

P-SERIES USB INSERTION READER TECHNICAL REFERENCE MANUAL

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MAGTEK[®]

REGISTERED TO ISO 9001:2000

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REVISIONS

| Rev Number | Date | Notes |
|------------|------------|--|
| 1 | 05 Oct 01 | Initial Release |
| 2 | 19 Oct 01 | Sec 4: Polling Interval Property, changed default value from 1 to 2 |
| 3 | 13 Nov 01 | Sect 1: Changed operating temp spec to 0° to 65° C (32° to 149° F) |
| 4 | 12 Dec 02 | Section 4, Command Number: Corrected GET and SET PROPERTY descriptions |
| 5 | 28 Jan 03 | Changed copyright symbol so pdf copies would print on all printers |
| 6 | 03 Jun 03 | Front Matter: added ISO line to logo, changed Tech Support phone number, added new warranty statement |
| 7 | 16 Jul 03 | Sec 4: In the paragraph beginning "This device is powered..." changed Product ID from 0x0002 to 0x0003 |
| 8 | 8 May 06 | Removed reference to CDL; added support brackets |
| 9 | 27 Mar 07 | Updated FCC statement |
| 10 | 14 Dec 07 | Added 3-track reader (21065148); removed description of mounting brackets |
| 11 | 30 Jan 08 | Added keyboard emulation feature. |
| 12 | 22 June 09 | Added 21065151; updated Limited Warranty and Agency approvals |
| 13 | 19 Sept 09 | Replaced mounting bracket kit (21065811) with new kit (21064519) |

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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.

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This digital apparatus does not exceed the Class B limits for radio noise from 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 la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérisé de la classe B est conforme à la norme NMB-003 du Canada.

CE STANDARDS

Testing for compliance with CE requirements was performed by an independent laboratory. The unit under test was found compliant with standards established for Class B devices.

UL/CSA

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

RoHS STATEMENT


When ordered as RoHS compliant, this product meets the Electrical and Electronic Equipment (EEE) Reduction of Hazardous Substances (RoHS) European Directive 2002/95/EC. The marking is clearly recognizable, either as written words like "Pb-free", "lead-free", or as another clear symbol ()

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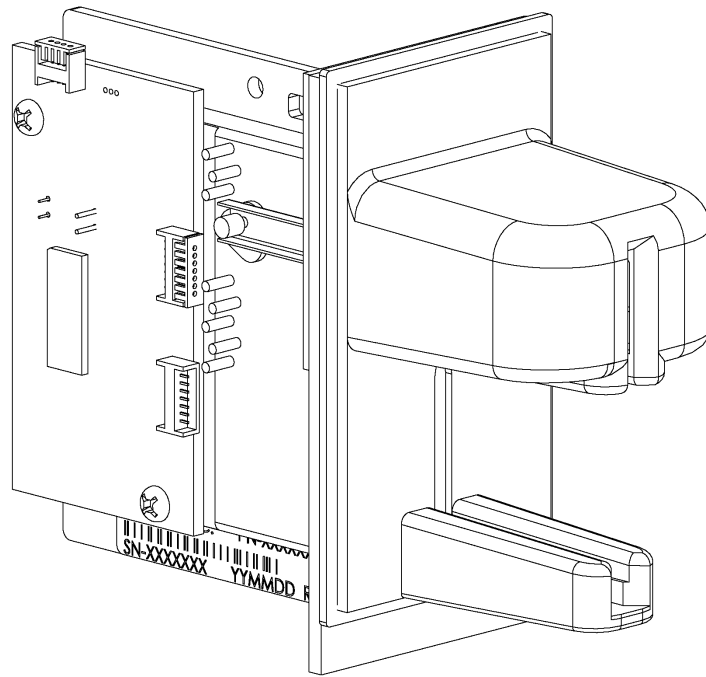


Figure 1-1. P-Series USB Insertion Reader – 2-Track

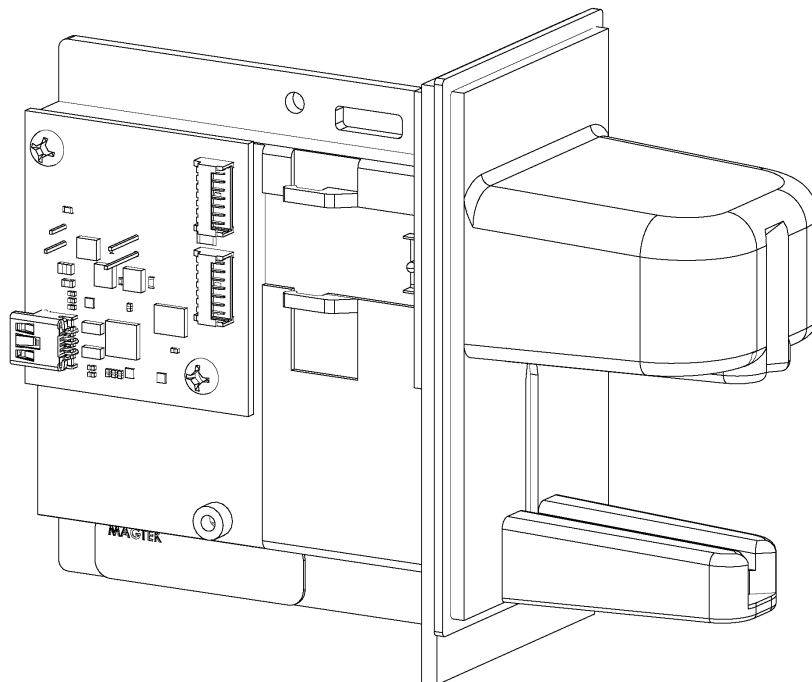


Figure 1-2. P-Series USB Insertion Reader – 3-Track

SECTION 1. FEATURES AND SPECIFICATIONS

The P-Series USB (Universal Serial Bus) Insertion Reader is a compact magnetic stripe card reader, which conforms to ISO standards. The Reader is compatible with the PC series of personal computers or any device with a 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 two-track version of the reader has circuitry that automatically ensures that the ISO magnetic stripe is read in the case where a dual-stripe JIS (Japanese) credit card is inserted on the dual head unit (the JIS stripe is ignored). On the three-track models, 2-sided cards cannot be read.

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

The Reader can be operated in two different modes:

- HID (herein referred to as “**HID** mode”) and
- HID with Keyboard Emulation (herein referred to as “**KB** mode”)

Note that only reader part number 21065148 and 21065151 with firmware version 21042817C01 or newer supports both modes. The other readers only support HID mode.

When operating in the HID mode, this device will 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 from other HID devices.

When configured for the Keyboard Emulation (KB) mode, the Reader emulates a USB HID United States keyboard or, optionally, any international keyboard using ALT ASCII code keypad key combinations or customizable key maps. This allows host applications designed to acquire card data from keyboard input to seamlessly acquire the card data from the USB swipe reader.

Caution

When in Keyboard Emulation mode, if another keyboard is connected to the same host as this device and a key is pressed on the other keyboard while this device is transmitting, then the data transmitted by this device may get corrupted.

