

Technical Description

Keyless Go FBS C6 IDG Typ 3314

Technical Description

Keyless Go System FBS Audi C6

Processed by:	R. Maier
Department:	AE21
Tel.:	+49 (0)7424/99-1576
Fax:	+49 (0)7424/99-2541
E-mail:	Ralf.Maier@marquardt.de
Initial issue:	02.08.2003
Modification status:	02.08.2003
Version:	1.0

confidential

Contents

1	DESCRIPTION OF THE COMPLETE SYSTEM	3
1.1	FUNCTIONAL PROPERTIES OF KEYLESS ENTRY	3
1.2	FUNCTIONAL PROPERTIES OF KEYLESS GO	3
1.3	ADDITIONAL FUNCTIONS	4
2	COMPONENT DESCRIPTION	5
2.1	KEYLESS GO COMPONENTS	5
2.2	MODES OF OPERATION	6
2.3	KEYS	7
2.3.1	<i>Functional description with block diagram</i>	7
2.3.2	<i>General technical data</i>	8
2.3.3	<i>Test mode</i>	10
2.4	EZS	11
2.4.1	<i>Block diagram</i>	11
2.4.2	<i>Technical data</i>	12
2.4.3	<i>Test mode (test software 0046 for approval measurement)</i>	13
2.5	KSG	14
2.5.1	<i>Block diagram</i>	14
2.5.2	<i>Technical data</i>	14
2.5.3	<i>Test mode</i>	15

Enclosures: none

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 2 of 15

1 Description of the complete system

The driver authorisation system (*German abbreviation: FBS*) comprises access authorisation (remote controlled central locking) and driving authorisation (immobiliser by inserting the key). It is supplemented by a non-touch and non-contact authorisation request for access (Keyless Entry or Advanced Entry) and driving authorisation (Keyless Go or Advanced Go).

Note:

Audi has specified the nomenclature for Keyless as Advanced. In this document, however, the term Keyless will be used.

The identification of the authorised vehicle user takes place without touch and without contact simply by carrying the key. When the door handle is touched, the key is activated by means of an inductive coded signal and bi-directional data exchange begins on 868.3 MHz, 433.92 MHz or 315.0 MHz. Once a valid key has been recognised, the driver door is unlocked. If the vehicle user wants to start the engine, the system will check if there is a Keyless Go key inside the vehicle. If there is a valid Keyless Go key inside the vehicle, the vehicle user can start the engine via a start switch. The term interior is defined by the passenger compartment and the boot.

In addition to Keyless Go operation, the key provides the basic functions of driver authorisation:

- Starting the vehicle by inserting the key in the ignition (transponder function)
- Opening / closing the vehicle via bi-directional radio transmission

1.1 Functional properties of Keyless Entry

Unlocking and locking the doors without having to press a button on the key.

When the door handle is grasped, the presence of a valid key in the vicinity of the vehicle is recognised. The release for access authorisation is given via the radio connection. The high safety level is achieved thanks to bi-directional communication between key and vehicle. Following the code-protected identification of the authorised key, the central locking system is released.

The vehicle is locked using a door handle button.

1.2 Functional properties of Keyless Go

Starting the vehicle without the key having to be inserted in the ignition.

Driving authorisation is granted on the basis of bi-directional communication between the vehicle and the key inside the vehicle. If the key is not inside the vehicle, a release will not be granted. The vehicle is started up by pressing the start button. In order to guarantee safety during vehicle start-up, the brake pedal or the clutch (in the case of the manual transmission version) must be pressed as the vehicle is started.

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Raif\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 3 of 15

1.3 Additional functions

If the battery voltage falls below a defined level, a warning will be given in the combination version. (Replace key battery)

Remote control functions by pressing buttons:

- Comfort opening and comfort closing
- Panic function for the remote control of the electronic alarm system
- Remote unlocking of the boot lid

Proprietary data, company confidential. All rights reserved.
Confie a titre de secret d'entreprise. Tous droits réservés.
Comunicado como segredo empresarial. Reservados todos os direitos.
Confidado como secreto industrial. Nos reservamos todos los derechos.

