USER MANUAL

MINIMAG & EASYMAG
USB HID READERS
Models IDMB & IDEA

INTERFACE REFERENCE

02/02/2006

CE

EMV™

80066510-003

Rev. A; R02/06

#412

FCC WARNING STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his expense.

FCC COMPLIANCE STATEMENT

This reader complies with Part 15 of the FCC Rules. Operation of this reader is subject to the following conditions: this reader may not cause harmful interference and this reader must accept any interference received, including interference that may cause undesired operation.

CE STANDARDS

An independent laboratory performed testing for compliance to CE requirements. The unit under test was found compliant to Class B.

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1. Introduction

The MiniMag USB HID Reader is a magstripe card reader that conforms to ISO standards. The reader is compatible with personal computers or a device with a USB interface. A LED (Light Emitting Diode) and a beeper on the reader provide status of the reading operations.

The reader conforms to the USB Human Interface Device (HID) Class specification Version 2.0. Host applications designed for the latest versions of Windows 98, Me, 2000, XP can easily communicate to the reader using standard Windows API calls.

The reader is a “vendor defined HID device” so that a direct communication path can be established with an application.

A demo program with its source code is available, written in Visual Basic, and exercises the reader using the standard Windows API.

2. Features and Specifications

- Powered through the USB – no external power supply
- Hardware Compatible with PC or terminal with a USB interface
- Reads encoded data that meets ANSI/ISO/CDL/AAMVA standards
- Reads up to three tracks of card data
- Bi-directional card reading LED for status
- Compatible with USB specification Revision 2.0
- Compatible with HID specification Version 2.0
- Can use standard Windows HID driver for communications.
- Programmable USB Interrupt in Endpoint polling interval
- Non-volatile flash EEPROM memory for reader configuration storage
- Built-in 6 foot USB cable

3. Installation

This section describes the cable connection and the Windows Plug & Play Setup.

3.1 UBC Connection

Connect the reader USB cable to a host USB port. The LED Indicator will light green. For Reference, the pin numbers for the 4-pin USB connector are shown in Figure 2-1.

Figure 2-1. Reader Cable and Connector

4-Pin Connector

Pin Number	Signal	Cable Color
1	V_{CC}	Red
2	- Data	White
3	+Data	Green
4	Ground	Black

3.2 Windows Plug and Play Setup

The first time the device is plugged into a specific USB port, Windows will pop up a dialog box. The box provides a guide through the process of installing the HID device driver. After this process is completed once, Windows will no longer request this process as long as the device is plugged into the same USB port. The device driver that Windows will install for this device is the driver used for HID devices and it is part of the Windows operating system. Most Windows will find all the files it needs on its own without giving you any prompts. Other times Windows will need to know the location of the files it needs.

4. Operation

This section describes the LED Indicator and Card Reading.

4.1 LED Indicator

The LED indicator will be either red, or green. The LED is green when the device is powered. When the device is first plugged in, the LED will be amble. As soon as the device is plugged in, the host will try to enumerate the device. Once the device is enumerated the LED will turn green indicating that the device is ready for use. When a card is being swiped, the LED will turn off temporarily until the swipe is completed. If there are no errors decoding the card data then the LED will turn green. If there are any errors decoding the card data, the LED will turn red for less than one second to indicate that an error occurred and then turn green. The reader does support USB suspend mode; the LED be off in suspend mode.

4.2 Card Reading

A card may be swiped through the reader slot when the LED is green. The magnetic stripe must face toward the magnetic read head and may be swiped in either direction. The data encoded on the card will be decoded and the data transmitted and accepted into the USB HID input report. The reader LED will be off during the data transfer and is ready to read another card when the LED returns to green. A red LED indicates an error and the beeper will also provide error indications. The beeper will beep for each correctly read track of data on the magstripe card.

5. USB HID Interface

The MiniMag reader conforms to the USB specification revision 2.0. This device also conforms to the Human Interface Device (HID) class specification version 2.0. The reader communicates to the host as a vendor defined HID device. The details about how the card data and commands are structured into HID reports follow later in this section. The latest versions of the Windows operating systems, Windows 98, Me, 2000, and XP all come with a standard Windows USB HID driver. Windows applications that communicate to this reader can be easily developed. These applications can communicate to the reader using standard windows API calls that communicate to the reader using the standard Windows USB HID driver. These applications can be easily developed using compilers such as Microsoft's Visual Basic or Visual C++. A demonstration program and its source code, written in Visual Basic, that communicates with this reader is available. This demo program can be used to test the reader and it can be used as a guide for developing other applications. More details about the demo program follow later in this document.

