

PROVISIONAL PATENT APPLICATION

MODULAR CONTACTLESS SMART CARD ACCESS CONTROL READER

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Field of the Invention

The present invention relates generally to access control readers and more specifically to modular contactless smart card access control readers. Such modular readers can provide for cost-effective, scalable and/or easily configurable design for a physical access control reader.

Background

Existing access control readers are limited in functionality. Such readers typically include a unified electronics board, a mounting plate, and an aesthetically pleasing cover. When the electronics become obsolete, the entire reader is discarded and replaced. Such an approach can be costly in terms of expenditures and wasted time. Accordingly, there exists a need in the art for advanced systems, devices and methods for access control.

Summary

Some embodiments of the present invention can be used in relation to physical access control related to a building or other secured location; to logical access control of, for example, a computer network; and/or to access control utilizing biometrics such as, for example, finger prints, retinal scans and/or the like.

A. A system for providing contactless access control, the system comprising:

a modular component group, wherein the modular component group includes a first active component and a second active component.

A+1. The system of A, wherein the first component is fixed in relation to a mounting surface, and wherein the second component is removable.

A+3. The system of A, wherein the second component is detached from the first component, and replaced with a third component.

A+4. The system of A+3, wherein the first component is PCB operable to implement wireless access.

A+5. The system of A+3, wherein the second component is selected from a group consisting of: a PCB operable to implement wireless access; a PCB operable to implement a keypad; and a dongle operable to implement infra red communications with the first component.

B. A multiple frequency access control device.

B+1. The multiple frequency access control device of B, wherein the device communicates over a first frequency band and a second frequency band.

B+2. The multiple frequency access control device of B+1, wherein the device additionally communicates over a third frequency band.

C. A method for controlling access, the method comprising:
providing a first set of access control parameters at a first operational frequency;
and
providing a second set of access control parameters at a second frequency.

C+1. The method of C, wherein the method further comprises:
migrating to the second set of access control parameters.

C+2. The method of C+1, wherein the method further comprises:
eliminating the first set of access control parameters.

D. A method for controlling access, the method comprising:
associating a wireless controller with an access control device; and
programming the access control device via the wireless controller.

D+1. The method of D, wherein the wireless controller is an infra red dongle.

This summary provides only a general outline of some embodiments according to the present invention. Many other objects, features, advantages and other embodiments of the present invention will become more fully apparent from the following detailed description, the appended claims and the accompanying drawings.

Figures

Various features and attendant advantages of the present invention will become fully appreciated as the same becomes better understood when considered in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the several views, and wherein:

FIG. 1 is a perspective view of the base assembly in accordance with an embodiment of the present invention;

FIG.2 is a perspective view of the cover assembly in accordance with an embodiment of the present invention;

FIG.3 is a rear view of the cover assembly in accordance with an embodiment of the present invention;

FIG.4 is a perspective view of the communications adaptor in accordance with an embodiment of the present invention;

FIG. 5 is a block diagram overview of the electronics in accordance with an embodiment of the present invention;

FIG.6 is a block diagram of the electronics in the base assembly in accordance with an embodiment of the present invention;

FIG.7 is a block diagram of the electronics in the cover assembly in accordance with an embodiment of the present invention;

FIG. 8 illustrates a method in accordance with some embodiments of the present invention;

FIG. 9 illustrates another method in accordance with some embodiments of the present invention; and

FIG. 10 illustrates yet another method in accordance with some embodiments of the present invention.

Detailed Description of the Inventions

In some embodiments of the present inventions a potted design is provided that includes two or more components. Such components can include a first electronic circuit board and a second electronic circuit board. The access control can be designed such that the first electronic circuit board and the second electronic circuit board are attached together by a connector. The first electronic circuit board provides baseline functionality, and the second electronic circuit board provides modular functionality. Thus, when a system is to be upgraded, the second electronic circuit board can be removed from the first electronic circuit board, and replaced by a different electronic circuit board. This provides an ability to upgrade a system without requiring a rewiring and/or total replacement of the system. In some cases, the system does not need to be dismounted from its fixed location, rather, only the upgrade component needs to be added. One example of the second electronic circuit board is that associated with a keypad controller and that associated with a RF controller.

In other embodiments, the systems include a programmable electronic element that can be updated to perform new and/or different operations. Thus, for example, the programmable electronic element can be communicably coupled to a programming port. This programming port can be an infra red port, and in some cases, the infra red port can be removably coupled to the programmable electronic element through, for example, attaching a dongle to an electronic circuit card. Alternatively, or in addition, the systems can include a wired programming interface that allows the programmable electronic element to be programmed from a remote location via a central computer system.

In some cases, such systems provide for upgrading systems easily. Further, in some cases, such systems can provide the ability to reprogram access control parameters

without cycling power. This offers increased flexibility for configuring and/or upgrading the product in the field. Such systems can be cost-effective, scaleable and easily configurable design for a physical access control reader.

One embodiment of the present invention provides a modular contactless smart card access control reader that substantially departs from the conventional concepts and designs of the prior art, and in so doing provides an apparatus primarily developed for the purpose of allowing a cost-effective, scaleable and easily configurable design for a physical access control reader.

In some cases, the present invention provides a new modular contactless smart card access control reader that has many of the advantages of the access control readers mentioned heretofore and many novel features that result in a new modular contactless smart card access control reader which is not anticipated, rendered obvious, suggested, or even implied by any of the prior art access control readers, either alone or in any combination thereof.

In one case, the present invention provides a contactless access control reader with a base assembly and a communication adaptor. The base assembly consists of a PCB potted into a piece of plastic which contains the following functionality: (1) the contactless card communications engine and security functions, (2) reader to host controller interface circuitry and (3) the reader microcontroller and all associated functionality. The cover assembly consists of a PCB potted into a piece of plastic which contains the following functionality: (1) One or more antennas and associated tuning circuits, (2) additional analog front end circuitry, (3) LEDs and (4) a part of the personality detection scheme novel in this invention. The communications adaptor consists of a small PCB potted in a piece of plastic that contains the following functionality: (1) An infrared interface, (2) several momentary switches and (3) the circuitry associated with programming a microcontroller in the base assembly.

Before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and to the arrangements of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood that the phraseology and terminology employed herein are for the purpose of the description and should not be regarded as limiting.

One example of possible modification is from a non-keypad to a keypad reader after installation in the field. In some cases, the present invention provides for modular contactless smart card access control readers that operate at multiple RF frequencies. For example, two or more frequencies can be supported including 125 KHz and 13.56MHz. This multiple frequency approach provides for transitioning systems from one generation of control to another. Thus, where access control is initially provided at 125 KHz, new processes of access control can be supported at 13.56MHz until the new processes of access control are fully implemented and the 125KHz processes can then be ended.

Various embodiments of the present invention provide a contactless smart card access control reader that can easily be re-programmed in the field with firmware updates. This can be accomplished by providing access to a programming connector without removing the reader

from its installed position on a wall or mullion. This connector can be accessed by simply removing the aesthetic cover from the reader. Yet other embodiments of the present invention can include a personality detection system operable to detect what type of cover is installed on the reader base and uses this information to configure the microcontroller appropriately for the application. Further, some embodiments of the present invention provide a contactless smart card access control reader that implements a tamper detection scheme capable of determining when the cover has been removed from the reader. This tamper detection scheme can be configured to send a message to the host controller and/or sound an alarm at the reader.

Yet further embodiments of the present invention provide a contactless smart card access control reader that implements an automatic software-based addressing scheme via an RS-485 network, or some other network. This scheme could allow a group of readers on a network to be automatically assigned addresses when first connected to a new host controller. Addressing the readers through software simplifies the installation procedure as well as keeps the cost of the readers lower by eliminating the need for a hardware switch or switch bank in the reader. Additional embodiments of the present invention provide a contactless smart card access control reader that can easily accept a communication adaptor for the purpose of programming or configuring the reader. This communication adaptor can be plugged into the base reader unit while it is still mounted in its service position on the wall or mullion. The communication adaptor will include infrared communication capability so that a personal data assistant with an infrared interface can be used to re-flash, configure or load keys into the reader.

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, the attached figures illustrate a modular contactless smart card access control reader, which comprises a base assembly, a cover assembly and a communication adaptor.

The base assembly mounts on the wall or mullion in the service position for the reader and is never removed. The base assembly PCB contains the following functionality: (1) the contactless smart card communications engine and security functions, (2) all reader to host controller interface circuitry, (3) the reader microcontroller and all associated functionality and (4) all interface circuitry to the host controller. Several possible structural and functional variations to the base assembly are obvious to one skilled in the art. These variations include any feature currently partitioned into the cover assembly. Examples of such variations include but are not limited to keypad, LCD, USB, CAN and/or TCP/IP connectivity interface electronics.

The cover assembly consists of the following functionality: (1) a PCB, (2) one or more antennas and associated tuning circuits, (3) additional analog front end circuitry, (4) LEDs and (5) a personality detection circuit that allows the microcontroller in the base assembly to determine the exact configuration of the cover assembly plugged into it. Several possible structural and functional variations to the cover assembly are obvious to one skilled in the art. These variations include any feature that may be integrated into a proximity access control reader. Examples of such variations include but are not limited to keypad, LCD, USB, CAN and/or TCP/IP connectivity interface electronics. It is also possible to include antennas, tuning networks, and appropriate RF reader electronics for other frequency reader systems including but not limited to 125 KHz, 433MHz, 800MHz, 900MHz and/or 2400MHz.

The communications adaptor consists of a small PCB that contains the following functionality: (1) an infrared interface, (2) several momentary switches, (3) a particular personality circuit (4) and the circuitry associated with programming a microcontroller in the base assembly. Several possible structural and functional variations to the communications adaptor exist. Some of these variations include but are not limited to a hardware programming, USB, serial or cellular phone interface. Any of these interfaces could be used through a PDA or other portable computing device to program, load keys, download data or program the reader in it's installed position on the wall or mullion.

The components and sub-components in this invention are interconnected as described as follows. First, the base assembly is wired into the existing building wiring at the reader installation location and the base assembly is mounted to the wall or mullion using screws. The base assembly contains a male PCB interconnect header. This header is visible and accessible through an open window on the exposed front surface of the base assembly. Second, the back of the cover assembly is potted with a rectangular shaped cavity recessed into the potting. In this cavity, there is a mating female PCB interconnect header. The cover assembly is snapped onto the base assembly and during this process, the female connector in the cover assembly engages the male connector in the base assembly. This connector mating provides the interconnect of all of the circuits that are distributed between the base and cover assemblies. The communications adaptor subassembly can be attached to the base assembly if the cover assembly is removed. The female header connector on the communications adaptor board is the same as that found on the cover assembly PCB. Before installing or after removing the cover assembly, a technician can install the communications adaptor by mating the connector on the communications adaptor to the exposed connector on the base assembly. (4) The portable PDA or programmer assembly can then interact with the base assembly through the infrared port on the PDA. A program running on the PDA allows several operations with the electronics on the base PCB. These operations include but are not limited to configuration or reader behavior, loading keys to the reader, addressing the reader for an RS-485 bus, downloading data from the reader and flashing the reader with new firmware.

There are several alternative variations to the aforementioned embodiments. The variations include re-partitioning the electronics/functionality in any way to change the features that are included in the base, cover and communications adaptor assemblies. For example, it is possible to include all of the functionality on the communications adaptor into the base assembly thus eliminating the need for the base assembly. Other potential variations include adding another operation frequency or protocol to the functionality of the reader.

This invention and the main components can operate collectively as a physical access control reader. In one embodiment, the system includes functionality at both 125 KHz and 13.56 MHz. In such an embodiment, the reader base assembly can be mounted on the wall, the communication adaptor is plugged into the base assembly and is used to configure or download or upload any information to or from the base assembly. The cover is then snapped onto the base assembly. The microcontroller in the base assembly detects when a cover assembly is snapped onto it and then reads the value on an analog to digital converter channel to determine

what type of cover it is. Based on the personality of the cover module, the microcontroller configures I/O and operation accordingly.

As just one example illustrating the power of the present invention, a reader that lacks keypad functionality is in service in the field. The user of the access control reader decides that they would like to convert the reader from a non-keypad to a keypad reader. An installer or service technician is sent to the site where the reader is in use. The installer removes the cover assembly from the reader and installs a new cover assembly that includes the keypad functionality. This process may or may not include using the communications adaptor to re-flash the firmware in the reader. After the new cover assembly is installed on to the base assembly, the microcontroller assembly detects the new cover and configures itself as a keypad reader.