Weitergabe sowie Vervielfältigung dieser Unterlage, Verwertung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden. Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte vorbehalten, insbesondere für den Fall der Patenterteilung oder GM-Eintragung

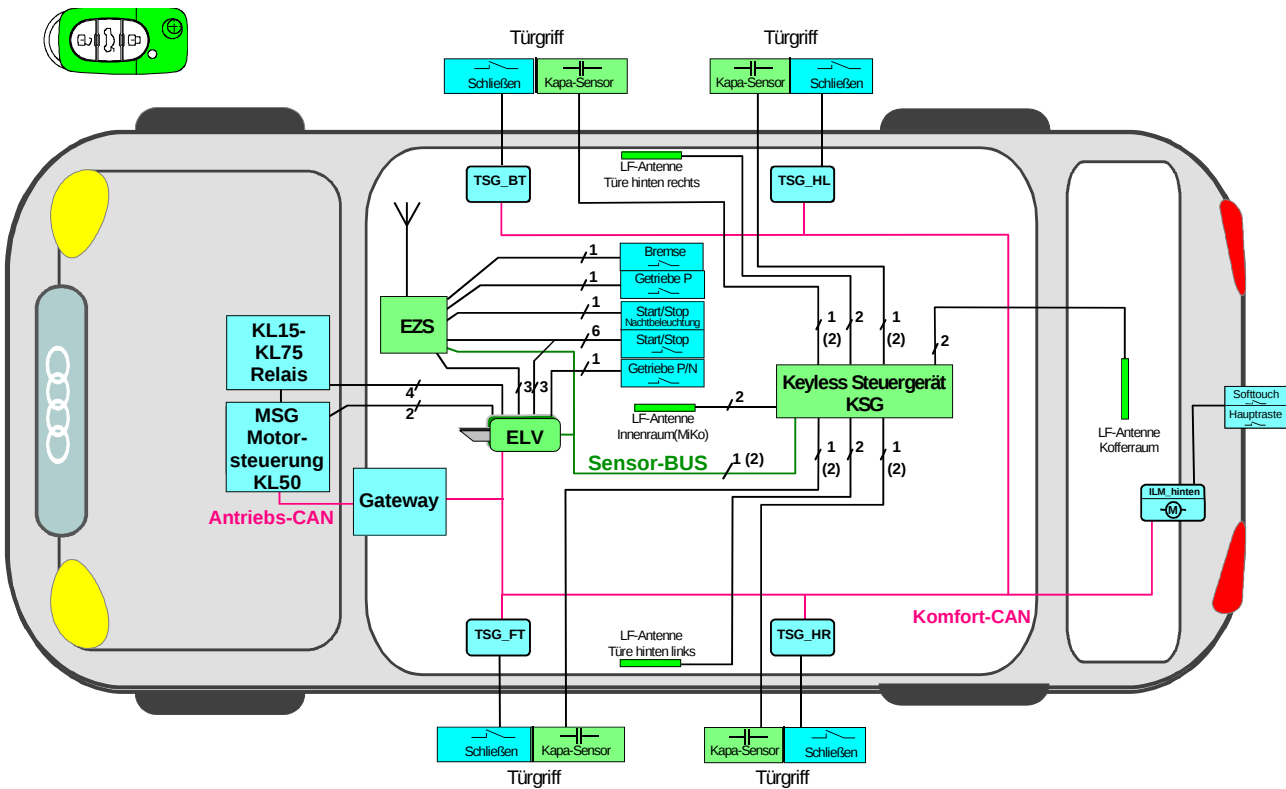
MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 4 of 15

2 Component description

2.1 Keyless Go components

The Keyless Go system comprises the following components:

- 2 main keys with Keyless Entry/Go function
- 1 ELV (electrical steering column lock)
- 1 EZS (electrical ignition start switch)
- 1 KSG (Keyless control unit)
- 4 LF aerials (transmission coils left/right/central console and rear)
- Rear window aerial for 868 / 433.92 / 315 MHz (connected to the EZS)



Block diagram FBS C6 with Keyless Go (components marked green)

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Rail\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 5 of 15

2.2 Modes of operation

The following modes of operation occur:

1.) Remote control via key to open and close the vehicle

Bi-directional communication: 868.3 MHz / 433.92 MHz / 315 MHz
Between the key and the EZS in the vehicle

2.) Access authorisation and driving authorisation Keyless Go

Uni-directional connection via inductive system (24.5 kHz)

➤ *In this case, the KSG transmits inductive signals to the key (RX) in sequence via the following transmission coils:*

- *the side LF aerials in the two rear doors*
- *the interior LF aerial in the central console*
- *the rear LF aerial in the boot*

Bi-directional communication 868 MHz / 433.92 MHz / 315 MHz

➤ *between the key and the EZS in the vehicle*

IN BRIEF:

