USB
INSERTION READER
TECHNICAL REFERENCE MANUAL

Manual Part Number 99875205 Rev 7

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MAGTEK®
REGISTERED TO ISO 9001:2000
20725 South Annalee Avenue
Carson, CA 90746
Phone: (310) 631-8602
FAX: (310) 631-3956
Technical Support: (651) 415-6800
www.magtek.com

REVISIONS

Rev Number	Date	Notes
1	29 Oct 01	Initial Release
2	13 Nov 01	Changed Temp Spec: Operating: 0° to 65° C (32° to 149° F), and Storage: -40° to 80° C (-40° to 176° F)
3	12 Dec 02	Section 4, Command Number: Corrected GET and SET PROPERTY descriptions
4	28 Jan 03	Changed copyright symbol so pdf copies would print on all printers
5	03 Jun 03	Front Matter: added ISO line to logo, changed Tech Support phone number, added new warranty statement.
6	16 Jul 03	Sec 4: In the paragraph beginning “This device is powered…” changed Product ID from 0x0002 to 0x0003.
7	30 May 06	Removed reference to JIS. Changed to 3-track reading capability. Added Reset, LED and Track Enable commands. Added description on reader LED operation. New top level reader part number 21065140. Updated temperature and swipe speed ranges.

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This equipment has been tested and found to comply with the limits for 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 residential 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. However, there is no guarantee that interference will not occur in a particular installation.

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This device complies with Part 15 of the FCC Rules. Operation of this device is subject to the following two conditions: (1) This device may not cause harmful interference; and (2) this device must accept any interference received, including interference that may cause undesired operation.

CANADIAN DOC STATEMENT

This digital apparatus does not exceed the Class B limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de las classe B prescrites dans le Réglement sur le brouillage radioélectrique édicté par les ministère des Communications du Canada.

CE STANDARDS

Testing for compliance to CE was performed by an independent laboratory. The unit under test was found compliant to Class B.

UL/CSA

This product is recognized per Underwriter Laboratories and Canadian Underwriter Laboratories 1950.

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TABLES AND FIGURES

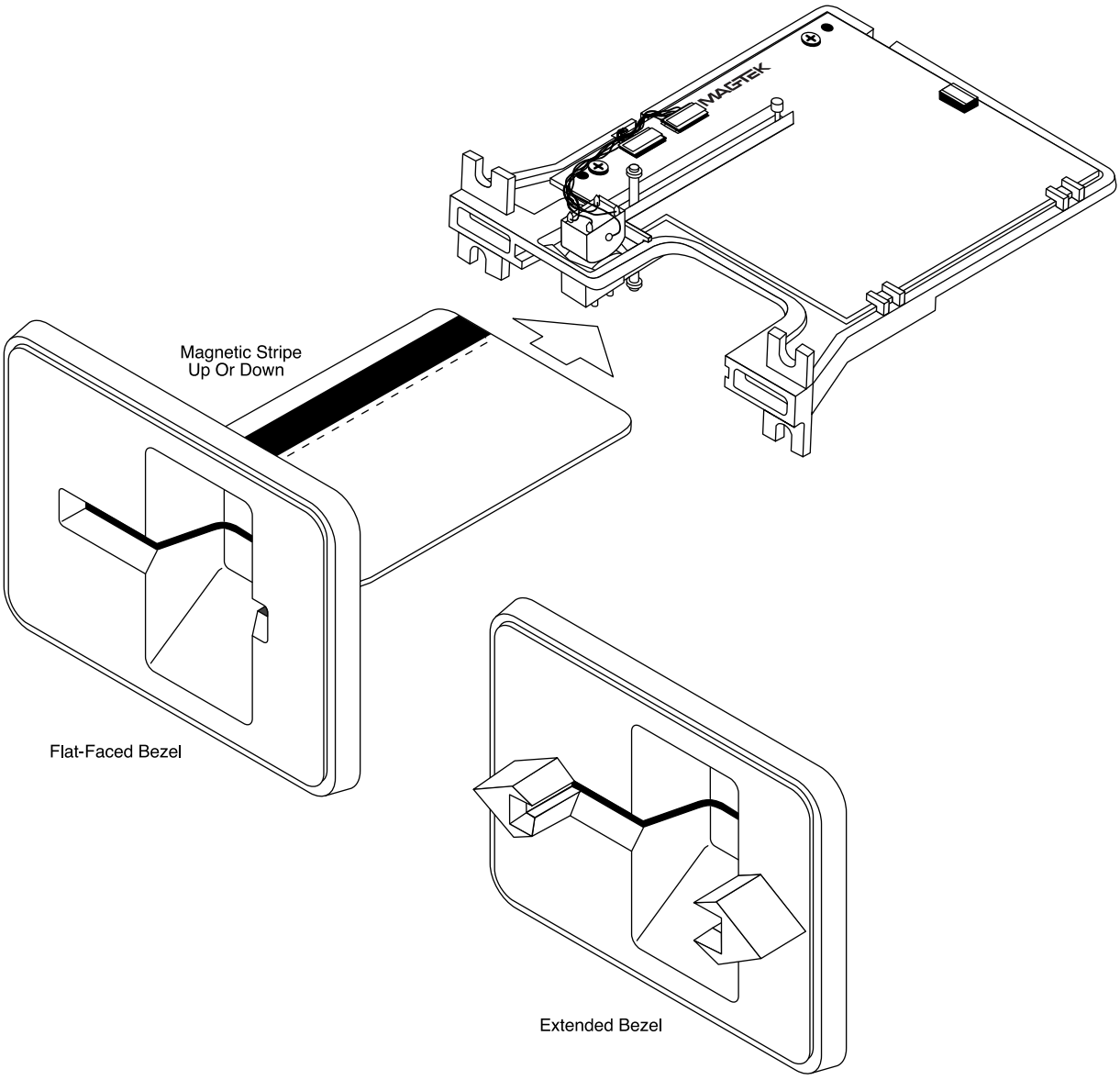

Figure 1-1. USB Insertion Reader

SECTION 1. FEATURES AND SPECIFICATIONS

The USB (Universal Serial Bus) HID (Human Interface Device) Insertion Reader is a compact magnetic stripe card reader, which conforms to ISO standards. The Reader is compatible with any device with a host USB interface. The reader can have single or dual head configurations. The dual head configuration can read a card with the magnetic stripe orientated in two directions. The single head configuration can read a card with the magnetic stripe orientated in one direction. A card is read by inserting it into and/or removing it out of the card slot when the card is oriented such that the card's magnetic stripe contacts a read head.

The reader conforms to the USB HID Class specification Version 1.1. This allows host applications designed for most versions of Windows to easily communicate to the device using standard Windows API calls that communicate to the device through the HID driver that comes with Windows.