The microcontroller then resets and begins the normal operation mode for the physical access control reader. In an embodiment, this includes polling for two or more different types of transponders within the field of the reader. At a predetermined period, the microcontroller turns on the RF interface, waits for the hardware to settle, either sends a poll or not depending on the type of transponder it is searching for, then checks the output of the receiver to determine if a transponder is in the field and responding. If a transponder is in the field and responding, the microcontroller then carries out all of the steps to read or write the data from or to the transponder. Once this operation is completed, the microcontroller formats the data appropriately and sends it to the host controller.

In addition to polling for a tag, the reader can be configured to operate in a "pass-through" mode. In this mode, the reader is controlled by a host computer through the serial port. The reader simply performs any command the host controller sends to it and responds with the appropriate message according to the serial protocol for the reader.

The reader can also contain several other features such as LEDs and a beeper that can be controlled by the host controller through hardware lines or through the serial protocol. The hardware control lines are normally pulled-up in the reader and are active low. When the host pulls the line low, the microcontroller detects this state and activates the appropriate feature as it is configured. These controls include but are not limited to green and red led and beeper. A novel feature included in this invention that can be employed to extend the physical cable distance employed between the host and reader is the use of an analog to digital converter on the microcontroller to detect the host activation of a control line. Since long cable lengths can result in the host being unable to pull the line below the digital threshold on the microcontroller I/O line, this invention employs the use of an a/d channel in lieu of a digital I/O line. This allows the activation threshold for the control line to be programmable and configurable resulting in significantly longer cable runs between the host computer and reader to be successfully detected.

One embodiment of the present invention provides a modular contactless smart card access control reader for allowing a cost-effective, scalable and easily configurable design for a physical access control reader. The inventive device includes a base assembly, a cover assembly and a communication adaptor. The base assembly consists of a pcb potted into a piece of plastic

which contains the following functionality: (1) the contactless smart card communications engine and security functions, (2) all reader to host controller interface circuitry and (3) the reader microcontroller and all associated functionality. The cover assembly consists of a pcb ported into a piece of plastic which contains the following functionality: (1) One or more antennas and associated tuning circuits, (2) additional analog front end circuitry, (3) leds and (4) a part of the personality detection scheme novel in this invention. The communications adaptor consists of a small pcb potted in a piece of plastic that contains the following functionality: (1) An infrared interface, (2) several momentary switches and (3) the circuitry necessary to program a microcontroller in the base assembly.

As to a further discussion of the manner of usage and operation of the present invention, the same should be apparent from the above description. Accordingly, no further discussion relating to the manner of usage and operation will be provided.

With respect to the above description then, it is to be realized that the optimum dimensional relationships for the parts of the invention, to include variations in size, materials, shape, form, function and manner of operation, assembly and use, are deemed readily apparent and obvious to one skilled in the art, and all equivalent relationships to those illustrated in the drawings and described in the specification are intended to be encompassed by the present invention. Therefore, the foregoing is considered as illustrative of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.



FIG. 1 is a perspective view of the base assembly in accordance with an embodiment of the present invention.



FIG.2 is a perspective view of the cover assembly in accordance with an embodiment of the present invention.



FIG.3 is a rear view of the cover assembly in accordance with an embodiment of the present invention.

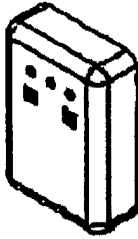


FIG.4 is a perspective view of the communications adaptor in accordance with an embodiment of the present invention.

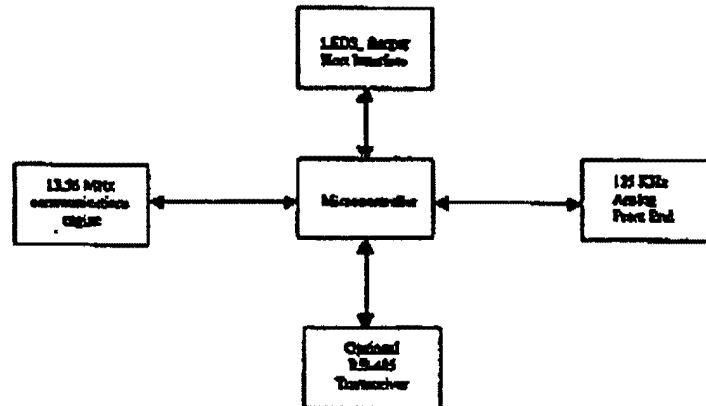


FIG. 5 is a block diagram overview of the electronics in accordance with an embodiment of the present invention.

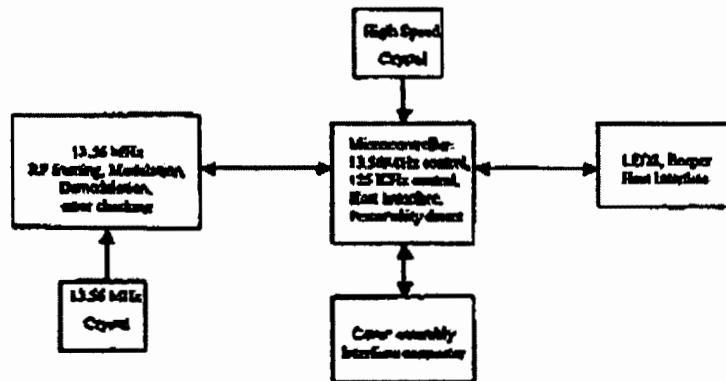


FIG.6 is a block diagram of the electronics in the base assembly in accordance with an embodiment of the present invention.

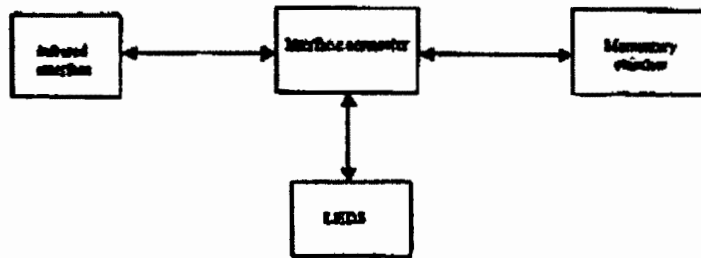


FIG.7 is a block diagram of the electronics in the cover assembly in accordance with an embodiment of the present invention.

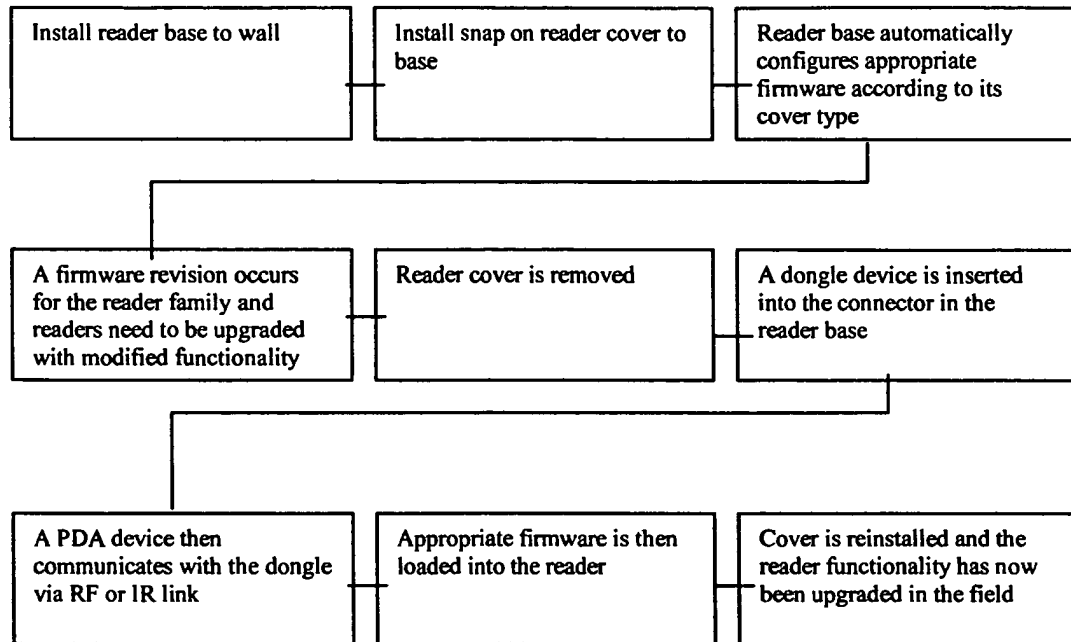


FIG. 8 illustrates a method in accordance with some embodiments of the present invention.

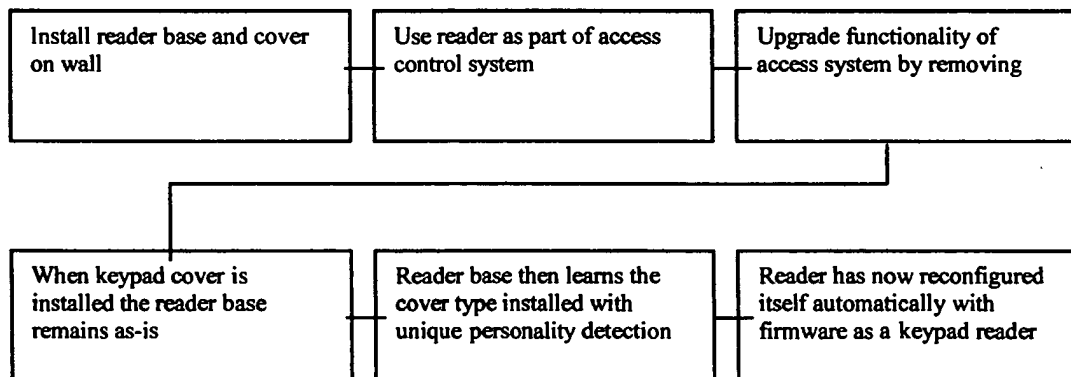


FIG. 9 illustrates another method in accordance with some embodiments of the present invention.

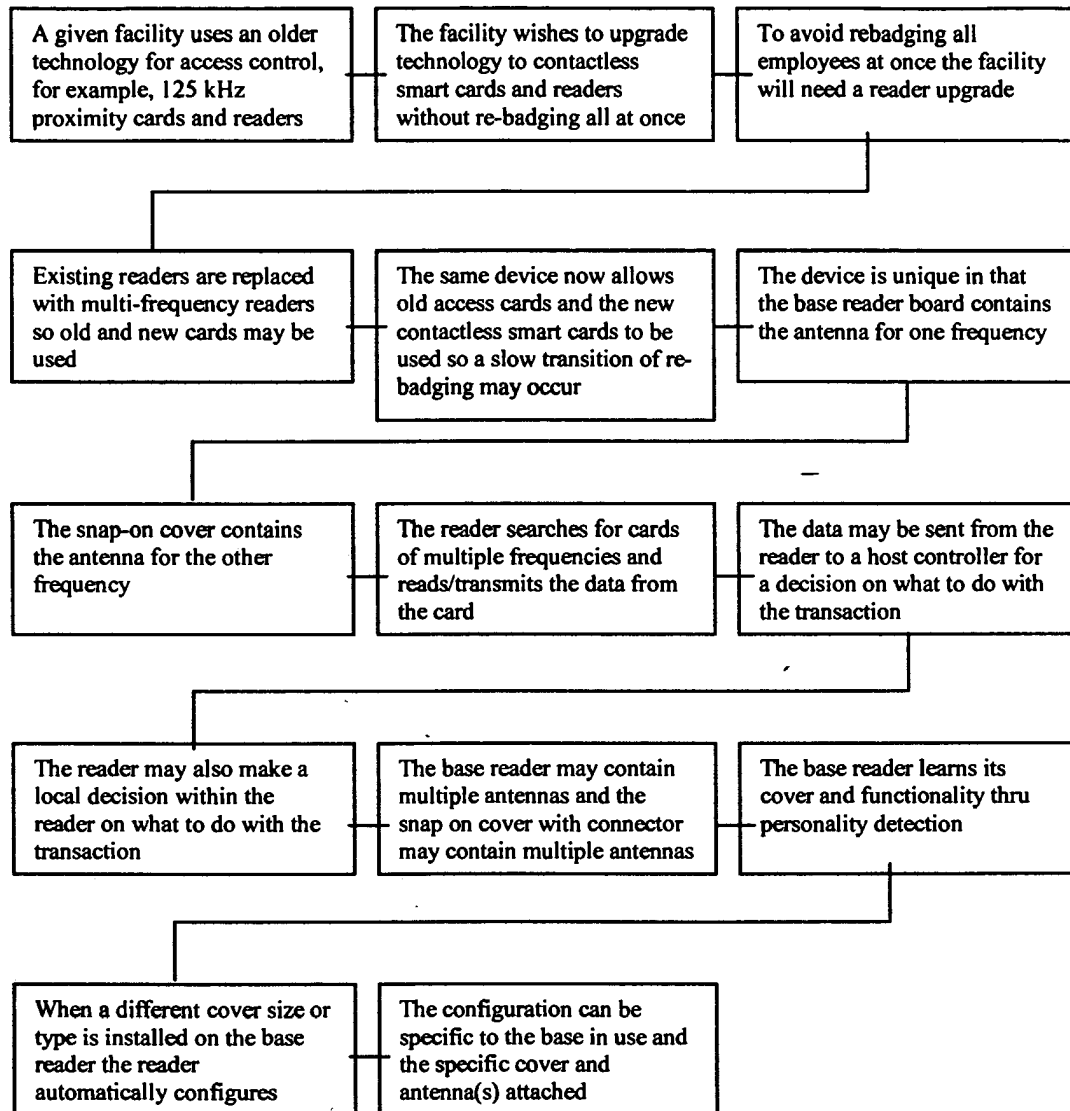


FIG. 10 illustrates yet another method in accordance with some embodiments of the present invention.

