Upgrading to the automatic dimming/rain sensor mirror.

Guinea pig vehicle: 2001 Golf GLS TDI

Prices are US dollars (list prices from the sources) and subject to change without notice and exclude taxes, shipping and handling. Sources are given below for reference and are not to be construed as an endorsement. Other sources are available. Items marked (*) are optional depending on wiring method used. See description for details.

Parts sourced from IMPEX (www.vwparts.com):

Mirror (3B0 857 511 H)	192.95	Conduit (3B0 857 591 A)	7.35
Cap (3B0 858 547 A)	3.78	Conduit (3B0 857 594 A)	6.42
Cap (3B0 858 548 A)	4.30	Relay (1J0 955 531)	57.16

If you have a grey interior, add color code Y20. If you have a tan interior, add color code 8YS.

Parts sourced from local VW® dealer:

Repair wire* (000 979 135)	2.45	Connector* (4B0 971 833)	2.50
Repair wire* (000 979 133A)	2.05	Connector*(4B0 972 623)	4.70
Rain sensor (1J0 971 411A)	171.40	Repair wire* (000 979 003) (Price each - 3 required)	1.90

Parts sourced from local AutoZone:

Littlefuse® MINI® Add-A-Circuit™	6.99

Parts sourced from local Radio Shack®:

3 spool pack of #22 stranded wire 278-1224	4.49
Heat shrink tubing* 278-1627	1.99

Parts sourced from local Home Depot®:

Ring terminals 781789700052	0.69	Butt splices 781789700380	0.69
Red splices 781789700281	0.69		

Parts sourced from the Whoopee Bowl, Clarkston, MI:

Cloth electrical tape (Cost unknown; it has been in-stock awhile. Common electrical tape can be substituted.)

Parts sourced from Mouser Electronics (www.mouser.com)

Connector* 571-876673 (Price each – 6 required)	0.19

Tools used:

T-20 Torx® screwdriver (your size may vary depending on the screws used in your car)

#2 Phillips screwdriver	Needle nose pliers
Flat blade screwdriver	Wire stripper/connector crimping tool
Cotter key puller (Sears® Craftsman® 4319)	Popsicle stick

Taking into consideration everything you are about to read, **this project should only be done if the windshield needs to be replaced** if you want the VW supplied automatic dimming/rain sensor mirror. Budget at least $550 USD plus windshield cost, if any. Read all directions through at least once before proceeding.

The mirror uses a different mounting (3B0 845 543 A). The Bentley CD describes using a heat gun and gentle persuasion to remove the existing mount. Unfortunately, the opportunity to explore this possibility escaped. It did not believe that this could replace the existing mount due to the blackout ceramic coating applied to the windshield. It would require removal of the ceramic coating probably resulting in scratched glass. My first step was to investigate the truth of this hypothesis. (Note: The local dealer says he cannot get separate adhesive for the mount. It must be mounted at the glass factory. The Bentley CD references a specific adhesive kit.)

First step is to remove the existing mirror. A careful attempt of this was made, but just as the mirror was about to release from the mount, the dreaded crack sound was followed by the visual effect typically associated with that sound coming from a glass object. Therefore, it was necessary to replace the windshield. GLX windshield was installed as a replacement. It comes with the rain sensor mirror mounting. Replacement cost was the insurance deductible. It was well pitted from rocks during the past year anyway.

When the glass shop asked if my windshield had a rain sensor, I said "No, but I would like to add one." They were kind enough to install the GLX windshield. An excellent installation was performed by Billy Fisher at Harmon Autoglass in Gladstone, MO (an unsolicited acknowledgment of a job done well). The windshield was identified as FW02117GYYN and the adhesive used is HAH016000. The car was left in the morning and a "It's ready" call was received about 14:30. The car does have to sit for at least a couple of hours to allow the adhesive to set up.

Billy informed me that if the mirror didn't come off properly, the other possibilities are that the glass breaks (like this one), or if the windshield is hot (such as on a hot day, sitting in the sun) the mirror mounting comes off with the mirror. This makes it very difficult to separate the mount from the mirror if you want to glue it back on.

