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Annex acc. to FCC Title 47 CFR Part 15
relating to
Leopold Kostal GmbH & Co.KG
KK1

Annex no. 5
User Manual

Title 47 - Telecommunication
Part 15 - Radio Frequency Devices
Subpart C – Intentional Radiators
Measurement Procedure: ANSI C63.4-2009

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User Manual of the test equipment (EUT)

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User's manual of the Keyless control unit KK1

Customer: **Daimler AG**

Artikel-Designation: **KK1**

Car lines: **Mercedes: E-Class and S-Class**

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Content

1 Change History

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2 Aim / Purpose

This document describes the Keyless control unit KK1, which communicates to the key by means of a unidirectional / bidirectional low frequency interface.

3 Operational description of the KK1 control unit

3.1 Functions in the car

The Keyless control KK1 unit is mounted in the cars rear trunk.
It activates up to four inductive antennas to send data to the key. (Antennas left, right, front, back)
The antennas left, right and back are only able to send data to the key.

The inductive antenna front is additionally able to receive data from the key. This function is an emergency function, if the battery in the key is down.

The data is transferred with a low frequency inductive field with a frequency of 21,845kHz. The function of the low frequency inductive field is to wake up the key and to allow the key to find out, if it is inside or outside the car. As a function of the position of the key the doors are opened/locked or the engine of the car is started/stopped.

If the emergency function is active, a bidirectional communication is done between the key and the antenna front. This emergency function is only possible in a short range between Antenna front and the key. (distance < 10cm)