Bi-directional communication on 868 MHz / 433.92 MHz / 315 MHz:

- to open and close the vehicle using remote control key
- between key and EZS in the vehicle
- with the frequency 868 MHz / 433.92 MHz / 315 MHz

Bi-directional communication on 868 MHz / 433.92 MHz / 315 MHz:

- for access and driving authorisation Keyless Go
- between the key and the EZS in the vehicle

Uni-directional communication via inductive system (24.5 kHz)

- for access and Keyless Go driving authorisation
- from KSG (via LF aerials) to the key

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 6 of 15

2.3 Keys

2.3.1 Functional description with block diagram

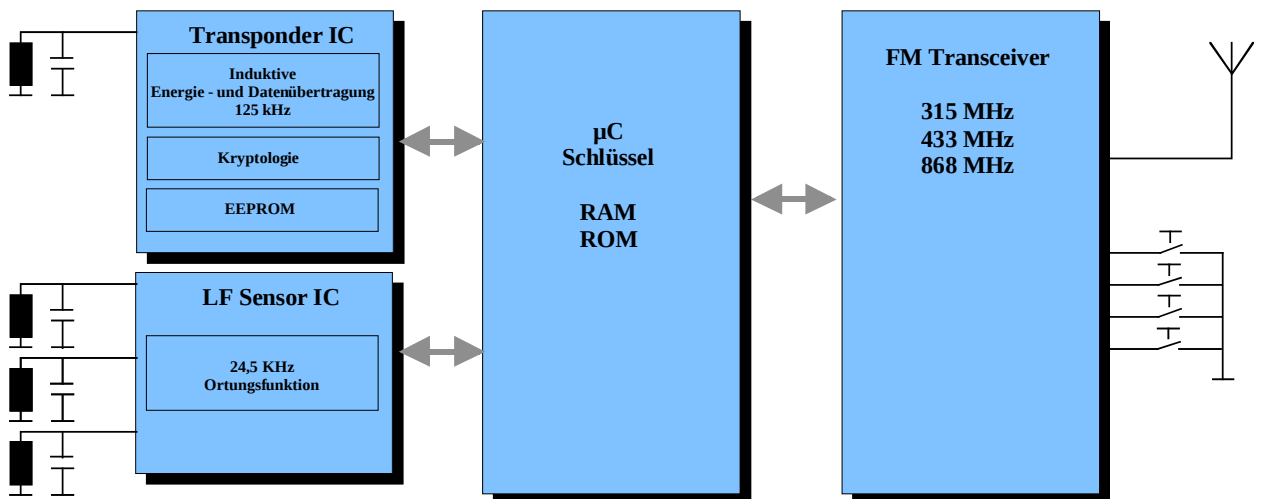
The FBS C6 key fulfils the following functions:

For the remote control of vehicle locking via radio signals, a message is sent to the vehicle from the key via a HF transmitter after a button has been pressed on the key. If the key is valid, the EZS then transmits a radio message to the key, which is answered again by the key.

For vehicle access (closing) and Keyless Go driving authorisation, bi-directional data communication takes place between the key and the vehicle via an HF transceiver. The communication is started by the vehicle by pressing an operating element on the door or the boot.

The key has a receiver for an inductive, low-frequency field (24.5 kHz). When it receives a certain data pattern that is transmitted by the vehicle on this frequency, the key is made ready for data communication (wakes up from its Stand By state). During the further function process, the key also evaluates the strength of the receiving field of the inductive field during unmodulated emission.

The structure of the FBS C6 key is represented in the following block diagram:



Block diagram of the FBS C6 key

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 7 of 15

2.3.2 General technical data

Temperature range:

Working temperature: -20 ...+65 °C

Type of data transmission: Half duplex

Transmitter:

Transmitting frequency: 868.30 MHz (ECE)
433.92 MHz (ECE)
315.00 MHz (USA)

Tolerance of transmission frequency: +/- 50 ppm
(production, ageing, temperature)

Transmission power (EIRP): typ. -18 dBm (< -15 dBm) @868.30 MHz
typ. -20 dBm (< -17 dBm) @433.92 MHz
typ. -22 dBm (< -19 dBm) @315.00 MHz (USA)

Modulation: Frequency shift keying (FSK2, incoherent)

Frequency shift: +/- 16 KHz

Modulation contents: Digital data

Data rate: 2.4 kBit/s (remote control)
20 kBit/s (Keyless Go)