Contact-less Smart Cards

Relevant ISO Specifications

- ◆ ISO 14443 – Identification cards –
Contact-less integrated circuit(s) cards –
Proximity cards (up to 100mm)
- ◆ ISO 15693 – Identification cards –
Contact-less integrated circuit(s) cards –
Vicinity cards (up to 1m)



Contact-less Smart Card other ISO Specifications

- ◆ ISO 10536 – Identification cards – Contact-less integrated circuit(s) cards – Close coupled cards (up to 10mm).
- ◆ ISO 10373 – Identification cards – Test Methods (covers the previous three specifications).
- ◆ ISO 7816 – Identification cards – Integrated circuit(s) cards with contacts.



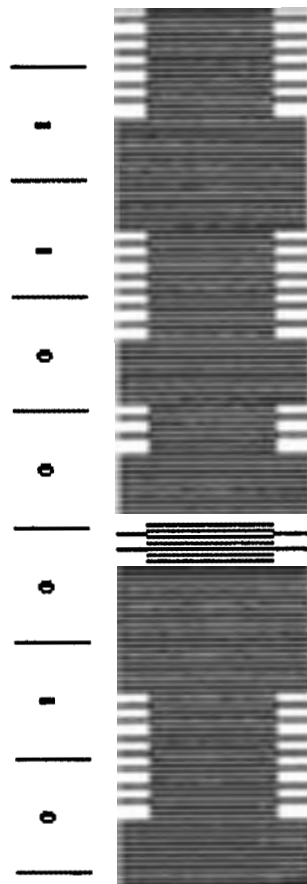
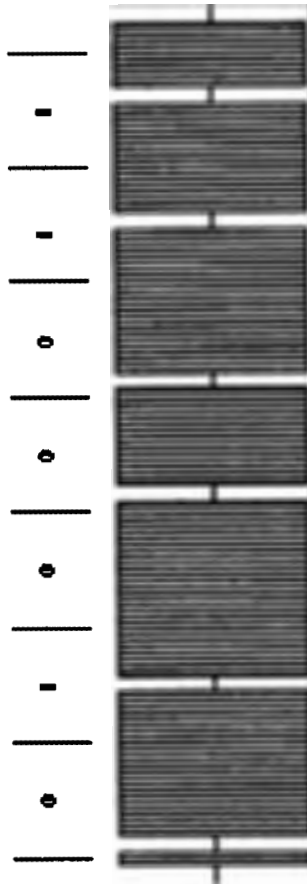
ISO 14443A

(courtesy of RFID Handbook)

Downlink:
ASK 100%, modified
Miller Code, 106
kBit/s

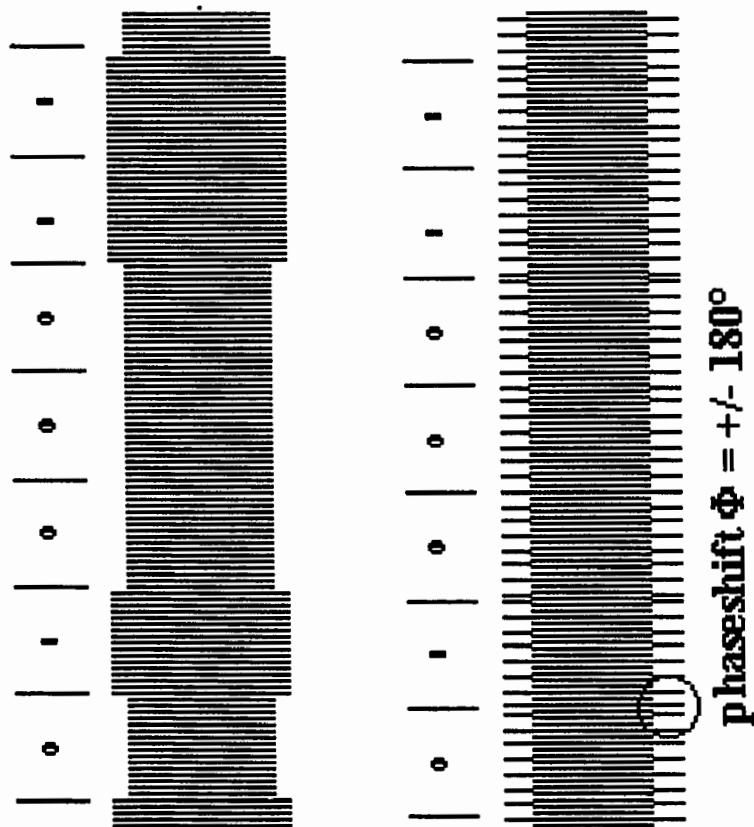
Uplink:
Loadmodulation with
847 kHz Subcarrier
ASK-modulated,
Manchester Code,
106 kBit/s

Anticollision:
Binary search tree



ISO 14443B

(courtesy of RFID Handbook)



phaseshift $\Phi = +/- 180^\circ$

Downlink:

ASK 10%, NRZ Code,
106 kBit/s

Uplink:

Load modulation with
847 kHz Sub-carrier
BPSK (bi-phase shift
keying) modulated, NRZ
Code, 106 kBit/s

Anticollision:

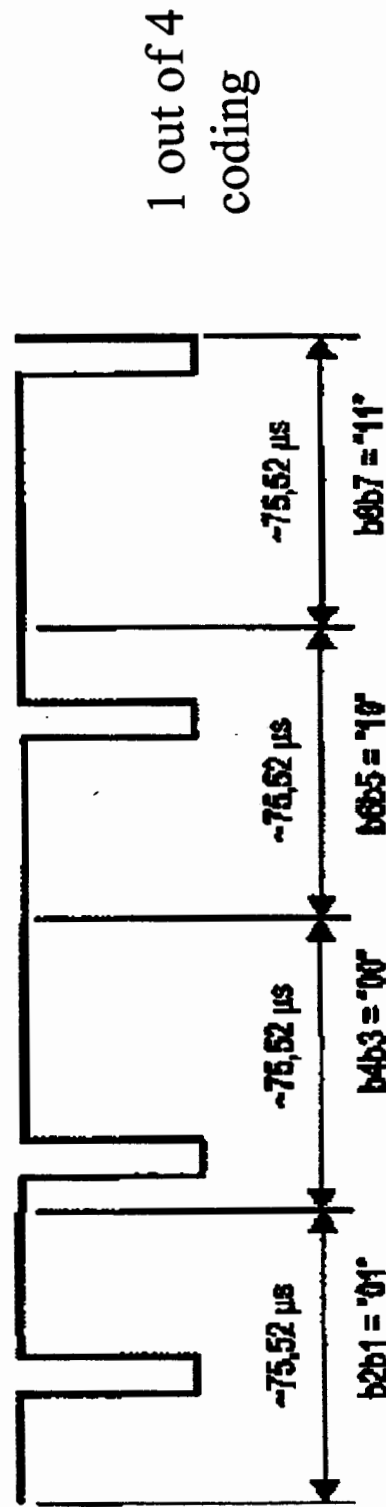
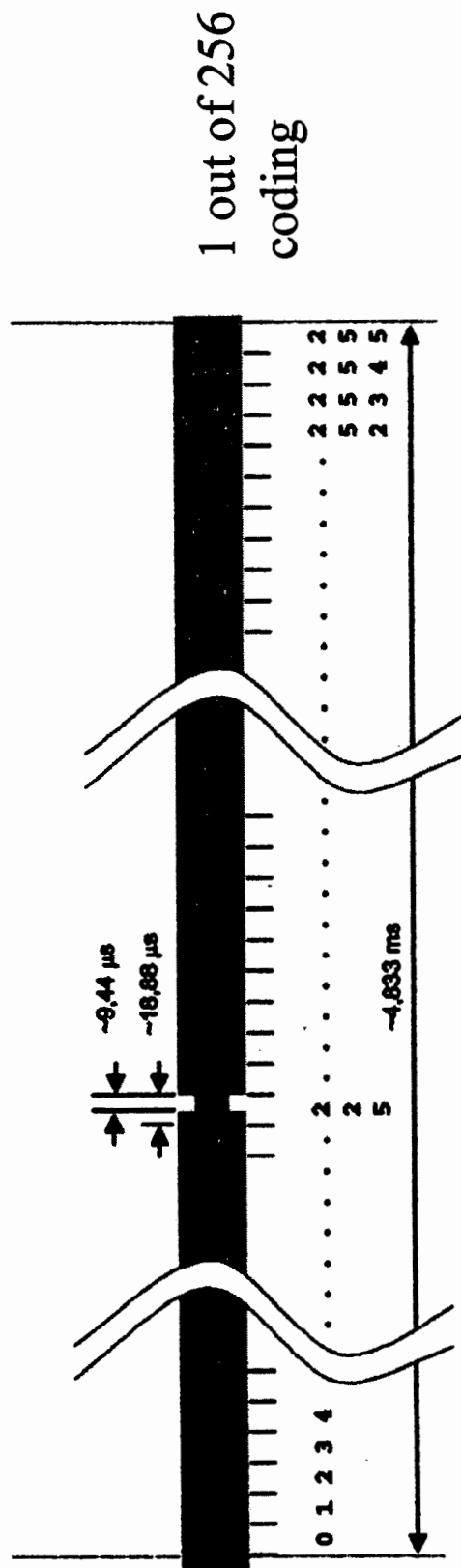
Slotted Aloha



ISO 15693 1 of 256 & 1 of 4 coding

Downlink:

10%, 100% ASK Modulation. 1 out of 256, 1 out of 4 Bit coding. 1.65 kBit/s, 26.48 kBit/s Baud



ISO 15693 - OOK Manchester

Uplink:

Load modulation with subcarrier

Bit coding: Manchester, the subcarrier is ASK (423 kHz) or FSK (423/485 kHz) modulated. Baud rate: 6.62 kBit/s, 26.48 kBit/s

FSK (423/485 kHz)

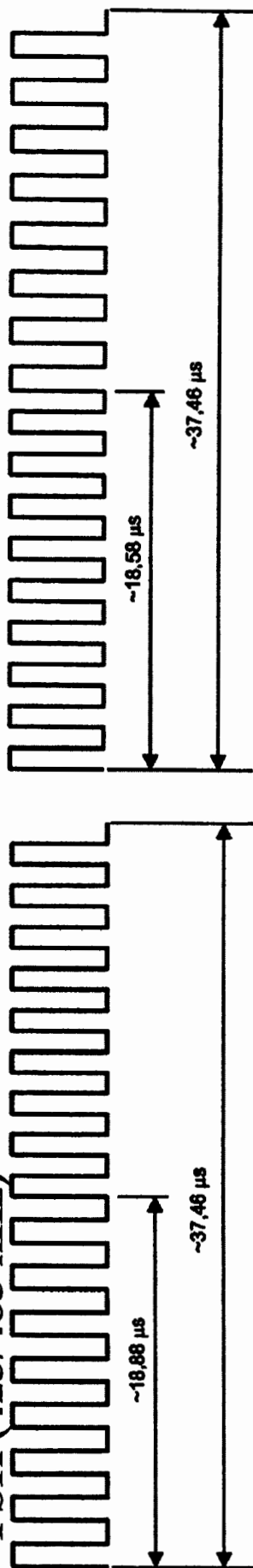


Figure 12 — Logic 0

ASK (423 kHz)