Developers should become familiar with the HID specification and the USB specification before attempting to communicate with the reader. This document assumes the developer is familiar with these specifications. Specifications can be downloaded free from www.usb.org.

This is a full speed USB reader. The reader has a number of programmable configuration properties. These properties are stored in non-volatile EEPROM memory. These properties can be configured at the factory or by the end user. The reader has an adjustable endpoint descriptor polling interval value that can be set to any value in the range of 1ms to 255ms. This property can be used to change the speed of the card data transfer rate.

5.1 Data Structure

MiniMag USB HID Reader supports both Mag-Tek and ID TECH data Structure with an EEPROM setting.

USB HID Data Format Setting:

Setting A: ID TECH Data Format (Default setting)	Product ID: 0500
Setting B: MagTek Data Format	Product ID: 0510

During first time the reader is plugged in, the Firmware will read the "Data Format Setting" from EEPROM and send current Product ID in enumeration. Each time after changing the "Data Format Setting", the firmware will save the setting to EEPROM then re-do the enumeration process. (On occasion, the reader will need to be disconnected and connected again to switch the data format.)

5.2 ID TECH Format Data Structure

Offset	Usage Name
0	T1 decode status
1	T2 decode status
2	T3 decode status
3	T1 data length
4	T2 data length
5	T3 data length
6	Card encode type
7, 8	Total Output Length
9-508	Output Data

In this approach, the reader will keep all of the ID TECH data editing and other features like preamble, postamble, etc. The output data is always 500 bytes; the "Total Output Length" field indicates the valid data length in the output data.

5.3 Mag-Tek Format Data Structure

Offset	Usage Name
0	T1 decode status
1	T2 decode status
2	T3 decode status
3	T1 data length
4	T2 data length
5	T3 data length
6	Card encode type
7-116	T1 data
117-226	T2 data
227-336	T3 data

5.4 IDTECH format and MagTek format

T1, T2 or T3 decode status: 0 for no error, 1 for error
T1, T2 or T3 Data Length: Each byte value indicates how many bytes of decoded card data are in the track data field. This value will be zero if there was no data on the track or if there was an error decoding the track. The track data includes all data string starting with the start sentinel and ending with the end sentinel.

Card Encode Type:

Value	Encode Type	Description
0	ISO/ABA	ISO/ABA encode format
1	AAMVA	AAMVA encode format
2	CADL	California Driver License
3	Blank	The card is blank
4	Other	The card has a non-standard format.

For example, ISO/ABA track 1 format on track 2

5.5 Descriptor Tables

Device Descriptor

Field	Value	Description
Length	12	
Des type	01	
bcd USB	10 01	
Device Class	03	
Sub Class	00	Unused
Device Protocol	00	Unused
Max Packet Size	20	32 bytes
VID	CD 0A	
PID	00 05 / 10 05	With ID TECH Structure With MagTech Structure
BCD Device Release	00 01	
i-Manufacture	01	
i-Product	02	
i-Serial-Number	00	
# Configuration	01	

Configuration Descriptor

Field	Value	Description
Length	09	
Des type	02	
Total Length	22 00	
No. Interface	01	
Configuration Value	01	
iConfiguration	00	
Attributes	80	Bus power, no remove wakeup
Power	32	100 mA

Interface Descriptor

Field	Value	Description
Length	09	
Des type	04	
Interface No.	00	
Alternator Setting	00	
# EP	01	
Interface Class	03	HID
Sub Class	00	
Interface Protocol	00	
iInterface	00	

HID Descriptor

Field	Value	Description
Length	09	
Des type	21	HID
bcdHID	11 01	
Control Code	00	
numDescriptors	01	Number of Class Descriptors to follow
DescriptorType	22	Report Descriptor
Descriptor Length	37 00	For ID TECH Format
	3D 00	For MagTek Format

End Pointer Descriptor

Field	Value	Description
Length	07	
Des Type	05	End Point
EP Addr	81	EP1 - In
Attributes	03	Interrupt
MaxPacketSize	20 00	
bInterval	0A	

Report Descriptor, (ID TECH Setting)