Coding: Manchester

Data burst rate: Remote control: max.10 000/a
Keyless Go: max. 100 000/a at
Driving performance of 100 000 km/a

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Raif\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 8 of 15

Receiver 1:

Receiving frequency: 433.92 MHz (ECE)
868.30 MHz (ECE)
315.00 MHz (USA)

Tolerance of the receiving frequency: +/- 50 ppm
(production, ageing, temperature)

Receiving band width: 160 KHz

Receiving sensitivity: ≤ -75 dBm (with aerial)

Receiving data rate: 2.4 kBit/s and 20 kBit/s
Coding: Manchester

Receiver 2 (inductive):

Receiving frequency: 24.5 kHz

Demodulator output: ASK/OOK-demodulation

Receiving data rate: 1.365 kBit/s
Data burst: 16 data bit

Mechanical design:

Button 1: Open
Button 2: Boot lid (not valid for estate cars)
Button 3: Close
Button 4: Panic (USA version)

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 9 of 15

Proprietary data, company confidential All rights reserved.
Confé à titre de secret d'entreprise. Tous droits réservés.
Comunicado como segredo empresarial. Reservados todos os direitos.
Confidado como secreto industrial. Nos reservamos todos los derechos.

Weitergabe sowie Vervielfältigung dieser Unterlage, Verbreitung und Mitteilung ihres Inhalts nicht gestattet, soweit nicht ausdrücklich zugestanden. Zuwiderhandlungen verpflichten zu Schadenersatz. Alle Rechte vorbehalten, insbesondere für den Fall der Patenterteilung oder GM-Entragung

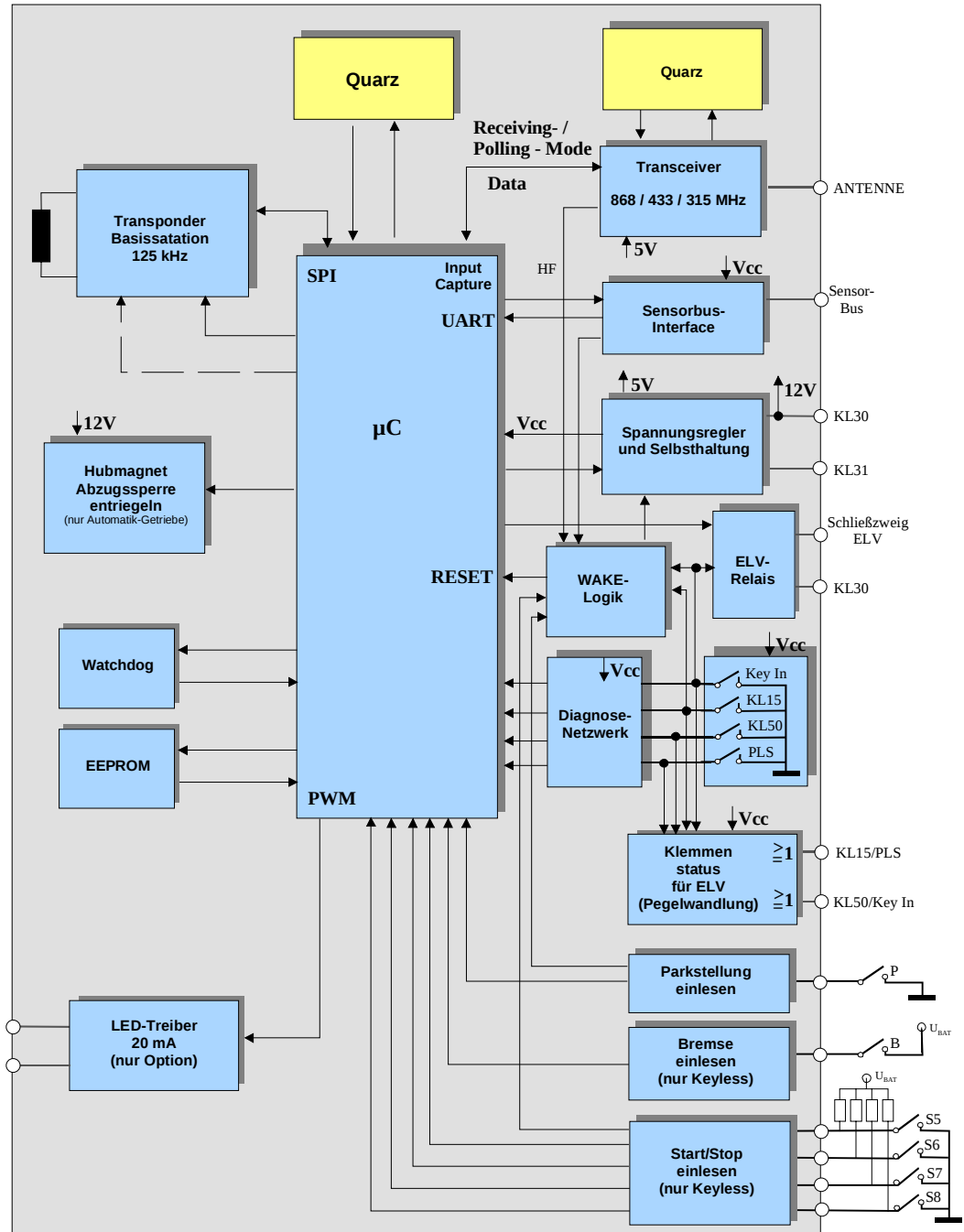
The operating mode is connected through by pressing the respective button. The key switches off automatically after a timeout of approx. 50 seconds.