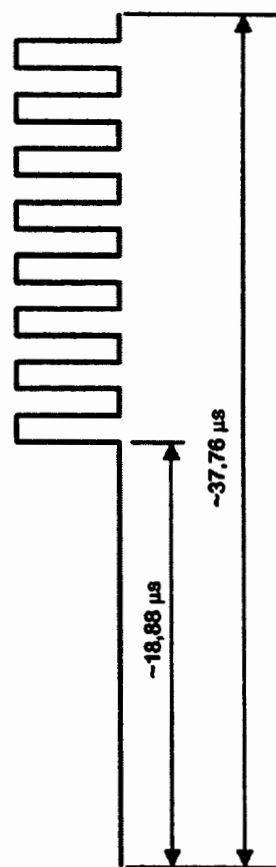


Figure 11 — Logic 1

Figure 13 — Logic 1

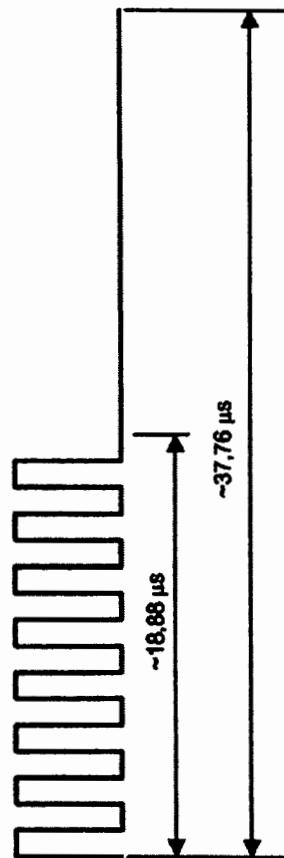
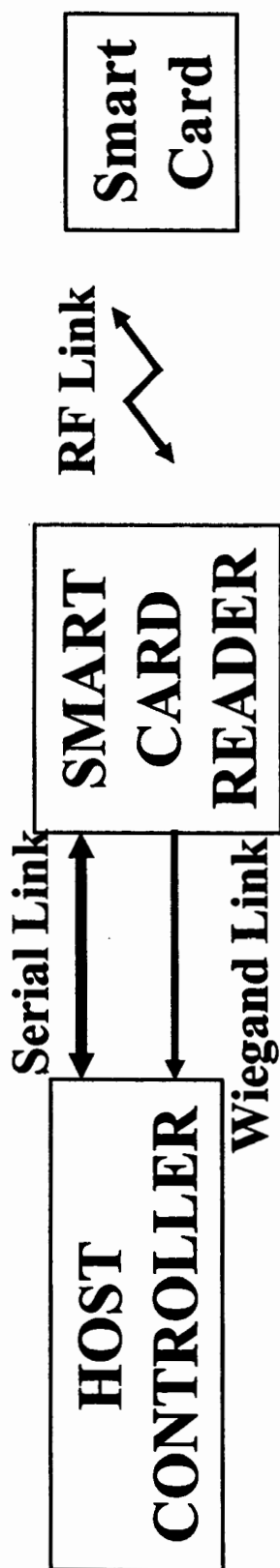


Figure 10 — Logic 0

SECURITY



GOAL: A SECURE COMMUNICATION CHANNEL

- ◆ CONFIDENTIALITY
- ◆ AUTHENTICATION
- ◆ INTEGRITY
- ◆ NON-REPUDIATION

XceedID Security System Requirements

- ◆ Ease of use, marketability
- ◆ Key management suited for distribution channels
- ◆ Mutual authentication
- ◆ Encryption for confidentiality
- ◆ Card key diversification for system security
- ◆ Strong cryptographic algorithms
- ◆ Rolling security keys (future/ASIC)
- ◆ Tamper control
- ◆ All bi-directional communication links protected by cryptography



Key Management

- ◆ Smart and Simple
- ◆ Keys protect system – Not Algorithms –
Must assume algorithms are well known
- ◆ Keys are used for:
 - Authentication between cards and readers
 - Authentication between reader and host
 - Encryption/decryption of information
 - Message authentication (MAC)



Key Management (cont.)

- ◆ FW and HW designed to handle any key distribution scheme
- ◆ Keys should be managed and distributed by a Trusted Authority :
- ◆ Keys must be updated as no key should be used for an indefinite period

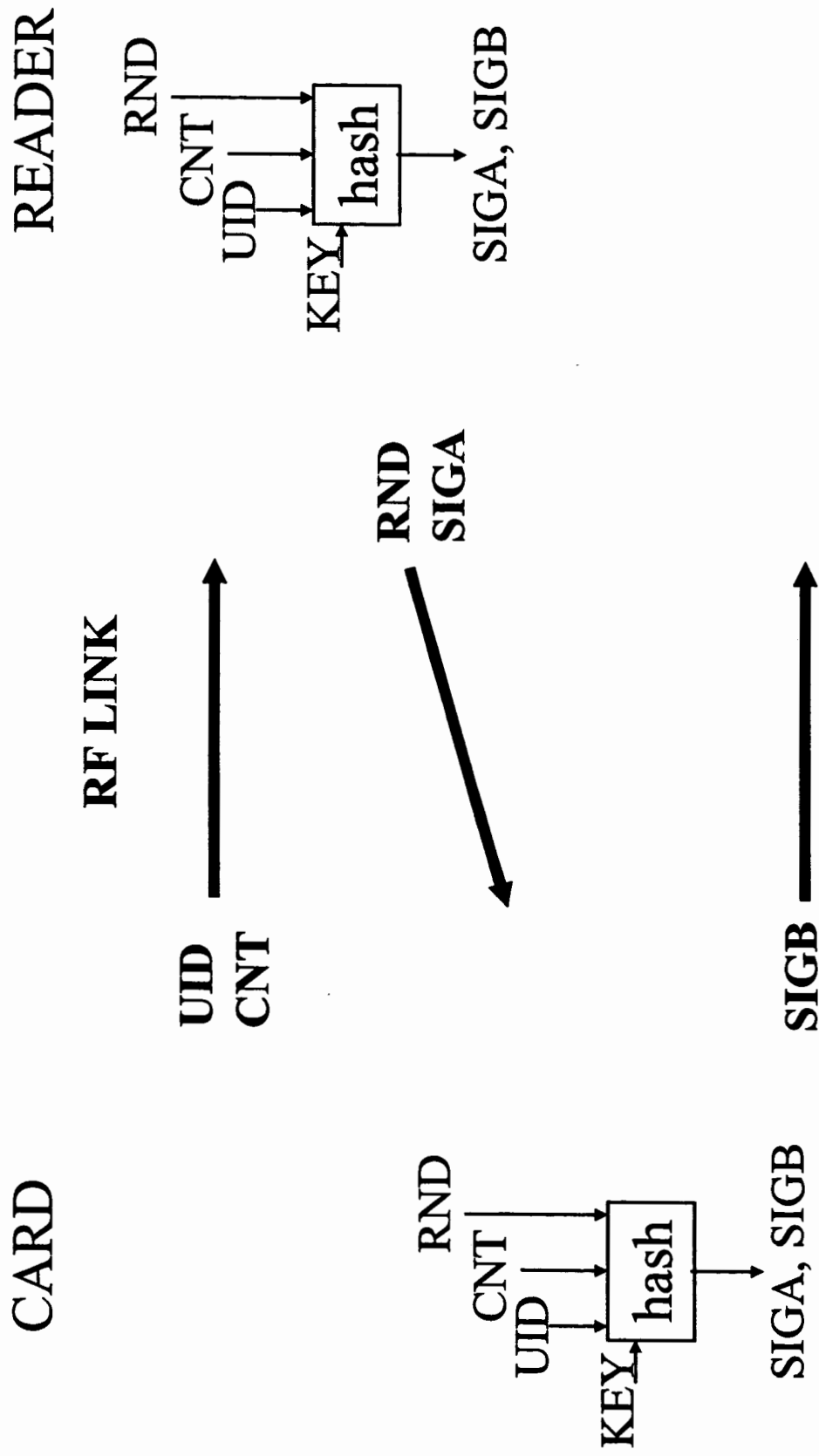


Algorithms used in Smart Card System

- ◆ Block ciphers (DES, 3-DES)
- ◆ Pseudo Random Sequence Generators
- ◆ Compression Algorithms (removes redundancy, thus increases security)
- ◆ One way hash functions (MD5, SHA)
- ◆ Message Authentication Codes (MAC) or key dependent one way hash function



3-Way Mutual Authentication



If computed signatures and received signatures match: authentication successful

Encryption

- ◆ DES, 3-DES (Written in assembly for speed: Approx. 1 ms / 4X faster)
- ◆ AES (future if required)
- ◆ Encryption of the RF link
- ◆ Encryption of the serial link
- ◆ Encryption at the host for pass-thru application



XceedID Hash function

Fast algorithm designed for a 56-64 bit message (4X faster). Can be used for:

- key diversification
- MACs
- Key updating



SECURITY FEATURES

- ◆ Confidentiality, Authentication, Integrity, Non-repudiation of every communication link (except one-way links like Wiegand)
- ◆ Tamper Control:
 - Sound alarm
 - Send Message to host
 - Delete security keys in RAM
 - Delete security keys in EEPROM (optional)
- ◆ Memory Management (example: keys only in RAM when being used)



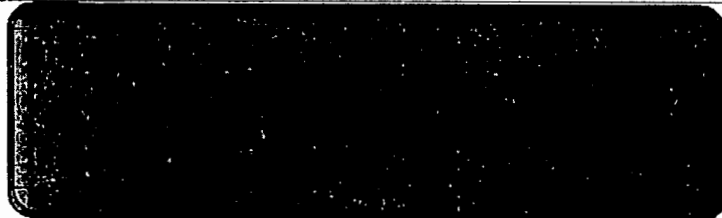
SECURITY FEATURES (cont.)

- ◆ Key Diversification:
Every application on every card is protected by a unique key derived from a master key and the card UID. The system remains intact even if a diversified key is compromised
- ◆ Rolling keys:
System designed to update the security keys.
- ◆ Secure reader flashing



Potential Reader Feature Set

Feature	Mullion	Mid-Range	OEM Module
F2F/Wiegand	Y	Y	Y
Serial (RS-485)	Y*	Y*	Y
125 KHz	Casi/other	Casi/other	N
13.56 MHz UID	14443/15693	14443/15693	14443/15693
Security Possibilities	A-1,A-2,A-3, 15693-1	A-1,A-2,A-3, 15693-1	A-1,A-2,A-3, 15693-1
RF Data Rate Possibilities (kbaud)	1.65/26.48/106/ 212/424/848	1.65/26.48/106/ 212/424/848	1.65/26.48/106/ 212/424/848
Achievable Serial Comm. (kbaud)	Up to 115.2	Up to 115.2	Up to 1,843.2
Keypad	N	N/Y	N
Tamper switch	Y	Y	N



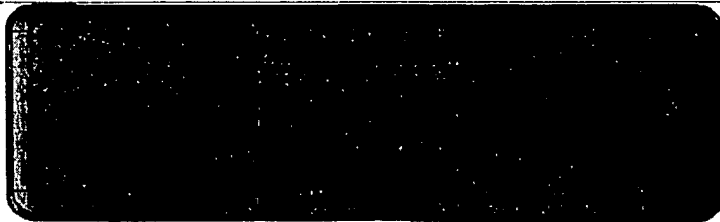
Potential Reader Feature Set

Feature	Mullion	Mid-Range	OEM Module
LED's	R/G	R/G	N
Host LED Control	H/W & serial	H/W & serial	N
Beeper	Y	Y	N
Host Beeper Control	H/W & serial	H/W & serial	N
Certifications	FCC/CE	FCC/CE	FCC/CE*
UL	294	294	N



