Functional description / User manual

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Functional Description

VAG Immobilizer System

WFS IV

1 System overview

The module described within this document shall be used in the following system environment:

- VAG Immobilizer System WFS IV

An immobilizer prevents the engine from running unless the correct key (transponder) is present. This protects the car from being "hot-wired" after entry has been achieved.

The microcircuit inside the key is activated by a small electromagnetic field that induces current to flow inside the key body, which in turn broadcasts a unique binary code which is read by the automobile's ECU. When the ECU determines that the coded key is both current and valid, the ECU activates the fuel-injection sequence.

Radio approval is required.

All requirements refer to the specification 'Lastenheft WFS IV Kombi Roadmap V2.1' of the Volkswagen AG.

Features:

- On Chip Crypto-Algorithm
- Two Way Authentication
- Secret-Key in EEPROM (unreadable)
- Fix Device Identification
- User Memory (UM)
- Data Transmission performed by Amplitude Modulation
- Bit Period = 32 periods of carrier frequency
- Temperature Range -40 to +85°C
- 125 kHz Field Frequency
- On chip Rectifier and Voltage Limiter

4 Power supply

Because ANT drivers drive antenna with VDD and VSS power supply level all variations and noise in power supply are directly fed to antenna resonant circuit. Any supply voltage fluctuations or ripple are transferred into antenna current fluctuations by the antenna driver transistors. This is equal to a current modulation that results in a voltage modulation at the antenna tap point. There is no possibility for the demodulator to distinguish this modulation from the transponder modulation (transponder signal superimposed on antenna voltage is in the range of tens of mV). Especially in the passband of the demodulator filters (<10 kHz), the system is very sensitive against supply hum and ripple.

For this reason a separate linear voltage regulator is used for the immobilizer circuit. The INH pin of this regulator is controlled by the microcontroller. The regulator is only enabled during transponder communication.

KL30 Voltage for guaranteed function and performance:

- Minimum Operating Voltage = 6.5V
- Nominal Operating Voltage = 13.5V
- Maximum Operating Voltage = 17V

5 Block diagram

The following figures show the block diagrams for the WFSIV Immobilizer System. They show the functionality of the immobilizer circuit and how the module interacts with the other vehicle electronic units.

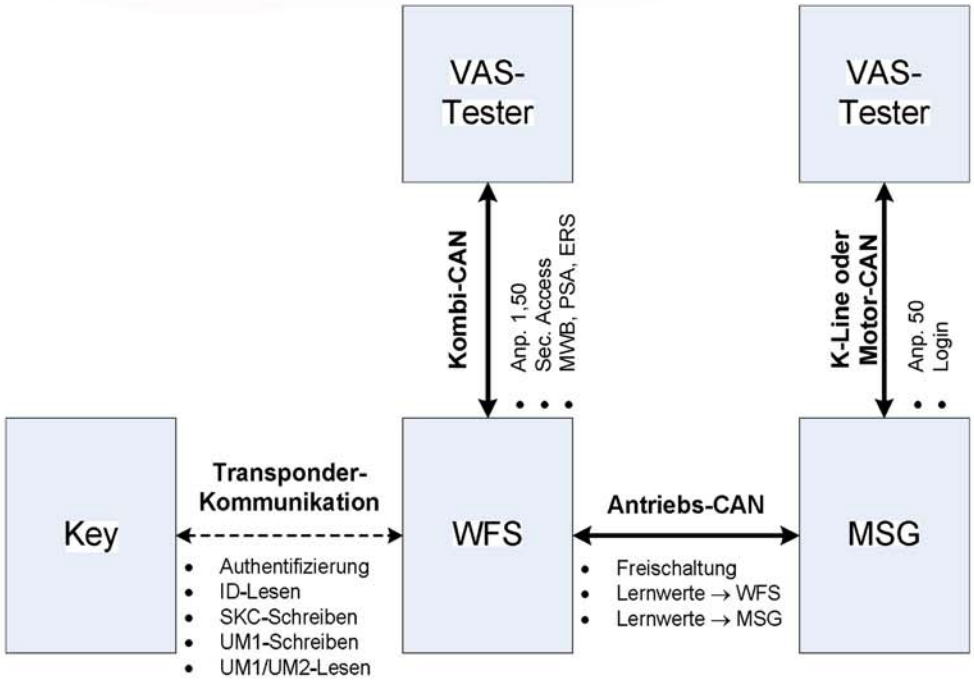

Figure 3: WFS IV Immobilizer System Block Diagram

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6 Technical data

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Supply						
Supply Voltage Immobilizer Module	V_{KL30}	6.5	13.5	17.0	V	
Supply Voltage LRES B2	V_{DD}	4.5	5.0	5.5	V	
Supply current in sleep mode (Quiescent current)	$I_{DDsleep}$			40	µA	Full temp. range
Supply current excluding drivers current in normal mode (Current consumption)	I_{DDon}		5	10	mA	
Power on reset level	V_{por}	1.4		3.6	V	Full temp. range
AGND level	V_{AGND}	2.35	2.5	2.65	V	Full temp. range
µC interface						
Input logic high	V_{IH}	0.8 V_{DD}			V	Full temp. range
Input logic low	V_{IL}			0.2 V_{DD}	V	Full temp. range
Input leakage current	I_L	-1		+1	µA	Full temp. range
L/Z_OUT sink current	I_{L/Z_OUT}			2.5	mA	
L/Z_OUT output logic low	V_{L/Z_OUT}			0.4	V	
Antenna circuit						
Carrier frequency	f_{ANT}		125		kHz	
Antenna circuit resonant frequency	f_{RES}	120	125	130	kHz	
Antenna voltage	V_{Coil1}	55	75	95	V_{pp}	L_{Coil} = 1.041mH ± 5%, Q_{Coil} = 8.55 ± 15%
Oscillator						
Resonator frequency	f_{OSC}		4		MHz	

7 Labelling

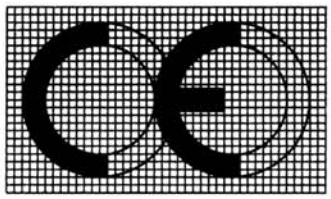
7.1 *European Union (EU)*

Since the 08th of April, 2000 the European R&TTE Directive 1999/5/EG is valid for the marketing, the free traffic and the introduction of radio equipment and telecommunications terminal equipment.

This means for manufacturers of radio equipment, to which also devices with integrated anti-theft device belong, that only devices may be brought in the traffic which fulfill all demands of the directive.

Devices shall be identified by the manufacturer by means of type, batch and/or serial numbers and by the name of the manufacturer or the person responsible for placing the device on the market.

The CE conformity marking must consist of the initials 'CE' taking the following form:



See Annex VII of Directive 1999/5/EC for details.

7.2 *United States (US)*

Products which has been approved by the Certification process, must have a label showing the FCC ID number.

FCC ID: KR5WFSIV

where **KR5** is the manufacturer's FCC grantee code and **WFSIV** is the equipment code.

Approval information in the User Manual:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1) This device may not cause harmful interference, and
2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the ser's authority to operate the equipment.

7.3 *Canada (CA)*

Products which has been approved by the Certification process, must have a label showing the IC ID number.

IC: 7812D-WFSIV

where **7812D** is the manufacturer's FCC grantee code and **WFSIV** is the equipment code.

Approval information in the User Manual:

This device complies with part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions:

1) This device may not cause harmful interference, and
2) this device must accept any interference received, including interference that may cause undesired operation.