HF diagnosis:		
Button		Diagnosis operating mode
Open button	(Button 1)	Please do not activate
Close button	(Button 3)	Please do not activate
Boot lid	(Button 2)	Transmit with square-wave signal 2.4 kBaud Transmit with square-wave signal 1 kBaud (MKey only) Transmit with square-wave signal 10 kBaud (MKey only) Transmit with square-wave signal 20 kBaud (MKey only)

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\IFBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 10 of 15

2.4 EZS

2.4.1 Block diagram



Block diagram EZS

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Railf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 11 of 15

2.4.2 Technical data

Temperature range:

The control unit works from -40 to $+85^{\circ}\text{C}$

Voltage supply

12V

Transmitter:

Transmitting frequency: 868.30 MHz (ECE)
433.92 MHz (ECE)
315.00 MHz (USA)

Tolerance of transmitting frequency: ± 50 ppm
(production, ageing, temperature)

Transmitting power to SMB jack typ. 6 dBm @868.30 MHz
typ. 7 dBm @433.92 MHz
typ. 8 dBm @315.00 MHz (USA)

Modulation: Frequency shift keying (FSK2, incoherent)

Frequency shift: ± 16 KHz

Modulation contents: Digital data
Data rate: 2.4 kBit/s (remote control)
20 kBit/s (Keyless Go)
Coding: Manchester

Receiver:

Receiving frequency: 433.92 MHz (ECE)
868.30 MHz (ECE)
315.00 MHz (USA)

Tolerance of average receiving frequency: ± 50 ppm
(production, ageing, temperature)

Receiving band width: 160 KHz

Receiving sensitivity: ≤ -90 dBm at the SMB jack

Receiving data rate: 2.4 kBit/s and 20 kBit/s
Coding: Manchester

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Raif\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 12 of 15

2.4.3 Test mode (test software 0046 for approval measurement)

After the supply voltage has been applied, the EZS is in active mode.
The IDG can be used to switch between two test modes.

HF-test (no IDG in the EZS):

The control unit transmits 16 HF data bytes at a transmission rate of 2.4kBD in a 200ms cycle.

LF-test (IDG in any position in the EZS):