If you happen to get the mirror off without breaking the windshield, you could remove the mounting (using a heat gun and pliers, adhesive remover, very fine sand paper, non-residue cleaner and a gentle touch), and glue on a GM or Chrysler (slightly larger - recommended) type button in the center of the ceramic blackout. This would allow you to mount other aftermarket autodimming mirrors with other features. Sources of these are Donnelly (www.donnelly.com) or Gentex (www.gentex.com sold via www.mitocorp.com). Mito sells a 10.5-inch wide Gentex autodimming only mirror, as well as a wider one with compass and thermometer options. This latter mirror is also available from J.C. Whitney (www.jcwhitney.com), other mail order places, and possibly through local customizing shops. (Mito Corp. customer service has been top-notch *years* after purchasing a product from them, in my experience.) The Donnelly mirrors are available direct from Donnelly and possibly through local customizing shops. Refer to the instructions below to aid in wiring the autodimming function of any of these mirrors.

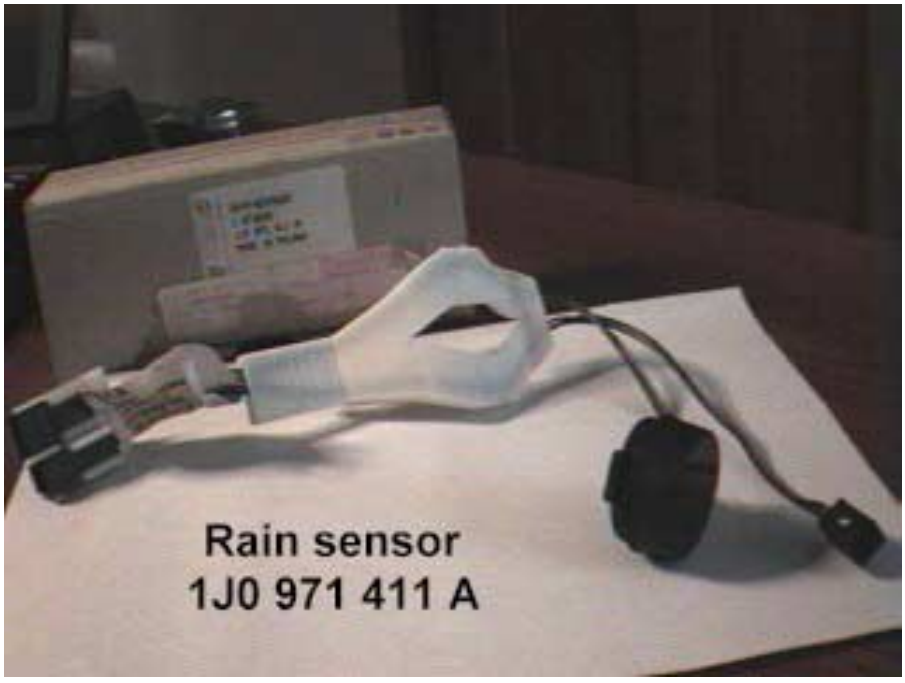
The new mounting looks like this (A white sheet of paper on the outside of the windshield was used for background and provide contrast):

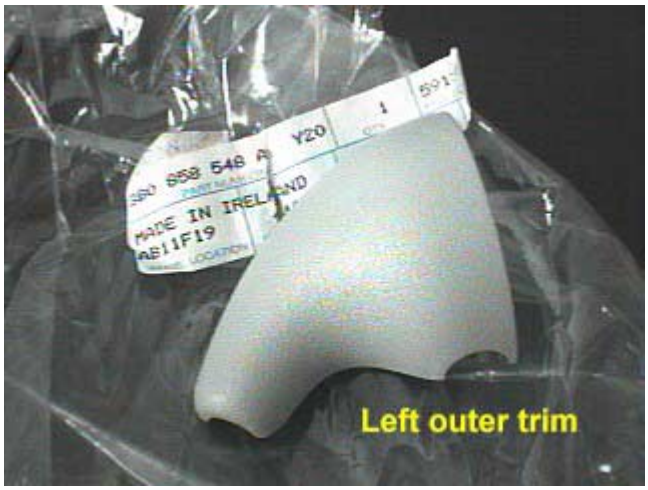
The mirror slides up onto the mount.

