, all engaged at the same time, but with power only being transmitted through one output shaft at a time; the other two



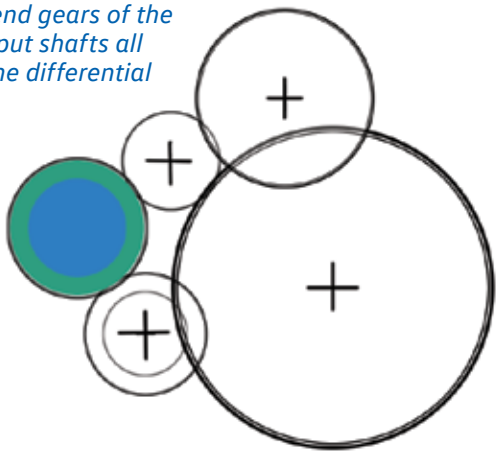
Each of the two driveshaft "cluster" gear assemblies is a solid piece of steel, with driveshaft 1 turning on roller bearings within driveshaft 2.

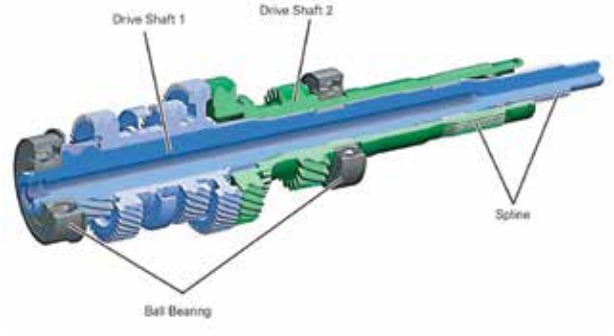


Note that at the right-hand end of each of the three gear clusters, the final gears are all aligned with the differential final drive gear.



Here's an end view showing how the end gears of the three output shafts all engage the differential ring gear.





output shafts are merely idling about the differential ring gear. This activity is analogous to the forward speed gears in a conventional manual transmission, in which first, second, third, etc., all free-wheel around the mainshaft even though they are turning at different speeds due to the gear ratios imposed by the different size drives on the cluster gear.

The genius of this transmission design is two-fold. One key feature is the use of two separate conventional dry clutches. When one is engaged, the other is not, allowing for power transmission via the appropriate gear. This also allows for the next higher or lower gear to be pre-selected before that next gear's clutch is engaged. This allows for smoother and more immediate shifts between gears.

The other distinctive feature is that each gear cluster rides on concentric drive shafts, each driven by one of the two splined clutch assemblies. This drive shaft arrangement allows for a compact drive unit ultimately driving three output shafts, each of which has an output gear which is in constant mesh with the differential ring gear.

Each of the two "manual" transmissions uses conventional synchronizer sleeves and synchro rings as would be found in conventional manual transmissions, with important exceptions. In deference to the loads imposed on each of the various gearsets, lower gears (first, second, and third) actually

Gear	1st to 3rd	4th	5th to 7th	R
Synchromesh	Three synchronizers	Two synchronizers	One synchronizer	
Synchronizer Ring Material	Brass with molybdenum coating			

use three separate synchro rings that are engaged by a common sliding synchronizer sleeve. The use of three synchro rings lightens the load on each, greatly extending synchro ring life while assuring smoother shifts under low-speed/heavy loading conditions.

Fourth gear utilizes two synchro rings, while fifth through seventh gear, which are subject to relatively lighter loads, are fitted with a single synchro ring. Reverse gear is also synchronized to assure smooth engagement, and is fitted with one synchro ring as well. All of the synchro rings are brass with a moly coating.

Gears are selected in a conventional manual transmission manner, with selector forks moving synchronizer sleeves in opposite directions depending on the gear selected.

The shift forks are actuated by hydraulic pressure as directed by the Mechatronic unit. Oil pressure is applied to the gear selector piston, which in turn, moves the selector fork and sliding synchronizer sleeve. A gear selector movement sensor rides adjacent to a permanent magnet, which sends a signal to the Mechatronic unit so it knows which gear is engaged.

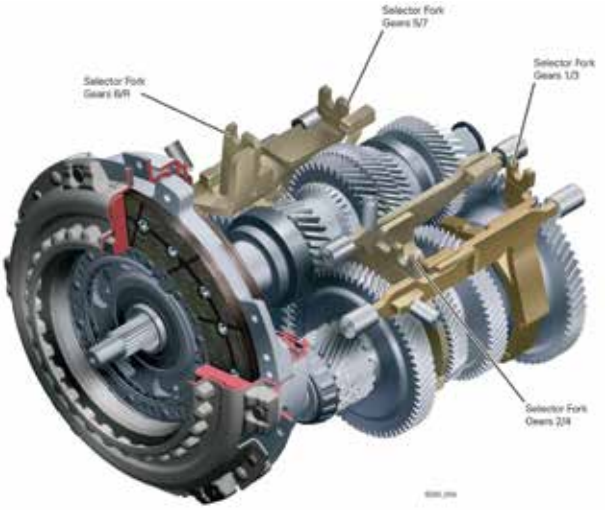
The Park function of the gearbox is performed by a fairly conventional dog ring and pawl. Engagement is purely mechanical via a Bowden cable between the gearshift lever and the parking lock tower on the transmission. This is the only function of the Bowden cable.

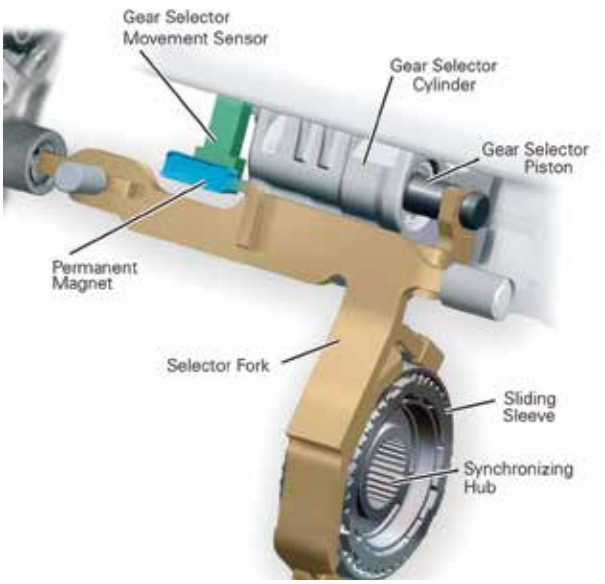
Coming through in the clutch

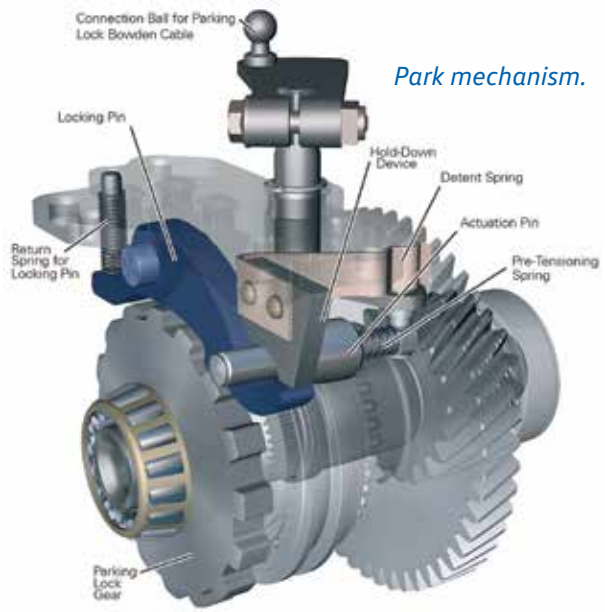
The double-clutch setup in the Volkswagen seven-speed automatic transmission, as shown on the next page, is an engineering marvel. Most technicians are familiar with dual-disc clutch setups in manual transmissions, which provide twice the contact area of single-disc set-ups, and afford extended clutch disc life along with more positive engagement during spirited driving and shifting. Of course, in such arrangements both clutch discs ride on the same transmission input shaft with a two-sided friction plate in between.

The clutch setup in the Volkswagen seven-speed automatic transmission builds on this technology, but with a twist. This double-clutch system also uses two clutch discs, but they are on opposite sides of a "drive plate," which provides the contact surface typically provided by a flywheel in a manual transmission setup, each disc with its own pressure plate assembly.

The clutch discs each have a different size set of internal splines. You'll recall that the input shaft that







Park mechanism.

meshes with the internal clutch disc splines is actually one shaft within another, each with integral gears that essentially make for two input shafts that also function as "cluster" gears. So, in effect, you have two "cluster" gears in-line, each driven by a different clutch disc.

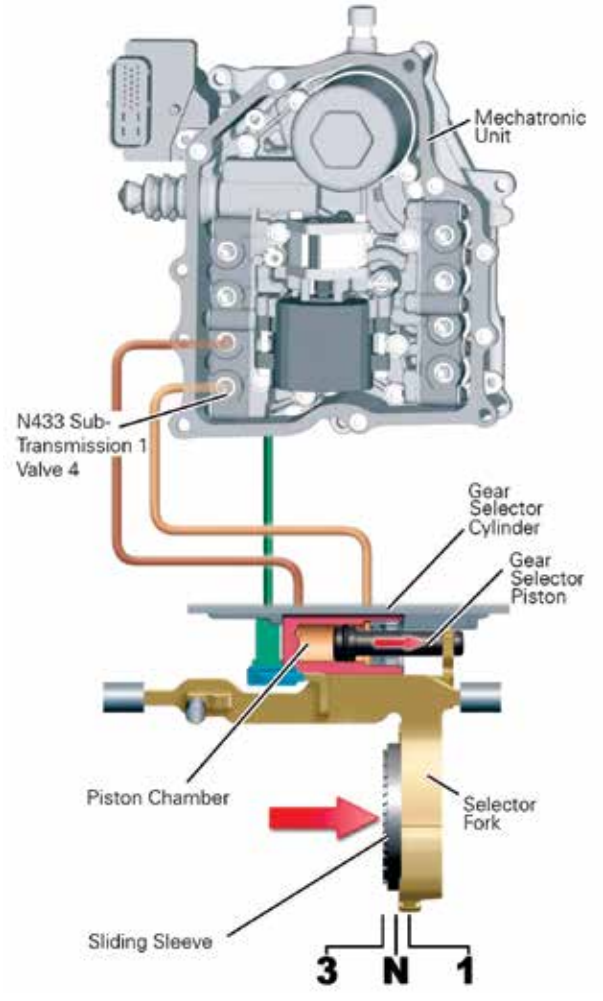
When the car is stationary, both clutches are disengaged. When the vehicle is in motion, one of the two clutches is engaged, with engagement and disengagement carefully coordinated with the movement of the hydraulically-operated shift forks and synchronizers. This whole process is choreographed by the Mechatronic unit, so that all of these dance partners operate in precise unity.

