Signal Transmission Specifications

Document Information

Title	Signal Transmission Specifications
Project	
Classification	First Access Internal Use Only

Distribution List

Owner	David Wine, Amos Daskal.
Approve	Amos Daskal
Review	Moshe Elgressy

Change History

Current Version

Revision	*Date*	*Comments*
n/a	12-May-1999	

Approvals

Revision	*Date*	*Comments*

1 Scope

This document defines the signaling behavior of the First Access Enterprise authentication system, 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 system as it relates to regulatory requirements.

2 Signals

2.1 Card to sensor

There are two types of transmissions, which may be made by the card. When it is so instructed by the computer, the card will transmit a train of periodic recognition code announcements. When it is otherwise instructed by the computer, the card will transmit a single secure recognition code.

2.1.1 inactive uninitialized state

The card is in its *inactive uninitialized* state on power-up or after the infrared *clear all* command has been serviced. In this state the card does not broadcast on RF. IR communication only is used to initialize the card, in a one-way transmission from the sensor to the card. The card makes no transmissions in RF in response but once successfully initialized will move to the *active initialized* state, in which it will send recognition code announcements, until it is again switched to *inactive uninitialized* state by the computer.

2.1.2 recognition code transmission

Once in the *active initialized* state the card issues periodic announcements of its recognition code. And include an indication that the message is an identity announcement, the card identity number, validation of this identity, error detection codes, and redundancy.

These announcements are spaced 10 to 10.5 seconds apart (quiet time). Each announcement is divided into 8 segments of 2.5 ms. radiation interleaved with 30-40 ms. quiet time reaching a total duration of between 250 and 300 ms.

Thus the duration of the transmission is no more than 300 ms with a period between transmissions of between 10.25 and 10.8 seconds.

[¶15.231(e)]

2.1.3 RF attention

To conserve power and to provide a mechanism for sensors to address particular cards, each card is attentive to RF for a brief period following its announcement.

When a sensor is instructed to send a message to a card it holds the message and waits for the card's recognition code announcement. Once it receives a recognition code that matches the identity of the addressee, it will wait for the end of the announcement and transmit the stored message.

For a period of 500 microseconds after its announcement, a card is receptive to RF. If a carrier is detected during this time then the card will continue to listen to the message that will follow. If the carrier is not detected the card will return to its *inactive initialized* state.

If the error detection code shows the message was not received intact then the card will send a two-byte *message fails validation* response.

2.1.4 secure recognition code transmission

The message, which can be sent from the computer to the card during the RF Attention State, is a request for a secure recognition code transmission. 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 card at computer request will send it typically 3 times per day or less but in any case, not more than once in an hour. The duration by the card of the transmission is 18 ms.

[¶15.231 (a) (b) (c)]

2.1 Sensor to card

2.1.1 listening

In its usual state the sensor is quiet and listening. It will receive card identity announcements and other messages and forwards these to the host.

2.1.2 listening and message loaded for card

A card is attentive to RF for only a brief period following its announcement. When the host wishes to address a transmission to a particular card it loads the sensor with this message, along with the identity of the card (addressee). The sensor then waits for this card to announce itself and consequently transmits the signal. The sensor then returns to its listening state.

These transmissions are sent typically 3 times per day or less.

[¶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

They are both (Sensor and Card) functions as a full superheterodyne TRANSCIEVERS, both operating on 433.92[MHz], and controlled by the TI Microcontroller MSP430x315IDL each.

Their transceivers of the sensor and card use the same technology. The antennas are different.

Refer to the schematics for callout labels within this description.

1.2 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.

1.1.1 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], filtering by F1, F2 filters 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.

1.1.2 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.

1.3 Sensor model SA108.

The Power supply is applied by regulator through the RS232.

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.

1.3.1 sensor 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.**

1.4 Card model CA108

The Card has only one antenna, it is a printed antenna in the printed circuit.