Main Reference Threads

VW Vortex - FAQ: Instrument Cluster / Immobilizer / MFA / FIS / SKC
http://forums.vwvortex.com/zerothread?id=3568883
Nihilator's thread - still active and monitored

TDI Club - MFA Cluster Conversion!
http://forums.tdiclub.com/showpost.php?p=371632
SVTWEB's thread - long and outdated, but with most of the basics, especially for earlier (Immo1 and Immo2) cars

UK-MKIV's - Speedo/Instrument Cluster
http://uk-mkivs.net/forums/t/167146.aspx

Immobilizer

Generally speaking, you can upgrade, but not downgrade – that is, an Immo3 cluster can go into an Immo2 car, but not an Immo2 cluster into an Immo3 car.

Immobilizer version can be quickly recognized by seeing if the cluster's Immobilizer icon (car silhouette on top of a key) is in the tachometer (Immo2) or the speedometer (Immo3).

Part Numbers

Cluster

Various part numbers (see Vortex reference thread for an overview)

1J [0|5]		**9 [19|20]**		**[8|9]**		**[0|2|4]**		**[5|6]**		**Suffix***	
Gauge Trim		CAN-Bus		Units		Info Display		Immobilizer			
1J[0]	Standard (Black)	9[19]	w/o CAN	[8]	km/h	[0]	No display	[5]	Immo2	B	Diesel (220km/h)
1J[5]	Sport (Chrome)	9[20]	w/CAN	[9]	mph	[2]	MFA (half)	[6]	Immo3	C	Diesel (260km/h)
						[4]	FIS (full)				

***** An "X" at the end of an OE part number typically denotes a refurbished part

- OE (stock) cluster: 1J5 920 806 Q [VDO]
- Replacement cluster: 1J5 920 946 C [VDO]

Cluster repair wire: 000 979 008 (x2 required, i.e. 4 terminals)

Cluster Identification

VAG clusters are made by multiple suppliers (VDO, Bosch, Magnetti Marelli, etc). Some modifications are specific to certain brands (see *Additional Programming Functions* below).

- Clusters made by VDO (including all sport clusters) have 2 x T10 Torx screws on back
- Clusters made by Bosch have 4 x T10 Torx screws on back

Wiper Stalk

Wiper stalk (with cluster control buttons):
4B0 953 503 **G** (Jetta sedan)
4B0 953 503 **H** (Golf, Jetta wagon w/rear wiper control)

Wiper stalk connector (T6e): 893 971 636 (should not be required - same part is used with the OE stalk)
Wiper stalk repair wire: 000 979 133 (x2 required, i.e. 4 terminals)

Note: T6e uses medium size repair wire connectors, and T32a uses the very smallest size. By using half a length of each repair wire, there is more than enough length to complete the harness between the wiper stalk and cluster without needing additional wire in the middle.

Outside Air Temperature

OAT sensor: 1J0 919 379 A or 1J0 919 379
OAT connector: 1J0 973 702
OAT mounting clip: 1J0 971 845 E
OAT repair wire:
    000 979 131 A (for OAT with "A" suffix)
    000 979 133 (for no suffix)

Connectors, Components & Locations

T6e
6-pin wiper stalk connector; located behind steering wheel.
http://forums.tdiclub.com/showpost.php?p=459823&postcount=6

T32a
32-pin instrument cluster (J285) connector, green; located behind cluster.

Wiring

Temperature Sensor

OAT sensor/1 (repair wire 131) - goes to T32a/26 (repair wire 008)
OAT sensor/2 (repair wire 131) - [grd] (ring terminal), goes to ground

Wiper/FIS Control Stalk

T6e/1 (repair wire 133) - T32a/24 (repair wire 008), MFA switch bottom ("down") button
T6e/2 (repair wire 133) - T32a/23 (repair wire 008), MFA switch top ("up") button
T6e/3 (repair wire 133) - [grd] (ring terminal), goes to ground post behind cluster
T6e/4 (repair wire 133) - T32a/25 (repair wire 008), MFA switch "reset" function
T6e/5 – OEM wipers (green/brown)
T6e/6 – OEM wipers (orange)

Pin-out diagrams for the cluster connectors are available in the Bentley manual, Jetta/Golf 1999-2005, 90-5, "*Table a. Instrument cluster 32-pin connector terminal identification*".