Unlike HID keyboard emulation readers, this device does NOT use keyboard emulation. It behaves like a vendor defined HID device so that a direct communication path can be established between the Host application and the device without interference such as keystrokes from other HID devices.

FEATURES

Major features of the Swipe Reader are as follows:

- Powered through the USB – no external power supply required (current consumption of less than one USB Unit Load)
- Hardware Compatible with PC or any computer or terminal with a USB interface
- Single or dual read head – Configuration can be single or dual read head
- Mag-Stripe reading during insertion and/or removal of card – for reliable card reading
- Reads encoded data that meets ANSI/ISO/AAMVA standards and other custom formats such as ISO track 1 format on track 2 or 3
- Reads up to three tracks of card data
- Optional LED available for status
- Compatible with USB specification Revision 1.1
- Compatible with HID specification Version 1.1
- Can use standard Windows HID driver for communications; no third party device driver is required
- Programmable USB serial number descriptor
- Programmable USB Interrupt In Endpoint polling interval
- Programmable read direction. (insert, withdrawal or both)
- Non-volatile memory for configuration storage
- Optional 6-foot Black or Pearl White cable; the 3-track version uses standard USB mini Type B connector

- Isolated PCB – isolates electronics from debris and liquids
- AGC (Automatic Gain Control) in MagTek's latest read IC - enhances read performance with less susceptibility to RF interference
- Beam-mounted Read-heads – improves card tracking capabilities
- Ruggedized Chassis and Bezel Material - improves temperature and impact performance
- Open Chassis Design – provides superior debris clearing capability
- Half-card Drop Out – allows half-size credit cards and coins to be cleared from insert channel.

HARDWARE CONFIGURATIONS

The Configuration is as follows:

Part Number	Head Configuration	Tracks	Bezel
21065099	Dual head	1,2	Yes
21065140	Dual head	1,2,3	Yes

ACCESSORIES

The accessories are as follows:

Part Number	Description
16051430	Cable USB A 6'
21042806	USB MSR Demo Program with Source Code (CD)
99510026	USB MSR Demo Program with Source Code (WEB)
21041494	Cable, Pearl White, 6 ft.
21041495	Cable, Black, 6 ft.

REFERENCE DOCUMENTS

Axelson, Jan. *USB Complete, Everything You Need to Develop Custom USB Peripherals*, 1999. Lakeview Research, 2209 Winnebago St., Madison WI 53704, 396pp., http://www.lvr.com.

USB Human Interface Device (HID) Class Specification Version 1.1.

USB (Universal Serial Bus) Specification, Version 1.1, Copyright 1998 by Compaq Computer Corporation, Intel Corporation, Microsoft Corporation, NEC Corporation.

USB Implementers Forum, Inc., *www.usb.org*

The USB Insertion Reader will read cards that meet the standards defined by ISO (International Standards Organization):

ISO 7811 Identification Cards - Mag-stripe Cards, Tracks 1-3
ISO 7810 Identification Cards - Physical Specifications (ID-1 Cards)

SPECIFICATIONS

Table 1-2 lists the specifications for the Port Powered Swipe Reader.

Table 1-2. Specifications

Reference Standards	ISO 7810 and ISO 7811/AAMVA*	
Power Input	5V From USB port	
Recording Method	Two-frequency coherent phase (F2F)	
Message Format	ASCII	
Card Speed	3 to 60 ips (7.62 to 152.4 cm/s)	
Magnetic Head Durability	500,000 insertion cycles	
ELECTRICAL		
Current		
Normal Mode	15 ma	
Suspend Mode	Meets USB 2.0 specification for a Low-power Function	
MECHANICAL		
Dimensions	Without bezel	With Flat-faced Bezel
Length	4.4" (111.76 mm)	4.58" (116.33 mm)
Width	3.51" (89.15 mm)	4.00" (101.60 mm)
Height	1.24" (31.50 mm)	3.00" (76.2 mm)
Bezel Thickness	Flat Faced: 0.31" (7.87mm)	
Weight	Without bezel	With Flat-faced Bezel
	2.25 oz. (65 gr.)	3.85 oz. (109 gr.)
Cable length (optional)	6ft.	
ENVIRONMENTAL		
Temperature		
Operating	-40° to 70° C (-40° to 158° F)	
Storage	-40° to 80° C (-40° to 176° F)	
Humidity		
Operating	10% to 90% noncondensing	
Storage	10% to 90% noncondensing	

* ISO (International Standards Organization) and AAMVA (American Association of Motor Vehicle Administrators)

SECTION 2. INSTALLATION

This section describes the cable connection, the Windows Plug and Play Setup, and the physical mounting of the unit.

USB CONNECTION

Connect the optional USB cable to a USB port on the host. The reader and optional cable connectors are shown in Figure 2-1.