Reader Design Concept - Base

- ◆ Common Base for Multiple readers:
 - Mullion
 - “Large” – Lets call mid-range
 - Base contains:
 - Reader interface circuitry
 - Reader voltage regulation
 - Main processor
 - 13.56 MHz communication engine (Analog Front End and processing)
 - 125 KHz processing
 - Connector interface to “Antenna Board”



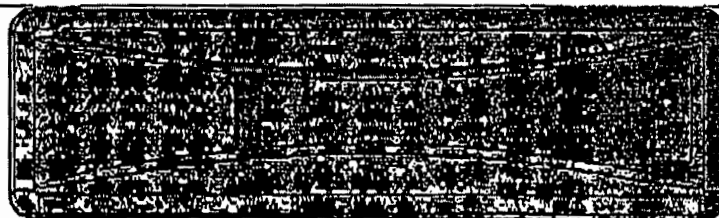
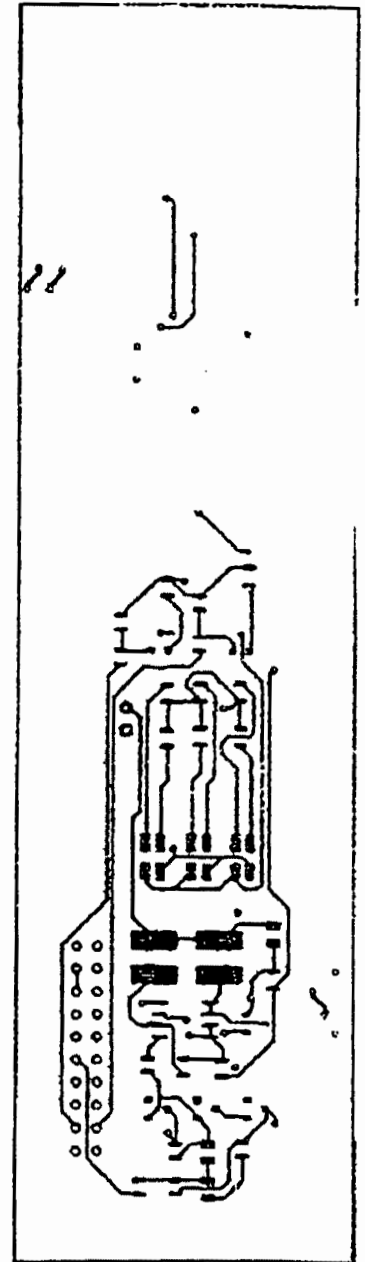
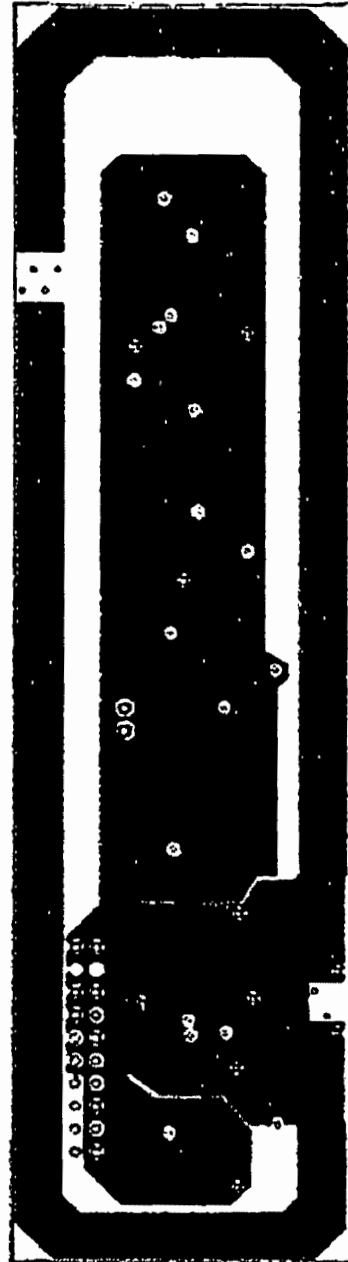
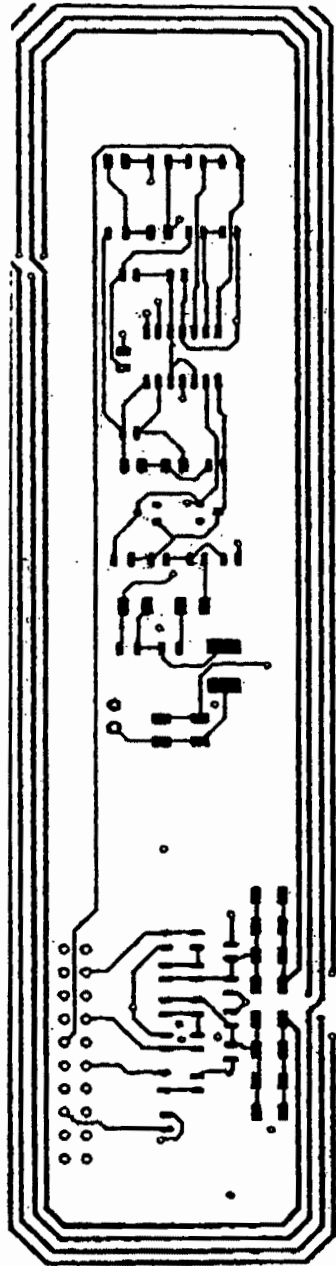
Reader Design Concept

Base Status

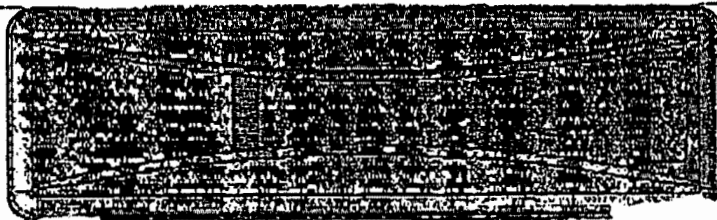
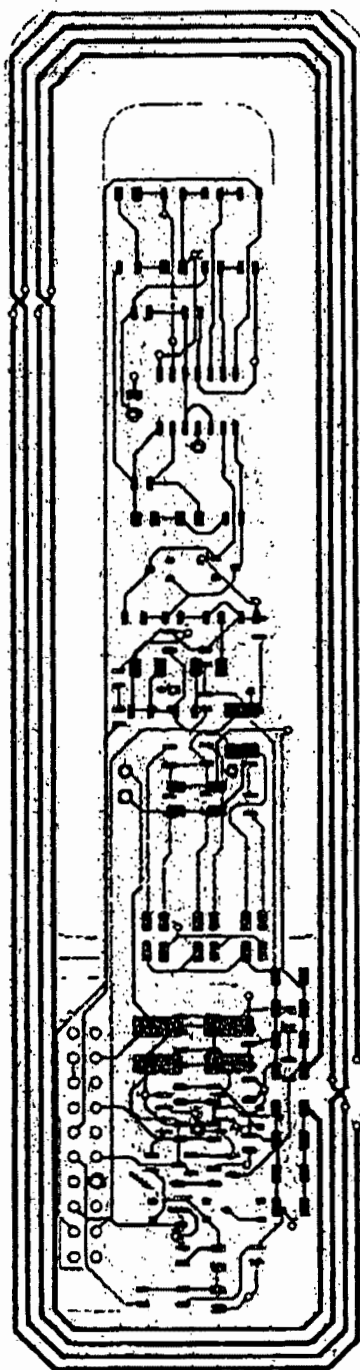
- ◆ Base board built and all functionality tested good
- ◆ A Few minor changes made and next revision board design complete
- ◆ Next revision board order on hold at this time pending outcome of these meetings



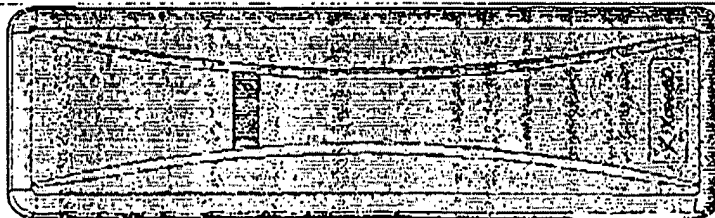
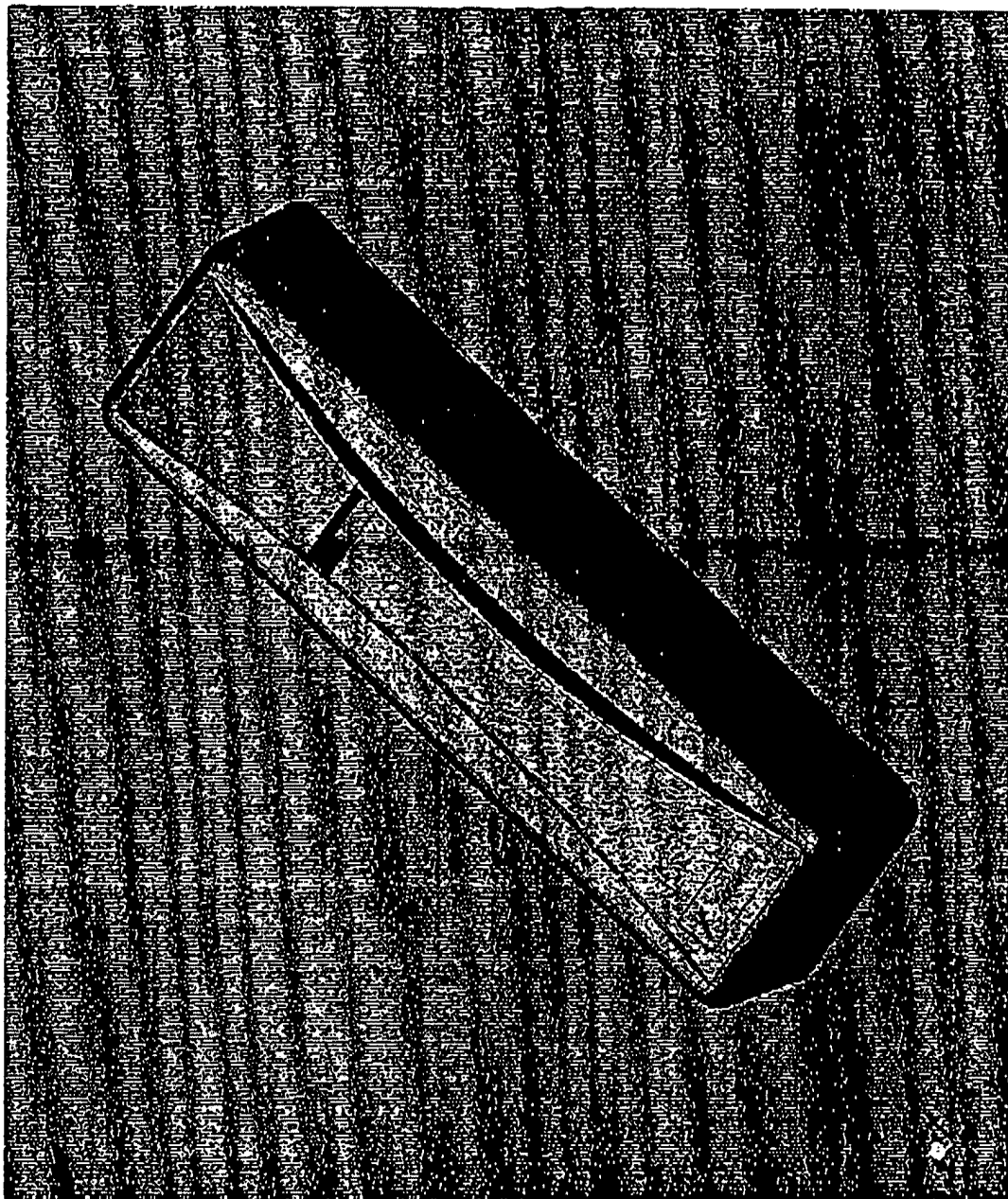
Antenna Board Layout