Programming/Adaptation

Background Information

Pin, SKC, WSC, Importer Number

The "**pin**" is the 4-digit login code for the cluster.
The "**SKC**" (Secret Key Code) is a 7-digit encryption of the pin plus the date the SKC was generated.
The "**WSC**" (Workshop Code) is a dealer identification number (see below).
The "**Importer Number**" is a region-specific code (see below).

To program Immo3 cars (2002+), you require either *just* the 4-digit pin ***OR*** the SKC *and* the date the SKC was generated *and* the WSC *and* the Importer Number.
http://forums.tdiclub.com/showpost.php?p=371613&postcount=246

VCDS *cannot* be used to recover the **pin** from any instrument cluster, nor can it change mileage on clusters that have more than 100km registered.

VAG-Tacho (and other programs) *can* be used, with the companion VAG-Tacho cable, to recover the pin and change mileage. **Use with caution**.

- Pin for **existing** (OE, stock) cluster:
- Pin for **replacement** (FIS) cluster:

Getting the SKC, WSC and Importer Number
http://www.ross-tech.com/vag-com/tour/pin-skc.html

VCDS can use the same SKC for a particular car at any time in the future, as long as you keep track of the SKC, the date it was generated, the dealer's WSC and Importer number.

The WSC can be found on the window stickers of vehicles on the dealer's lot. The dealer number will be listed next to the name and address of the dealer. In the US, the dealer number will be a 4 followed by five more digits, for example 401742. To obtain the WSC, delete the 4 and simply use the remaining five digits: 01742 in the above example.

The Importer Number should be:
- 444 for all dealerships in the US
- 999 for all dealerships in Canada

Soft Coding

There is a 5-digit cluster code that configures the behaviour of the cluster. In VCDS, enter module 17-Instruments and check the "Soft. Coding" field - this is the cluster coding. Make note of this code with the original cluster connected; you will adapt the replacement cluster with the same code.

- Cluster soft code of OE (stock) cluster: **15332**
- Cluster soft code for replacement cluster:

First two digits (equipment options):
(Add values of equipped sensors together to get final 2-digit code)
00 = No equipment coding
+01 = Brake wear sensor alarm equipped
+02 = Seatbelt warning equipped
+04 = Washer fluid warning equipped
+08 = Seatbelt warning active (NA only)
+10 = Seatbelt warning driver & passenger active (NA only)
+16 = Secondary display (Radio/Navigation) active

15 = 01+04+10; Cluster MIL will display if any of the equipped sensors are tripped.

Third digit (region):
1 = ECE - 24hr clock, km, litres, Celsius, German default
2 = USA - 12hr clock, miles, gallons, Fahrenheit, English default
3 = Canada/Mexico/Latin America - 12hr clock, km, litres, Celsius, English default
4 = UK - 24hr clock, miles, UK gallons, Celsius, English default
5 = Japan

6 = Saudi Arabia
7 = Australia

Fourth digit (service intervals):
0 = fixed service intervals without oil sensor
1 = flexible service intervals with oil sensor
2 = fixed service intervals with oil sensor
3 = vehicles without service interval display (USA, Canada)

Note: Ross-Tech indicates that the following are also valid for the fourth digit, but I do not know what they do differently:
4 = four-cylinder engine
6 = six-cylinder engine

Fifth digit (distance impulse number, K-value)*:*
0 = All Engines/Transmissions (Impulse via CAN)
1 = 4345 Impulses/km
2 = 3528 Impulses/km (all other engines/transmissions)
3 = 4134 Impulses/km
4 = 3648 Impulses/km (engines with 5-speed automatic transmission)

With the original cluster connected

Before continuing with any adaptation, note the current odometer reading of the existing cluster.