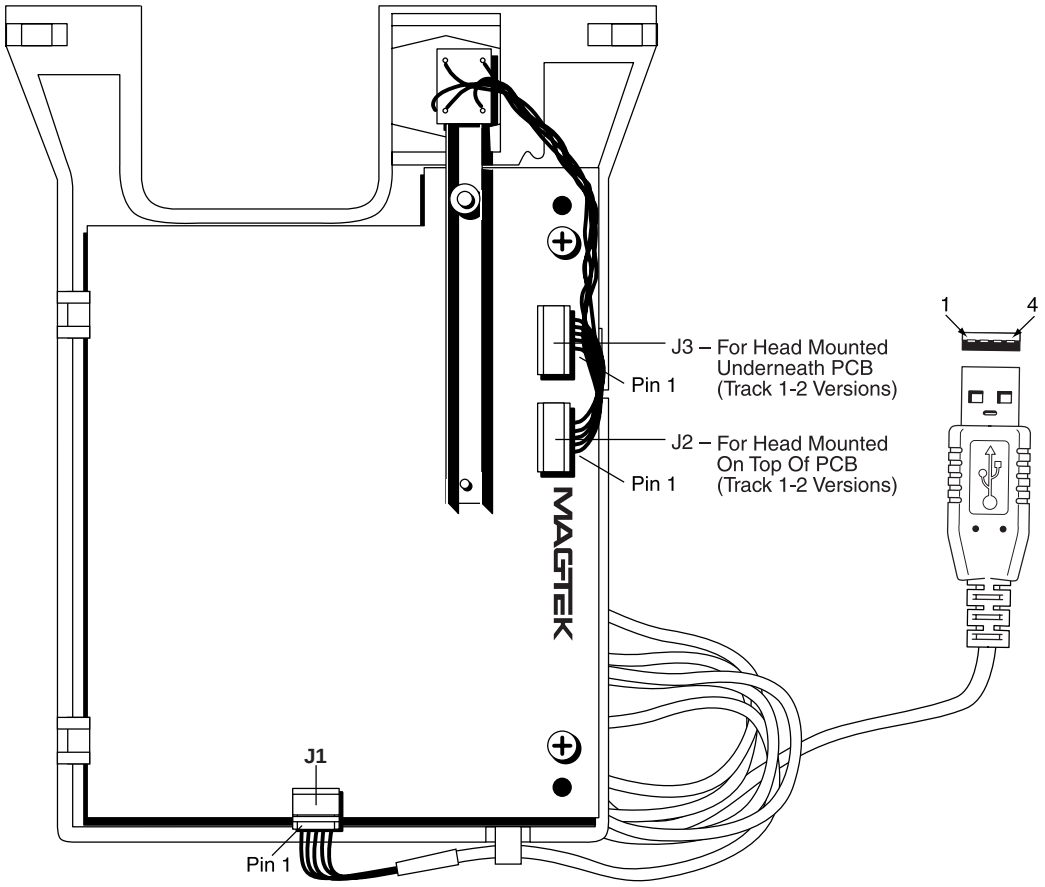

Figure 2-1. Cabling

The 4-pin mini USB type B to USB type A cable connector pin numbers and signal descriptions shown in the illustration are listed in Table 2-1.

Table 2-1. 4-Pin USB Type A Connector

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

WINDOWS PLUG AND PLAY SETUP

On hosts with the Windows operating system, the first time the device is plugged into a specific USB port, Windows will pop up a dialog box, which will guide you through the process of installing a device driver for the device. 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. When the dialog box pops up, follow the instructions given in the dialog box. Sometimes Windows will find all the files it needs on its own without giving any prompts. Other times Windows will need to know the location of the files it needs. If Windows prompts for the file locations, insert the CD that was used to install Windows on your PC and point Windows to the root directory of the CD. Windows should find all the files it needs there.

MOUNTING

Figure 2-1 shows the board layout and indicates the cable connections.

Note

As shown in Figure 2-1, there is also a cable, which may add to the length of the unit. If used as shown, approximately 1.5" inch is added to the length of the unit.

For users who are interested in designing their own bezel, refer to the dimensions in Appendix A.

Figure 2-2 shows the dimensions for mounting when using a MagTek Bezel. The top view and the side view show the heads mounted above and below the PCB with connectors J2 and J3.

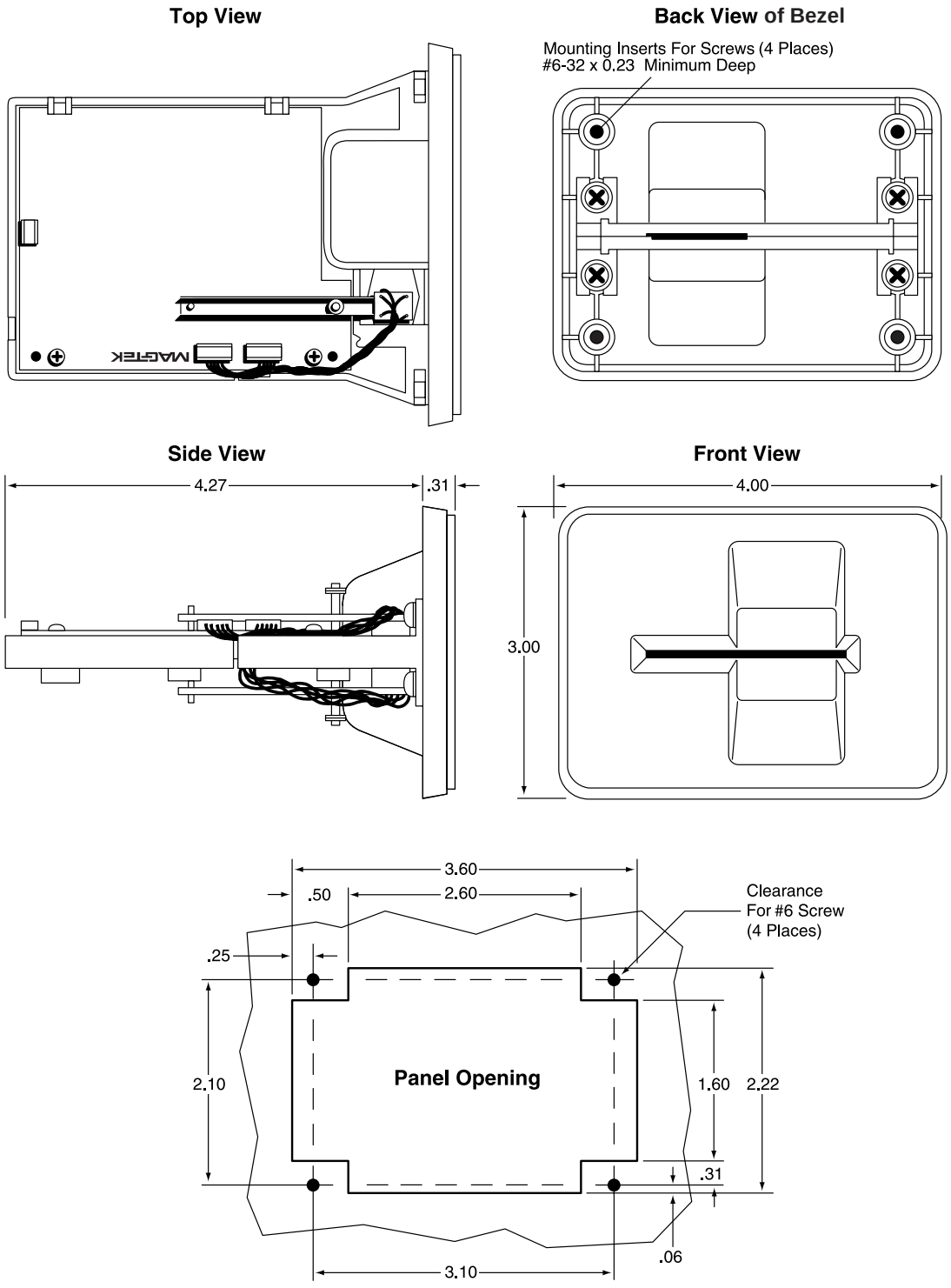

Figure 2-2. MagTek Bezel Mounting Dimensions

CARD INSERTION AND ORIENTATION

The Reader can be mounted in two positions as shown in Figure 2-3. On the left panel of the illustration, the card is inserted with the magnetic stripe to the left. On the right panel of the illustration, the card is inserted with the magnetic stripe up. These are the mounting positions that permit any foreign object inserted into the slot to drop out of the reader.

The card may be inserted with the magnetic stripe either facing up or down, and data is read in either the forward or reverse direction as indicated in the illustration. For forward read, the start sentinel is read first; for reverse read, the start sentinel is read last.