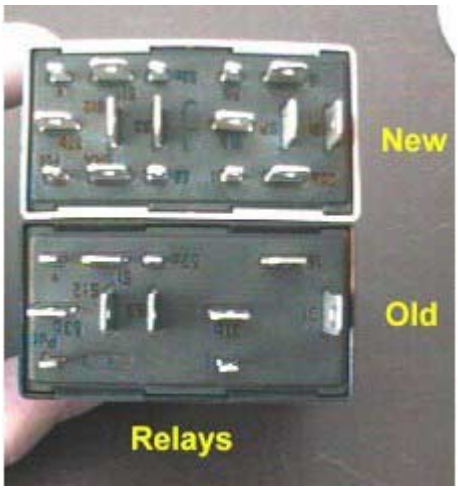
The mirror parts look like these pictures:

All of the parts (except the relay and sensor) are marked with Donnelly part numbers. The relay is marked with a Siemens part number.

Individually:







Comparing old and new relays, the new relay has contacts for the headlamp washer pump (extra 3 contacts along the bottom) as well as the two needed for the rain sensor connection (right side upper left and center). The relay will flip over 180 degrees and plug into the existing location.

Preparation of the wiring

It is recommended that wiring to connect to the mirror/sensor harness be prepared first. If you are not comfortable crimping connectors to wires, use the repair wire 000979003. You will need three and cut each in half.

For any wiring method using the connectors shown, you first have to remove the metal connectors from the shells.

This can be accomplished by using a very small screwdriver (a Craftsman® 41671 1,5x40 works well), or other suitable tool to push a locking tab in while pulling out the metal piece. The metal tab is in the low slots visible in the photo, and you would push it to the right (in this picture).

The metal pieces slide out through the end (top of this picture). A straightened paper clip was used to aid in removal. It is recommended that you remove all six metal pieces so you have four (1 from the other connector) spare for crimping. After crimping the connectors on the wires, slide them back in until that tab locks. After all three wires are installed, slide on the cover part of the connector. (Or slide one half of a repair wire into each of the three slots.)

15 cm (6 inches) long pieces of wire were used for this initial wiring. Later they were connected to longer running wires with butt connectors, or the grounding point with a ring connector, as described later.

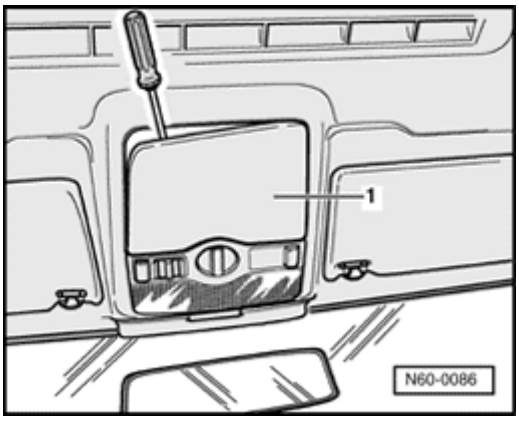
Starting with the six-position connector (mirror) align the mating connector (shown above) with the mirror/sensor harness. Label each (1), (2), and (3) by wrapping masking tape around each and writing on it. Wire (1) corresponds to the black/blue wire, (2) corresponds to brown/blue and (3) corresponds to brown. In the picture above, black was used for (1), green for (2) and red for (3) with the wire from the Radio Shack package. The terminal housing is keyed to fit into the mirror/sensor wiring harness. There is a central slot on one side and an offset slot on the opposite side. In this picture, the central slot is barely visible on the left. This side will mate the harness, closest to its plastic carrier. (The terminal cover is not installed for clarity, be sure to install it.)