- Odometer reading:

1. Confirm Immobilizer Version

http://www.ross-tech.com/vag-com/cars/Immo3-cluster-swapping.html

- In VCDS, enter module 17-Instruments and look at the first "Extra" field.
- If you see something like: "Immo-ID VWZ7Z0W0648696", you've got **Immo2** (or maybe even Immo-1 in earlier non-US models).
- If you see something like "WVZKB58001H231169 VWZ7Z0W0648696", you've got **Immo3**. The first 17-digit string is the VIN. The second 14-digit string is the Immobilizer ID.

- My VIN:
- My Immo3 Immobilizer ID:

With the replacement cluster connected

2. Verify Replacement Cluster Immobilizer Status

Immobilizer status on the replacement cluster must be **4** ("New or replacement part cluster; not matched/adapted") in order to perform adaptation

http://www.ross-tech.com/vag-com/cars/Immo3-measuring-blocks.html

- In VCDS, enter module 17-Instruments, Measuring Blocks (08), Group 023
- The fourth box should be a number (4, 5, 6 or 7) - it needs to be 4; if it is not, see step 3 (*Wiping Replacement Cluster Immobilizer Settings*), if it is, proceed to step 4 *Import Immo-3 Settings to Replacement Cluster*
- Note: Group 024 (first box) is cluster lock-out time, in minutes, to a max of 255 minutes (see link above); see *Immobilizer 3 Measuring Blocks* below for more information.

3. Wiping Replacement Cluster Immobilizer Settings

- In VCDS, enter module 17-Instruments, and select Login (11) under Advanced Functions
- Enter 0 + 4-digit pin for the replacement cluster (should have been included with cluster)
- This should set the immobilizer status to 4; repeat step 2, *Verify Replacement Cluster Immobilizer Status* to confirm

4. Import Immo-3 Settings to Replacement Cluster

http://forums.tdiclub.com/showpost.php?p=2628435&postcount=14

- In VCDS, enter module 17-Instruments, Adaptation (10), Channel 50
- *Do not try and login on the main screen yet*
- The first box should say "PIN?"; if it says "Disabled" or "Error", see step 2, *Verify Cluster Immobilizer Status* above
- Enter your existing (old) cluster pin (0 + 4-digits) in the "New Value" field
- Click "Test"
- If verified, click "Save"; if failed, retrace and confirm steps to this point. Saving imports Immo-3 data from the ECU to the cluster.
- Shut car off and on, repeat step 1*, Confirm Immobilizer Version*, verify correct VIN is now reported by the replacement cluster

Another option may be to write your old cluster EEPROM to the new cluster (using VAG-Tacho):
http://forums.tdiclub.com/showpost.php?p=2625888&postcount=11

Component Installation

Installing the Cluster

Important Notes

- Record mileage and soft coding prior to removal of cluster
- Ensure no trouble codes are reported by 01-Engine or 17-Instruments or you wont be able to perform the Adaptation (check and clear Fault Codes with VCDS)
- As a precaution, keep a charger on the battery while performing the Adaptation, especially if you end up having to wait for a locked cluster to time-out (if voltage drops below 11.5V, changes will not be saved)
- Ensure you have your radio code as it may be required after installing new cluster

Procedure

http://forums.vwvortex.com/zerothread?id=1921113

1. Move steering wheel to bottom outward position (you do not need to remove the steering wheel in order to remove the cluster)
2. Pull straight out to release the tabs that hold the lower trim from the bottom of the cluster; there is one tab on each side, and it will take some force to remove it
3. Remove 2 x T20 Torx screws from bottom of cluster – don't drop the screws!
4. Wiggle/pull out cluster and disconnect two connectors on rear (caution: cables on back of cluster are short)
5. Disconnect connectors (first the blue one, then the green one) by flipping up purple lever; there is a small tab in the center of the connector that you should push down to "unlock" the lever
6. Installation is reverse of removal

Swapping Gauge Faces

Important Notes

- Only rotate needles counter clockwise, and *gently* pull/push on spindle as required to remove and install.
- Gauge faces are in two pieces - the tachometer face, plus the speedometer face with the fuel and coolant gauges (and center overlay where applicable); you may not need to remove the tachometer needle if you are only switching the speedometer (i.e. mph to km/h)