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

FEATURES

Major features of the Insert Reader are as follows:

- Powered through the USB – no external power supply required
- Hardware Compatible with PC or any computer or terminal with a USB interface
- JIS Discrimination circuitry - automatically detects if a dual-stripe JIS (Japanese Industrial Standard) card is inserted and auto-routes the ISO data signals to the microcontroller. This ensures that dual-head features still work for Japanese card holders. (Only supported on the 2-track model.)
- Mag-Stripe reading during insertion and/or removal of card – for reliable card reading
- Reads encoded data that meets ANSI/ISO/AAMVA standards and others such as ISO track 1 format on track 2
- Reads up to three tracks of card data
- Error reduction for withdrawal reads by using good insert read data
- 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 flash EEPROM memory for property storage
- Optional 6-foot Black or Pearl White cable
- Sealed Chassis design - provides superior protection from moisture
- 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

CONFIGURATIONS

The available configurations are as follows:

| Part Number | Head Configuration | Tracks | Interface Type | Connector |
|--------------------|---------------------------|---------------|-----------------------|------------------|
| 21065128 | Dual head | 1,2 | HID | Molex |
| 21065148 | Dual head | 1,2,3 | HID | USB mini-B |
| 21065151 | Dual head | 1,2,3 | KB | USB mini-B |

ACCESSORIES

The accessories are as follows:

| Part Number | Description |
|-------------|--|
| 16051430 | USB A to USB Mini-B, Pearl White, 6 ft. |
| 21041494 | 5-Pin Molex Cable, Pearl White, 6 ft. |
| 21041495 | 5-Pin Molex Cable, Black, 6 ft. |
| 21042806 | USB MSR Demo Program with Source Code (Diskette) |
| 21064519 | Angle Bracket Mounting Kit |
| 99510026 | USB MSR Demo Program with Source Code (WEB) |

REFERENCE DOCUMENTS

Axelsson, 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 P-Series 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 USB P-Series Insert Reader.

Table 1-2. Specifications

| | |
|---------------------|--|
| Reference Standards | ISO 7810 and ISO 7811, AAMVA & JISB9561* |
| Power Input | 5V from USB port |
| Recording Method | Two-frequency coherent phase (F2F) |
| Message Format | ASCII |
| Card Speed | 3 to 50 IPS |
| Head Life | 1,000,000 passes (500,000 insert cycles) |

ELECTRICAL

| | |
|--------------|--------|
| Current | |
| Normal Mode | 30 mA |
| Suspend Mode | 300 uA |

MECHANICAL

| | |
|--------------|---------------------|
| Weight | 3.74 oz. (106.03 g) |
| Dimensions | See Appendix A |
| Cable length | Optional |

ENVIRONMENTAL

| | |
|-------------|------------------------------------|
| Temperature | |
| Operating | -40 °F to 185 °F (-40 °C to 85 °C) |
| Storage | -40 °F to 185 °F (-40 °C to 85 °C) |
| Humidity | |
| Operating | 10% to 90% noncondensing |
| Storage | 10% to 90% noncondensing |

* ISO (International Standards Organization), AAMVA (American Association of Motor Vehicle Administrators) and JIS B9561 (Japanese Industrial Standard).

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 readers and pin numbers for the cable connectors are shown in Figure 2-1 and Figure 2-2. The optional MagTek or user-supplied cable is attached to J1 on either model.

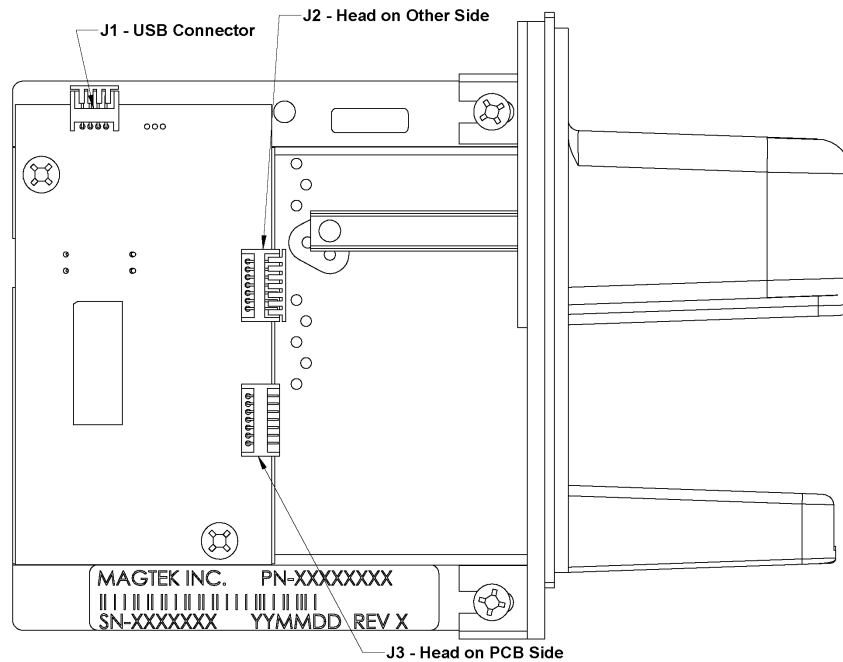


Figure 2-1. Cabling for 21065128

The 5-pin connections (on J1) between the Reader and the USB connector shown in the illustration are listed in Table 2-2.

Table 2-1. 5-Pin Connector (J1)

| Pin Number | Signal | Cable Color |
|------------|-----------------|-------------|
| 1 | V _{CC} | Red |
| 2 | - Data | White |
| 3 | +Data | Green |
| 4 | Ground | Black |
| 5 | Shield Ground | Black |

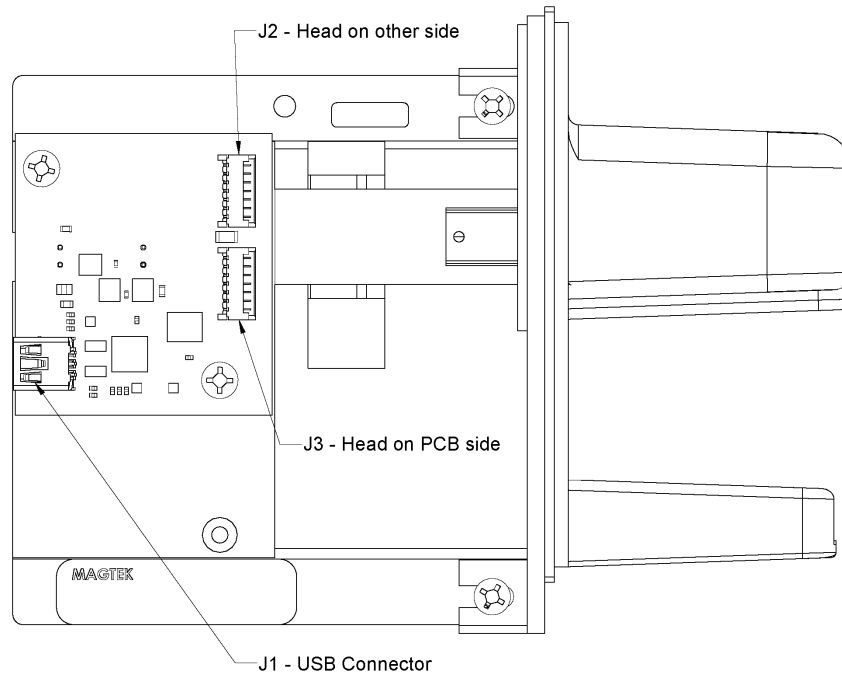


Figure 2-2. Cabling for 21065148 and 21065151

The 5-pin USB mini-B connector pin numbers and signal descriptions shown in the illustration are listed in Table 2-1.

