Sensor Transmission Specifications

Document Information

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Project	
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Change History

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1 Scope

This document defines the signaling behavior of the First Access Sensor, described from the perspective of signal transmission. This specification does not specify software application behavior, security aspects, or other features of the system design. The main purpose of this document is to specify the RF behavior of the sensor as it relates to regulatory requirements.

2 Signals

2.1 Card background

The signal transmission specifications for the First Access Card are documented separately. Reference FCC application number OC8CA108. For the purpose of understanding the sensor specifications we will summarize the role of the card.

The card transmits an identity recognition code which the sensor receives. The card also will respond to a specific request from the sensor to send a secure (cryptographically) recognition code.

The card sleeps most of the time. The only time that is alert to the sensor's request is in the 500 microseconds after the card itself transmits its recognition code, so called Card RF Attention State. During this interval the sensor will begin its transmission.

2.2 Sensor listening

In its usual state the sensor is quiet and listening. It will receive card identity announcements and forward these to the host by serial interface.

2.3 Sensor request for card secure recognition code transmission

The request for a card to send its secure recognition code is sent from the sensor to the card during the Card RF Attention State. After the card successfully receives this request it will compute and then send the response. The secure recognition code is an identifier that cannot be faked by an imposter card.

This transmission is not periodic. The user will request this transmission (by keyboard) typically 3 times per day or less. The duration of the transmission by the sensor is 18 ms.

[¶15.231 (a) (b) (c)]

3 Hardware Description

3.1 General description

The hardware is split into two parts: Sensor Model SA108 and Card Model CA108. The card hardware is documented elsewhere.

Both card and sensor function as a full superheterodyne TRANSCIEVERS, operating on 433.92 MHz and controlled by the TI Microcontroller MSP430x315ID. The transceivers of the card and sensor use the same technology. The antennas are different.

3.2 Transceiver

The principle of transceiver operation is sending for 600[μS] the carrier frequency (433.92[MHz] without modulation) by the transmitter.

While receiving the carrier by the receiver, it calibrates it self in order to be ready to get the data correctly.

3.2.1 receiver

The controller loads the PLL to it's local oscillator (LO) frequency of 423.22 MHz. This frequency is entered through the voltage controlled oscillator (VCO) (based on an RF Amplifier, a varactor, transistor Amplifier and LC net) and a RF switch to the receiver.

The receiver is responsible of mixing the LO and the input frequency to a result frequency of 10.7 MHz, filtered and detected by discriminator to a band of ±90 KHz.

The signal is entered to a buffer that acts as a sample and hold to achieve calibration.

3.2.2 transmitter

The controller loads the PLL to a frequency of 433.92 MHz. This frequency is entered through the VCO (based on a RF Amplifier, a varactor, transistor Amplifier and LC net) a RF switch and the matching filter network to the antenna.

3.3 Power supply

The Power supply is applied by regulator through the RS232.

3.4 Controller

The micro-controller is Texas Instrument model #: MSP430x315IDL. It controls all the RF function and protocol. Input to the micro-controller comes from the PC by the RS232 shielded cable.

3.5 Antenna

The Sensor has two Antennas and they operated through the RF switch to the RF LC band pass filter.

One antenna is soldered by wire to the Printed circuit. The second antenna is the RS232 cable shielding which is connected through the Inductor to the ground. **Neither antenna may be removed or modified by the user.**