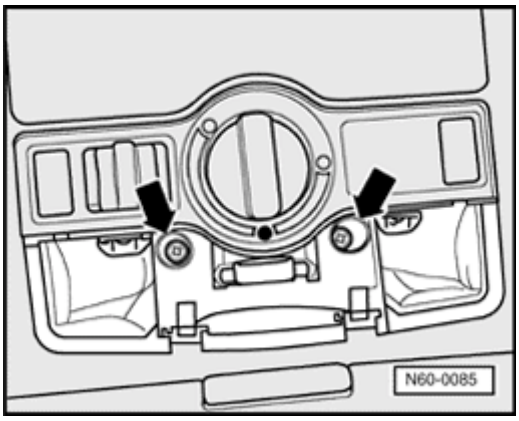
Similarly, prepare the four-position sensor connector (4B0972623) with (4) corresponding to brown (red wire in photo), (5) corresponding with green (green wire in photo) and (6) with black/green (black wire in photo). Using (4), (5) and (6) keeps from confusing them with the other set of wires.

An alternative to using the repair wires and connectors is to use small connectors attached to short wires and protected with heat shrink material. Connectors such as 571-876673 from Mouser Electronics will work and are nearly identical to the metal parts of the connectors shown. Use the smallest diameter heat shrink tubing in the package from Radio Shack. After attaching the connectors to wires, gently push them into the connectors on the sensor harness and label them as above. Use electrical tape to secure the wires and little connectors to the wiring harness.

Mounting the sensor/mirror

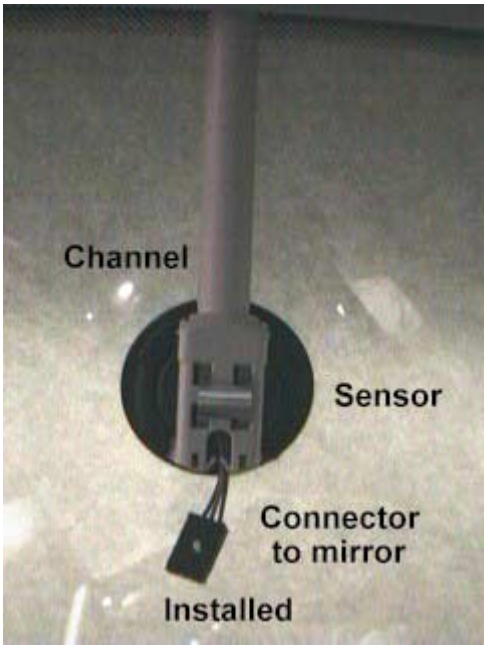
Remove the overhead light and sunroof motor (if equipped) cover. The cover snaps out easily. Use a flat blade tool to gently pry the windshield edge of the light lens out, pivoting down to remove the lens. There are two Phillips screws to be removed from the light bulb holder/sunroof switch and then it snaps out. You might disconnect the electrical connectors so the switch is not dangling in your face as you work.





Next, the little visor over the mirror was removed to allow the front edge of the headliner to come free for running the wires. Once that is accomplished, it is a matter of attaching the sensor to the mount, the mirror to the mount and connecting up the wiring. Proceed as follows.

Install the channel pieces to the sensor wires first. They slide together around the wires between sensor and the large cable guide on the sensor harness. Be mindful of the protective cap on the sensor. Keep it in place and snap the sensor into the larger of the channel pieces. Then wrap a piece of tape around the cap and channel piece to hold the cap in place. An electrical connector should hang loose from the sensor end as seen in this photo.



Install the sensor to the windshield by routing the connectors (mounted on the plastic holder) between the headliner and the roof at the windshield edge. The large plastic cable guide must also be fed up through there. The cable guide has three posts that snap into holes existing in the roof frame. Once installed, you're not getting it out without breaking those posts. You may want to wait until after testing to push it into the holes. A suggestion is to tape over the holes until you are ready to permanently mount it.