Procedure

http://forums.tdiclub.com/showpost.php?p=965123&postcount=108

1. Remove 2 x T10 Torx screws on the back of the cluster
2. If necessary, cut or remove any tape or labels across the joint between the front and back pieces
3. Gently unclip 2 clips on bottom of cluster and hold slightly separated
4. Gently unclip 4 clips on top of cluster and separate front and back pieces
5. To remove needles, gently turn **counter clockwise** while gently pulling
6. To remove the gauge face, “unclip” the speedometer face in the top left, and rotate the sheet clockwise until the small white tabs on the needle shaft line up with the cut-outs in the gauge face, and remove the sheet
7. Put the new face and needles on using the same method, **always counter clockwise**, but don’t push needles too close to the face; they may interfere with the free movement of the needle. The worst part is to calibrate them – approximately: temp gauge is 1 needle width below the low line, fuel gauge is at the line (Empty mark) and speedo is 2 needle widths below 0. See step 9 for calibration output tests.
8. If transferring faces from a non-FIS or MFA cluster to an FIS cluster, you will have to cut out the non-FIS center display overlay. Overlay the two sheets so that you can trace the cut line onto the back of the non-FIS sheet with a pencil, and cut with scissors; see note below, re: ambient light sensor
9. Before assembling the cluster: The needles need to be calibrated. Connect the back half of the cluster in the car, and with VCDS enter 17-Instruments, and select Output Tests. In turn, each gauge will travel across its entire range, and then come to a rest at a set value: 3000 rpm for the tach, half-way for the temp and fuel gauge, and 100km/h for the speedo.
10. Ensure everything is dust-free and clean and re-assemble in reverse of disassembly

Ambient Light Sensor

The FIS display brightness adjusts according to both the rheostat (dimmer) setting and ambient light levels via a light sensor located just below the "0" mark of the speedometer with a cut-out in the face. At night, it's dimmest, and during bright daylight, it's brightest. Non-MFA clusters don't have the light sensor, so their faces don't have the window for it. If you put non-FIS faces on an FIS cluster (cutting out the plastic that would cover the display area, of course), the display will be perpetually dim, because the ambient light sensor is being blocked by the opaque cluster face and it thinks it's constantly dark out. You can scrape off the white backing in the location of the light sensor window, which may help.

Installing the Wiper/FIS Control Stalk

Removing the Airbag

http://forums.tdiclub.com/showpost.php?p=356625&postcount=7
c.f. Bentley, Jetta/Golf 1999-2005, 69-19, "*Airbag unit in steering wheel, removing and installing*"

1. Disconnect the negative battery terminal
2. Put key into ignition in “run” so wheel can be turned and turn the wheel 90 degrees until you find a small slot on the back of the wheel at the top
3. Pull the wheel out and up as far as you can and lock into place
4. Use a short flathead screwdriver and insert into the hole
5. Angle the screwdriver with the handle down and the tip up and feel for the spring clip inside the wheel

6. The spring clip will release the airbag, once you push it down towards the center of the wheel. The screwdriver pushes the spring clip. You will know if you were successful with the first clip if the bag comes away slightly from the steering wheel.
7. Do one side, rotate the wheel 180 degrees and do the other side; the airbag will then release – be careful not to pull it too far away until disconnecting it.
8. There is a 2-pin connector on the airbag itself; this will pull straight out (i.e. there are no clips or locks holding it in place)
9. Set airbag aside.
10. You may also disconnect the 5-pin connector on the slip ring – push the connector in slightly, squeeze the outer tabs, and pull off

Removing the Steering Wheel, Airbag Slip Ring and Wiper Stalk

c.f. Bentley, Jetta/Golf 1999-2005, 69-17, "*Steering wheel* "

http://forums.tdiclub.com/showpost.php?p=356626&postcount=8
http://forums.vwvortex.com/zerothread?id=764870