Table 2-2. 5-Pin USB Mini-B Connector (J1)

| Pin Number | Signal | Cable Color |
|------------|------------------|-------------|
| 1 | V _{BUS} | Red |
| 2 | - Data | White |
| 3 | +Data | Green |
| 4 | n/c | - - |
| 5 | Ground | Black |

WINDOWS PLUG AND PLAY SETUP

On hosts with the Windows operating system, the first time the reader 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 reader. After this process is completed once, Windows will no longer request this process as long as the reader is plugged into the same USB port. The device driver that Windows will install for this reader 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 to you in the dialog box. Sometimes 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. If Windows prompts you 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

The standard orientation of the Reader is with the larger guide up as shown in Figure 2-3. The position shown offers the best protection for the heads from moisture, dust, or foreign particles.

In both models, connector J3 is wired to the head that is on the same side as the PCB. Connector J2 is wired to the head that is opposite the PCB. The magnetic stripe must be inserted in the Large Guide but may be be facing in either direction.

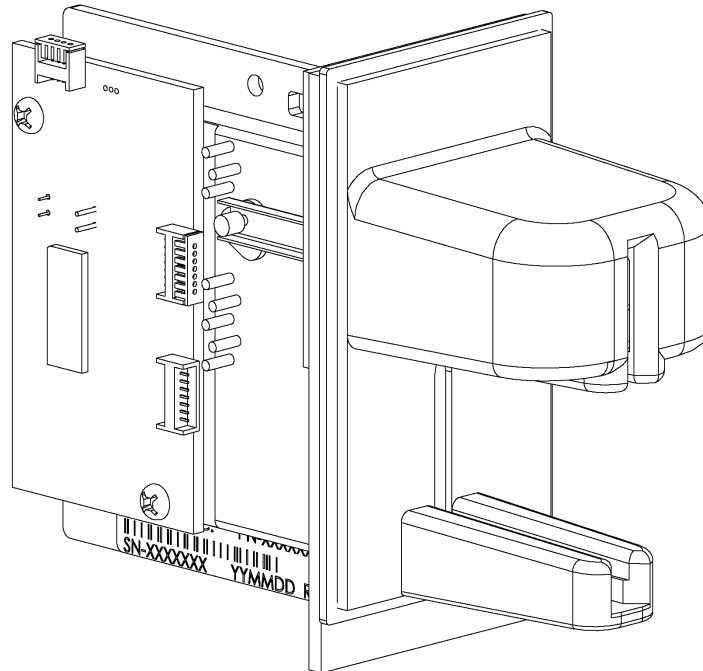


Figure 2-3. MagTek Bezel Mounting Position

OPTIONAL MOUNTING BRACKET

In applications where moisture-intrusion is a concern, it is recommended that the reader be mounted with a 4° - 5° *downward* angle with respect to the horizontal plane. This will allow gravity to drain away any excess moisture that may have entered into the Card Reader slot.

For more information about the mounting bracket kit (21064519) that can be used to tip the reader forward, contact your MagTek salesperson.

SECTION 3. OPERATION

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 reader will attempt to decode the data and then send the results to the host via a USB HID input report or, if in Keyboard Emulation mode, as if the data was being typed on a keyboard. After the results are sent to the host, the reader 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 (HID)

The Reader can be operated in two different modes:

- HID (herein referred to as “**HID** mode”) and
- HID with Keyboard Emulation (herein referred to as “**KB** mode”)

Note that only readers 21065148 and 21065151 with firmware version 21042817C01 or newer support both modes. The other readers only support HID mode.

When operating in the HID mode, this device will 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 from other HID devices.

When configured for the Keyboard Emulation (KB) mode, the Reader emulates a USB HID United States keyboard or, optionally, any international keyboard using ALT ASCII code keypad key combinations or customizable key maps. This allows host applications designed to acquire card data from keyboard input to seamlessly acquire the card data from the USB swipe reader.

This section only describes USB communications when the device is in the HID mode. See the USB communications (KB) section for a description of USB communication when the device is in the KB mode. (Refer to [Interface Type Property](#) for information on how to change modes.)

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. More details about these properties can be found later in this document in the command section.

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 exists 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 than 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 |
| 16 | INTERFACE_TYPE | Type of USB interface |
| 27 | 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 “21042817C01”. 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 31 37 43 30 31 |

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 |

INTERFACE TYPE PROPERTY

Property ID: 16 (0x10)

Property Type: Byte

Length: 1 byte

Get Property: Yes

Set Property: Yes

Default Value: 0 (HID)

Description: The value is a byte that represents the devices interface type. The value can be set to 0 for the HID interface or to 1 for the keyboard emulation interface. When the value is set to 0 (HID) the device will behave as described in the USB communications (HID) section of the manual. When the value is set to 1 (keyboard emulation) the device will behave as described in the USB communications (KB) section of the manual. This property should be the first property changed because it affects which other properties are available. After this property is changed, the device should be power cycled before changing any other properties.

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 **Interface Type** property Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 02 | 10 | 01 |

Example Set **Interface Type** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **Interface Type** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 10 |

Example Get **Interface Type** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 01 | 00 |

TRACK ID ENABLE PROPERTY

Property ID: 27 (0x1B)
 Property Type: Byte
 Length: 1 byte
 Get Property: Yes
 Set Property: Yes
 Default Value: 0x95
 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 | |

SECTION 5. USB COMMUNICATIONS (KB)

The Reader can be operated in two different modes:

- HID (herein referred to as “**HID** mode”) and
- HID with Keyboard Emulation (herein referred to as “**KB** mode”)

Note that only readers 21065148 and 21065151 with firmware version 21042817C01 or newer support both modes. The other readers only support HID mode.

When operating in the HID mode, this device will 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 from other HID devices.

When configured for the Keyboard Emulation (KB) mode, the Reader emulates a USB HID United States keyboard or, optionally, any international keyboard using ALT ASCII code keypad key combinations or customizable key maps. This allows host applications designed to acquire card data from keyboard input to seamlessly acquire the card data from the USB swipe reader.

This section only describes USB communications when the device is in the KB mode. See the USB communications (HID) section for a description of USB communication when the device is in the HID mode. (Refer to [Interface Type Property](#) for information on how to change modes.)

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 HID keyboard device. The latest versions of the Windows operating systems come with a standard Windows USB HID keyboard driver.

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. More details about these properties can be found later in this document in the command section.

The device will go into suspend mode when directed to do so by the host. The device will wake up 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. The vendor ID is 0x0801 and the product ID is 0x0001.