The brain of the system

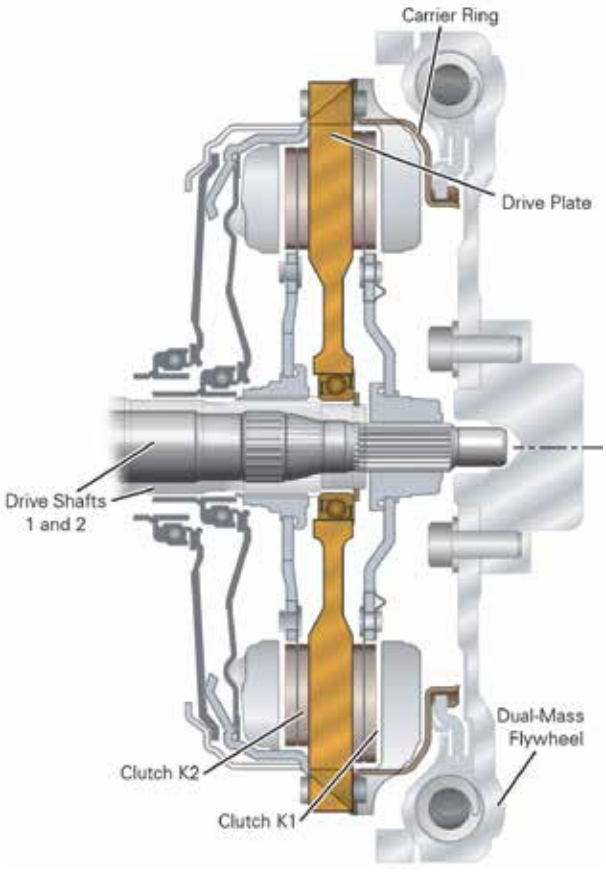
The seven-speed transmission is controlled by the latest-generation Mechatronic unit, which is both mechanical and electronic. It incorporates 11 internal, and one external, sensors to control the eight solenoid valves for shifting the seven gears (plus reverse) and for actuating the double-clutch system.

The Mechatronic system is completely self-contained and autonomous. Besides the sensors just mentioned, it incorporates its own separate oil system and circuitry. This affords several benefits. It prevents particulate contamination that may be present in the mechanical transmission area from entering the Mechatronic unit, and contains a dedicated fluid compounded specifically for the needs of the Mechatronic unit, which differ from those of the fluid in the mechanical portion of the gearbox. And it also affords unusually good low-temperature operation since it is not subject to compromises that would be necessary if its fluid also had to serve the needs of the mechanical portion of the transmission.

The hydraulics within the Mechatronic system consists of an electrically-driven pump, a filter, a pressure limiting valve, a pressure accumulator,



This illustration shows how the hydraulic system, controlled by the Mechatronic unit, directs hydraulic pressure to select first gear. Engagement of other gears is similar, with hydraulic pressure being directed to the appropriate piston chamber.



Note that the two drive shafts shown are separate shafts, one inside the other, and each with its own set of gears that take the role of those on a conventional manual transmission's cluster gear.

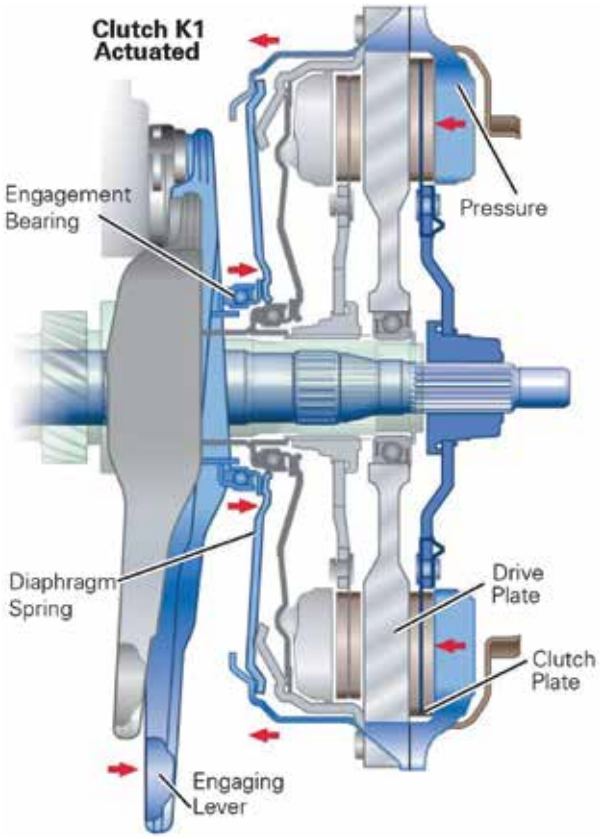
and a hydraulic pressure sending unit, along with supporting circuitry. As with standard engine oil filters, there is a bypass feature that assures that the system continues to function even if the filter or related passages should become clogged.

With all components working in harmony, the seven-speed automatic transmission is able to shift smoothly and seamlessly between gears, thanks to the operation of the electronically-controlled double-clutch setup and the advanced synchronization system that makes use of multiple synchro rings in selected gears.

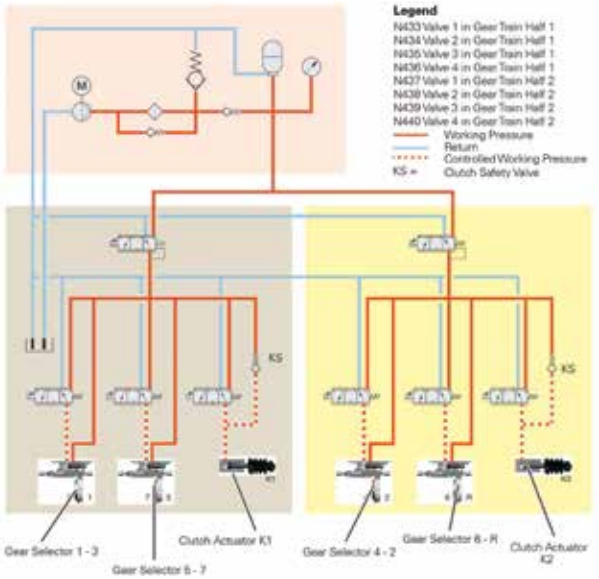
As noted earlier, it's unlikely that you'll see many seven-speed transmission-equipped vehicles come into your shop for gearbox service any time soon. And, inasmuch as they have only been used up until now in the Jetta Hybrid, the special tools and techniques for safely servicing these vehicles dictate that they only be serviced at Volkswagen dealerships with specially-trained technicians.

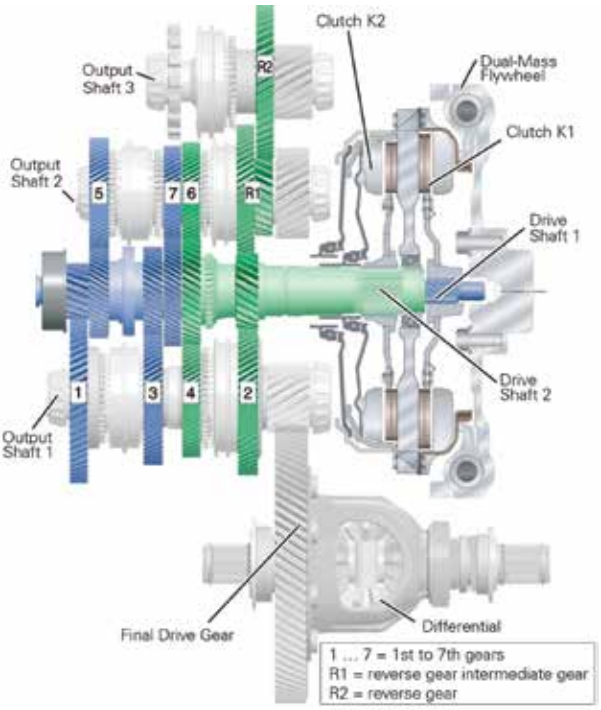
Since there are no externally-serviceable components here, and the fluid fill is for life, there's no need to worry about periodic adjustments or fluid changes. Nevertheless, you have to admire the ingenuity that has gone into development of this advanced transmission, and you have to be fascinated by technology that includes dual concentric input shafts, double-acting electronic-controlled dry clutches, and gear synchronization that features multiple synchro rings.

It is indeed a technological wonder. •



This illustration shows how clutch K1 is engaged, with power passing through clutch disc K1 and on to the innermost splines and drive shaft. Operation of the other clutch assembly is similar.





Here you can see how power is transmitted through the various gear, clutch, and shaft combinations on to the differential.