The business end of the sensor assembly consists of the sensor (with a protective cap) and a six–pin connector (three connections used). The sensor is mounted in the center of the windshield holder. Remove the taped-on cap and push the sensor/channel assembly into the center of the windshield mount with the shaft of the channel pieces pointing to the headlining. The larger of the channel pieces snaps into place on the windshield holder, holding the sensor against the glass. This is shown in the first picture to the right.

Next, slide the mirror (parallel to the windshield) up onto the mount from below. Connect the electrical connectors at the base of the mirror and fit them into the recess. Finish by snapping the two outer shell pieces together around the mirror base. The completed installation of the mirror is shown in the pictures below.

Wiring of the connections

It is advised that you work with one connector at a time. At this point you may want to refer to the "How to access the relay panel" section for instructions on removing the trim around the fuse and relay panels.

To aid in routing the wires, the door seal was pulled loose. This allows access to pull the wires from the base of the A-pillar trim into the area of the relay panel. The seal is the black rubber part (with attached interior matching trim) that goes around the door opening. You do not have to remove the entire seal. Pull loose just the part going along the area left of the instrument panel. Once the wires are routed into the relay panel area, the seal can be pushed back into place. A claw-type retrieval tool may be useful in grabbing the wires and routing them through this area.

The subject vehicle has side curtain air bags. The Bentley CD outlines how to remove it but it requires the use of tool T10078 (or suitable fabricated hook) and replacing the safety clips holding on the trim. The added expense was avoided by using an alternative method.

Just tuck the wires around the trim along the windshield edge. They will not interfere with the side curtain airbag. You might delay tucking them into place until everything is wired and tested. Those without side curtain airbags may remove the trim to tuck in the wires.

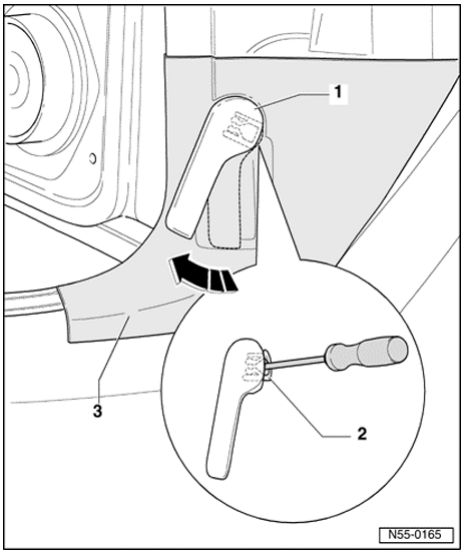
Note: a minimum length of 2 meters (79 inches) is recommended for the four wires that run to the fuse and relay panel locations.

After running the wires, connecting them and testing the functions, a cotter key puller tool was used to hook behind the A-pillar trim along the windshield edge and pull it slightly away. (*Do not pry on the windshield!*) This allowed the wires to be slipped into that area a little better. Use a Popsicle stick (or equivalent) as an aid to pushing the wires into place.

On the following pages, finishing the mirror wiring is described first and then the sensor wiring. As stated earlier, short wires were used connecting to the connectors that mate to the mirror/sensor harness. Butt connectors were used to mate the wires to the longer runs of wire that go along the headlining edge and down the A-pillar.

Mirror wiring (wire colors refer to the wires on the mirror/sensor harness)

Wire #1: power. Connect black/blue wire from mirror to power from fuse 5. Rather than fuss with access behind the fuse panel, a Littlefuse® MINI® Add-A-Circuit™ was plugged into the location with the factory 7.5-ampere fuse (the circuit for a factory installed mirror). The fuse adapter includes a butt connector for the other end. When installed into the 7.5 amp fuse location, the wire-lead and butt connector should go to the right. Transfer the 7.5-ampere fuse to the adapter and use the 3-ampere fuse supplied with the adapter for the added circuit. Crimp the fed power wire to the adapter butt connector. An alternative method is to use a spade or ring connector at the 75X threaded connection at the bottom of the relay panel. Be sure to add a fuse in-line with the power wire if connecting here.