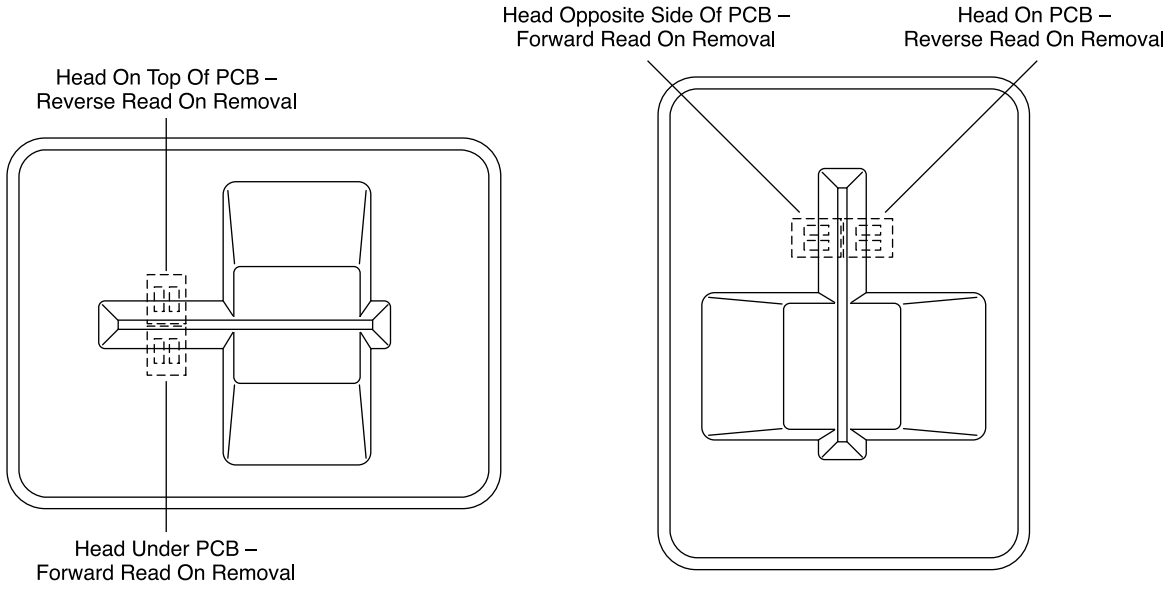

Figure 2-3. Card Insertion and Orientation

Although the card is read during insertion, the data will not be transmitted until the card is withdrawn. If an error is encountered during insertion, the card will be read again as the card is removed. In either case, the device will indicate that the card has been inserted when the rear sensor is blocked.

SECTION 3. OPERATION

This section describes the LED Indicator and Card Read.

LED INDICATOR

The LED indicator will be either off, red, or green (orange is possible with a command issued by the host). When the device is not powered, the LED will be off. When the device is first plugged in, the LED will be red. 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 inserted or withdrawn, the LED will turn off temporarily until the swipe is completed. If there are no errors after decoding the card data then the LED will turn green. If there are any errors after decoding the card data, the LED will turn red for approximately two seconds to indicate that an error occurred and then turn green. Anytime the host puts the device into suspend mode, the LED will turn off. Once the host takes the device out of suspend mode, the LED will return to the state it was in prior to entering suspend mode. The LED can also be controlled by the host application.

CARD READ

A card may be read by inserting it into the reader slot or removing it from the reader slot. The direction of the read that is sent to the host is controlled by the MSR_DIRECTION property, which is described in the next section. The magnetic stripe must face toward a read head during the swipe. Once the card is swiped, the device will attempt to decode the data and then send the results to the host via a USB HID input report. The report contains the card encode type, the decoded card data, decode error information, and swipe direction. After the results are sent to the host, the device will be ready to read the next swipe. To help reduce read errors, if a good read occurs when the card is inserted and a bad read occurs when the card is removed, then the read data for the card insert will be sent to the host when the card is removed instead of the bad read data from the removal.

SECTION 4. USB COMMUNICATIONS

This device conforms to the USB specification revision 1.1. This device also conforms with the Human Interface Device (HID) class specification version 1.1. The device 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 come with a standard Windows USB HID driver. Windows applications that communicate to this device can be easily developed. These applications can communicate to the device using standard windows API calls that communicate to the device 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 device is available. This demo program can be used to test the device and it can be used as a guide for developing other applications. More details about the demo program follow later in this document.

It is recommended that application software developers become familiar with the HID specification and the USB specification before attempting to communicate with this device. This document assumes that the reader is familiar with these specifications. These specifications can be downloaded free from www.usb.org.

This is a full speed USB device. This device has a number of programmable configuration properties. These properties are stored in non-volatile memory. These properties can be configured at the factory or by the end user. The device 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 speed up or slow down the card data transfer rate. The device has an adjustable serial number descriptor. The device also has an adjustable MSR direction property that determines if a card is read on insert, withdrawal or both directions. More details about these properties can be found later in this document in the command section.

The device has a card inserted property command that can be used to determine if a card is currently fully inserted into the device.

The device will go into suspend mode when directed to do so by the host. The device will wakeup from suspend mode when directed to do so by the host. The device does not support remote wakeup.

This device is powered from the USB bus. Its vendor ID is 0x0801 and its product ID is 0x0003.

HID USAGES

HID devices send data in reports. Elements of data in a report are identified by unique identifiers called usages. The structure of the device's reports and the device's capabilities are reported to the host in a report descriptor. The host usually gets the report descriptor only once, right after the device is plugged in. The report descriptor usages identify the devices capabilities and report structures. For example, a device could be identified as a keyboard by analyzing the device's report descriptor. Usages are four byte integers. The most significant two bytes are called the usage page and the least significant two bytes are called usage IDs. Usages that are related can share a common usage page. Usages can be standardized or they can be vendor defined.

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.

Magnetic Stripe 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
39	Card status	Data	Input
20	Command message	Data	Feature

REPORT DESCRIPTOR

The HID report descriptor is structured as follows:

Item	Value(Hex)
Usage Page (Magnetic Stripe Reader)	06 00 FF
Usage (Decoding reader device)	09 01
Collection (Application)	A1 01
Logical Minimum (0)	15 00
Logical Maximum (255)	26 FF 00
Report Size (8)	75 08
Usage (Track 1 decode status)	09 20
Usage (Track 2 decode status)	09 21
Usage (Track 3 decode status)	09 22
Usage (Track 1 data length)	09 28
Usage (Track 2 data length)	09 29
Usage (Track 3 data length)	09 2A
Usage (Card encode type)	09 38
Report Count (7)	95 07
Input (Data, Variable, Absolute, Bit Field)	81 02
Usage (Track 1 data)	09 30
Report Count (110)	95 6E
Input (Data, Variable, Absolute, Buffered Bytes)	82 02 01
Usage (Track 2 data)	09 31
Report Count (110)	95 6E
Input (Data, Variable, Absolute, Buffered Bytes)	82 02 01
Usage (Track 3 data)	09 32
Report Count (110)	95 6E
Input (Data, Variable, Absolute, Buffered Bytes)	82 02 01
Usage (Card Status)	09 39
Report Count (1)	95 01
Input (Data, Variable, Absolute, Bit Field)	81 02
Usage (Command message)	09 20
Report Count (24)	95 18
Feature (Data, Variable, Absolute, Buffered Bytes)	B2 02 01
End Collection	C0

CARD DATA

Card data is only sent to the host on the Interrupt In pipe using an Input Report. The device will send only one Input Report per card swipe. The MSR direction property, defined later in this section, determines the direction of the card swipe that will generate an Input Report. This property can be set to insert, withdrawal or both. If the host requests data from the device when no data is available, the device will send a Nak to the host to indicate that it has nothing to send. When a card is swiped, the Input Report will be sent even if the data is not decodable. The following table shows how the input report is structured.