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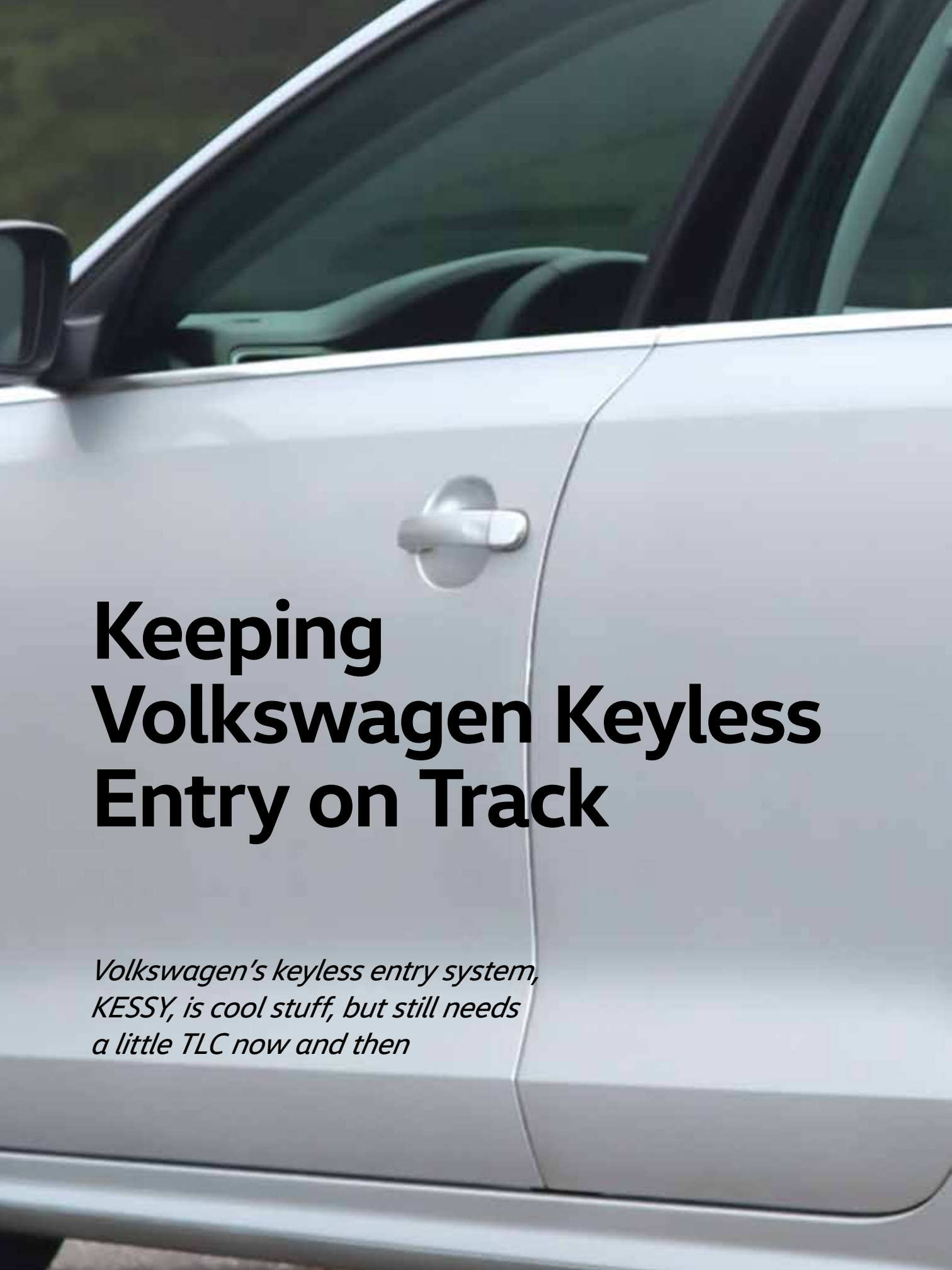


Keeping Volkswagen Keyless Entry on Track

Volkswagen's keyless entry system, KESSY, is cool stuff, but still needs a little TLC now and then

Most of us are used to enjoying keyless entry, no matter what we drive or service, but today's Volkswagen keyless entry system, known affectionately as KESSY, is quite something. Walking up to the car with the key fob in your pocket or purse somewhere in your possession, all you have to do to unlock the car is place your hand in the door handle and, voilà, you're in.

Want access to the trunk or tailgate? You can just place your hand into the trunk handle area and, again, the trunk or tailgate pops open. In Touareg and Passat vehicles, if you're toting a large or heavy object and you have the key fob in your pocket, you only have to sweep your foot in a kick at the trunk, and, yet again, up pops the trunk lid. And when leaving the vehicle, just push the lock button on the door handle and the car is locked.

Neat. This usually works flawlessly day in and day out for thousands of miles and probably years.

Then, all of a sudden, things can go awry, and unlocking the Jetta, Beetle, Golf, or Passat without inserting a physical key just got complicated – the key fob is not working and does nothing, one door lock is not working, the windows work off the passenger side switch, but not the driver's side, or vice versa, the door lock works in only one direction, locks work from the switch, but not the remote, the interior light does not come on when the door is opened, the alarm goes off when the door is opened, and/or many other often quite strange factors appear.

Time to take a look.

Volkswagen's keyless entry system consists of four basic components:

- the key fob and sending unit
- individual door control modules and door lock sensor
- mechanical door locking/unlocking mechanisms
- the central Convenience (or, Comfort) Control Module (CCM), or upgraded unit

Check the fuses!

If the system appears to have gone mad, the solution to these problems can be complicated – or in some cases, very simple. Before going into major diagnosis and troubleshooting mode, do one or both of two things:

- Check the fuses, especially Fuse 14. This is for interior lights and the internal locking system. If it's blown, it will often disable most or all of the keyless entry system. If you find it blown, replace it and see if everything is miraculously fixed. Other relevant fuses are:
  - Fuse 5: Comfort system, cruise control, Climatronic, AC, heated seat control module, and control unit for multifunction steering wheel
  - Fuse 6: Central locking system
  - Fuse 38: Central locking system, luggage compartment light, remote fuel tank door, unlock rear lid or tailgate
- Disconnect both battery cables and touch the positive and negative cables together for a few seconds, discharging any remaining current in the system, then reconnect the cables. This sometimes clears malfunctions and just like turning your computer off and restarting it, can return the system to normal.

It may seem obvious, but if the key fob is not working, there is no keyless entry. If the fob appears lifeless, in most cases the simple fix is to replace the key fob battery, and that may cure the problem right away. The battery is located under a cover at the chrome clasp of the remote key fob.

Touareg and CC four door Comfort Coupe vehicles don't use ordinary keys as such, but have three

Hand inside the door handle and voilà, the door is unlocked.

Push the button on the door handle and the vehicle is locked tight as a drum.

Hand grasps the trunk lock area and open it comes.

buttons in the fob to unlock and lock the vehicle, and open the rear lid. If the VW emblem is pressed along with an additional release under the top of the key, an emergency key pops out of the fob, which is meant to be inserted into the physical door lock under a cover on the driver door handle, and unlocks or locks the door if the remote is not working.

If the fob has not been working and replacing the battery has no effect on KESSY, proceed to the rest of the system.

When the system is working properly, the fob – whether by pushing the button signal or simply by being on the person of an approaching driver – sends a radio pulse signal to the proximity sensor in the lock cylinder when the key fob is within 1.5 meters of the door. This signal "engages" the individual door computer, which is attached to the mechanical door locking/unlocking mechanism.

Door CCM activates unlocking mechanism

When the driver touches the door handle, the door CCM (J386) receives the message from the door lock sensor and relays it to the central control module (J393) located under the carpet near driver's door on older vehicles, behind the dash near the steering wheel, or behind the glove box in later vehicles, or to the Electrical System Control Module (J519) in late model vehicles. This unit incorporates most functions of the former CCM (J393) and is sometimes referred to as a Body Control Module, or Access/Start Authorization Control Module (J518) in late model Phaetons.

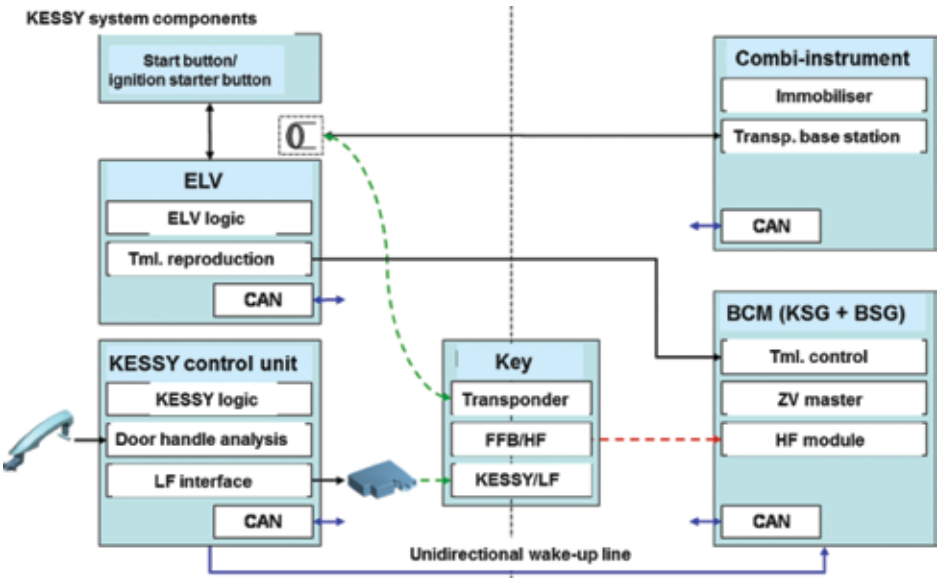
The central control module signals the door's CCM microswitch to "tell" the door module to turn a lever to the mechanical door unlocking/locking mechanism and unlock the door, allowing the driver to open and enter the vehicle. All of this happens with the driver doing nothing but approaching the vehicle and placing his or her hand in the door handle, as long as he or she has the key fob in a pocket or purse.

Passat expands range of sensors

Late model Passat vehicles utilize a battery of sensors and slave modules throughout the vehicle and a more comprehensive central control module handling more functions, called the Access/Start Authorization Control Module (J518), which works with the traditional J393 CCM to unlock and lock doors.

Volkswagen vehicles are equipped with an alarm that sounds if unauthorized entry is attempted, and

No hands because of carrying a bulky object? Sweep your foot in a kick and the trunk will pop open.



Original J393 Convenience Control Module began VW's KESSY keyless entry system.

should keep silent if intended entry is correct, and an immobilizer that freezes vehicle start functions if incorrect entry appears to be underway. The immobilizer was normally controlled by the vehicle ECM, but in late models is included in the central Electrical System Control Module (J519) or Access/Start Authorization Control Module (J518) in late model Passat vehicles.