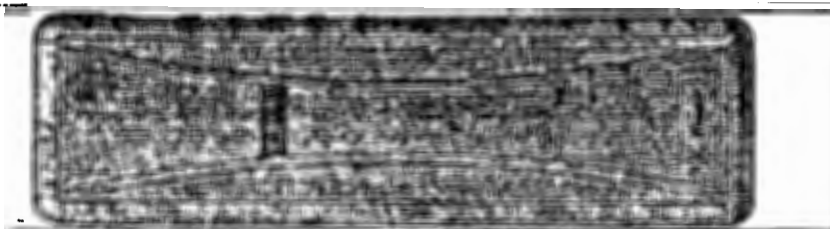
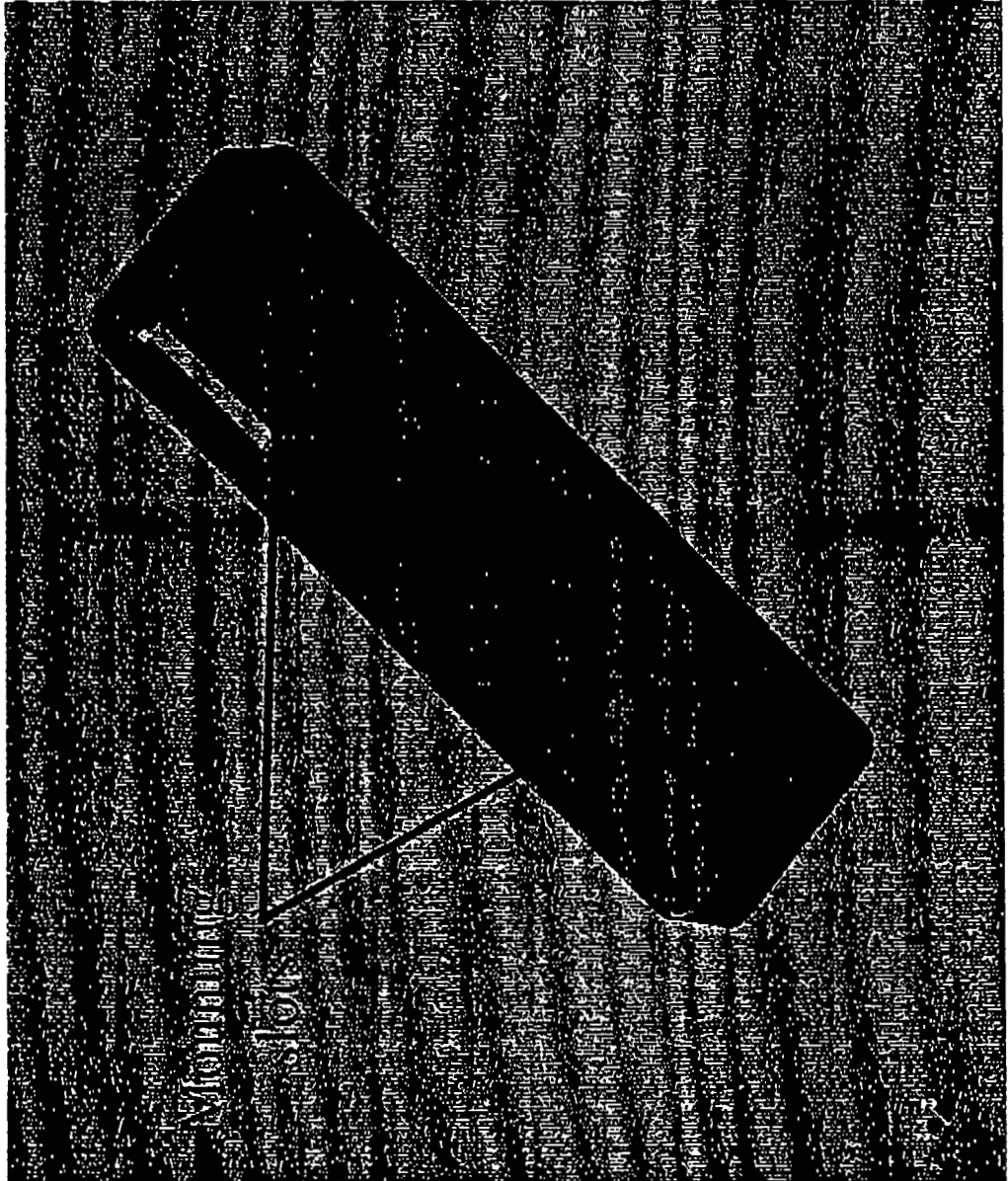
Antenna Board Layout



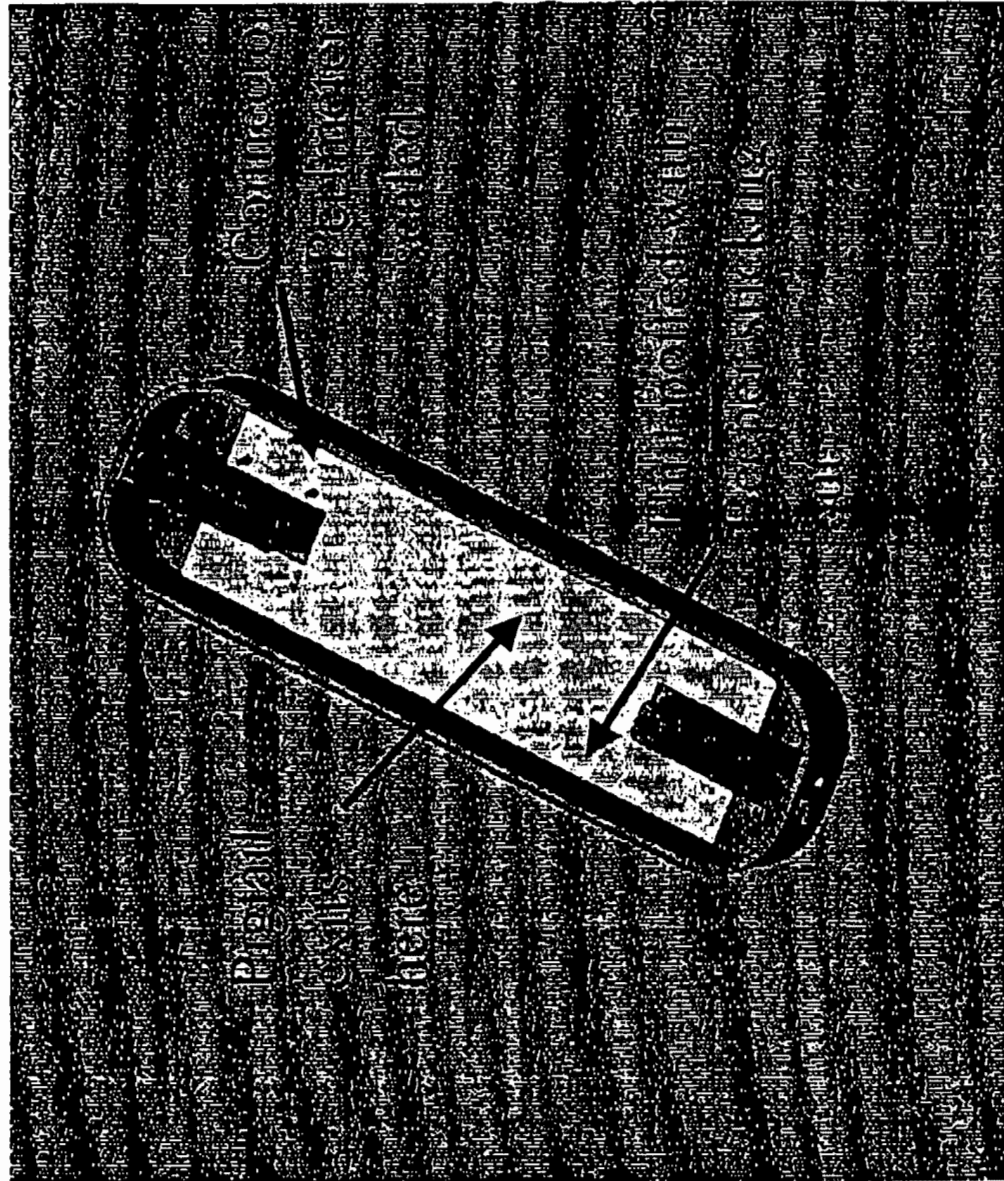
“Snap-on cover”



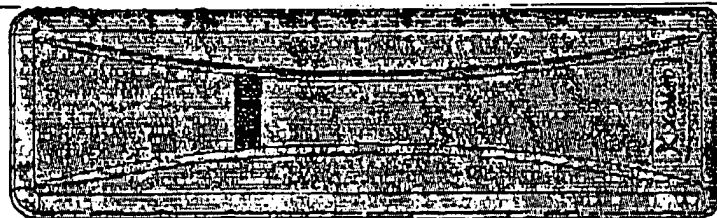
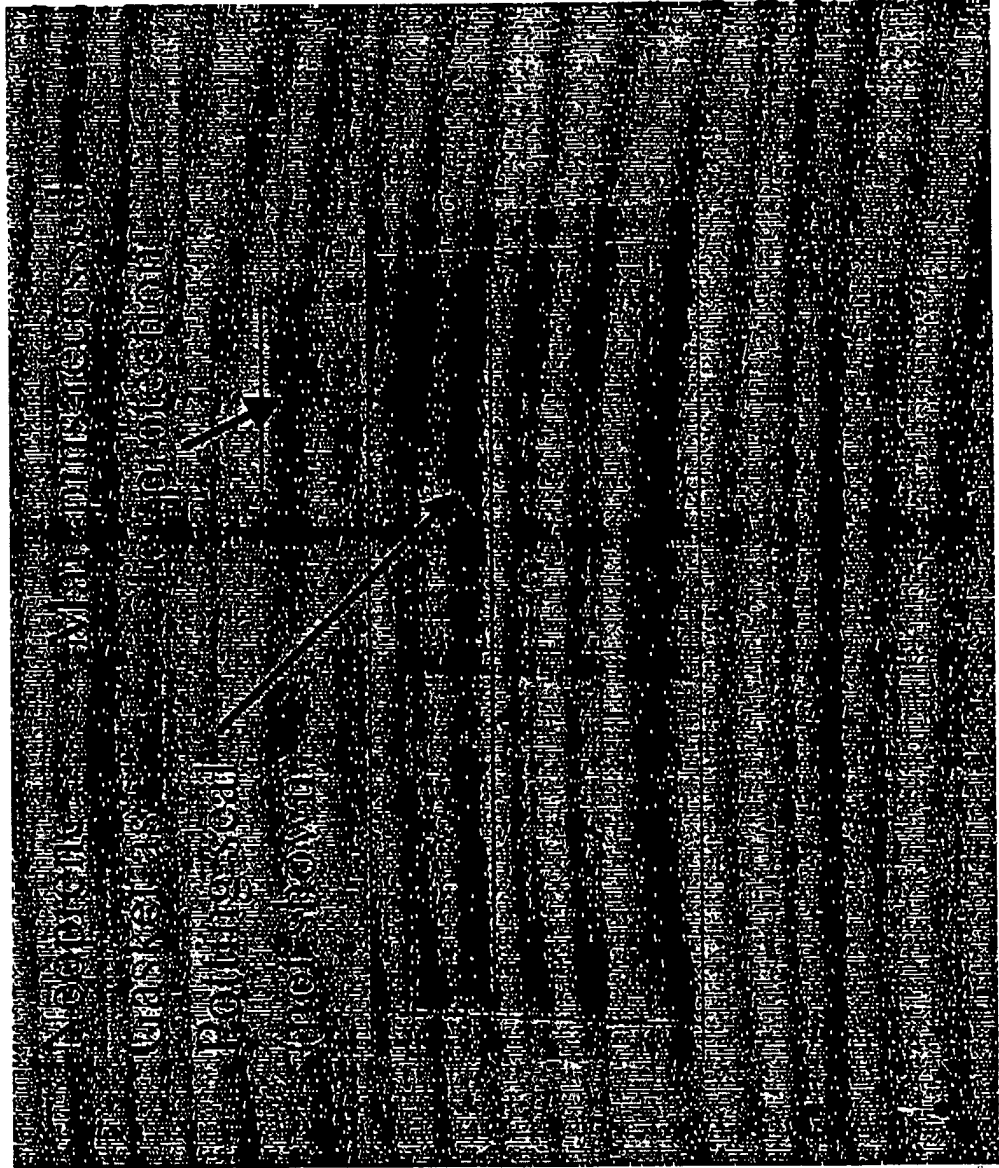
Base Plastic