Offset	Usage Name
0	Track 1 decode status
1	Track 2 decode status
2	Track 3 decode status
3	Track 1 data length
4	Track 2 data length
5	Track 3 data length
6	Card encode type
7 – 116	Track 1 data
117 – 226	Track 2 data
227 - 336	Track 3 data
337	Card Status

TRACK 1 DECODE STATUS

Bits	7-1	0
Value	Reserved	Error

This is a one-byte value, which indicates the status of decoding track 1. Bit position zero indicates there was an error decoding track 1 if the bit is set to 1. If it is zero, then no error occurred. If a track has data on it that is not noise, and it is not decodable, then a decode error is indicated. If a decode error is indicated, the corresponding track data length value for the track that has the error will be set to zero and no valid track data will be supplied.

TRACK 2 DECODE STATUS

Bits	7-1	0
Value	Reserved	Error

This is a one-byte value, which indicates the status of decoding track 2. Bit position zero indicates if there was an error decoding track 2 if this bit is set to one. If it is zero, then no error occurred. If a track has data on it that is not noise, and it is not decodable, then a decode error is indicated. If a decode error is indicated, the corresponding track data length value for the track that has the error will be set to zero and no valid track data will be supplied.

TRACK 3 DECODE STATUS

Bits	7-1	0
Value	Reserved	Error

This is a one-byte value, which indicates the status of decoding track 3. Bit position zero indicates there was an error decoding track 3 if this bit is set to one. If it is zero, then no error occurred. If a track has data on it that is not noise, and it is not decodable, then a decode error is indicated. If a decode error is indicated, the corresponding track data length value for the track that has the error will be set to zero and no valid track data will be supplied.

TRACK 1 DATA LENGTH

This one byte value indicates how many bytes of decoded card data are in the track 1 data field. This value will be zero if there was no data on the track or if there was an error decoding the track.

TRACK 2 DATA LENGTH

This one byte value indicates how many bytes of decoded card data are in the track 2 data field. This value will be zero if there was no data on the track or if there was an error decoding the track.

TRACK 3 DATA LENGTH

This one byte value indicates how many bytes of decoded card data are in the track 3 data field. This value will be zero if there was no data on the track or if there was an error decoding the track.

CARD ENCODE TYPE

This one byte value indicates the type of encoding that was found on the card. The following table defines the possible values.

Value	Encode Type	Description
0	ISO/ABA	ISO/ABA encode format
1	AAMVA	AAMVA encode format
2	CADL	No longer supported
3	Blank	The card is blank
4	Other	The card has a non-standard encode format. For example, ISO/ABA track 1 format on track 2.
5	Undetermined	The card encode type could not be determined because no tracks could be decoded.
6	None	No decode has occurred. This type occurs if no magnetic stripe data has been acquired since the data has been cleared or since the device was powered on. This device only sends an Input report when a card has been swiped so this value will never occur.

TRACK DATA

If decodable track data exits for a given track, it is located in the track data field that corresponds to the track number. The length of each track data field is fixed at 110 bytes, but the length of valid data in each field is determined by the track data length field that corresponds to the track number. Track data located in positions greater that the track data length field indicates are undefined and should be ignored. The HID specification requires that reports be fixed in size, but the number of bytes encoded on a card may vary. Therefore, the Input Report always contains the maximum amount of bytes that can be encoded on the card and the number of valid bytes in each track is indicated by the track data length field. The track data is decoded and converted to ASCII. The track data includes all data starting with the start sentinel and ending with the end sentinel.

TRACK 1 DATA

This field contains the decoded track data for track 1.

TRACK 2 DATA

This field contains the decoded track data for track 2.

TRACK 3 DATA

This field contains the decoded track data for track 3.

CARD STATUS

Bits	7-1	0
Value	Reserved	Card Inserted

This is a one-byte value, which indicates the card status. Bit position zero indicates that the card was swiped in the insertion direction if it is set to one. If it is set to zero, then the card was swiped in the withdrawal direction. All other bit positions are reserved.

COMMANDS

Most host applications do not need to send commands to the device. Most host applications only need to obtain card data from the device as described previously in this section. This section of the manual can be ignored by anyone who does not need to send commands to the device.

Command requests and responses are sent to and received from the device using feature reports. Command requests are sent to the device using the HID class specific request Set_Report. The response to a command is retrieved from the device using the HID class specific request Get_Report. These requests are sent over the default control pipe. When a command request is sent, the device will Nak the Status stage of the Set_Report request until the command is completed. This insures that as soon as the Set_Report request is completed, the Get_Report

request can be sent to get the command response. The usage ID for the command message was shown previously in the Usage Table.

The following table shows how the feature report is structured for command requests:

Offset	Field Name
0	Command Number
1	Data Length
2 – 23	Data

The following table shows how the feature report is structured for command responses.

Offset	Field Name
0	Result Code
1	Data Length
2 – 23	Data

COMMAND NUMBER

This one byte field contains the value of the requested command number. The following table lists all the existing commands.

Value	Command Number	Description
0	GET_PROPERTY	Gets a property from the device
1	SET_PROPERTY	Sets a property in the device
2	RESET_DEVICE	Resets the device

DATA LENGTH

This one byte field contains the length of the valid data contained in the Data field.

DATA

This multi-byte field contains command data if any. Note that the length of this field is fixed at 22 bytes. Valid data should be placed in the field starting at offset 2. Any remaining data after the valid data should be set to zero. This entire field must always be set even if there is no valid data. The HID specification requires that Reports be fixed in length. Command data may vary in length. Therefore, the Report should be filled with zeros after the valid data.

RESULT CODE

This one byte field contains the value of the result code. There are two types of result codes: generic result codes and command specific result codes. Generic result codes always have the most significant bit set to zero. Generic result codes have the same meaning for all commands and can be used by any command. Command specific result codes always have the most significant bit set to one. Command specific result codes are defined by the command that uses them. The same code can have different meanings for different commands. Command specific result codes are defined in the documentation for the command that uses them. Generic result codes are defined in the following table.