HOST APPLICATIONS

This device can be used with existing applications that acquire card data via keyboard input. Also, applications that communicate to this device can be easily developed. These applications can be developed using compilers such as Microsoft’s Visual Basic or Visual C++. To demonstrate this device’s card reading capabilities any application that accepts keyboard input such as Window’s Notepad can be used.

CARD DATA

The card data is converted to ASCII and transmitted to the host as if it had been typed on a keyboard. Any data with ASCII values 0 – 31 or 127 will be transmitted as their equivalent control code combination. For example a carriage return value 13 (0x0D) will be sent as (^M) where ^ represents the Ctrl key on the keyboard.

Caution

If another keyboard is connected to the same host as this device and a key is pressed on the other keyboard while this device is transmitting, then the data transmitted by this device may get corrupted.

Because of potential “data interleave” issues associated with the USB Keyboard interface, MagTek recommends that the USB Keyboard Emulation mode should only be used by customers who have previously used MagTek’s Keyboard Wedge MSR, or who are interfacing with an existing PC software application which gathers card data from the keyboard port. If previous applications were based upon RS-232 serial interface MSR’s, or if this is a brand new development effort, it is recommended that you use the HID mode).

The device’s programmable configuration options affect the format of the card data.

The card data format for the default configuration is as follows:

[Tk1 SS] [Tk1 Data] [ES] [Tk2 SS] [Tk2 Data] [ES] [Tk3 SS] [Tk3 Data] [ES] [CR]

where:

Tk1 SS = % (7-bit start sentinel)
Tk2 SS = ; (ISO/ABA 5-bit start sentinel)
 @ (7-bit start sentinel)
Tk3 SS = + (ISO/ABA start sentinel)
 # (AAMVA start sentinel)
 & (7-bit start sentinel)
ES = ? (end sentinel)
CR = (carriage return) (0x0D)

All data will be sent in upper case regardless of the state of the caps lock key on the keyboard. If no data is detected on a track then nothing will be transmitted for that track. If an error is detected on a track the ASCII character E will be sent in place of the track data to indicate an error.

The card data format for all programmable configuration options is as follows:

[P18][P11] [P13] [Tk1 SS] [Tk1 Data] [ES] [LRC] [P14] [P5] [P13] [Tk2 SS] [Tk2 Data] [ES] [LRC] [P14] [P5] [P13] [Tk3 SS] [Tk3 Data] [ES] [LRC] [P14] [Sensor][P5] [P12][P19]

where:

| | | |
|---------|---|---|
| ES | = | P22 (end sentinel) |
| LRC | = | Longitudinal redundancy check character |
| P5 | = | Terminating character |
| P11 | = | Pre card character |
| P12 | = | Post card character |
| P13 | = | Pre track character |
| P14 | = | Post track character |
| P18 | = | Pre card string |
| P19 | = | Post card string |
| Tk1 SS= | | P20 (ISO/ABA start sentinel) |
| Tk2 SS= | | P21 (ISO/ABA 5-bit start sentinel) |
| | | P6 (7-bit start sentinel) |
| Tk3 SS= | | P8 (ISO/ABA start sentinel) |
| | | P9 (AAMVA start sentinel) |
| | | P10 (7-bit start sentinel) |
| Sensor= | | Sensor status if enabled by the sensor blocked and/or sensor unblocked char properties described later in this document |

All fields with the format P# are programmable configuration property numbers. They are described in detail later in this document.

PROGRAMMABLE CONFIGURATION OPTIONS

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 using a program supplied by MagTek. Programming these parameters requires low level communications with the device. During normal device operation, the device acts like a USB HID keyboard so the host operating system takes care of all low level communications with the device so that the application developer is not burdened with these low level details. Details on how to communicate with the device to change programmable configuration properties follows in the next few sections. These details are included as a reference only. Most users will not need to know these details because the device will be configured at the factory or by a program supplied by MagTek. Most users may want to skip over the next few sections on low level communications and continue with the details of the configuration properties.

LOW LEVEL COMMUNICATIONS

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

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 the standard HID keyboard usages or vendor defined magnetic stripe reader usage page 0xff00. The vendor defined 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 |
|---------------------------|-------------------|-----------------------|------------------------|
| 20 | Command message | Data | Feature |

REPORT DESCRIPTOR

The HID report descriptor is structured as follows:

| Item | Value(Hex) |
|--|-------------------|
| Usage Page (Generic Desktop) | 05 01 |
| Usage (Keyboard) | 09 06 |
| Collection (Application) | A1 01 |
| Usage Page (Key Codes) | 05 07 |
| Usage Minimum (224) | 19 E0 |
| Usage Maximum (231) | 29 E7 |
| Logical Minimum (0) | 15 00 |
| Logical Maximum (1) | 25 01 |
| Report Size (1) | 75 01 |
| Report Count (8) | 95 08 |
| Input (Data, Variable, Absolute) | 81 02 |
| Report Count (1) | 95 01 |
| Report Size (8) | 75 08 |
| Input (Constant) | 81 03 |
| Report Count (5) | 95 05 |
| Report Size (1) | 75 01 |
| Usage Page (LEDs) | 05 08 |
| Usage Minimum (1) | 19 01 |
| Usage Maximum (5) | 29 05 |
| Output (Data, Variable, Absolute) | 91 02 |
| Report Count (1) | 95 01 |
| Report Size (3) | 75 03 |
| Output (Constant) | 91 03 |
| Report Count (6) | 95 06 |
| Report Size (8) | 75 08 |
| Logical Minimum (0) | 15 00 |
| Logical Maximum (101) | 25 66 |
| Usage Page (Key Codes) | 05 07 |
| Usage Minimum (0) | 19 00 |
| Usage Maximum (101) | 29 66 |
| Input (Data, Array) | 81 00 |
| Logical Maximum (255) | 26 FF 00 |
| Usage Page (vendor defined (MSR)) | 06 00 FF |
| Usage (command data) | 09 20 |
| Report Count | 95 18 |
| Feature (Data, Variable, Absolute, Buffered Bytes) | B2 02 01 |
| End Collection | C0 |

COMMANDS

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 |
| 3 | GET_KEYMAP_ITEM | Gets a key map item |
| 4 | SET_KEYMAP_ITEM | Sets a key map item |
| 5 | SAVE_CUSTOM_KEYMAP | Saves the custom key map |

