



- **Keyfob**

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- Hardware description (brief)

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- Preliminary/Draft



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Version history:

Version number	Author	Changes
1.00	Fadil Beqiri	- Initial version

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0 INTRODUCTION

0.1 General

This description is focused on the IEEE 802.15.4™ Keyfob remote control from FALCOM GmbH. It contains short information about purpose and use of the Keyfob concept.

The Keyfob remote control contains an IEEE 802.15.4™ module that works on the 2.4 GHz ISM-Band. It uses 16-channels in interval of 5 MHz (2405–2480 MHz).

The Keyfob supports an over-the-air data rate of 250 kb/s by using the O-QPSK (offset quadrature phase-shift keying) modulation type. The duty-cycle with the PHD100 device is:

- 1 ms transmit (Tx)
- 300 ms receive (Rx)
- 5 s sleep

Based on these features, the Keyfob will spend most of its operational life in a sleep state that favor the AAA-batteries a long lifetime; however, the Keyfob periodically listens to the RF channel in order to determine whether a message is pending.

The Keyfob has an internal Multi-Layer-Ceramics antenna from Murata with the gain of –1 dB. The IEEE 802.15.4™ module works with a chipset from Freescale called MC13192 (Transceiver), MC9S08GT60 (8-bit Processor).

The keyfob operates with the help of three buttons. It supports 3 LEDs, a buzzer and a vibrator for signal indication.

0.2 Circuit concept

The Keyfob architecture includes the following major functional components:

❖ ARCHITECTURE INTEGRATES:

- ✓ high-performance IEEE802.15.4 wireless module for communication
- ✓ 1 x Buzzer
- ✓ 1 x Vibrator
- ✓ MC9S08GT60 Processor (8-bit) that controls all functions of the system
- ✓ Power Control for AAA Batteries
- ✓ IEEE antenna

❖ PHYSICAL INTERFACES:

- ✓ 3 x push-buttons.
- ✓ 3 x LEDs
- ✓ 2 X AAA batteries

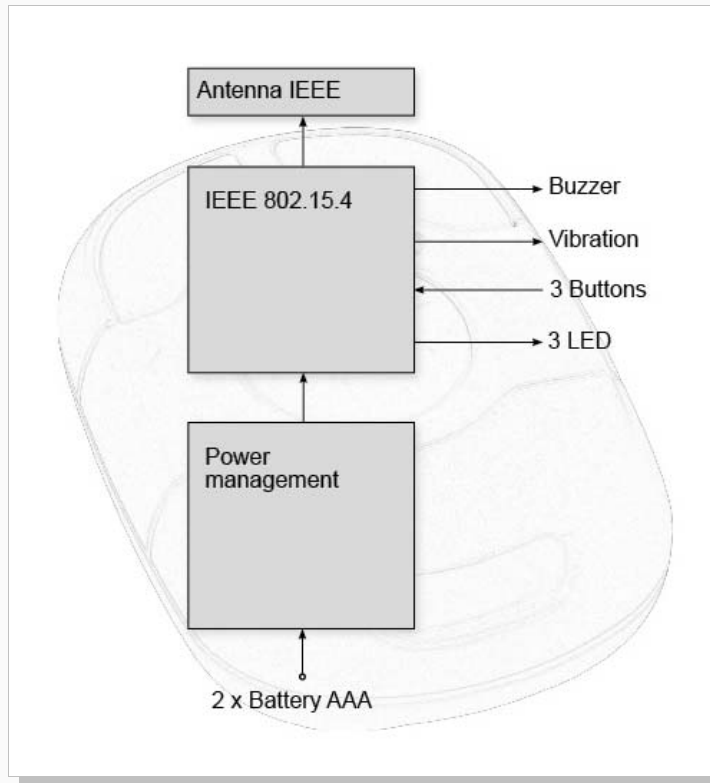


Figure 1: Architecture of the Keyfob remote control

1 TECHNICAL DATA

1.1 General specifications of Keyfob

❖ **Power supply:**

- **O**perating voltage from 2.4 V to 3.3 VDC
- Powered by 2 x AAA batteries

❖ **Temperature range:**

- **N**ormal operation: -25 °C to +55 °C

❖ **Physical characteristics:**

- **S**ize: 66 mm x 46 mm x 20 mm
- **W**eight: approx. 55 g

❖ **Audio:**

- **1** x Buzzer

❖ **Vibration:**

- **1** x Vibrator

❖ **Connectivity:**

- IEEE 802.15.4™ connectivity.