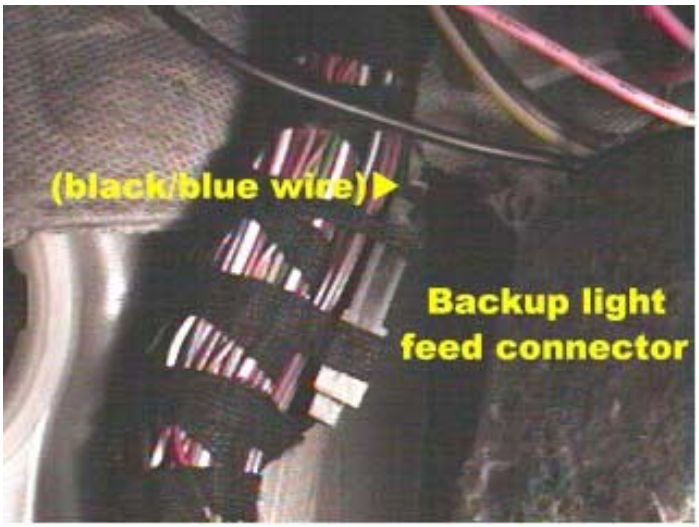
Wire #2: reverse lamp. Connect mirror brown/blue wire to reverse (backup) lamp circuit. The reverse (backup) light feed can be obtained from the black/blue wire running to the backup lights. It is located behind the trim at the base of the A-pillar. To access this wire for the reverse lamps, remove the hood release handle and lower A-pillar trim.

The location shown is common to manual and automatic transmission vehicles. For automatic transmission cars, the feed can also be found at a connector higher up at the plenum, but it is harder to access.

The wire connects to the BLACK connector taped to the wiring harness found behind the trim.

An alternative is to run a wire from the backup lights at the rear of the vehicle all the way back to the front of the passenger compartment.

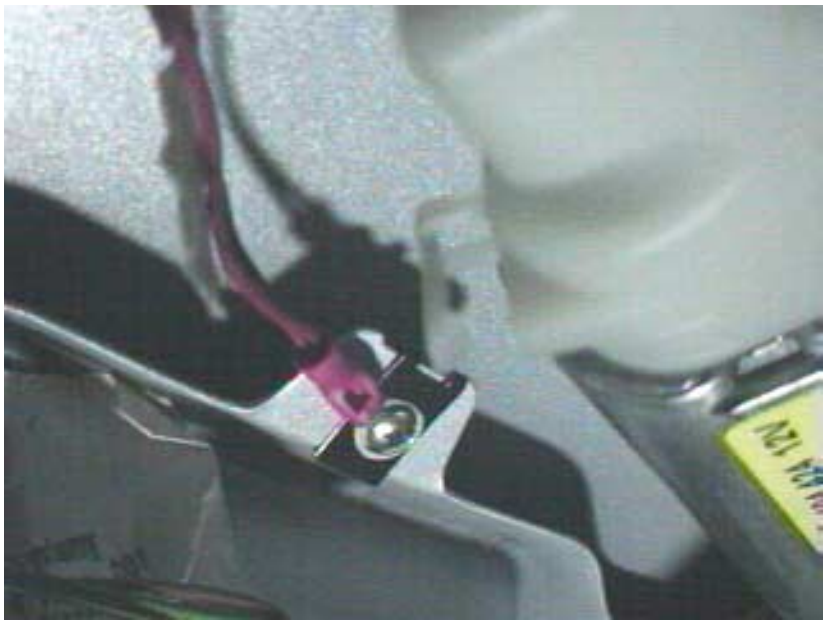
Connecting as described here is less work. Use a splice connector here and a butt connector at the repair wire.



Wire #3: ground for auto dimming mirror. Brown wire connects to a convenient grounding point. It may be connected to the brown wire for the overhead light, or sunroof controller (if equipped).

A U-clip was used with a small screw to ground the ring connector on the ground wires at the location pictured, centered in the sunroof motor access above the mirror/sensor harness.

You might want to combine this wire connection with wire #6 (see below).