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 |
| 27 | TRACK_ID_ENABLE | Track enable / ID enable |
| 26 | TRACK_DATA_SEND_FLAGS | Track data send flags |
| 5 | TERMINATION_CHAR | Terminating char / per track or card flag |
| 6 | SS_TK2_7BITS | Start sentinel char for track 2 – 7 bit data |
| 7 | Reserved for future use | |
| 8 | SS_TK3_ISO_ABA | Start sentinel char for track 3 – ISO/ABA |
| 9 | SS_TK3_AAMVA | Start sentinel char for track 3 - AAMVA |
| 10 | SS_TK3_7BITS | Start sentinel char for track 3 – 7 bit data |
| 11 | PRE_CARD_CHAR | Pre card char |
| 12 | POST_CARD_CHAR | Post card char |
| 13 | PRE_TK_CHAR | Pre track char |
| 14 | POST_TK_CHAR | Post track char |
| 15 | ASCII_TO_KEYPRESS_CONVERSION_TYPE | Type of conversion performed when converting ASCII data to key strokes |
| 16 | INTERFACE_TYPE | Type of USB interface |
| 17 | ACTIVE_KEYMAP | Selects which key map to use |
| 18 | PRE_CARD_STRING | Pre card string |
| 19 | POST_CARD_STRING | Post card string |
| 20 | SS_TK1_ISO_ABA | Start sentinel char for track 1 – ISO/ABA |
| 21 | SS_TK2_ISO_ABA | Start sentinel char for track 2 – ISO/ABA |
| 22 | ES | End sentinel char for all tracks/formats |
| 3 | MSR_DIRECTION | Magnetic stripe read direction |
| 4 | CARD_INSERTED | Card inserted indicator |
| 28 | SENSOR_BLOCKED_CHAR | Sensor blocked char |
| 29 | SENSOR_UNBLOCKED_CHAR | Sensor unblocked char |
| 23 | ES_TK1 | End sentinel char for track 1 |
| 24 | ES_TK2 | End sentinel char for track 2 |
| 25 | ES_TK3 | End sentinel char for track 3 |

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 “21042817C01”. 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 31 37 43 30 31 |

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. The value of this property, if any, will be sent to the host when the host requests the USB string descriptor.

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 **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: 1

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. The value of this property will be sent to the host when the host requests the device’s USB endpoint descriptor.

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 **Polling Interval** property to 10 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 |

TRACK ID ENBLE PROPERTY

Property ID: 27 (0x1B)
 Property Type: Byte
 Length: 1 byte
 Get Property: Yes
 Set Property: Yes
 Default Value: 0x95
 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 AAMVA, CA DL/ID 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 |

TRACK DATA SEND FLAGS PROPERTY

Property ID: 26 (0x1A)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0x63
Description: This property is defined as follows:

| | | | | | | | |
|-----|----|----|-----|---|----|----|----|
| ICL | SS | ES | LRC | 0 | LC | Er | Er |
|-----|----|----|-----|---|----|----|----|

ICL 0 – Changing the state of the caps lock key will not affect the case of the data
1 – Changing the state of the caps lock key will affect the case of the data

SS 0 – Don't send Start Sentinel for each track
1 – Send Start Sentinel for each track

ES 0 – Don't send End Sentinel for each track
1 – Send End Sentinel for each track

LRC 0 – Don't send LRC for each track
1 – Send LRC for each track

Note that the LRC is the unmodified LRC from the track data. To verify the LRC the track data needs to be converted back from ASCII to card data format and the start sentinels that were modified to indicate the card encode type need to be converted back to their original values.

LC 0 – Send card data as upper case
1 – Send card data as lower case

Note that the state of the Caps Lock key on the host keyboard has no affect on what case the card data is transmitted in unless the ICL bit in this property is set to 1.

Er 00 – Don't send any card data if error
01 – Don't send track data if error
11 – Send 'E' for each track error

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.

TERMINATION CHAR PROPERTY

Property ID: 5
 Property Type: Byte
 Length: 1 byte
 Get Property: Yes
 Set Property: Yes
 Default Value: 0x0D (carriage return)
 Description: This property is defined as follows:

| | | | | | | | |
|-----|---|---|---|---|---|---|---|
| mod | c | c | c | c | c | c | c |
|-----|---|---|---|---|---|---|---|

mod 0 – Send c after card data
 1 – Send c after each track

c 1-127 – 7 bit ASCII char code
 0 – send nothing

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.

SS_TK2_7BITS PROPERTY

Property ID: 6
 Property Type: Byte
 Length: 1 byte
 Get Property: Yes
 Set Property: Yes
 Default Value: 0x40 '@'
 Description: This character is sent as the track 2 start sentinel for cards that have track 2 encoded in 7 bits per character format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

SS_TK3_ISO_ABA PROPERTY

Property ID: 8
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0x2B '+'
Description: This character is sent as the track 3 start sentinel for cards that have track 3 encoded in ISO/ABA format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

SS_TK3_AAMVA PROPERTY

Property ID: 9
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0x23 '#'
Description: This character is sent as the track 3 start sentinel for cards that have track 3 encoded in AAMVA format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

SS_TK3_7BITS PROPERTY

Property ID: 10 (0x0A)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0x26 '&'
Description: This character is sent as the track 3 start sentinel for cards that have track 3 encoded in 7 bits per character format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

PRE CARD CHAR PROPERTY

Property ID: 11 (0x0B)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0
Description: This character is sent prior to all other card data. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

POST CARD CHAR PROPERTY

Property ID: 12 (0x0C)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0
Description: This character is sent after all other card data. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

PRE TK CHAR PROPERTY

Property ID: 13 (0x0D)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0
Description: This character is sent prior to the data for each track. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

POST TK CHAR PROPERTY

Property ID: 14 (0x0E)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0
Description: This character is sent after the data for each track. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character be sent.

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.

ASCII TO KEYPRESS CONVERSION TYPE PROPERTY

Property ID: 15 (0x0F)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0 (keymap)
Description: The value is a byte that represents the devices ASCII to keypress conversion type. The value can be set to 0 for keymap (the active keymap is set with the ACTIVE_KEYMAP property) or to 1 for ALT ASCII code (international keyboard emulation). When the value is set to 0 (keymap), data will be transmitted to the host according to the active keymap which defaults to the United States keyboard keymap. For example, to transmit the ASCII character ‘?’ (063 decimal), the character is looked up in a keymap. For a United States keyboard keymap, the ‘/’ (forward slash) key combined with the left shift key modifier are stored in the keymap to represent the key press combination that is used to represent the ASCII character ‘?’ (063 decimal). When the value is set to 1 (ALT ASCII code), instead of using the key map, a international keyboard key press combination consisting of the decimal value of the ASCII character combined with the ALT key modifier is used. For example, to transmit the ASCII character ‘?’ (063 decimal), keypad ‘0’ is sent combined with left ALT key modifier, next keypad ‘6’ is sent combined with the left ALT key modifier, last keypad ‘3’ is sent combined with the left ALT key modifier. In general, if this device only needs to emulate United States keyboards then this property should be set to 0 (keymap).
If this device needs to be able to emulate all country’s keyboards then this property should be set to 1 (ALT ASCII code). The tradeoff is that the ALT ASCII code mode is slightly slower than keymap mode because more key presses need to be transmitted. Some applications are not compatible with ALT ASCII code mode.

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 **ASCII To Keypress Conversion Type** property Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 02 | 0F | 00 |

Example Set **ASCII To Keypress Conversion Type** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **ASCII To Keypress Conversion Type** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 0F |

Example Get **ASCII To Keypress Conversion Type** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 01 | 00 |

INTERFACE TYPE PROPERTY

Property ID: 16 (0x10)

Property Type: Byte

Length: 1 byte

Get Property: Yes

Set Property: Yes

Default Value: 1 (keyboard emulation)

Description: The value is a byte that represents the devices interface type. The value can be set to 0 for the HID interface or to 1 for the keyboard emulation interface. When the value is set to 0 (HID) the device will behave as described in the USB communications (HID) section of the manual. When the value is set to 1 (keyboard emulation) the device will behave as described in the USB communications (KB) section of the manual. This property should be the first property changed because it affects which other properties are available. After this property is changed, the device should be power cycled before changing any other properties.