Value	Result Code	Description
0	SUCCESS	The command completed successfully.
1	FAILURE	The command failed.
2	BAD_PARAMETER	The command failed due to a bad parameter or command syntax error.

GET AND SET PROPERTY COMMANDS

The Get Property command gets a property from the device. The Get Property command number is 0.

The Set Property command sets a property in the device. The Set Property command number is 1.

The Get and Set Property command data fields for the requests and responses are structured as follows:
Get Property Request Data:

Data Offset	Value
0	Property ID

Get Property Response Data:

Data Offset	Value
0 – n	Property Value

Set Property Request Data:

Data Offset	Value
0	Property ID
1 – n	Property Value

Set Property Response Data:

None

The result codes for the Get and Set Property commands can be any of the codes list in the generic result code table.

Property ID is a one-byte field that contains a value that identifies the property. The following table lists all the current property ID values:

Value	Property ID	Description
0	SOFTWARE_ID	The device's software identifier
1	SERIAL_NUM	The device's serial number
2	POLLING_INTERVAL	The interrupt pipe's polling interval
3	MSR_DIRECTION	Magnetic stripe read direction
4	CARD_INSERTED	Card inserted indicator
5	MAX_PACKET_SIZE	The interrupt pipe's packet size
1B	TRACK_ID_ENABLE	Allows Tracks to be disabled

The Property Value is a multiple byte field that contains the value of the property. The number of bytes in this field depends on the type of property and the length of the property. The following table lists all of the property types and describes them.

Property Type	Description
Byte	This is a one byte value. The valid values depend on the property.
String	This is a multiple byte ASCII string. Its length can be zero to a maximum length that depends on the property. The value and length of the string does not include a terminating NUL character.

SOFTWARE_ID PROPERTY

Property ID: 0
Property Type: String
Length: Fixed at 11 bytes
Get Property: Yes
Set Property: No
Description: This is an 11 byte read only property that identifies the software part number and version for the device. The first 8 bytes represent the part number and the last 3 bytes represent the version. For example this string might be "21042804A02". Examples follow:

Example Get SOFTWARE_ID property Request (Hex):

Cmd Num	Data Len	Prp ID
00	01	00

Example Get SOFTWARE_ID property Response (Hex):

Result Code	Data Len	Prp Value
00	01	32 31 30 34 32 38 30 34 41 30 32

SERIAL_NUM PROPERTY

Property ID: 1
Property Type: String
Length: 0 – 15 bytes
Get Property: Yes
Set Property: Yes
Default Value: The default value is no string with a length of zero.
Description: The value is an ASCII string that represents the device's serial number. This string can be 0 – 15 bytes long. This property is stored in non-volatile EEPROM memory so it will not change when the unit is power cycled. The value of this property, if any, will be sent to the host when the host requests the USB string descriptor. When this property is changed, the unit must be power cycled to have these changes take effect for the USB descriptor. If a value other than the default value is desired, it can be set by the factory upon request. Examples follow.

Example Set SERIAL_NUM property Request (Hex):

Cmd Num	Data Len	Prp ID	Prp Value
01	04	01	31 32 33

Example Set SERIAL_NUM property Response (Hex):

Result Code	Data Len	Data
00	00	

Example Get SERIAL_NUM property Request (Hex):

Cmd Num	Data Len	Prp ID
00	01	01

Example Get SERIAL_NUM property Response (Hex):

Result Code	Data Len	Prp Value
00	03	31 32 33

POLLING_INTERVAL PROPERTY

Property ID: 2
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 2
Description: The value is a byte that represents the devices polling interval for the Interrupt In Endpoint. The value can be set in the range of 1 – 255 and has units of milliseconds. The polling interval tells the host how often to poll the device for card data packets. For example, if the polling interval is set to 10, the host will poll the device for card data packets every 10ms. This property can be used to speed up or slow down the time it takes to send card data to the host. The trade-off is that speeding up the card data transfer rate increases the USB bus bandwidth used by the device, and slowing down the card data transfer rate decreases the USB bus bandwidth used by the device. This property is stored in non-volatile EEPROM memory so it will not change when the unit is power cycled. The value of this property will be sent to the host when the host requests the device's USB endpoint descriptor. When this property is changed, the unit must be power cycled to have these changes take effect for the USB descriptor. If a value other than the default value is desired, it can be set by the factory upon request. Examples follow:

Example Set POLLING_INTERVAL property Request (Hex):

Cmd Num	Data Len	Prp ID	Prp Value
01	02	02	0A

Example Set POLLING_INTERVAL property Response (Hex):

Result Code	Data Len	Data

00	00	

Example Get POLLING_INTERVAL property Request (Hex):

Cmd Num	Data Len	Prp ID
00	01	02

Example Get POLLING_INTERVAL property Response (Hex):

Result Code	Data Len	Prp Value
00	01	0A

MSR_DIRECTION PROPERTY

Property ID: 3
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 2 (Withdrawal)
Description: This value is a byte that represents the devices magnetic stripe read direction. The device will generate a USB HID Input Report when a card is swiped in the direction indicated by this property. The value can be set to 1 for insert, 2 for withdrawal or 3 for both directions. If this property is set to 3 (both) then it is strongly recommended that the devices POLLING_INTERVAL property is set to 2ms or less and that the devices MAX_PACKET_SIZE is set to 32 bytes or more so that the device can keep up with the speed of swiping in both directions. If this is not done then if a card is withdrawn quickly after inserting the card, the withdrawal may have a read error because the read will not start until the device is finished sending the USB HID Input Report to the host for the Insert read. This property is stored in non-volatile EEPROM memory so it will not change when the unit is power cycled. When this property is changed, the unit must be power cycled to have these changes take effect. If a value other than the default value is desired, it can be set by the factory upon request.
Note that this reader reads better when a card is removed from it than when a card is inserted into it.