Base Assembly



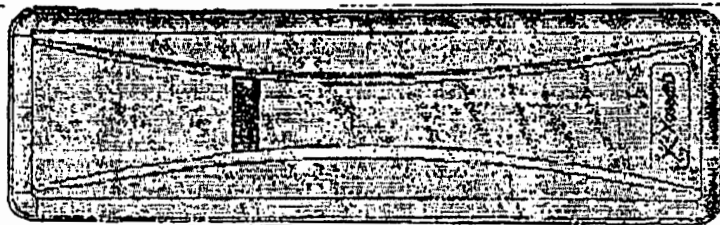
Base Assembly



Reader Design Concept - Cover

◆ Snap-on covers containing “Antenna Board”:

- 13.56 MHz antenna & tuning components
- 125 KHz analog front end
- LED’s (red, green & amber capability)
- Tamper detection scheme
- Keypad electronics
- LCD ???
- Personality detection
- 2 Unused I/O (RFU)
- Programming Interfaces:
 - Immediate hardware programming capability
 - Future Infrared “communication adapter” programming capability

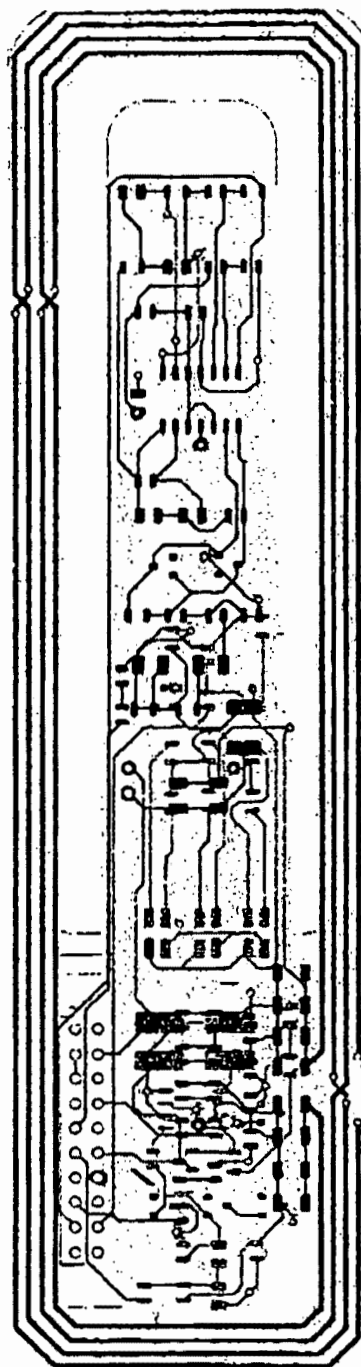


Antenna Board Status

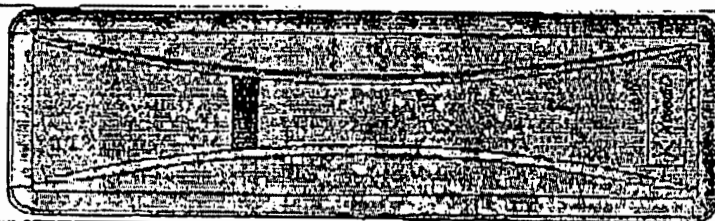
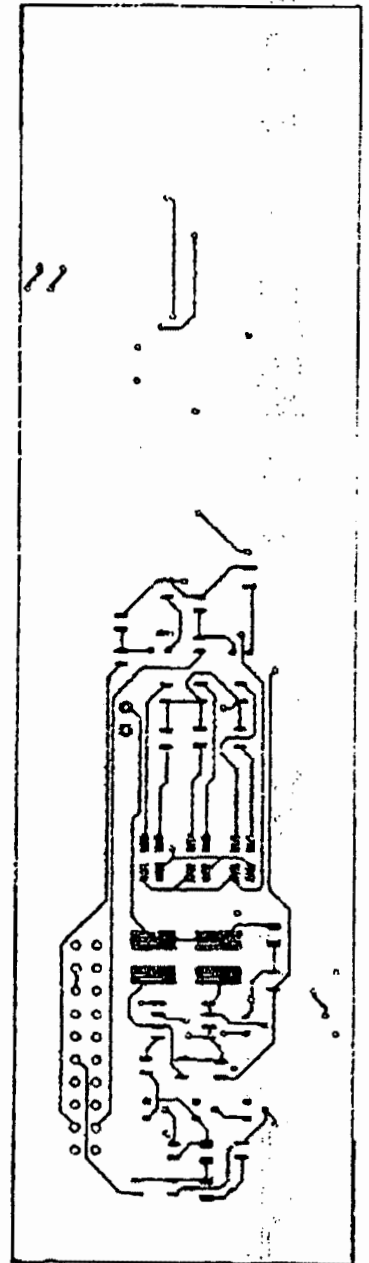
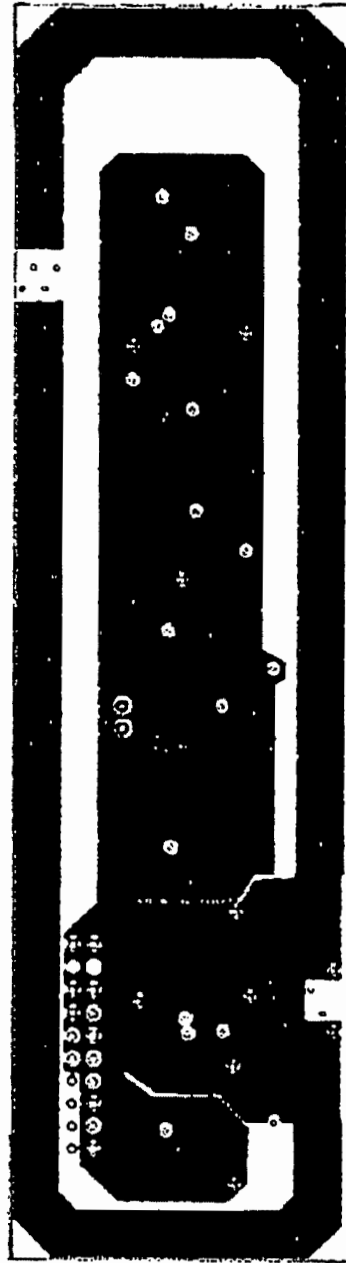
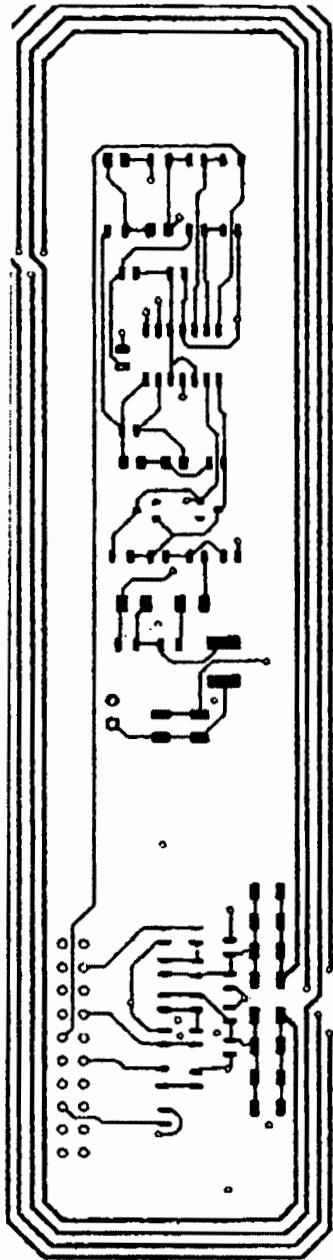
- ◆ Antenna Board Layout Complete including:
 - 125 KHz Analog Front End circuit mock-up:
 - Exciter breadboard built and tested
 - Receiver breadboard built and tested
 - Hand made antenna built and tested
 - Antenna designed and first prototypes built
 - 13.56 MHz antenna design and tuning network



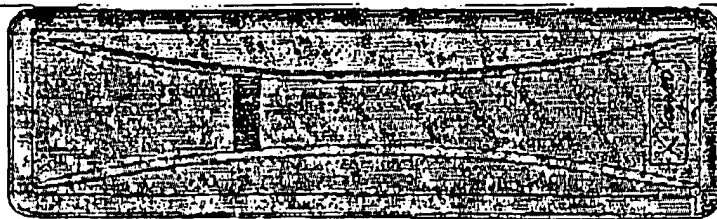
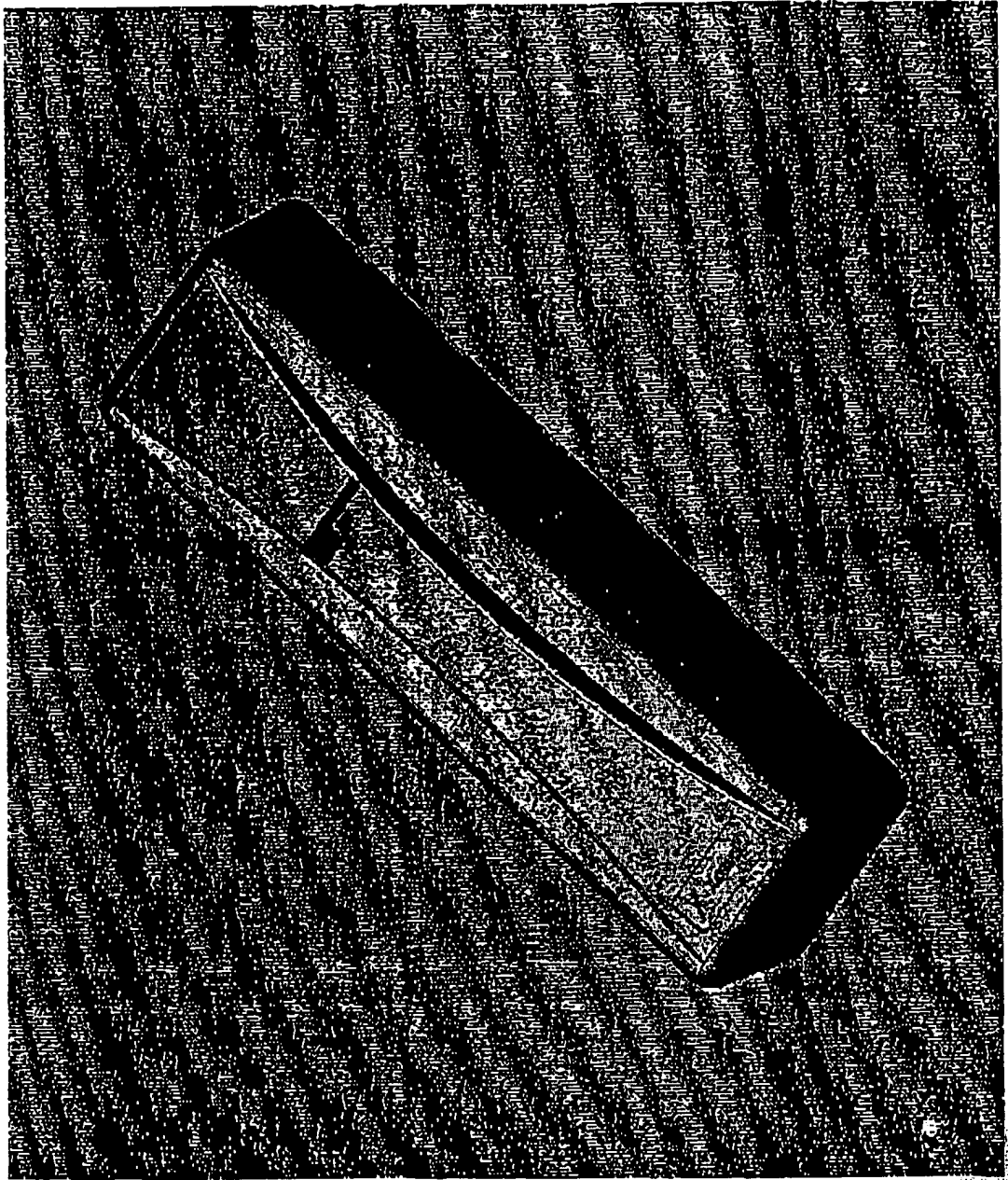
Antenna Board Layout