If a request is received from an immobilizer slave module to activate the immobilizer, a valid key authentication is needed to proceed with starting and operating the vehicle, and this is accomplished primarily with the normal KESSY procedure:

- a signal from the start/stop button is sent from the electronic steering column lock (ESCL/ELV) to the KESSY control unit
- the KESSY control unit communicates with the key in the vehicle interior via a low-frequency (LF) aerial
- the key reports back via its high-frequency (HF) transmitter and through the central Body Control Module to the immobilizer master cluster, authorizing starting the vehicle or immobilizing it

Since the access system includes the immobilizer related components, all four of them will need adapting to match one another if more than one of them is changed. These include:

- Access/Start Control Module (J518)
- Steering Column Lock Actuator (N360)
- Remote key
- Engine Control Module

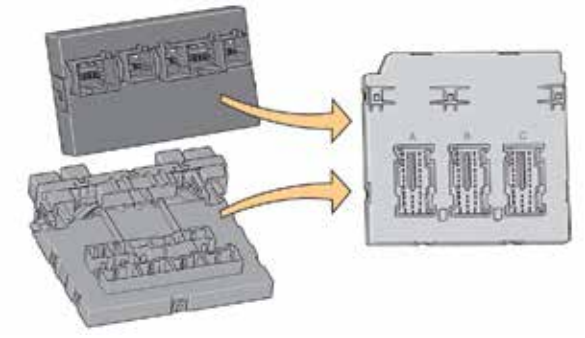
The adaption procedure, normally performed at the factory before the vehicle is released, can be done during servicing using a Volkswagen Scan Tool and ODIS Service.

Control Modules throughout the vehicle transmit signals digitally without separate wiring and respond to KESSY messages to unlock or lock doors and trunk.

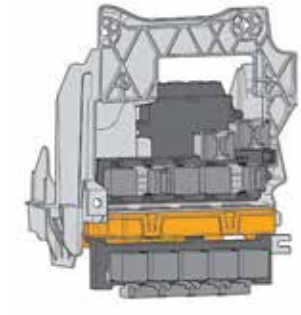
Test unlocking both driver and passenger doors

Not working? Try using the lock/unlock button on the driver's door and passenger door as well as the remote control. If the driver's door is not responding, yet the other doors are fine, the problems is often a dead door lock mechanism, defective door CCM microswitch, or a disconnected door lock wiring harness. If only one door does not unlock, but everything else appears to work correctly, rule out the problem being a defective central CCM.

Remove the door panel to troubleshoot and if appropriate repair the lock/unlock mechanism or replace the door CCM, which is attached to and appears at first to be part of the mechanical lock/unlock mechanism. The microswitch in the door CCM, which governs the unlocking mechanism operations, is prone to fail after time, and without it working that door simply



Former J393 CCM was integrated into J519, controlling keyless entry, other functions.



J519 located behind the dash as was the former CCM.

will not respond to any commands from the key fob. Often, after very carefully disassembling the door CCM from the mechanical mechanism, simply replacing this microswitch, about the size of a holiday postage stamp, will put the whole system back in operation.

What's happening with the door locks?

There could be a problem with the door's lock/unlock linking rod connector. The linkage can sometimes come loose if the doors have been unlocked by inserting a clothes hanger or other device down into the door and hooking into the rod causing it to disconnect. If this appears to be the situation, remove the interior door panel and reconnect or adjust the linkage. The plastic rod retainer may need replacement if it was broken during forced unlocking.

When one door lock is not working, it's probably due to errors within the door, including the switch for that side, latch, actuator, or loose or unconnected wires. If the lock slowly loses speed unlocking and locking - or stops working intermittently and starts again - the mechanical lock/unlock mechanism is most likely to blame.

If more than one door is inoperative, however, including the passenger door, interior lights and even the ability to start the vehicle without a key by simply pressing the start button, it's time to investigate the central control module for possible replacement.

Apparent control module malfunctions often really damaged wiring

Before ordering a replacement control module, however, consider that more often than not what appears to be a defective main module or door CCM is really loose, disconnected, or damaged wiring. If the primary control module is inoperative, carefully check the wiring harness connected to the unit for loose, damaged or broken wiring. If any wiring is broken, this must be corrected either by re-soldering the wire back together, or by using a wire-joining clip. Even if not broken, wires that are missing insulation are subject to moisture and shorting, and should be cleaned and thoroughly taped to restore insulation.

With any suspicion of unseen wiring damage, run voltmeter tests on harnesses at the primary CCM and door units to determine whether or not the wiring is good. If not, carefully trace the wiring to find the problem. Vehicles can have bad solder points where the harness connector mounts to the circuit board at the door locking mechanism, and re-soldering those joints can clear malfunction problems.

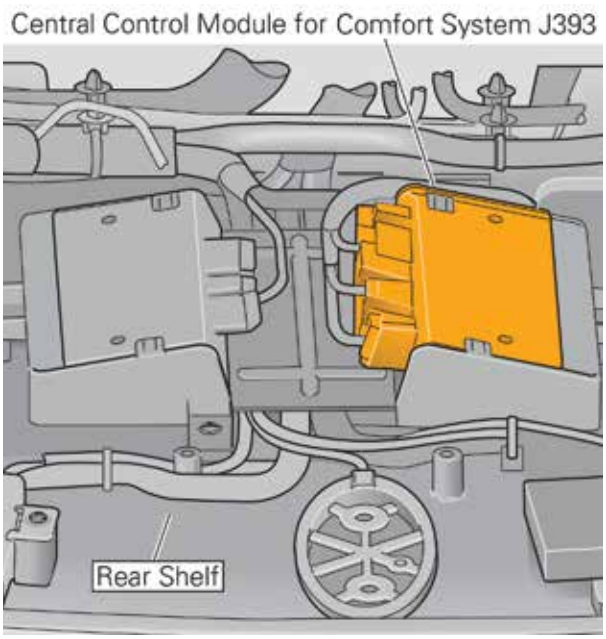
If thoroughly checking for and either finding no damaged or loose wiring or correcting anything found does not restore the CCM and KESSY to sanity, replace the central module.

Match replacement module and existing module part numbers

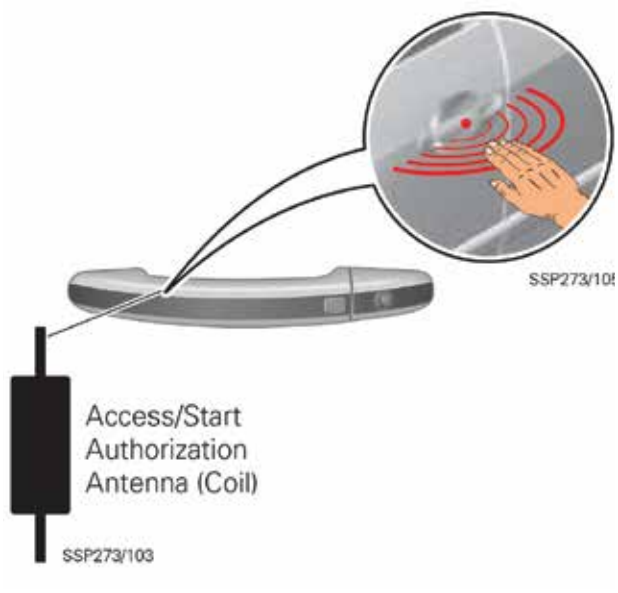
The CCM is located under the carpet in the floor near the driver's door in earlier vehicles, behind the lower dash area behind the glove box in many vehicles from 2009 to 2011, and in later models.

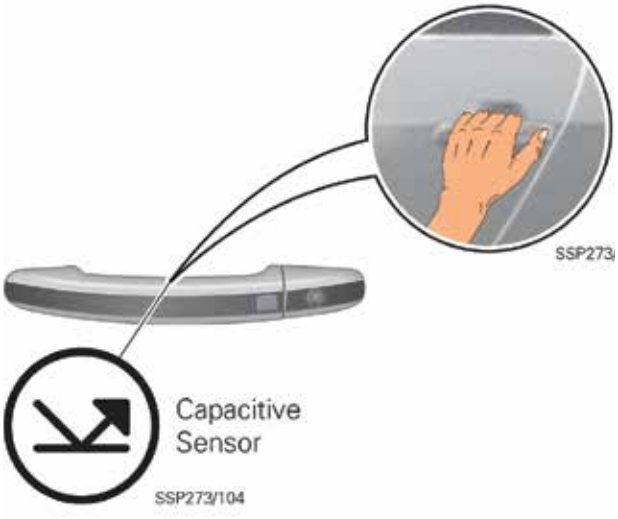
Wherever the CCM is located, it must be re-emphasized that you should check all wiring connected to it for breaks, corrosion, broken insulation, or simply a loose connection. Corrupted wiring will render the CCM useless, and must be thoroughly repaired to put the CCM back into operation, make KESSY work, and ensure that the problem does not reoccur.

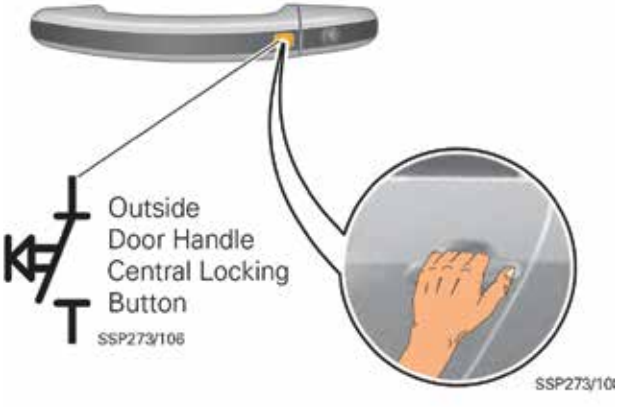
The driver's-side compartment on the floor near the door is prone to taking on water, sometimes soaking the CCM and damaging key wiring. Dry off the CCM if wet, dry the wiring and dry the compartment if damp or containing water. Check to



J518 is located in the trunk below the shelf. Across from it is the trunk lid control module.







It all starts with the door getting the message that the remote is near and a hand is grabbing the door handle.

see that the ground wire that comes out of the plastic control housing and fastens to a stud on the floor pan is sound and not corroded. Check the wiring harness and all connections for corrosion and any of the other plugs and wires going to the CCM. If any wires or connections are not sound – frayed, broken, without insulation – this will either totally stop the CCM from controlling the keyless access system or render its operation quite erratic, so it must be repaired.

Strange keyless access behavior from vehicles equipped with a floor mounted CCM is quite often the result of a water-damaged wiring harness connected to the CCM, not the module itself.