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 **Interface Type** property to HID Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 02 | 10 | 00 |

Example Set **Interface Type** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **Interface Type** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 10 |

Example Get **Interface Type** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 01 | 00 |

ACTIVE KEYMAP PROPERTY

Property ID: 17 (0x11)

Property Type: Byte

Length: 1 byte

Get Property: Yes

Set Property: Yes

Default Value: 0 (United States)

Description: The value is a byte that represents the device's active key map. The value can be set to 0 for the United States key map or to 1 for the custom key map. The active key map will be used by the device to convert ASCII data into key strokes. The United States key map should be used will all hosts that are configured to use United States keyboards. The custom key map can be used to set up the device to work with hosts that are configured to use other countries keyboards. The default custom key map is the same as the United States key map. The key map can be modified to another countries key map by using commands "Get Key Map", "Set Key Map" and "Save Custom Key Map". See the command section of this manual for a complete description of these commands. To set up a device to use a custom key map, select the appropriate key map to be modified using the active key map property, reset the device to make this change take affect, use the "Get Key Map" and "Set Key Map" commands to modify the active key map, use the "Save Custom Key Map" command to save the active key map as the custom key map, set the active key map property to custom to use the custom key map, reset the device to make these changes take affect.

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 **Active Keymap** property Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 02 | 11 | 00 |

Example Set **Active Keymap** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **Active Keymap** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 11 |

Example Get **Active Keymap** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 01 | 00 |

PRE CARD STRING PROPERTY

Property ID: 18 (0x12)

Property Type: String

Length: 0 – 7 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 pre card string. This string can be 0 – 7 bytes long. This string is sent prior to all other card data.

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 **Pre Card String** property Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 04 | 12 | 31 32 33 |

Example Set **Pre Card String** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **Pre Card String** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 12 |

Example Get **Pre Card String** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 03 | 31 32 33 |

POST CARD STRING PROPERTY

Property ID: 19 (0x13)
 Property Type: String
 Length: 0 – 7 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 post card string. This string can be 0 – 7 bytes long. This string is sent after all other card data.

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 **Post Card_String** property Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 04 | 12 | 31 32 33 |

Example Set **Post Card_String** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **Post Card_String** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 12 |

Example Get **Post Card_String** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 03 | 31 32 33 |

SS_TK1_ISO_ABA PROPERTY

Property ID: 20 (0x14)
 Property Type: Byte
 Length: 1 byte
 Get Property: Yes
 Set Property: Yes
 Default Value: 0x25 ‘%’
 Description: This character is sent as the track 1 start sentinel for cards that have track 1 encoded in ISO/ABA format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

SS_TK2_ISO_ABA PROPERTY

Property ID: 21 (0x15)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0x3B ‘;’
Description: This character is sent as the track 2 start sentinel for cards that have track 2 encoded in ISO/ABA format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

ES PROPERTY

Property ID: 22 (0x16)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0x3F ‘?’
Description: This character is sent as the end sentinel for all tracks with any format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

MSR DIRECTION PROPERTY

Property ID: 3 (0x03)
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 output card data 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. 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 (0x04)
 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 optionally present in the Sensor field of the card data 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 |

SENSOR BLOCKED CHAR

Property ID: 28 (0x1C)
 Property Type: Byte
 Length: 1 byte
 Get Property: Yes
 Set Property: Yes
 Default Value: 0
 Description: This character is sent in the sensor field of the card data when the sensor is blocked. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

Examples follow:

Example Set **Sensor Blocked Char** property to ASCII “1” Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 02 | 1C | 31 |

Example Set **Sensor Blocked Char** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **Sensor Blocked Char** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 1C |

Example Get **Sensor Blocked Char** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 01 | 31 |

SENSOR UNBLOCKED CHAR

Property ID: 29 (0x1D)

Property Type: Byte

Length: 1 byte

Get Property: Yes

Set Property: Yes

Default Value: 0

Description: This character is sent in the sensor field of the card data when the sensor is unblocked. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent.

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.

Examples follow:

Example Set **Sensor Unblocked Char** property to ASCII “0” Request (Hex):

| Cmd Num | Data Len | Prp ID | Prp Value |
|---------|----------|--------|-----------|
| 01 | 02 | 1D | 30 |

Example Set **Sensor Unblocked Char** property Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

Example Get **Sensor Unblocked Char** property Request (Hex):

| Cmd Num | Data Len | Prp ID |
|---------|----------|--------|
| 00 | 01 | 1D |

Example Get **Sensor Unblocked Char** property Response (Hex):

| Result Code | Data Len | Prp Value |
|-------------|----------|-----------|
| 00 | 01 | 30 |

ES_TK1 PROPERTY

Property ID: 23 (0x17)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0xFF (use ES property)
Description: This character is sent as the end sentinel for track 1 with any format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent. If the value is 0xFF then the value of the ES property will be used instead of this property.

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.

ES_TK2 PROPERTY

Property ID: 24 (0x18)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0xFF (use ES property)
Description: This character is sent as the end sentinel for track 2 with any format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent. If the value is 0xFF then the value of the ES property will be used instead of this property.

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.

ES_TK3 PROPERTY

Property ID: 25 (0x19)
Property Type: Byte
Length: 1 byte
Get Property: Yes
Set Property: Yes
Default Value: 0xFF (use ES property)
Description: This character is sent as the end sentinel for track 3 with any format. If the value is 0 no character is sent. If the value is in the range 1 – 127 then the equivalent ASCII character will be sent. If the value is 0xFF then the value of the ES property will be used instead of this property.

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.

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 | |

GET KEYMAP ITEM COMMAND

Command number: 3

Description: This command is used to get a key map item from the active key map. The active key map is determined by the active key map property. Data from a magnetic stripe card is a sequence of ASCII characters. These ASCII characters are mapped to key strokes and these key strokes are sent to the host to represent the ASCII character. The key map maps a single ASCII character to a single USB key usage ID and USB key modifier byte. The key usage ID and the key modifier byte are transmitted to the host via USB to represent the ASCII character. The ASCII value is the value of the ASCII character to be transmitted to the host. See an ASCII table for the values of the ASCII character set. The USB key usage ID is a unique value assigned to every keyboard key. For a list of all key usage IDs see Appendix A. The key modifier byte modifies the meaning of the key usage ID. The modifier byte indicates if any combination of the right or left Ctrl, Shift, Alt or GUI keys are pressed at the same time as the key usage ID. For a list and description of the key modifier byte see Appendix B.

When both the key usage ID and the key modifier byte are set to 0xFF for a given ASCII value, the ALT ASCII code is sent instead of the key map values. The ALT ASCII code is a key press combination consisting of the decimal value of

the ASCII character combined with the ALT key modifier. For example, to transmit the ASCII character '?' (063 decimal), keypad '0' is sent combined with left ALT key modifier, next keypad '6' is sent combined with the left ALT key modifier, last keypad '3' is sent combined with the left ALT key modifier.