❖ **Channels:**

- 16 channels

Channel	Frequency
1	2.405 GHz
2	2.410 GHz
3	2.415 GHz
4	2.420 GHz
5	2.425 GHz
6	2.430 GHz
7	2.435 GHz
8	2.440 GHz
9	2.445 GHz
10	2.450 GHz
11	2.455 GHz
12	2.460 GHz
13	2.465 GHz
14	2.470 GHz
15	2.475 GHz
16	2.480 GHz

2 BI-DIRECTIONAL KEYFOB, REMOTE OPERATION

The Keyfob gives you remote operation of your security system. This Keyfob operates with the push of one button or buttons combination. It also gives you direct feedback on its operation with a blinking light as well as with voice prompts, so you can be sure that your security system is operating as you intended. The communication to the Keyfob unit is based on the IEEE 802.15.4 wireless network systems.



Figure 2: Keyfob control with allocated Buttons and LEDs names

Buttons common functionalities

Items	Buttons overview	Using the marked Button(s)	Description/Functionalities
1	Button 1	B1	Tests the range of remote control
2	Button 2	B2	Sets the alarm active
3	Button 2	B2	If no alarm activated, activates the alarm, otherwise returns activated alarm to inactive (see also Item 2).
4	Button 3	B3	Checks the status of the internal batteries
5	Button 1 + 3	B1+ B3	Switches the Keyfob on.
6	Button 1 + 3 + 2	B1+ B3 + B2	Switches the Keyfob and connected device off.
7	Button 1 + 2 + 3	B1+ B2 + B3	Pairs the Keyfob with external device.

Table 1: Button description

LEDs lighting colours

Items	LEDs overview	LEDs marked	Colour of light
1	LED 1	L1	Orange
2	LED 2	L2	Red
3	LED 3	L2	Yellow

Table 2: LED description

Actions and Reactions of the Keyfob while performing activations

Items	Buttons	Actions generated by Key combination	Reaction Possibilities	Meaning
Short pressing = press the button for less than 2 seconds				
Long pressing = press the button for longer than 2 seconds				
1	B1	short pressing	while the B1 is pressed the L1 blinks one time, after the B1 is released, each of L1 and L3 blinks one time in sequence and two beep tones are respectively generated.	Indicates that the external device and Keyfob are within the wavelength of communication systems.
2			simultaneously generates three beep tones, and three times blinking of L1 and L3.	Indicates that the external device and Keyfob are out of the wavelength of communication systems.
3	B2	Long pressing	lights the L1 for longer than 2 seconds	Indicates that the alarm is set active (arm)
4		Within 6 seconds two times short pressing.	simultaneously generates two beep tones and two times blinging of L1.	Indicates that the activated alarm is returned to inactive (disarm) or no alarm is already set.
5	B3	Long pressing	lights the L1+L2+L3 while the B3 is pressed.	Indicates that the battery is full charged.
6			lights the L1+L2 while the B3 is pressed.	Indicates that the batteries is half-full charged, they can be recharged (if rechargeable).
7			lights the L1 while the B3 is pressed.	Indicates that the batteries reach the low level, they must be replaced or recharged (if rechargeable).
8	B1 + B3	Simultaneously the B1 and B3 short pressing.	-	Indicates that the Keyfob is switched on.
			simultaneously generates three beep tones, and three times blinking of L1 and L3.	Indicates that the external device and Keyfob are out of the wavelength of communication systems or they are already not paired (enter the key number by using the HARLEY.KEY<index> parameter)
9	B1+B3+(B2)	Simultaneously, press and hold the B1 and B3 for longer than 2 seconds. Release when the L1 and L3 light. Then the B2 long pressing.	the L2 lights until the B2 is released.	Indicates that the external device and Keyfob are shut down. The external device will be shut down and set itself into one of sleep modes based on the user defined alarm (e.g. into SleepIgnition, SleepMotion, SleepAll or SleepWakeup supported by the SYSTEM action type).
10	B1+B2+B3	Simultaneously the B1, B2 and B3 long pressing.	causes lighting of L1, L2 and L3 in series (one LED after another in sequence)	Indicates that the external device and Keyfob are paired (remote communication is set up and both devices are ready for use).
11	-	-	If the L1 and L3 light and a beep tone is generated as well as the L2 lights and Keyfob vibrates (in sequence, one after another, not simultaneously)	Indicates an incoming alarm sent by the Black box. To turn the Reaction off perform the action on the Item 12.
12	B2	Within 3 seconds two times short pressing	-	Turns off the incoming alarm.
13	-	-	If simultaneously are generated, a long beep tone (high to low tone) and L2 lights for a long time.	Indicates that the external device and Keyfob are longer than 5 seconds out of the wavelength of communication systems. The Keyfob is going into the sleep mode.

Table 3: Description of Actions and Reactions

3 RF EXPOSURES

This device contains 2.4 GHz IEEE 802.15.4 wireless functions that is operational in this frequency.

The following statements according to the FCCs are only applied for the Keyfob.

Statement according to FCC part 15.19:

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

- ☞ this device may not cause harmful interference, and
- ☞ this device must accept any interference received, including interference that may cause undesired operation.

Statement according to FCC part 15.21:

Modifications not expressly approved by this company could void the user's authority to operate the equipment.

Statement according to FCC part 15.105:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help