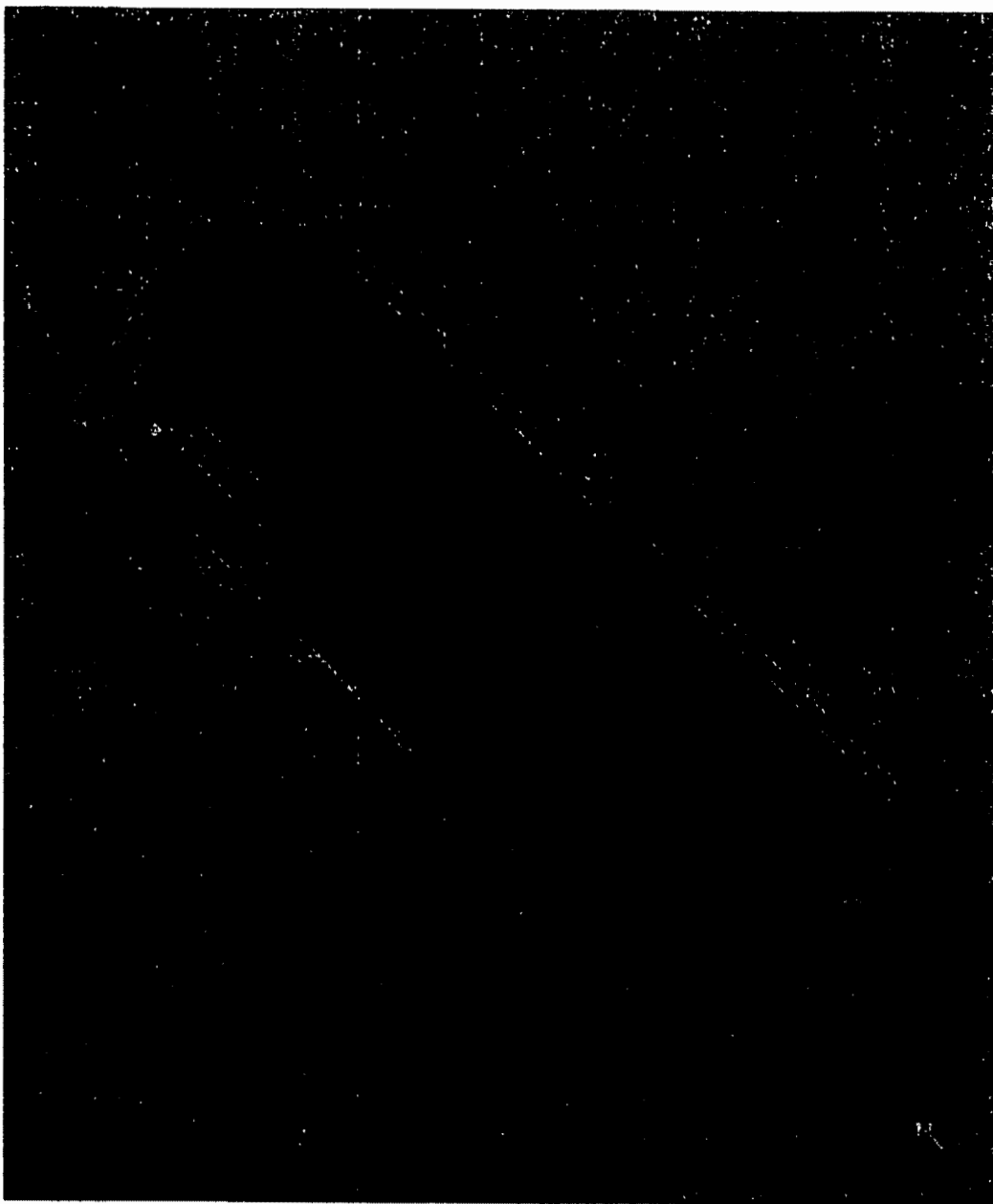
Antenna Board Layout



“Snap-on cover”



Reader Assembly – ISO View



Mid-Range Reader

- Mid-Range Reader(s) (~6" x ~6"):
 - Functionality same as Mullion Reader except there will be a keypad version as well
 - Aesthetics similar to Mullion but right side stretched out by an additional 4 inches
 - Keypad version will have keypad on the right side of “raised” feature

OEM Module

- Small form factor ($< 1.2'' \times 1.2''$)
- Double sided pcb
- Header for pcb interface
- Remote mount antenna capability
- TTL high speed serial interface (up to 1.84 Mbaud) coupled with 848 kbaud transponder data rate allowing extremely fast operation for large amounts of data (I.e. Biometrics)
- No design work done to date but comm engine common with reader design work underway
- Need to develop a serial protocol

Reader Firmware

- **Field Upgradeable Firmware:**
 - Initially through portable programmer:
 - Remove cover, plug into connector and flash
 - Future capability to re-flash through Infrared communication adaptor or serial interface with host controller:
 - Remove cover, plug communication adaptor into connector and flash using PDA
- **Field Configurable:**
 - Reader settings
 - Security keys
 - Through communication adaptor, configuration cards or through serial interface

Complete BOM Costs

(Digi-Key Pricing)

Product	Cost (\$)
125 KHz only – Wiegand/F2F	20.7
13.56 MHz only – Wiegand/F2F	27.85
Combo 125/13.56 – Wiegand/F2F	29.14
13.56 MHz only – Wiegand/F2F & Serial (RS-485)	29.75
Combo 125/13.56 – Wiegand/F2F & Serial (RS-485)	31.04
OEM Module	14.94

What was XceedID planning before GE? - A Summary

- 2004 Product Plan
 - A Million and Mid-size (with and without keypad) Reader
 - Secure 13.56 MHz using a DESFIRE transponder chip
 - XceedID 125 KHz
 - Wiegand
 - RS-485 capable
 - Target 5 – 16V operation (Absolutely 6 – 16V).
 - An OEM module
 - Secure 13.56 MHz
 - TTL output
 - Serial protocol and high speed serial output (up to 1.8 Mbaud)
 - Production programmer
 - Add secure 15693 functionality to product line

What was XceedID planning before GE? - A Summary

- 2005 Product Plan
 - Communication adapter/PDA application
 - 13.56 MHz Long range reader (125Khz)
 - Micro-sized (2.5" x 1.5") low cost reader
 - Customer programmer
 - Sustaining engineering/ongoing support

Possible Future Products

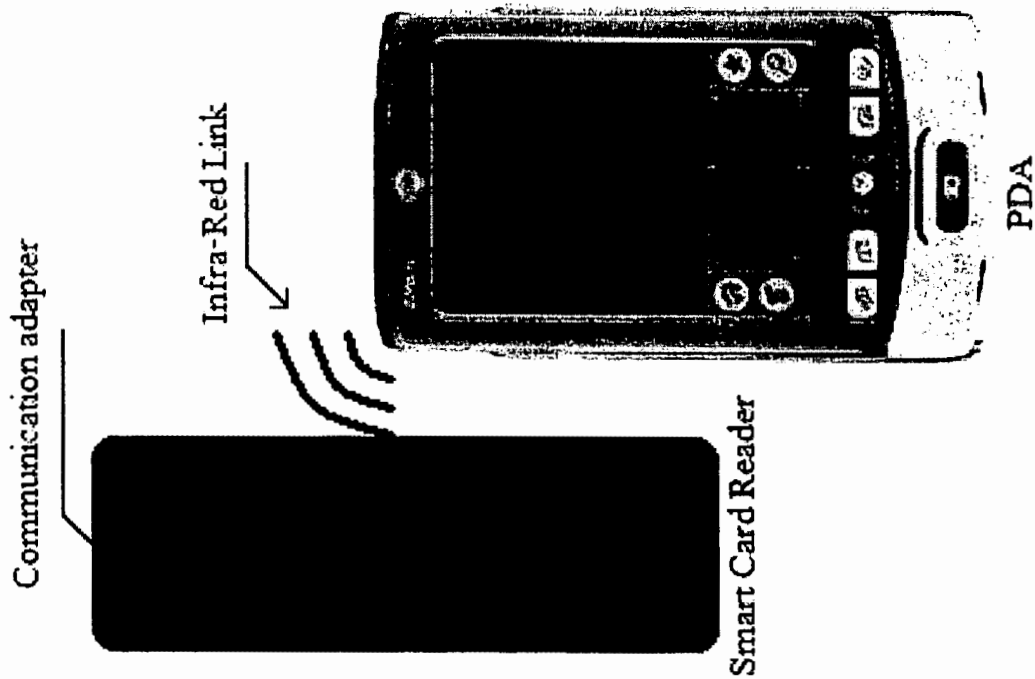
- OEM Programmer
- Communication Adapter/PDA Application
- Long Range Reader
- LCD/Keypad Reader
- USB interface (i.e. Logical access reader)
- Custom Transponder ASIC
- Performance Enhanced/cost reduced AFE
- Battery powered reader
- Ongoing Product Support

Programmer

- A PC application linked to a programmer (i.e. a Mid-range reader with special firmware) through a secure serial link
- Programmer application allows:
 - Multi-application data management
 - Key Management (key rolling, storage of key history,...) with encrypted database
 - Storage of “other” data that may be on cards (access privileges, audit trail, ...)
 - Programming of configuration cards or PDA (new keys or hex file for updating readers)
 - Biometric enrollment station

Communication Adapter/PDA Application

- Communication adaptor is a small board with an Infrared interface
- The security director or technician removes the reader cover and installs the adaptor
- The reader will recognize the adaptor and allow updates AFTER a successful mutual authentication
- A PDA application is used to transfer data between the PDA and reader



Custom Transponder ASIC

- Multi-protocol including 14443 & 15693
- Unique non-ISO mode for minimizing sideband energy in long range applications
- Potential micro core to allow different public algorithms as part of security
- Potential customizable security through metal mask options

Application Data Sheet

Application Information

Application number::

Filing Date:: March 15, 2004

Application Type:: Provisional

Subject Matter:: Utility

Suggested classification::

Suggested Group Art Unit::

CD-ROM or CD-R?:: None

Number of CD disks::

Number of copies of CDs::

Sequence submission?::

Computer Readable Form
(CFR)?::

Number of copies of CRF::

Title:: Modular Contactless Smart Card Access Control
Reader

Attorney Docket Number:: 303008

Request for Early Publication?:: No

Request for Non-Publication?:: No

Suggested Drawing Figure::

Total Drawing Sheets:: Forty-two (42)

Small Entity?:: Yes

Latin name::

Variety denomination name::

Petition Included?:: No

Petition Type::

Licensed US Govt. Agency::

Contract or Grant Numbers::

Secrecy Order in Parent Appl.?:: No

Applicant Information

Applicant Authority Type:: Inventor

Primary Citizenship
Country:: US

Status:: Full Capacity

Given Name:: Michael

Middle Name:: T.

Family Name:: CONLIN

Name Suffix::

City of Residence::

State or Province of
Residence::

Country of Residence::

Street of mailing address::

City of mailing address::

State or Province of
mailing address::

Country of mailing
address::

Postal or Zip Code of
mailing address::

Applicant Authority Type:: Inventor
Primary Citizenship
Country:: US
Status:: Full Capacity
Given Name:: Jean-Hugues
Middle Name::
Family Name:: WENDLING
Name Suffix::
City of Residence::
State or Province of
Residence::
Country of Residence::
Street of mailing address::
City of mailing address::
State or Province of
mailing address::
Country of mailing
address::
Postal or Zip Code of
mailing address::

Correspondence Information

Correspondence Customer
Number:: 35657
Name:: Faegre & Benson LLP
Street of mailing address:: 3200 Wells Fargo Center
1700 Lincoln Street

City of mailing address:: Denver

State or Province of mailing address:: CO

Country of mailing address:: US

Postal or Zip Code of mailing address:: 80203-4532

Phone number:: 303-607-3500

Fax Number:: 303-607-3600

E-Mail address:: dhamilton@faegre.com

Representative Information

Representative Customer Number::	35657	
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Representative Designation::	Registration Number::	Representative Name::
Primary	47,629	Douglas M. Hamilton

Domestic Priority Information

Application::	Continuity Type::	Parent Application::	Parent Filing Date::

Foreign Priority Information

Country::	Application number::	Filing Date::	Priority Claimed::

Assignee Information

Assignee name::	XceedID Corporation
Street of mailing address::	10531 Ridgecrest Circle
City of mailing address::	Highlands Ranch
State or Province of mailing address::	CO
Country of mailing address::	US
Postal or Zip Code of mailing address::	80129

DNVR1:60259689.01