Data structure:

Request Data:

| Offset | Field Name | Description |
|--------|-------------|--|
| 0 | ASCII value | Value of the ASCII character to be retrieved from the key map. This can be any value between 0 and 127 (0x7F). For example, to retrieve the key map item for ASCII character '?' (card data end sentinel) use the ASCII value of '?' which is 63 (0x3F). |

Response Data:

| Offset | Field Name | Description |
|--------|-------------------|--|
| 0 | Key Usage ID | The value of the USB key usage ID that is mapped to the given ASCII value. For example, for the United States keyboard map, usage ID 56 (0x38) (keyboard / and ?) is mapped to ASCII character '?'. |
| 1 | Key Modifier Byte | The value of the USB key modifier byte that is mapped to the given ASCII value. For example, for the United States keyboard map, modifier byte 0x02 (left shift key) is mapped to ASCII character '?'. |

Result codes: 0 (success)

Example Request (Hex):

| Cmd Num | Data Len | Data |
|---------|----------|------|
| 03 | 01 | 3F |

Example Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|-------|
| 00 | 02 | 38 02 |

SET KEYMAP ITEM COMMAND

Command number: 4

Description: This command is used to set a key map item of the active key map. The active key map is determined by the active key map property. Data from a magnetic stripe card is a sequence of ASCII characters. These ASCII characters are mapped to key strokes and these key strokes are sent to the host to represent the ASCII character. The key map maps a single ASCII character to a single USB key usage ID and USB key modifier byte. The key usage ID and the key modifier byte are transmitted to the host via USB to represent the ASCII character. The ASCII value is the value of the ASCII character to be transmitted to the host. See an ASCII table for the values of the ASCII character set. The USB key usage ID is a unique value assigned to every keyboard key. For a list of all key usage IDs see Appendix A. The key modifier byte modifies the meaning of the key usage ID. The modifier byte indicates if any combination of the right or left Ctrl, Shift, Alt or GUI keys are pressed at the same time as the key usage ID. For a list and description of the key modifier byte see Appendix B. Once a key map item is modified, the changes take affect immediately. However, the changes will be lost if the device is reset or power cycled. To make the changes permanent, the save custom key map command must be issued. To use the new custom key map after a reset or power cycle, the active key map property must be set to custom.

When both the key usage ID and the key modifier byte are set to 0xFF for a given ASCII value, the ALT ASCII code is sent instead of the key map values. The ALT ASCII code is a key press combination consisting of the decimal value of the ASCII character combined with the ALT key modifier. For example, to transmit the ASCII character '?' (063 decimal), keypad '0' is sent combined with left ALT key modifier, next keypad '6' is sent combined with the left ALT key modifier, last keypad '3' is sent combined with the left ALT key modifier.

Data structure:

Request Data:

| Offset | Field Name | Description |
|--------|-------------------|---|
| 0 | ASCII value | Value of the ASCII character to be set in the key map. This can be any value between 0 and 127 (0x7F). For example, to set the key map item for ASCII character '?' (card data end sentinel) use the ASCII value of '?' which is 63 (0x3F). |
| 1 | Key Usage ID | The value of the USB key usage ID that is to be mapped to the given ASCII value. For example, for the United States keyboard map, usage ID 56 (0x38) (keyboard / and ?) is mapped to ASCII character '?'. To change this to the ASCII character '>' use usage ID 55 (0x37) (keyboard . and >). |
| 2 | Key Modifier Byte | The value of the USB key modifier byte that is to be mapped to the given ASCII value. For example, for the United States keyboard map, modifier byte 0x02 (left shift key) is mapped to ASCII character '?'. To change this to the ASCII character '>' use modifier byte 0x02 (left shift key). |

Response Data: None

Result codes: 0 (success)

The following example maps the card ASCII data end sentinel character '?' to the '>' keyboard key.

Example Request (Hex):

| Cmd Num | Data Len | Data |
|---------|----------|----------|
| 04 | 03 | 3F 37 02 |

Example Response (Hex):

| Result Code | Data Len | Data |
|-------------|----------|------|
| 00 | 00 | |

SAVE CUSTOM KEYMAP COMMAND

Command number: 5

Description: This command is used to save the active key map as the custom key map in non volatile memory. The active key map is determined by the active key map property. Once a key map item is modified, the changes take affect immediately. However, the changes will be lost if the device is reset or power cycled. To make the changes permanent, the save custom key map command must be issued. To use the new custom key map after a reset or power cycle, the active key map property must be set to custom.

Data structure:

Request Data: None
Response Data: None

Result codes: 0 (success)

Example Request (Hex):

| Cmd Num | Data Len | Data |
|----------------|-----------------|-------------|
| 05 | 00 | |

Example Response (Hex):

| Result Code | Data Len | Data |
|--------------------|-----------------|-------------|
| 00 | 00 | |

SECTION 6. DEMO PROGRAM

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

- 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. For the keyboard emulation interface type, typically an existing application is used to read card data and no commands need to be sent to the device after the initial configuration so the developer would probably not have to review this source code.
- Read cards from the device and view the card data. The keyboard emulation interface type can also use other common applications to view card data such as Windows Notepad.

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

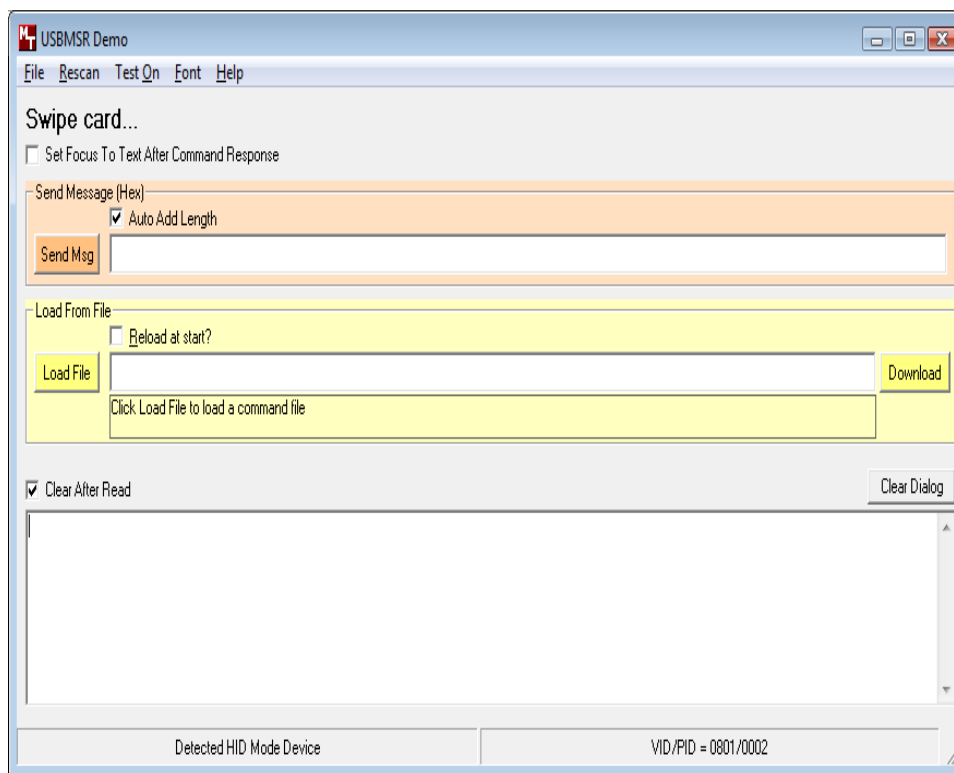
INSTALLATION

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:

- Attach the device into a USB port on the host.
- If this is the first time the device has been plugged into the host, 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.