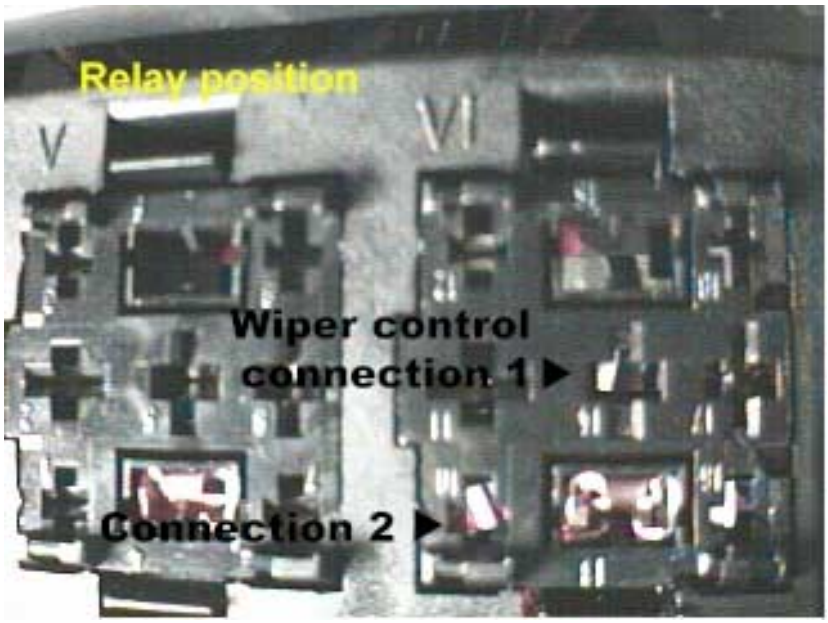


Sensor wiring (wire colors refer to the wires on the mirror/sensor harness)

Wire #4: Brown wire for rain sensor ground. See mirror wire #3.

The replacement relay is marked "192". It replaces relays marked "377", "378", "389" or "603". The existing relay cannot be modified to make it a "192". After wires #5 and #6 are installed as described below, or short pigtails soldered on, the new relay is inserted into the relay panel.

Wire #5: one wire for rain sensor circuit to relay. This is "Connection 1" in the picture. Connect sensor green wire to position 14 of the relay in the lower right of the relay panel. (See the relay panel access information later in this document.)



The relay positions shown are what you see when the existing wiper control relay is removed.

A "poor man's" connection for this is to feed the wire through the opening from behind the panel, and loop the stripped end through the hole in the male connector on the relay. A slightly higher cost connection is to solder the wire to the relay. It appears that repair wire 000 929 135 can be used at this location. However, it was not possible to get the violet colored wire retainer and black front of the relay socket apart when it was removed from the relay panel.

An easier solution is to solder on a 15 cm (6 inches) long wire to the relay tab and feed it through the hole. A butt connector is then used to connect to the wire fed from the mirror/sensor connector.

Wire #6: the other wire for rain sensor circuit to relay. This is shown as "Connection 2" in the picture above. Connect sensor black/green wire to position 10 of the relay in the lower right of the relay panel. It appears that repair wire 000 979 133 could be used at this location. The same method of wiring #5 was used.

When the wires are all connected, plug the connectors into the mirror/sensor harness. The six-position connector is on the right in this picture.

After installation is completed, test the autodimming functionality of the mirror. Turn on the ignition, cover the sensor on the windshield side of the mirror, and shine a flashlight into the mirror side sensor. The mirror should dim. If not, recheck power and ground wiring connections. Next, test the reverse light "no-dim" feature by setting the parking brake, shift the transmission to reverse and retest as described above. The mirror should not dim. If it does dim, recheck the reverse light feed wiring.