1. Use a 12mm triple square bit to remove the center bolt that holds the wheel in place; re-installation torque is 40 ft-lbs (55 Nm) and the bolt should only be re-used up to 5 times.
2. The steering wheel is now loose and can be removed; note that the wheel and steering column shaft have registration marks denoting the center position. Ensure the wheels are straight and these marks are aligned before removing wheel.
3. After you remove the airbag and steering wheel, the next step is to remove the slip ring / steering angle sensor. **Be *VERY* careful removing this part**, as it is sensitive to damage and very expensive to replace. Do not spin or rotate the ring; ensure you know and maintain its proper orientation.
4. You must remove the upper and lower steering column trim first. Remove the 4 small Philips screws in the lower trim (one on each side, two on the bottom). Remove the T25 Torx screw in the lower trim, beneath the column adjustment lever.
5. Lift the top trim up and pull out (there are two hooks on the back that hold the top trim tight to the bottom trim; note these for re-installation). You will see the grounding post on the left side of the steering column, which you will use when wiring the new stalk.
6. The bottom trim will fall down and be retained by the adjustment handle; there is no need to remove it any further.
7. On the slip ring, disconnect the bottom connector by flipping down the orange lock lever, pinching the yellow tabs and pulling out the yellow connector.
8. Carefully pry the 3 plastic tabs that hold the slip ring to the column assembly; they are flexible and do not take any effort to unclip.
9. Be careful not to turn the slip ring so that it stays "indexed" properly; set it aside carefully.
10. Remove the wiper stalk using a small flathead screwdriver to pry the small tab adjacent to the steering column; the stalk will come away easily. Undo the two connectors.
11. To wire T6e, you need to unlock the connector using a small knife to pry open each end of the connector on the car side.
12. To unlock T32a, the green cluster connector, cut the zip tie holding the harness to the connector, slide the purple end piece down and off the connector, and pull off the green connector cover.
13. Complete your wiring, re-install the wiper stalk, slip ring, trim pieces, steering wheel and airbag.
    a. Place wheel onto the column, ensuring to align the registration marks; center bolt torque is 40 ft-lbs (55 Nm)
    b. Plug in harness, connect airbag harness and press the airbag into place
    c. Turn the key to the run position, and reconnect the battery terminal; keeping the key turned will keep any power surges out of the airbag circuit. This is how the Bentley manual describes how to do this properly.

Additional Programming Functions

Changing Languages

With VCDS, enter module 17-Instruments, select Adaptation (10), and update Channel 04 with one of the following numbers:
00001 German
00002 English
00003 French
00004 Italian
00005 Spanish
00006 Portuguese
00008 Czech

Calibrating the FIS Fuel Calculations

If the fuel efficiency displayed by the FIS doesn't reflect pen & paper calculations, you can adjust the correction factor by +/-15% to bring it inline with your actual efficiency. Note that this may not be adjustable for some Immo3 clusters.

http://forums.tdiclub.com/showthread.php?t=111362
http://forums.tdiclub.com/showpost.php?p=1536891&postcount=91

With VCDS, enter module 17-Instruments, select Adaption (10), and update value in Channel 03. Default value is 100 (percent); range is 85 to 115, in 1-unit increments.

- *Increase* value for the FIS to report improved fuel efficiency (lower L/100 or higher MPG).
- *Decrease* value for the FIS to report reduced fuel efficiency (higher L/100 or lower MPG).

~112 is a common correction factor for the TDI.

Cluster EEPROM Coding Updates

For these updates, use VAG-Tacho to read the cluster EEPROM, make the code changes using a Hex editor, and then use VAG-Tacho to write the EEPROM back to the cluster.

You can use VAG-Tacho to write the EEPROM to the cluster. The write option does have issues at times though, so try writing the image 3 or 4 times, one after the other. That should ensure a full write. Even though it completes with no errors it may not have done a complete write.
http://forums.tdiclub.com/showpost.php?p=2675493&postcount=7

It may also be necessary to disconnect/reconnect the battery for uploaded EEPROM changes to take effect (i.e. reboot).

Freeware Hex Editor, XVI32

http://www.chmaas.handshake.de/delphi/freeware/xvi32/xvi32.htm

Enabling "Distance to Empty" Feature

Adds a distance to empty display (in miles or km, depending on the region specified in the cluster soft coding) to the trip computer, based on remaining fuel level and the fuel consumption trend.
http://forums.tdiclub.com/showpost.php?p=1479957&postcount=26
http://forums.tdiclub.com/showpost.php?p=2650256&postcount=2
(Only available on Immo3 VDO or Bosch RB8 clusters.)