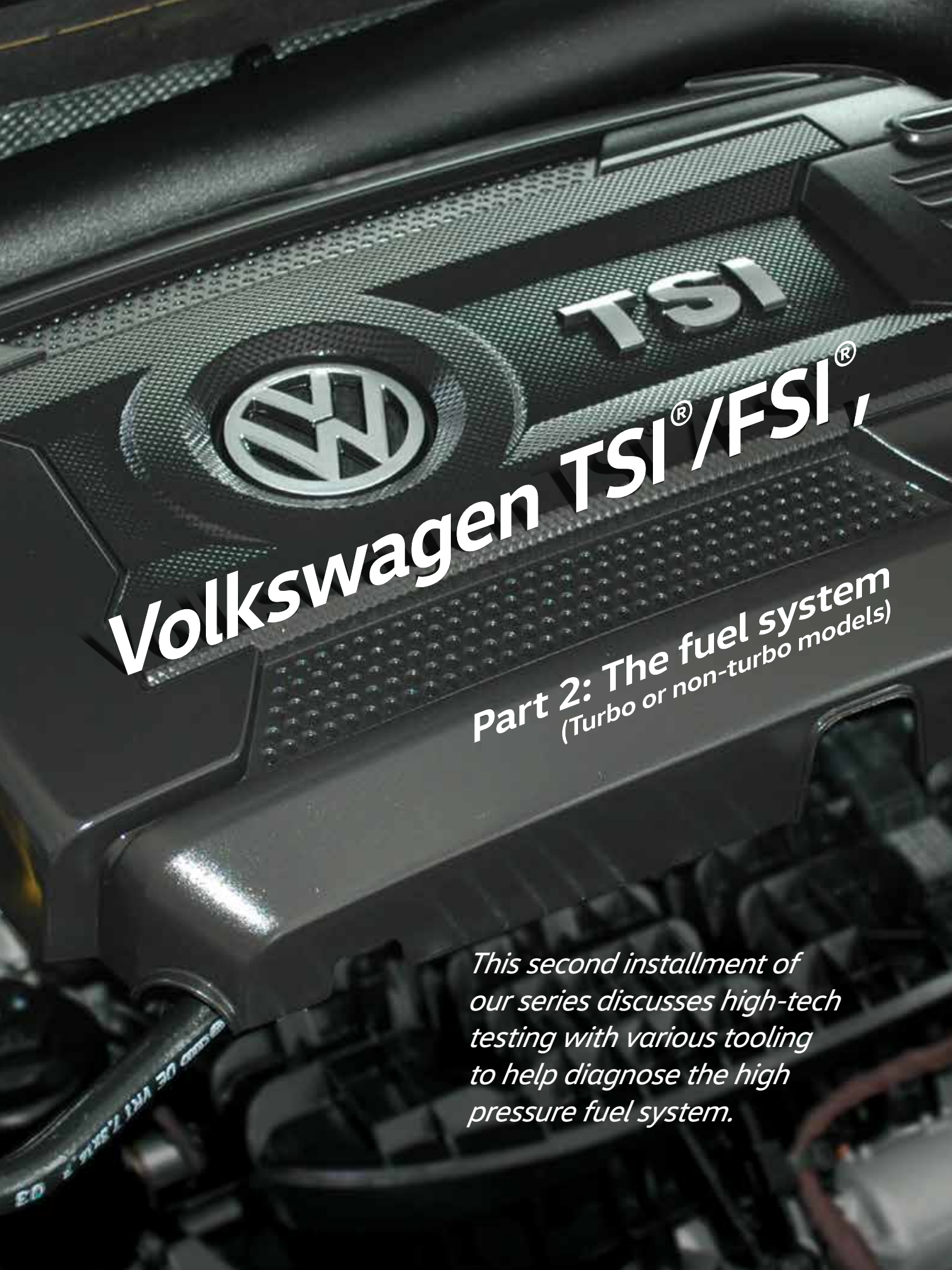
When replacing the central control module, regardless of its location, the new module must match the vehicle VIN – a control module sitting on the shelf can only replace the existing module coming out of the vehicle and operate correctly if they both have exactly the same part number, and a matching module may need to be ordered to install and restore keyless entry. Use a scan tool to get the module part number, or take the existing number from the unit itself - *the replacement module and the unit being replaced that matches the vehicle VIN must have exactly the same part number.*

Once a replacement central module is installed, program the key fob so it transmits the appropriate signals to the KESSY system, unlocks the door when the driver touches the door handle, and turns on the dome light as the driver enters the car.

The vehicle alarm is part of the KESSY system. If the CCM is not operating properly, it could sound erratically at odd times, such as when the door is opened or when simply driving. If this happens after installing a new CCM and programming the key fob, suspect loose wires or connections still not found somewhere in the lock/unlock wiring system, and this should be corrected before turning the vehicle loose. •

Repairing damaged wiring is crucial to proper keyless entry operation.

Inspect wiring for damage and repair anything even slightly suspicious if there are keyless access problems.

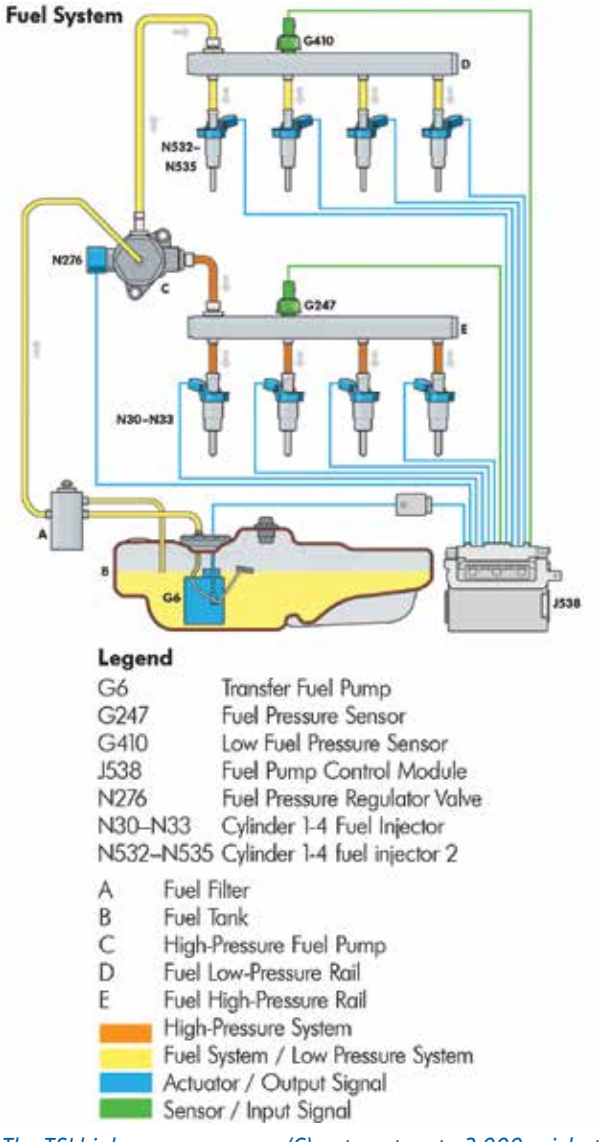


Volkswagen TSI®/FSI®,

Part 2: The fuel system
(Turbo or non-turbo models)

This second installment of our series discusses high-tech testing with various tooling to help diagnose the high pressure fuel system.

The electric in-tank fuel pump is controlled by duty cycle.



The TSI high-pressure pump (C) puts out up to 3,000 psi, but the low-pressure transfer pump (G6) must do its job, too.

Note: Read and understand all cautions and safety procedures before working with the TSI/FSI fuel system.

To repeat what we said in Part 1 of this series: Electrical issues can play a major role in service and repair. The battery and installed controllers should be treated as an integrated system. The power supply discussed in Part 1 of this series is part of a system that can be under stress depending on the environment the systems are subjected to. Repairs, diagnostics and vehicle research should begin with a stable and effective power supply.

Basic knowledge

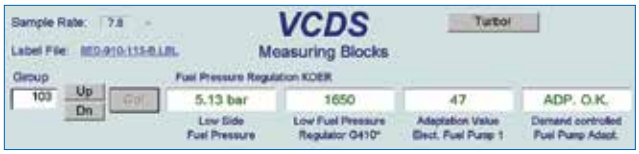
Compared to a port-injected engine, the basics of how the engine operates are very similar. The one major difference is how fuel and air are delivered to each cylinder. All models and all configurations of a gasoline direct injected engine will have these components that differ from those used in a port-injected model.

Currently, all direct-injection models employ an electric fuel pump and a fuel pump control module that is controlled by the ECM. The fuel pump control module activates the electric fuel pump via duty cycle, depending on load and temperature demands. The regulated fuel supplies the mechanical high pressure pump(s). Depending on the engine configuration, you may see more than one high pressure pump. For example; the four-cylinder engine has one pump as opposed to an eight-cylinder engine having two pumps (one per bank).

As noted in our previous installment, the fuel pump G6 and fuel pump control module J538 are located under the rear seat access panel.

Technical data

- Idle speed cannot be adjusted; it is regulated by idle stabilization via ECM.
- Engine speed limitation is via fuel injector shut-off and controlled by the ECM.
- Fuse 28 should be the power supply for the fuel pump control module J538 (refer to the correct schematic).
- This is a duty cycle system.
- Fuel pump control module J538 provides a pulse width modulation signal to fuel pump G6.
- Low fuel pressure sensor G410 measures fuel pressure sent from the fuel pump G6 and sends that data to the ECM J220.



Adapted normal pressure.

Average Pressure at Idle.

- Low fuel pressure sensor G410 is attached between fuel pump (FP) G6 and the high pressure mechanical pump.
- If If reference pressure deviates from the programmed map within the ECM, the ECM will increase or decrease the PWM signal (in Hz) to the fuel pump control module (FPCM). In turn the FPCM will send a PWM signal (in kHz) to FP G6 to achieve the desired pressure.

Running Conditions & Live Data

The two "VCDS Measuring Blocks" images indicate a normally operating fuel pressure system.

What are we looking at and why

The first image indicating group 103 field one, offers an average (actual) ECM controlled low pressure value via low fuel pressure sensor G410 from G6 at idle. The second image indicating group 140 field three, offers an average (actual) ECM controlled high pressure value via fuel pressure regulator N276 at idle.