Examples follow:

Example Set MSR_DIRECTION property Request (Hex):

Cmd Num	Data Len	Prp ID	Prp Value
01	02	03	02

Example Set MSR_DIRECTION property Response (Hex):

Result Code	Data Len	Data
00	00	

Example Get MSR_DIRECTION property Request (Hex):

Cmd Num	Data Len	Prp ID
00	01	03

Example Get MSR_DIRECTION property Response (Hex):

Result Code	Data Len	Prp Value
00	01	02

CARD_INSERTED PROPERTY

Property ID: 4
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: No
Default Value: None
Description: This value is used to determine if a card is fully inserted into the device. If a card is fully inserted into the device this property will contain one. If not, the property will contain zero. This property is intended to be used by hosts that want to check if a card is currently inserted in the device during startup. This card inserted information is also contained in the Card Status field of the Input report sent to the host during each card swipe. So there should be no need to poll the host for this information on a continuing basis. Examples follow:

Example Get CARD_INSERTED property Request (Hex):

Cmd Num	Data Len	Prp ID
00	01	04

Example Get CARD_INSERTED property Response (Hex):

Result Code	Data Len	Prp Value
00	01	01

MAX_PACKET_SIZE PROPERTY

Property ID: 5
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 32
Description: The value is a byte that represents the devices maximum packet size for the Interrupt In Endpoint. The value can be set in the range of 1 – 64 and has units of bytes. The maximum packet size tells the host the maximum size of the Interrupt In Endpoint packets. For example, if the maximum packet size is set to 32, the device will send HID reports in multiple packets of 32 bytes each or less for the last packet of the report. This property can be used to speed up or slow down the time it takes to send card data to the host. Larger packet sizes speed up communications and smaller packet sizes slow down communications. The trade-off is that speeding up the card data transfer rate increases the USB bus bandwidth used by the device, and slowing down the card data transfer rate decreases the USB bus bandwidth used by the device. This property is stored in non-volatile EEPROM memory so it will not change when the unit is power cycled. The value of this property will be sent to the host when the host requests the device's USB endpoint descriptor. When this property is changed, the unit must be power cycled to have these changes take effect for the USB descriptor. If a value other than the default value is desired, it can be set by the factory upon request. Examples follow:

Example Set MAX_PACKET_SIZE property Request (Hex):

Cmd Num	Data Len	Prp ID	Prp Value
01	02	05	20

Example Set MAX_PACKET_SIZE property Response (Hex):

Result Code	Data Len	Data
00	00	

Example Get MAX_PACKET_SIZE property Request (Hex):

Cmd Num	Data Len	Prp ID
00	01	05

Example Get MAX_PACKET_SIZE property Response (Hex):

Result Code	Data Len	Prp Value
00	01	20

TRACK_ID_ENABLE PROPERTY

Property ID: 1B (hex)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 95 (hex)
Description: This property is defined as follows:

id	0	T_3	T_3	T_2	T_2	T_1	T_1

Id 0 – Decodes standard ISO/ABA cards only
1 – Decodes AAMV and 7-bit cards also

T# 00 – Track Disabled
01 – Track Enabled
10 – Track Enabled/Required (Error if blank)

This property is stored in non-volatile memory, so it will persist when the unit is power cycled. When this property is changed, the unit must be reset (see Command Number 2) or power cycled to have these changes take effect.

Example Set TRACK_ID_ENABLE property Request (Hex):

Cmd Num	Data Len	Prp ID	Prp Value
01	02	1B	95

Example Set TRACK_ID_ENABLE property Response (Hex):

Result Code	Data Len	Data
00	00	

Example Get TRACK_ID_ENABLE property Request (Hex):

Cmd Num	Data Len	Prp ID
00	01	1B

Example Get TRACK_ID_ENABLE property Response (Hex):

Result Code	Data Len	Prp Value
00	01	95

RESET_DEVICE COMMAND

Command number: 2

Description: This command is used to reset the device. This command can be used to make previously changed properties take affect without having to unplug and then plug in the device. When the device resets, it automatically does a USB detach followed by an attach. After the host sends this command to the device it should close the USB port, wait a few seconds for the operating system to handle the device detach followed by the attach and then re-open the USB port before trying to communicate further with the device.

Data structure: No data is sent with this command

Result codes: 0 (success)

Example Request (Hex):

Cmd Num	Data Len	Data
02	00	

Example Response (Hex):

Result Code	Data Len	Data
00	00	

LED STATE COMMAND

Command number: 6

Description: This command changes the LED state.

Data structure: No data is sent with this command

Data	LED State
0	OFF
1	RED
2	GREEN
3	ORANGE

Result codes: 0 (success)

Example Request to set LED to green (Hex):

Cmd Num	Data Len	Data
02	01	01

Example Response (Hex):

Result Code	Data Len	Data
00	00	

SECTION 5. DEMO PROGRAM

The demo program, which is written in Visual Basic, can be used to do the following:

- Read cards from the device and view the card data
- Send command requests to the device and view the command responses
- Guide application developers in their application development by providing examples, in source code, of how to properly communicate with the device using the standard Windows APIs

The part numbers for the demo program can be found in this document in Section 1 under Accessories.

Note that demo program version 1.1.0 or later is required for this Reader. The original version 1.0.0 only supports the USB swipe readers, not the insert readers.

INSTALLATION

To install the demo program, run the setup.exe file and follow the instructions given on the screen.

OPERATION

To operate the demo program perform the following steps:

- Plug the device into a USB port on the host
- If this is the first time the device has been plugged into the host, then follow the instructions on the screen for installing the Windows HID device driver. This is explained in more detail in the installation section of this document.
- Run the demo program.
- To read cards and view the card data, click on the Read Cards button and swipe a card when prompted to do so.
- When finished reading cards, close the dialog box.
- To send commands to the device, click on the send commands button.
- Enter a command in the Message edit box. All data entered should be in hexadecimal bytes with a space between each byte. Enter the command number followed by the command data if there is any. The application will automatically calculate and send the command data length for you. For example, to send the GET_PROPERTY command for property SOFTWARE_ID enter 00 00.
- Press Enter or click on Send message to send the command and receive the result.
- The command request and the command result will be displayed in the Communications Dialog edit box.
- The Clear Dialog button clears the Communication Dialog edit box.

SOURCE CODE

Source code is included with the demo program. It can be used as a guide for application development. It is described in detail, with comments, to assist developers. The book *USB Complete* by Jan Axelson is also a good guide for application developers, especially the chapter on Human Interface Device Host Applications (see "Reference Documents" in Section 1).

APPENDIX A. BEZEL DESIGN

The engineering drawings in this section are for customers interested in designing their own bezel. The example shown is a typical design from MagTek.

Please note that the bezel is an active part of the Reader; therefore the bezel design is important for card alignment and the performance of the Reader.