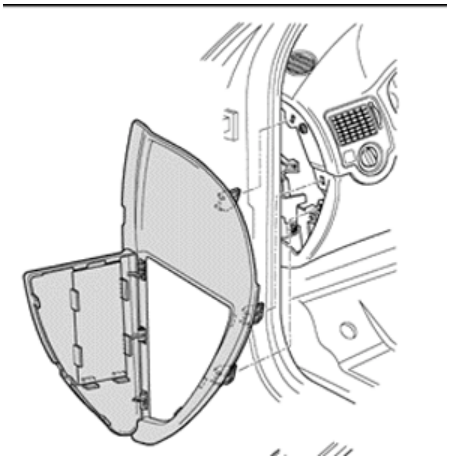
The owners manual describes the functionality provided by the rain sensor. There is no test or diagnostic information given in the owners manual, nor service manual, nor repair manual on CD-ROM. If rain is not available for testing, you might try a garden hose and vary the amount of water sprayed on the windshield to test the speed of the wipers. A simple dry test that can be performed on a sunny day is to turn on the wipers to the slowest intermittent wipe speed as you drive along. The wipers should wipe once at the initial turn on but not wipe after that.

If all wiring functions, it is time to finish locating the wires. The white connector holder on the sensor harness snaps onto a hook on the sunroof motor on the subject vehicle (at least that is what was done on the subject vehicle). This hook is seen in the previous ground point photo. Just make sure it is secured in some manner to prevent rattling. All previously removed trim pieces must be put back on. These are (1) visor above the mirror, (2) overhead light, (3) sunroof motor access panel, (4) lower A-pillar trim and hood release handle, (5) foot well panel, (6) instrument knee panel, (7) instrument side panel, and (8) fuse cover. Be sure the door seal is back in place if it was pulled loose.

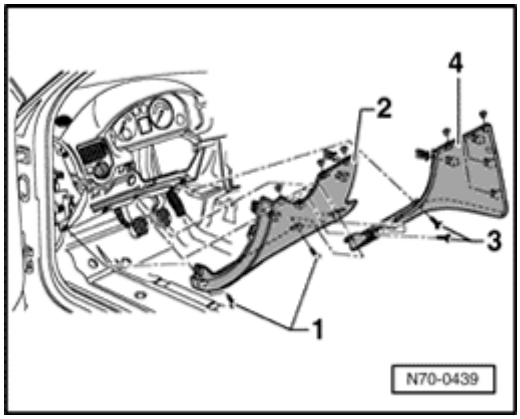
Installation is now complete. Congratulations and enjoy the view.

Relay panel access

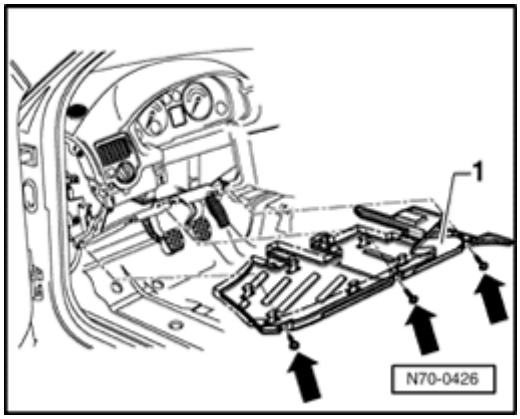
1. Remove the left trim from the instrument panel. It just pulls out.



2. Remove the three screws (1 and 3) at the bottom of the instrument panel knee trim (also shown with arrows in bottom picture) and pull panel 2 off.



3. Pry out center hooking part of panel shown below and slip it out of the car.



The relay panel can now be accessed up behind the instrument panel.

Acknowledgements:

Some of the illustrations shown come from the Volkswagen Official Factory Repair Manual on CD-ROM Golf, GTI, Jetta 1999 ▶ 2002 (ISBN 0-8376-0841-4), produced by Bentley Publishers, a division of Robert Bentley, Inc. These illustrations are copyright 2002 Volkswagen of America, Inc. I highly recommend this product for those persons interested in maintaining, upgrading, or otherwise modifying their applicable vehicle.

Thanks goes to Eric Maurier and Lito Tongson for supplying all the part numbers that the local dealer was reluctant to look up. I think they were skeptical that this modification could be done and didn't want to see me waste money.