NOTE: To service the fuel system, fuel pressure MUST be relieved using the following procedure.

Remove the fuse (usually fuse number 28) at idle, and take notice of group 140 field 3.The indication in field 3 will drop very quickly after one to two minutes, because the mechanical high pressure pump is no longer supplied with fuel from the electrical fuel pump from the fuel tank G6.

The indication must not drop below 6 bar, because otherwise the engine will shut off, risking catalytic converter damage.

Switch ignition off once an indication of approximately 8 bar is achieved.

The fuel rail will still be filled with fuel, but it will no longer be under high pressure.

Now, components or lines can be opened. Place a clean towel around the connection in order to capture escaping fuel.

An extreme test and pushing a few limits

Capturing live data while simulating a failed pump offers an insight of how the high pressure pump behaves. Looking at this image, data was captured in group 140, fields 1, 2 and 3 and placed within an excel spread sheet.

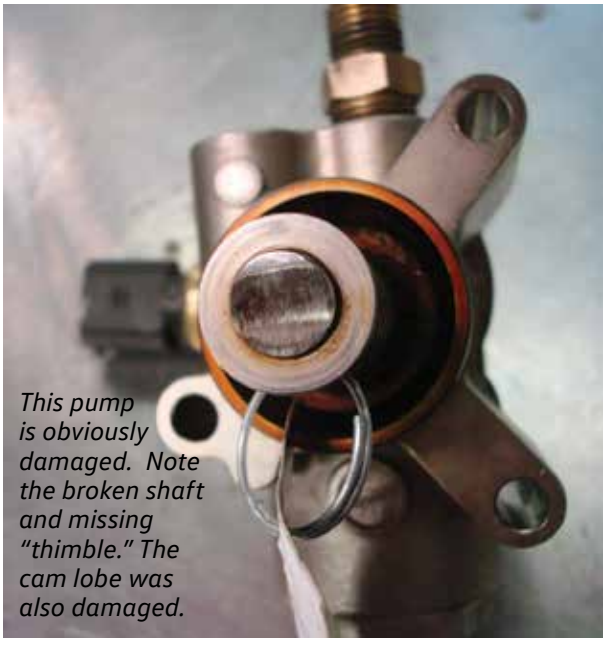
The capture began when the fuse was removed until the engine stalled.

So why are the green and blue lines moving in opposite directions?

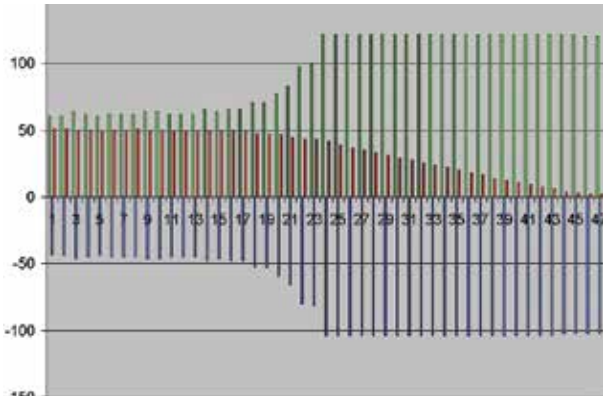
Simply, view it as a check and balance for the Quantity Valve. The spreading values when aligning the red line dropping means that the Quantity Valve (ECM controlled) is opening at a quick rate to maintain idle.

Fuel pressure loss, measured from the low side and high side, plays a critical role that the ECM is attempting to maintain. The only option is to allow far more pressure and flow than the ECM can keep

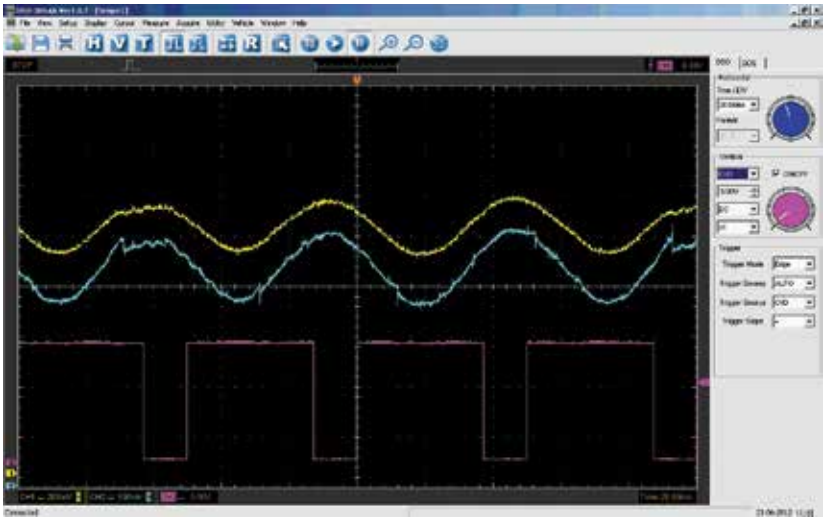
This is the high-pressure pump removed for inspection and testing. Diagnosis proved no faults, no issues with this pump, and a visual inspection also shows no damage.



This pump is obviously damaged. Note the broken shaft and missing "thimble." The cam lobe was also damaged.



Green = Field one: Quantity Valve closing Angle
Blue = Field two: Quantity Valve opening Angle
Red = Field three: Rail Pressure (actual)



Low pressure at idle.

up with. The immediate loss of fuel pressure drives the ECM to control the Quantity Valve rail pressure to its absolute limit.

So what does a Pulse Width Modulation (PWM) (or duty cycle) fuel pump control look like?

The violet trace indicates the pulse width at idle. The more load induced, the longer the pulse width commanded by the ECM.

This is only a test to monitor and examine how the low side pressure transducer behaves with a known perfect pump.

If the fuel system was disabled, expect all lines to flatten in short order.

Note: Volkswagen-approved special tools, lines, and attachments must be used within these fuel systems.

The yellow trace is another pressure transducer added in parallel to the OEM transducer to test relatively good quality pressure transducers on the low side with an oscilloscope.

The blue trace is the OEM transducer measured at the low side.

These specific pressure tests were captured directly at transducer G410.

Since the high pressure pump was removed, the cam shaft count is three lobes only. If the scope image is extended, every hash on the blue trace measuring every third lobe will indicate that the ECM is controlling pressure every third stroke.

These simple oscilloscope tests (without any fuel line attachments) can be accomplished directly at the ECM or at the pressure transducer.

The low side pressure transducer test should be viewed as distinct peaks and valleys, the high side pressure transducer test however should be nearly flat because of some small factors (testing at idle):

(A) the larger inner diameter of the rail

(B) very little fuel is consumed (short injector PW), maintaining constant rail pressure.

Therefore, when increasing idle or load requirements:

- Expect increased FP pulse width.
- Expect increased high pressure.
- Expect longer injector PW. •

Volkswagen TSI®/FSI®, Parte 2

El sistema de combustible
(Modelos con Turbo o sin turbo)

Esta segunda entrega de nuestra serie, analiza pruebas de alta tecnología con varias herramientas para ayudar a diagnosticar el sistema de combustible de alta presión.

NOTA: Hay que leer y comprender todas las precauciones y procedimientos de seguridad antes de trabajar con el sistema de combustible FSI/TSI.

Para repetir lo que dijimos en la parte 1 de esta serie: Las situaciones eléctricas pueden desempeñar un papel importante en la reparación y servicio automotriz. La batería y controladores instalados deben tratarse como un sistema integrado. La fuente de alimentación descrita en la parte 1 de esta serie es parte de un sistema que puede ser sometido a estrés dependiendo del ambiente bajo el cual el vehículo está trabajando. Las reparaciones, diagnóstico e investigación deben comenzar con una fuente de alimentación estable y eficaz.

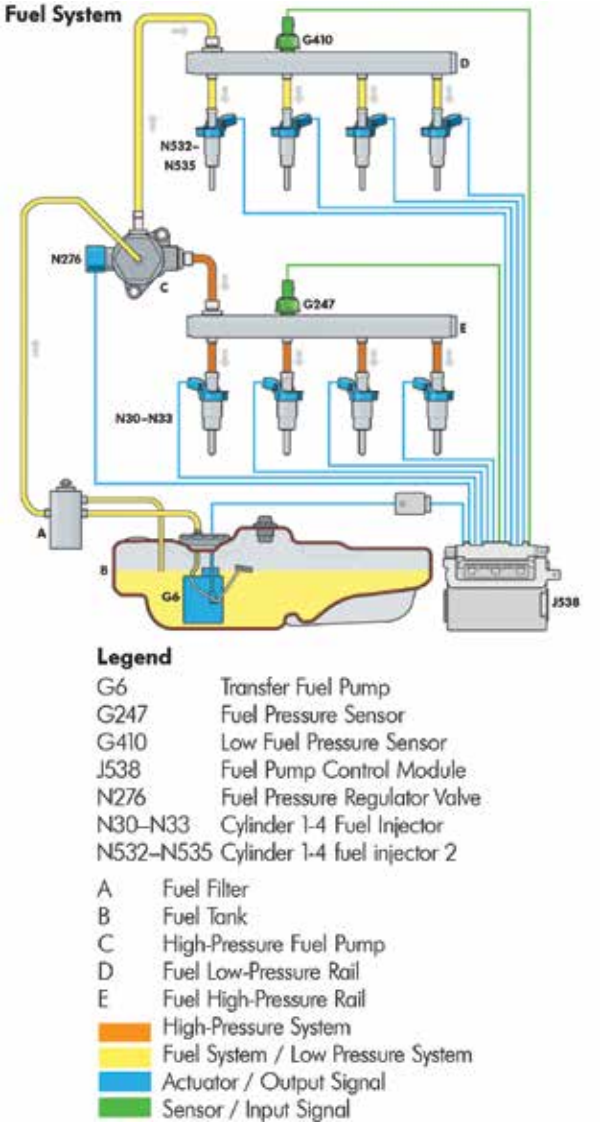
Conocimiento básico

En comparación con un motor de inyección de puerto, los fundamentos de operación son muy similares. Una diferencia principal es la manera en que se entregan combustible y aire a cada cilindro. Todos los modelos y todas las configuraciones de los motores de inyección directa de gasolina, tendrán estos componentes que difieren de los utilizados en un modelo de inyección de puerto.