3.2 Block diagram of the environmental connections

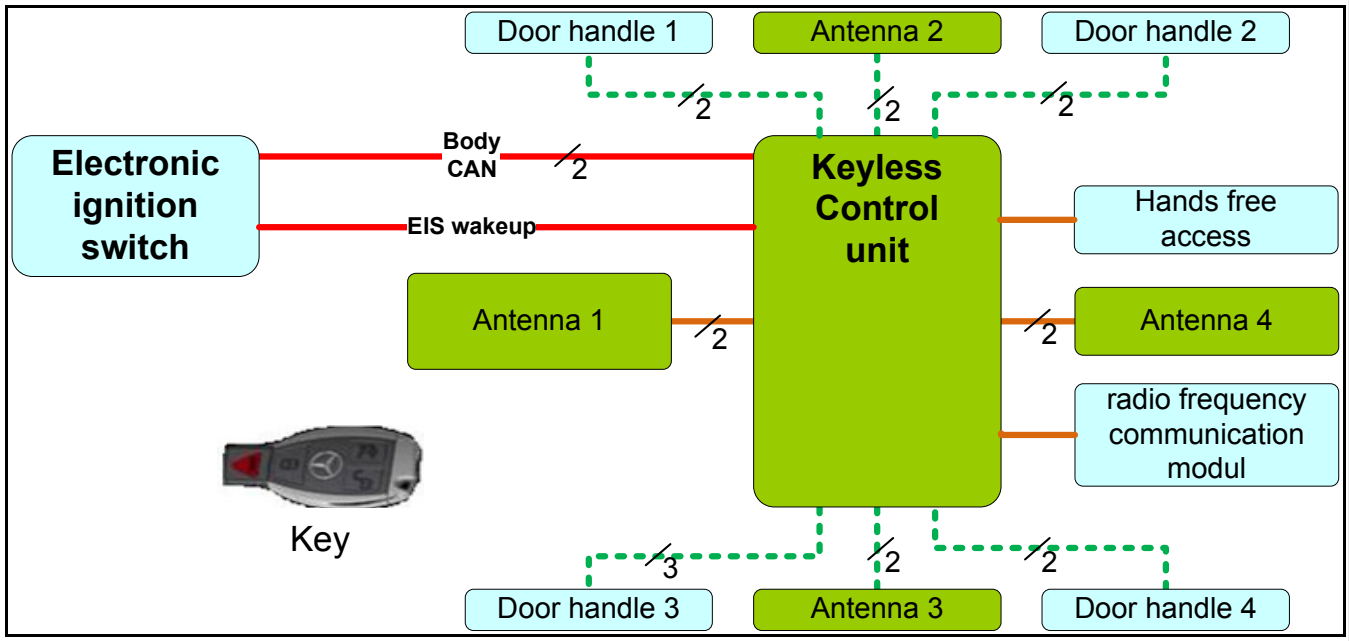

Fig 1: Block diagram of the environmental connections of the KK1 control unit

3.3 Environmental connections in detail

- 6 data lines (Signal and GND) to communicate with the Door handles
- 1 power line to supply a door handle with integrated Near Field Communication module
- 1 LIN interface to communicate with the Hands Free Access control unit
- 1 CAN interface to communicate with all other control units connected with the Body-CAN
- 1 data line to communicate with the radio frequency communication module
- 1 data line to communicate with the Electronic Ignition Switch

- 6 power lines (signal and modulation) to actuate the antennas

3.4 Operational states

- **KK1 sleep mode (Abbreviation: Test mode 1)**
  - The data line to the radio frequency communication module is monitored to wake up the microcontroller
  - The data lines to the door handles are monitored to wake up the microcontroller
- **KK1 communicates with the key to make an authorisation of car access (Abbreviation: Test mode 2)**
  - The antennas were driven according the protocol for car access
- **KK1 communicates with the key to make an authorisation of engine start (Abbreviation: Test mode 3)**
  - The antennas were driven according the protocol for engine start
- **KK1 communicates with the key to make an authorisation of engine start in transponder mode (Abbreviation: Test mode 4)**
  - The emergency antenna is driven according the protocol for engine start in transponder mode

3.5 Variants overview

Regarding the amount of inductive antennas there will be two different variants build up.

The variant **KeylessStart** is able to drive two inductive antennas. The antenna front and the antenna back. The antenna left and antenna right are not connected. With this variant it is only possible to start/stop the engine of the car.

The variant **KeylessGo** is able to drive four inductive antennas. The antenna front, antenna back and additional the antennas left and the antenna right. With this variant it is possible to open/lock the doors and it is possible to start/stop the engine.

Both of these variants are also available with an additional output to supply a door handle with an integrated NFC module. Regarding the inductive antennas there are no differences between the variants with or without the NFC output.