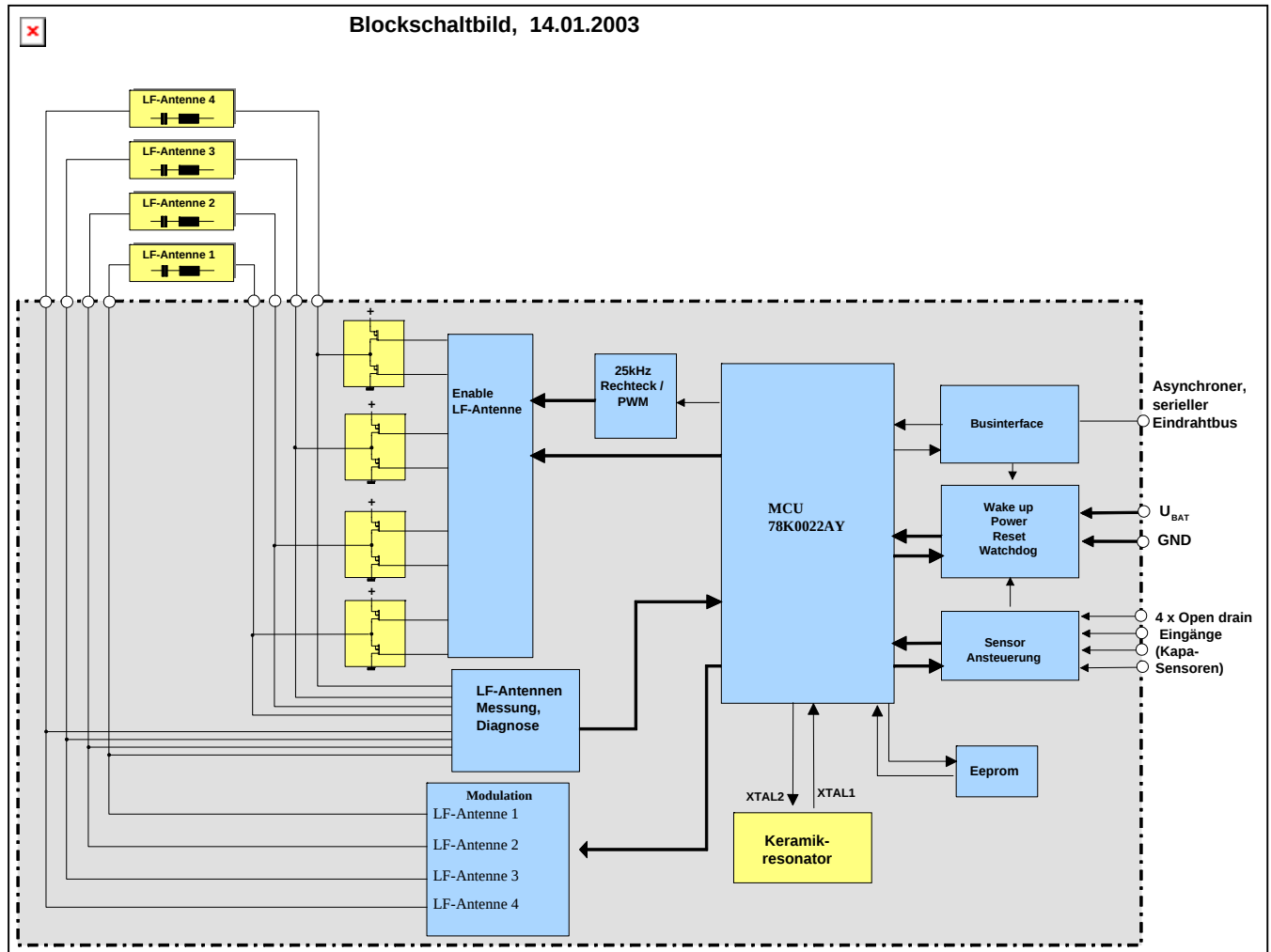
LF communication every 200ms for a period of approx. 50ms.

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 13 of 15

2.5 KSG

Keyless control unit

2.5.1 Block diagram



2.5.2 Technical data

Temperature range:

The control unit works from -40 to $+85^{\circ}\text{C}$

Position of the control unit:

Underneath the glove compartment

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Raif\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 14 of 15

Protection within the on-board mains system

The control unit has a 20 A fuse.

The aerials are triggered by the control unit.

Voltage supply	12V
Current consumption during transmission	3A
Frequency	24.5kHz
Modulation	ASK
Baud rate	1365Baud
Transmission power	
(10m – distance measurement with metal)	<42 dBµA /m

2.5.3 Test mode

Test software for approval measurement:

The control unit with the test software transmits LF data cyclically once the supply voltage has been applied and a short GND pulse has been triggered on the S-bus line (brief activation of the button). For this, all 4 LF aerials must be connected.

In a 400ms cycle, an ASK signal is transmitted to one aerial for 29ms followed by an unmodulated (weaker) signal to all 4 aerials for approx. 12ms.

The ASK signal is transmitted to a different aerial for every new cycle.

MARQUARDT GmbH Schloßstraße 16 D 78 604 Rietheim - Weilheim	Initial issue	02.08.2002	Version	
	Department	AE21	File	C:\Dateien\Ralf\Testberichte\U S A\Marquardt\Audi FBS- C6\FBS C6 - functional description.doc
	Processed by	R. Maier	Docum. no.	
	Date	02.08.2002	Page	Page 15 of 15