Field	Value	Description
	06 00 FF	Usage Page (MSR)
	09 01	Usage(Decoding Reader)
	A1 01	Collection (Application)
	15 00	Logical Minimum
	26 FF 00	Logical Maximum
	75 08	Report Size
	09 20	Usage (Tk1 Decode Status)
	09 21	Usage (Tk2 Decode Status)
	09 22	Usage (Tk3 Decode Status)
	09 28	Usage (Tk1 Data Length)
	09 29	Usage (Tk2 Data Length)
	09 2A	Usage (Tk3 Data Length)
	09 38	Usage (Card Encode Type)
	95 07	Report Count
	81 02	Input (Data,Var,Abs,Bit Field)
	09 30	Usage (Total Sending Length)
	95 02	Report Count (2)
	82 02 01	Input (Data, Var, Abs, Bit Field)
	09 31	Usage (Output Data)
	96 F4 01	Report Count (328*)
	82 02 01	Input (Data, Var, Abs, Bit Field)
	09 20	Usage (Command Message)
	95 20	Report Count
	B2 02 01	Feature (Data,Var, Abs, Buffered Bytes)
	C0	End Collection

Report Descriptor, (MagTek Setting)

Field	Value	Description
	06 00 FF	Usage Page (MSR)
	09 01	Usage(Decoding Reader)
	A1 01	Collection (Application)
	15 00	Logical Minimum
	25 FF 00	Logical Maximum
	75 08	Report Size
	09 20	Usage (Tk1 Decode Status)
	09 21	Usage (Tk2 Decode Status)
	09 22	Usage (Tk3 Decode Status)
	09 28	Usage (Tk1 Data Length)
	09 29	Usage (Tk2 Data Length)
	09 2A	Usage (Tk3 Data Length)
	09 38	Usage (Card Encode Type)
	95 07	Report Count
	81 02	Input (Data,Var,Abs,Bit Field)
	09 30	Usage (Tk1 Data)
	95 6E	Report Count (110)
	82 02 01	Input (Data, Var, Abs, Bit Field)
	09 31	Usage (Tk2 Data)
	95 6E	Report Count (110)
	82 02 01	Input (Data, Var, Abs, Bit Field)
	09 32	Usage (Tk3 Data)
	95 6E	Report Count (110)
	92 02 01	Input (Data, Var, Abs, Bit Field)
	09 20	Usage (Command Message)
	95 20	Report Count
	B2 02 01	Feature (Data, Var, Abs, Buffered Bytes)
	C0	End Collection

6. HID Usages

This HID reader sends data reports. Elements of data in a report are identified by unique identifiers called usages. The structure of the reader's reports and the reader's capabilities are reported to the host in a report descriptor. The host usually gets the report descriptor only once and after the reader is powered. The report descriptor usages identify the reader's capabilities and report structures. Usages are four byte integers. Standardized usages such as usages for mice and keyboards can be found in the HID Usage Tables document and can be downloaded free at www.usb.org. Vendor defined usages must have a usage page in the range 0xff00 – 0xffff. All usages for this device use vendor defined magnetic stripe reader usage page 0xff00. The usage IDs for this device are defined in the following table. The usage types are also listed. These usage types are defined in the HID Usage Tables document.

6.1 IDTECH format reader usage page 0xff00

1	Decoding reader device	Collection	None
20	Track 1 decode status	Data	Input
21	Track 2 decode status	Data	Input
22	Track 3 decode status	Data	Input
28	Track 1 data length	Data	Input
29	Track 2 data length	Data	Input
2A	Track 3 data length	Data	Input
38	Card encode type	Data	Input
30	Total Data Length	Data	Input
31	Output Data	Data	Input
20	Command message	Data	Feature

6.2 Mag-Tek format reader usage page 0xff00

Usage ID (Hex)	Usage Name	Usage Type	Report Type
1	Decoding reader device	Collection	None
20	Track 1 decode status	Data	Input
21	Track 2 decode status	Data	Input
22	Track 3 decode status	Data	Input
28	Track 1 data length	Data	Input
29	Track 2 data length	Data	Input
2A	Track 3 data length	Data	Input
30	Track 1 data	Data	Input
31	Track 2 data	Data	Input
32	Track 3 data	Data	Input
38	Card encode type	Data	Input
20	Command message	Data	Feature

7. Commands and responses

Commands and responses are exchanged with the reader using feature reports. Commands are sent to the reader using HID class specific request Set Report (21 09 …). The response to a command is retrieved from the reader using HID class specific request Get Report (A1 01 …). These requests are sent over the default control pipe.