4 Block diagram of the KK1 control unit

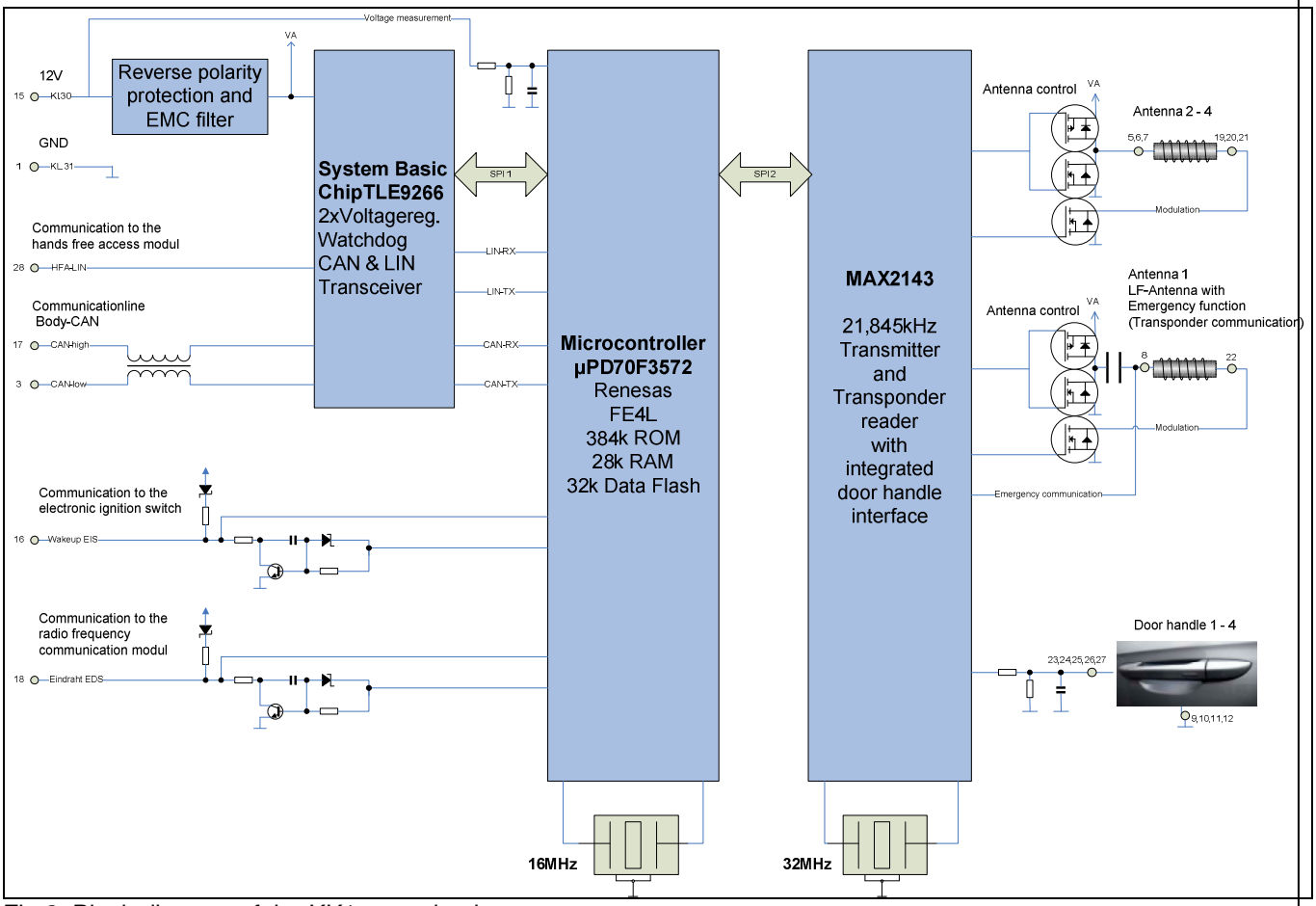

Fig 2: Block diagram of the KK1 control unit

5 Connector of the KK1 control unit

Pin	Signal	current	width
1	Signal (GND)	6 A	0,75 mm²
2	free		
3	Body-CAN low		[1]
4	free		
5	Antenna back (LF1)	4 A	0,75 mm² [1]
6	Antenna right (LF1)	4 A	0,75 mm² [1]
7	Antenna left (LF1)	4 A	0,75 mm² [1]
8	Antenna front (LF1)	4 A	0,75 mm² [1]
9	GND door handle back right	0,2-0,4 A	0,35 mm²
10	GND door handle back left	0,2-0,4 A	0,35 mm²
11	GND door handle front right	0,2-0,4 A	0,35 mm²
12	GND door handle front left	0,2-0,4 A	0,35 mm²
13	free		
14	free		
15	Signal 30 (12V)	6 A	0,75 mm²
16	Wakeup EIS/CGW	0,2-0,4 A	0,35 mm²
17	Body-CAN high		[1]
18	Communicationline (EDS)	0,2-0,4 A	0,35 mm²
19	Antenna back (LF2)	4 A	0,75 mm² [1]
20	Antenna right (LF2)	4 A	0,75 mm² [1]
21	Antenna left (LF2)	4 A	0,75 mm² [1]
22	Antenna front (LF2)	4 A	0,75 mm² [1]
23	Signal door handle back right	0,2-0,4 A	0,35 mm²
24	Signal door handle back left	0,2-0,4 A	0,35 mm²
25	Signal door handle front right	0,2-0,4 A	0,35 mm²
26	Signal door handle front left	0,2-0,4 A	0,35 mm²
27	Power door handle NFC		
28	LIN HFA		

Fig. 3: Pinning of the KK1 control unit

6 Technical data

6.1 Technical Data of the KK1 control unit

- Supply voltage: 6V…27V
- Supply current peak: 6A
- Frequency: 21,845kHz
- Modulation: binary phase shift keying
- Datacoding in normal mode: NRZ
- Datacoding in emergency mode NRZM
- Modulation frequency: 5,461 kbps
- Temperature range: -40°C…85°C

7 Journalisation of the car's owners manual

For Canada:
This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

For USA:
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 user's authority to operate the equipment.