Actualmente, todos los modelos de inyección directa emplean una bomba eléctrica de combustible y un módulo de control de bomba de combustible que está controlado por la ECM. El módulo de control de la bomba de combustible activa la bomba de combustible eléctrica mediante un ciclo de trabajo (duty-cycle), dependiendo de las exigencias de carga y temperatura. El combustible regulado proporciona la bomba mecánica de alta presión. Dependiendo de la configuración del motor, se puede ver más de una sola bomba de alta presión. Por ejemplo, el motor de cuatro cilindros tiene una sola bomba mientras el motor de ocho cilindros tiene dos bombas (una por cada banco).

La bomba de combustible eléctrica en el tanque se controla por un ciclo de trabajo (duty-cycle).

Izquierda: Esto es una bomba de alta presión que se quitó para la inspección y pruebas. El diagnóstico probó que no hay fallas, ningún problema con esta bomba, y una inspección visual también no muestra ningún daño.



La bomba de alta presión de TSI (C) suministra hasta 3,000 psi, pero la bomba de transferencia de baja presión (G6) debe hacer su trabajo, también.

Como se señaló en nuestro artículo anterior, la bomba de combustible G6 y el módulo de control de la bomba J538 se encuentran debajo de un panal de acceso del asiento trasero.

Datos técnicos

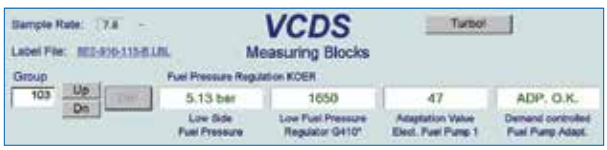
- La velocidad de marcha mínima no puede ser ajustada; se regula por la estabilización de marcha mínima por la ECM.
- Limitación de la velocidad de motor es a través de apagar los inyectores de combustible y controlado por el ECM.
- El fusible 28 debe ser la fuente de alimentación para el módulo de control de la bomba de combustible J538 (consulte el esquema correcto).
- Este es un sistema de ciclo de trabajo.
- El módulo de control de la bomba de combustible J538 proporciona una señal de modulación de ancho de pulso a la bomba de combustible G6.
- El sensor de presión baja de combustible G410 mide la presión del combustible de la bomba G6 y envía esos datos a la ECM J220.
- El sensor de presión baja de combustible G410 se une entre la bomba G6 (FP) y la bomba mecánica de alta presión.
- Si se desvía la presión de referencia del mapa programado en la ECM, la ECM aumenta o disminuye la señal PWM (en Hz) para el módulo de control de bomba de combustible (FPCM). A su vez la FPCM enviará una señal PWM (en kHz) a FP G6 para alcanzar o mantener la presión deseada.

Condiciones de Funcionamiento y Datos en Vivo

Las imágenes de dos "VCDS Measuring Blocks" indican un sistema de presión de combustible trabajando normal.

Que estamos mirando y por qué

La primera imagen que indica grupo 103, campo uno, enseña un valor promedio (actual) de control de la ECM de baja presión a través del sensor de presión baja del combustible G410 de G6 a marcha mínima. La segunda imagen está indicando grupo 140 campo tres, que enseña un valor promedio (actual) de control de alta presión de la ECM a través del regulador de presión de combustible N276 a marcha mínima.



Presión normal adaptada.

El promedio de presión a marcha mínima.

NOTA: Para hacer servicio del sistema de combustible, la presión del combustible debe aliviarse usando el siguiente procedimiento.

Quite el fusible (fusible generalmente el número 28) a marcha mínima y note el grupo 140, campo 3. La indicación en el campo 3 caerá muy rápidamente después de uno o dos minutos, porque la bomba de alta presión mecánica ya no se suministra con la gasolina de la bomba de combustible del tanque G6.

La indicación no debe caer debajo de 6 bar, porque de lo contrario el motor se apaga, y hay el riesgo de daño del convertidor catalítico.

Apague la llave una vez se logra una indicación de aproximadamente 8 bar.

El riel de combustible todavía estará lleno de combustible, pero ya no estará con alta presión.

Ahora, se puede abrir los componentes o líneas. Coloque una toalla limpia alrededor de la conexión para capturar el combustible que puede escapar.

Una prueba extrema y empujando unos limites

Capturando datos en tiempo real mientras simulando una bomba fallada ofrece una visión de cómo la bomba

Esta bomba está dañada obviamente. Tenga en cuenta el eje roto y la falta de un "dedal". También fue dañado el lóbulo del árbol de levas.

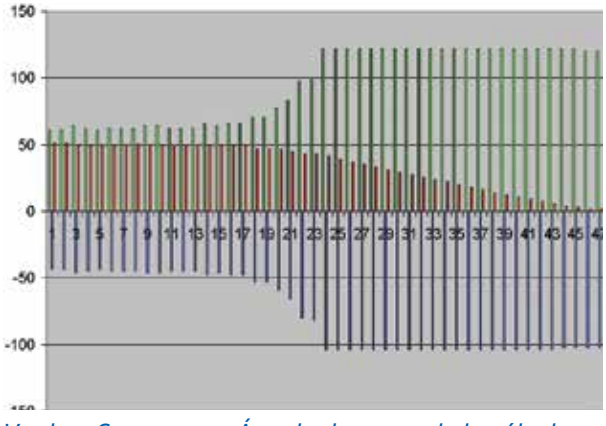
de alta presión se comporta. Mirando esta imagen, se nota los datos capturados en grupo 140, campos 1, 2 y 3 y colocados dentro de una hoja de Excel.

La captura comenzó cuando se quitó el fusible mientras el motor se apagaba.

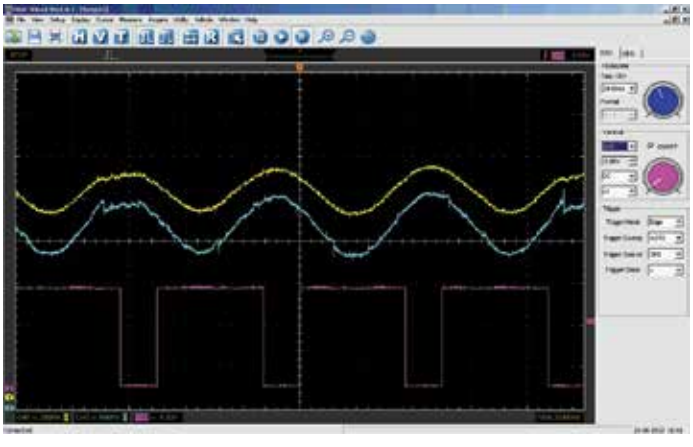
Así que ¿por qué las líneas verdes y azules avanzan en direcciones opuestas?

Simplemente, se ve en ellas la función y equilibrio de la válvula de volumen (Quantity Valve). Los valores que se separan cuando se alinean a la línea roja significan que la válvula de volumen (controlada por la ECM) está abriendo rápidamente con el fin de mantener la marcha mínima.

Pérdida de presión de combustible, medida desde el lado bajo e igual el lado alto, juega un papel fundamental que la ECM está intentando mantener. La única opción es permitir más presión y flujo que la ECM puede mantenerse. La pérdida inmediata de la presión de combustible impulsa la ECM para controlar la presión a través de la válvula de volumen hasta el límite absoluto.



Verde = Campo uno: Ángulo de cerrar de la válvula de volumen (Quantity Valve)
Azul = Campo dos: Ángulo de abertura de la válvula de volumen (Quantity Valve)
Rojo = Campo tres: Presión del Riel (actual)



Baja presión a marcha mínima.

Entonces, ¿cómo aparece una modulación de anchura de pulso (PWM o ciclo de trabajo) de control de la bomba de combustible?

El trazado violeta indica la anchura de pulso a marcha mínima. Induciendo aún más carga, así más el ancho de pulso comandado por la ECM.

Esto es sólo una prueba para supervisar y examinar cómo se comporta el transductor de presión del lado bajo con una bomba conocida como buena.

Si se deshabilita el sistema de combustible, puede esperar que todas las líneas de valores se ponen planos en poco tiempo.

NOTA: Accesorios y herramientas especiales aprobados por Volkswagen deben utilizarse dentro de estos sistemas de combustible.

El trazado amarillo es otro transductor de presión en paralelo con el transductor del vehículo para probar los transductores de presión en el lado de baja presión de combustible con un osciloscopio.

El trazado azul es el voltaje del transductor del vehículo en el lado de baja presión.

Estas pruebas de presión fueron capturadas directamente en el transductor G410.

Desde que se quitó la bomba de alta presión, la cuenta de lóbulos en el árbol de levas es solamente tres. Si la imagen del osciloscopio se extiende, cada marca en el rastro azul midiendo cada tercero lóbulo indicará que la ECM controla la presión en cada tercer golpe.

Estas pruebas sencillas de osciloscopio (sin cualquier accesorio de la línea de combustible) pueden realizarse directamente en la ECM o en el transductor de presión.

La prueba del transductor del lado de baja presión debe ser vista como valles y cumbres distintas, sin embargo la prueba del transductor de presión del lado alto debe ser casi plana debido a algunos factores pequeños (la prueba en la marcha mínima):

(A) el diámetro interior más grande del riel

(B) muy poco consumo de combustible (pulsos muy cortos), manteniendo presión del riel bastante constante.

Por lo tanto, al aumento de revoluciones o requisitos de la carga:

- Puede esperar mayor ancho de pulso de la bomba.
- Puede esperar aumento de la presión alta.
- Puede esperar mayor ancho de pulso de los inyectores (PW). •

Volkswagen High Strength Steel Training

Hands-on, Practical, Awesome!

Traditional collision repair techniques are not effective at restoring today's automobiles to pre-collision performance. Restoring integrity to modern advanced high-strength steel components and structures requires that decisions regarding whether to repair or replace damaged components, what attachment methods to use, and even what tools and equipment to use, are all made properly.

Background image in part by BSGStudio

Volkswagen vehicles are made with advanced high strength steels (HSS), and that changes everything. How many times have you heard, or asked, "Can I straighten this high-strength steel part?" What impact does the fact that a part contains several types of HSS in different layers of its material stack have on the choice of attachment method? Did you know that some structural components can have one type of reinforcement on one end and transition to a completely different HSS reinforcement on the other end – of the same part? The answers to these and many other critical collision repair questions are in the Volkswagen High-Strength Steel Training course.