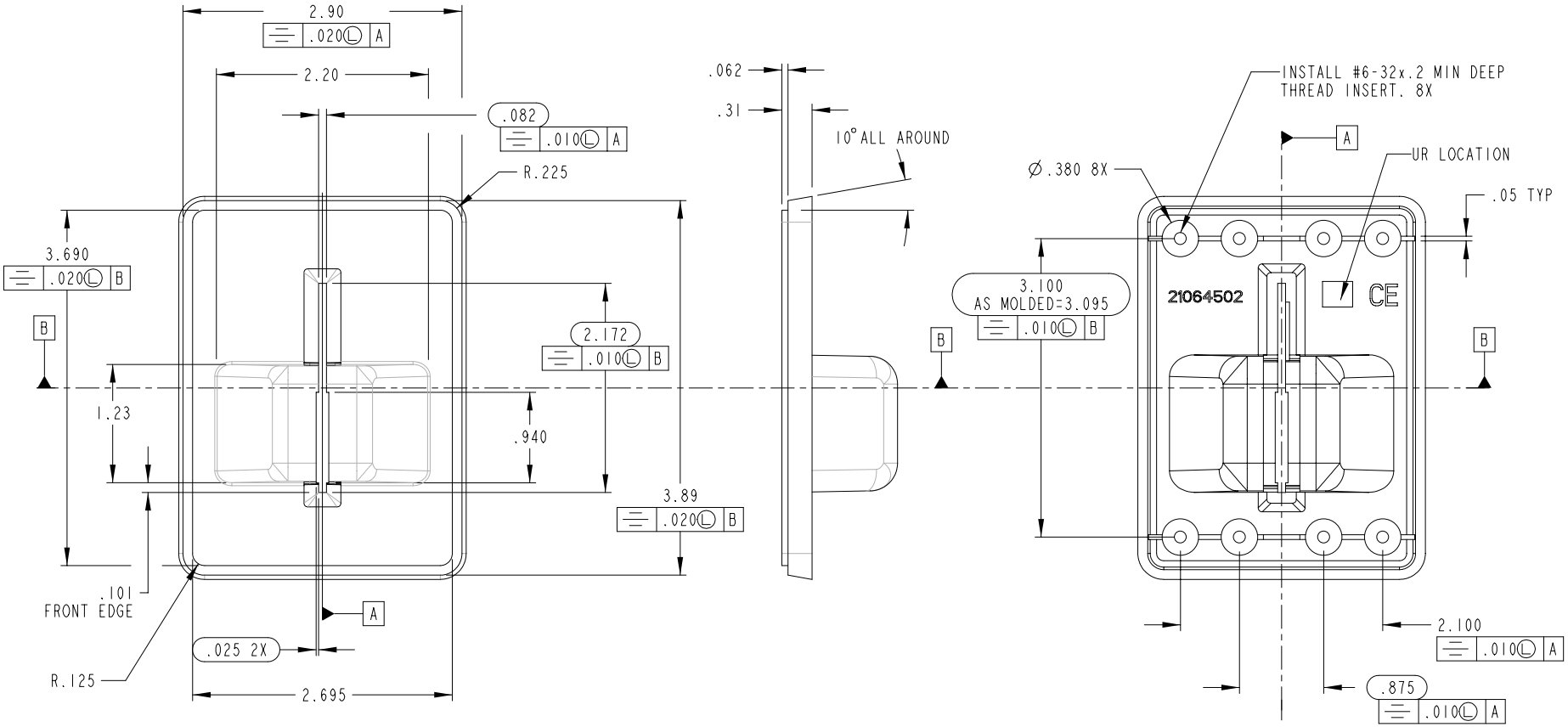

Figure A-1. Dimensions for Bezel Design Sheet 1

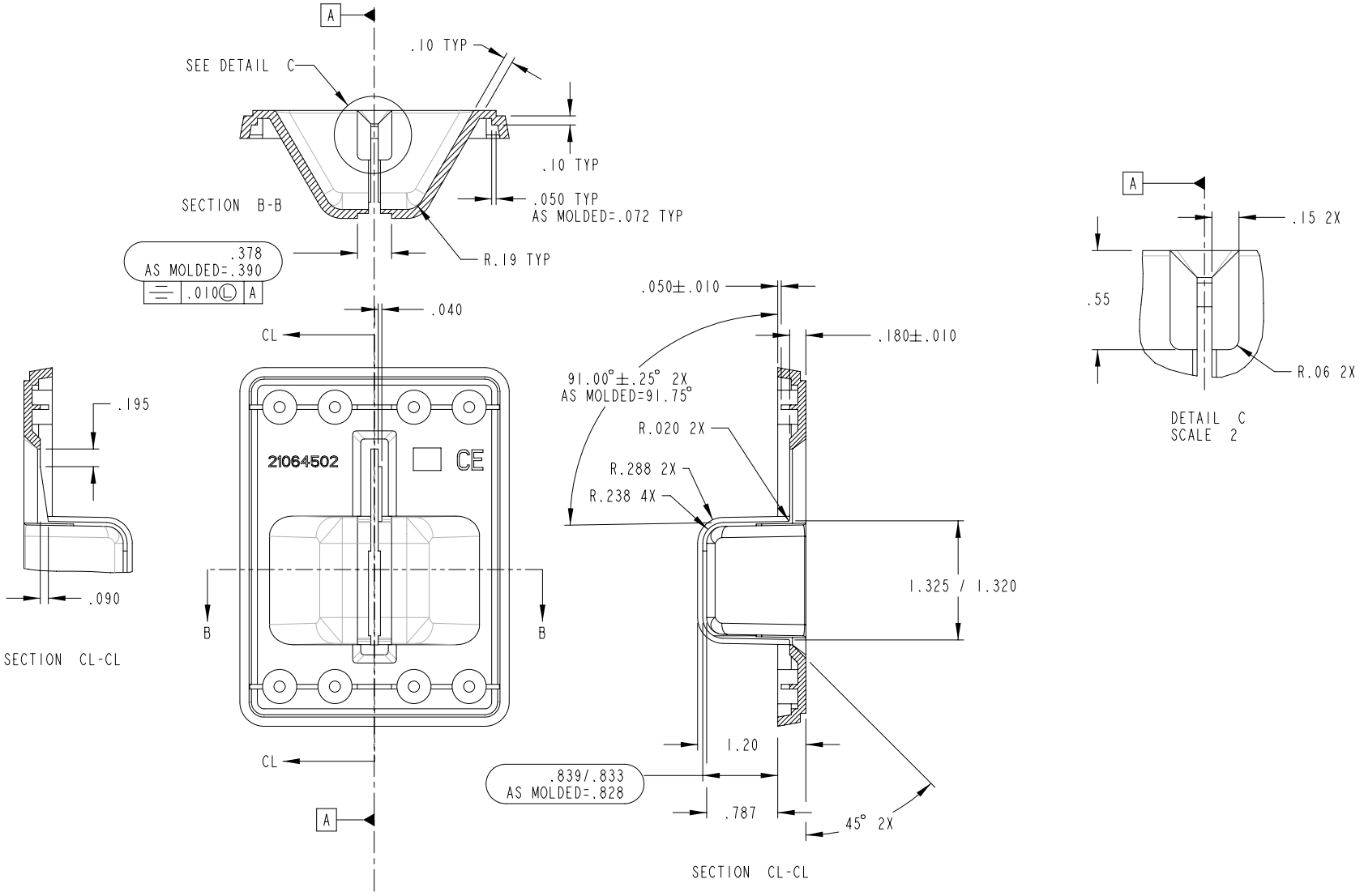

Figure A-2. Dimensions for Bezel Design Sheet 2