Change address **0x0416** from **C1** to **E1**

Enabling "Welcome" Message

On FIS clusters only, displays "Welcome" when starting the car.
http://forums.tdiclub.com/showthread.php?t=153338

Change address **0x0417** from **02** to **6B**

Enabling Control of Cluster Lighting

With the car on, and the main light switch *off*, you can configure specific cluster lights to be turned on (needles, gauges, clock and odometer info displays).
http://forums.tdiclub.com/showthread.php?t=153338
(post 34 and on)

(Only available on Immo3 VDO clusters.)

Change address **0x01ED** from **30** to

30 – default, turn off all cluster lighting
33 – turn on info display lighting (clock & odometer)
35 – turn on gauge lighting
37 – turn on gauge and info display lighting (clock & odometer)
39 – turn on needle lighting
3B – turn on needle and info display lighting (clock & odometer)
3D – turn on needle and gauge lighting
3F – turn on all cluster lighting

Linear Coolant Gauge

http://forums.tdiclub.com/showthread.php?t=153338
(post 125 and on, esp post 136)
Coolant gauge by default is centred while coolant temp is between 182F and 207F; this mod will have the gauge indicate the actual temperature.

Related and Interesting Links

Cluster LED Project - Good pics and instructions for cluster removal and disassembly)
http://forums.vwvortex.com/zerothread?id=2898256

Installation How-To with pictures
http://forums.vwvortex.com/zerothread?id=1921113

GTI-TDI - Lots of cluster pictures
http://www.gti-tdi.de/Webgalerie/index_2.htm

Enabling "Lamp Failure" warning in cluster
http://forums.tdiclub.com/showthread.php?t=80035

Immobilizer 3 Measuring Blocks

http://www.ross-tech.com/vag-com/cars/Immo3-measuring-blocks.html

Immo-3 knows your car's VIN. Access 17-Instruments and look at the first "Extra" field. If you see "Immo-ID VWZ7Z0W0648696", you've got Immo-2. If you see "WVZKB58001H231169 VWZ7Z0W0648696", you've got Immo-3. The first 17-digit string is the VIN; the second 14-digit string is the Immo-ID.

022	Engine Start Permitted	ECU Responding	Key condition OK	Number of adapted keys
	1= Yes car can be driven **0=No** key is not or matched or incorrectly matched or the Engine Control Module is incorrectly adapted or malfunctioning	**1 = Yes** communications with ECU OK (whether ECU is matched or not) **0 = No** it will not be possible to match the Immo to the ECU at this time.	**1 = Yes** a legitimate transponder code could be read (whether it was authorized or not) **0 = No** not possible to match this particular key!	Maximum of 8 Keys
023	Variable Code Matched	Transponder Status	Fixed Code Authorized	Immobilizer Status
	1 = Yes **0 = No** variable code is not matched -- key's code algorithm is not yet the same as in the instrument cluster.	**1 = Yes** Transponder in key is locked. Key can no longer be adapted to a different Immobilizer System. **0 = No** Transponder in key is not locked. Key has not yet been adapted to Instrument Cluster (new replacement key)	**1 = Yes** **0 = No** fixed transponder code of key is not authorized.	**4 =** New or replacement part cluster, not matched/ adapted **5 =** Customer service locked; adaptation data programmed **6** = Immobilizer adapted, normal operating condition **7 =** Key adaptation in progress via scan-tool
024	Cluster Lock Time	ECU Lock Time	Not used	Transponder Lock Time
	0 to 255 minutes Indicates how much time must pass before another attempt to perform a Login can be made. If SKC data used to perform a Login is incorrect, the lock time starts at 10 minutes	**0 to 255 minutes** Indicates how much time must pass before an another attempt to match the ECU can be made at Adaptation channel 50 can be made again. If SKC data used to match ECU at adaptation channel 50 is incorrect, the lock time starts at 10 minutes.		**0 to 10 minutes** Indicates how much time must pass before a transponder recognition is possible again. This lock is activated after an unauthorized key is detected 20 times in a row.

Note: Lock times only count down while the ignition is ON. If you've managed to accumulate long lock times, you may want to connect a battery charger to the car while letting it count down