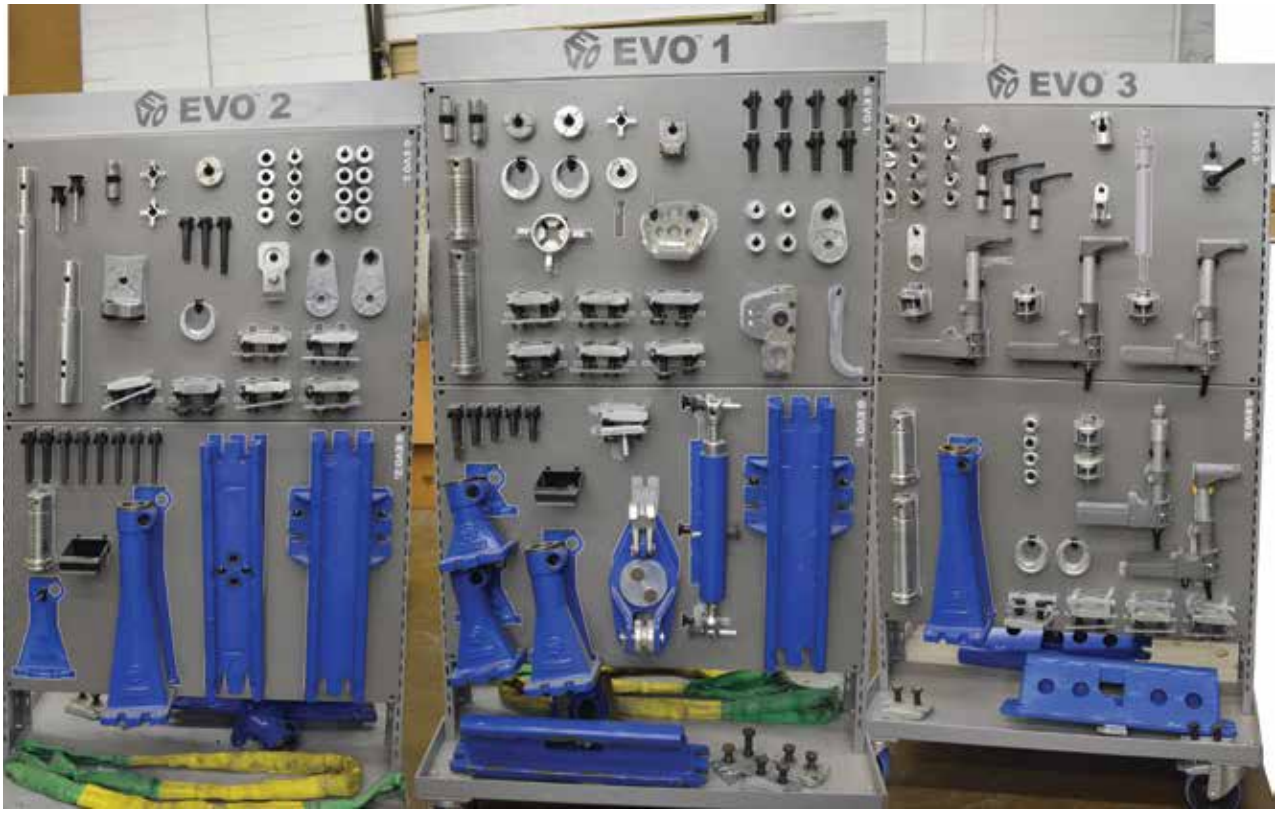
You know that Volkswagen publishes detailed information in excellent collision repair manuals and online resources. However, there is nothing like live, instructor-led training. Now you can get state-of-the-art training on Volkswagen's advanced high-strength steel repair procedures in a 40% classroom, 60% hands-on format. The two-day class is limited to 8-10 technicians, so you'll get plenty of personal attention from Volkswagen instructors.

High-strength steel is less workable than mild steel

Post-collision workability of high-strength steel tends to be less than mild steel because HSS has already been hardened to the desired level for its automotive application. Any bending or re-forming, such as occurs in a collision, can cause work hardening that tends to make the steel brittle. If you then attempt to cold-straighten and bend the steel back to its original dimensions, the brittle material may tear, or develop micro-fissures and cracks that leave it vulnerable to part failure in a future collision.

Repair or Replace?

Knowing what the damaged component is made of, and whether that material can be repaired or must be replaced after sustaining collision damage, is critical. Thanks to ingenious chemists, metallurgists, and engineers, there are dozens of different types of high-strength steel in use on today's Volkswagen vehicles.



The VW family of anchoring jigs includes basic (EVO 1), specialty (EVO 2), and universal (EVO 3) jig kits that work with any of four different VW-approved Car-O-Liner measuring and alignment systems.

Different steels offer a range of properties important to automobile safety. Each type is formulated to offer a specific range of tensile strength (the maximum force the steel can handle before it will fail), ductility (the ability to be easily formed into different shapes), joining capabilities (how well the material responds to welding or other attachment methods), and other factors. These and other material properties have a major impact on which collision repair options are acceptable for a given component and damage scenario.

If the damage is not too extensive, some HSS exterior panels can be cold-straightened. If an HSS part is a structural component, replacement is the only option. There will be a factory-required location where you can install a replacement.

You don't have to know the metallurgy. Thankfully, there is Volkswagen's high-strength steel training program. The class covers the types of HSS used on various models, and which parts are made of HSS. It walks you through using the company's Elsa and erWIN online repair information systems. You'll learn where HSS parts are located on any VW model, and how to access factory-approved step-by-step replacement procedures. You'll see demonstrations of how various components respond to heat, pulling, and different joining technologies, and get live, on-car practice in the repair or replacement options that Volkswagen deems appropriate for a given component.

Master Welder

Technicians in the Volkswagen Certified Collision Repair Facility program and in Volkswagen Dealer-owned body shops can attend the HSS and other Volkswagen collision training classes. Contact Ashley Biggs, Volkswagen CCRF Program Coordinator (703) 364-7642 or Warren Barbee, Collision Technology Instructor, Volkswagen Academy (703) 364-7192.

After completing this Volkswagen class, you'll know so much about working with HSS, your repair efficiency, cycle time, and repair effectiveness will be off the charts. You won't want to wait until next year to see what's new to learn. •

The rear lower body panel on this 2013 VW Tiguan contains HSS, but can be straightened if the damage is minor.

Photos courtesy of Jim Ellis Collision Center, a Volkswagen Certified Collision Repair Facility in Atlanta, Georgia.

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 OE-quality replacement parts at competitive prices and the technical information you need to 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.

Tom Piefer,
Wholesale Parts Field Operations Specialist, South Central Region

It started out as a "summer" job...

I wonder how many of you have said the same thing. I was about to end my first year of college and needed a way to make some money. My dad was a salesperson at our local Volkswagen dealer and got me a job in the detail shop. Before the end of the summer, I became a parts driver, then subsequent moves to a shipping and receiving clerk, and then the retail parts counter. I would spend the next 18 years of my "summer" job at two different dealerships in the Denver market, working as a parts consultant, assistant manager, parts manager and then IT.

In May of 2002 I had the opportunity to join Volkswagen of America as the Parts Training and Merchandising Specialist for dealers serviced out of the Fort Worth Parts Distribution Center (PDC). I traveled throughout the service area delivering training on parts systems and processes as well as consulting with dealers on ways to make the most of their part sales opportunities. I later moved into the role of Inventory Manager then Operations Manager at the PDC. Perhaps my most exciting time at the PDC was when I was on the team that launched Parts Logistics operations to support the Chattanooga-built Passat.

Before Chattanooga, we were pretty much an importer, ordering parts from Germany and Mexico then selling them to dealers. Passat introduced a lot of new complexity, including managing relationships with over 200 suppliers and exporting parts to Germany and Mexico. As part of the NMS team I had the pleasure of helping develop the logistics processes to support the new Passat and then opened the distribution center that would meet worldwide demand for service parts.

When the Wholesale Parts team was formed in 2014, I saw it as a chance to get back to my roots. I love to go into dealers and use my experience in multiple facets of the business to help improve their sales and operations. Whether it's helping them with our suite of Wholesale tools like CRM and Genuine Advantage, giving inventory advice, or looking at the layout of their department, I kind of see it as giving back. This brand and industry have meant a lot to me over the last thirty plus years. We have all seen the good and the bad, but I can't start to tell you where I would be without Volkswagen.

From washing cars to helping launch them – and many roles in-between – I have to say it's been a pretty interesting "summer" job. •

Thank you for your Continued Support
Volkswagen Certified Collision Repair Facility Appreciation Dinner

Volkswagen Certified Collision Repair Facility Owners and their guests enjoyed dinner and entertainment at our annual Appreciation Dinner in Las Vegas, Nevada on Wednesday, November 4th 2015. With the AAPEX/SEMA convention beginning November 3rd, it was an excellent opportunity for guests to mix business with pleasure, and a great time was had by all!

During the event, Volkswagen held a raffle, through which, with the generosity of attendees, raised $845 for the Yellow Ribbon Fund – a 501(c)(3) organization that raises money for the severely injured service men and women. The Yellow Ribbon Fund is an incredible organization headquartered in Bethesda, MD which Volkswagen is proud to support.

The Yellow Ribbon Fund recognizes the importance of keeping a family together during the critical recuperation phase and was founded to serve the injured coming back from the wars in Iraq and Afghanistan. They provide practical support to injured service members and their families while they're at Walter Reed National Military Medical Center, Fort Belvoir Community Hospital, and after they return to their hometowns.

Since its beginning, more than 80 cents of every dollar spent has gone directly to programs and services, thanks in part to the small staff and a volunteer force that has grown to more than 1,300. Visit yellowribbonfund.org for more information on how to support our service men and women.

Volkswagen of America would like to thank the Certified Collision Repair Facility network, members, and their guests for the the donations during the dinner and work they do everyday that helps to ensure Volkswagen owners receive the quality repairs necessary to maintain their vehicle's market value and original equipment safety standards. It was terrific seeing everyone and we look forward to seeing you at AAPEX/SEMA next year.

Sincerely,
The Volkswagen Wholesale Operations Team

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