- 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** if the *Auto Add Length* box is checked. For example, to send the GET_PROPERTY command for property SOFTWARE_ID enter 00 00.
- Press Enter or click *Send Msg* 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.
- To read cards and view the card data, swipe the card.

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. USAGE ID DEFINITIONS

This appendix is from the following document found on www.usb.org: Universal Serial Bus HID Usage Tables, Version 1.12 and specifically for this manual, Section 10, Keyboard/Keypad Page (0x07).

KEYBOARD/KEYPAD PAGE (0X07)

This section is the Usage Page for key codes to be used in implementing a USB keyboard. A Boot Keyboard (84-, 101- or 104-key) should at a minimum support all associated usage codes as indicated in the “Boot” column below.

The usage type of all key codes is Selectors (Sel), except for the modifier keys Keyboard Left Control (0x224) to Keyboard Right GUI (0x231) which are Dynamic Flags (DV).

Note. A general note on Usages and languages: Due to the variation of keyboards from language to language, it is not feasible to specify exact key mappings for every language. Where this list is not specific for a key function in a language, the closest equivalent key position should be used, so that a keyboard may be modified for a different language by simply printing different keycaps. One example is the Y key on a North American keyboard. In Germany this is typically Z. Rather than changing the keyboard firmware to put the Z Usage into that place in the descriptor list, the vendor should use the Y Usage on both the North American and German keyboards. This continues to be the existing practice in the industry, in order to minimize the number of changes to the electronics to accommodate other languages.

Table A-1. Keyboard/Keypad

| Usage ID (Dec) | Usage ID (Hex) | Usage Name | Ref: Typical AT-101 Position | PC-AT | Mac | UNIX | Boot |
|----------------|----------------|--|------------------------------|-------|-----|------|-----------|
| 0 | 00 | Reserved (no event indicated) ⁹ | N/A | √ | √ | √ | 4/101/104 |
| 1 | 01 | Keyboard ErrorRollOver ⁹ | N/A | √ | √ | √ | 4/101/104 |
| 2 | 02 | Keyboard POSTFail ⁹ | N/A | √ | √ | √ | 4/101/104 |
| 3 | 03 | Keyboard ErrorUndefined ⁹ | N/A | √ | √ | √ | 4/101/104 |
| 4 | 04 | Keyboard a and A ⁴ | 31 | √ | √ | √ | 4/101/104 |
| 5 | 05 | Keyboard b and B | 50 | √ | √ | √ | 4/101/104 |
| 6 | 06 | Keyboard c and C ⁴ | 48 | √ | √ | √ | 4/101/104 |
| 7 | 07 | Keyboard d and D | 33 | √ | √ | √ | 4/101/104 |
| 8 | 08 | Keyboard e and E | 19 | √ | √ | √ | 4/101/104 |
| 9 | 09 | Keyboard f and F | 34 | √ | √ | √ | 4/101/104 |
| 10 | 0A | Keyboard g and G | 35 | √ | √ | √ | 4/101/104 |
| 11 | 0B | Keyboard h and H | 36 | √ | √ | √ | 4/101/104 |
| 12 | 0C | Keyboard i and I | 24 | √ | √ | √ | 4/101/104 |
| 13 | 0D | Keyboard j and J | 37 | √ | √ | √ | 4/101/104 |
| 14 | 0E | Keyboard k and K | 38 | √ | √ | √ | 4/101/104 |
| 15 | 0F | Keyboard l and L | 39 | √ | √ | √ | 4/101/104 |
| 16 | 10 | Keyboard m and M | 52 | √ | √ | √ | 4/101/104 |

P-Series USB Insertion Reader

| Usage ID (Dec) | Usage ID (Hex) | Usage Name | Ref: Typical AT-101 Position | PC-AT | Mac | UNIX | Boot |
|----------------|----------------|--|------------------------------|-------|-----|------|-----------|
| 17 | 11 | Keyboard n and N | 51 | √ | √ | √ | 4/101/104 |
| 18 | 12 | Keyboard o and O ⁴ | 25 | √ | √ | √ | 4/101/104 |
| 19 | 13 | Keyboard p and P ⁴ | 26 | √ | √ | √ | 4/101/104 |
| 20 | 14 | Keyboard q and Q ⁴ | 27 | √ | √ | √ | 4/101/104 |
| 21 | 15 | Keyboard r and R | 20 | √ | √ | √ | 4/101/104 |
| 22 | 16 | Keyboard s and S ⁴ | 32 | √ | √ | √ | 4/101/104 |
| 23 | 17 | Keyboard t and T | 21 | √ | √ | √ | 4/101/104 |
| 24 | 18 | Keyboard u and U | 23 | √ | √ | √ | 4/101/104 |
| 25 | 19 | Keyboard v and V | 49 | √ | √ | √ | 4/101/104 |
| 26 | 1A | Keyboard w and W ⁴ | 18 | √ | √ | √ | 4/101/104 |
| 27 | 1B | Keyboard x and X ⁴ | 47 | √ | √ | √ | 4/101/104 |
| 28 | 1C | Keyboard y and Y ⁴ | 22 | √ | √ | √ | 4/101/104 |
| 29 | 1D | Keyboard z and Z ⁴ | 46 | √ | √ | √ | 4/101/104 |
| 30 | 1E | Keyboard 1 and ! ⁴ | 2 | √ | √ | √ | 4/101/104 |
| 31 | 1F | Keyboard 2 and ! ⁴ | 3 | √ | √ | √ | 4/101/104 |
| 32 | 20 | Keyboard 3 and # ⁴ | 4 | √ | √ | √ | 4/101/104 |
| 33 | 21 | Keyboard 4 and \$ ⁴ | 5 | √ | √ | √ | 4/101/104 |
| 34 | 22 | Keyboard 5 and % ⁴ | 6 | √ | √ | √ | 4/101/104 |
| 35 | 23 | Keyboard 6 and ^ ⁴ | 7 | √ | √ | √ | 4/101/104 |
| 36 | 24 | Keyboard 7 and & ⁴ | 8 | √ | √ | √ | 4/101/104 |
| 37 | 25 | Keyboard 8 and * ⁴ | 9 | √ | √ | √ | 4/101/104 |
| 38 | 26 | Keyboard 9 and (⁴ | 10 | √ | √ | √ | 4/101/104 |
| 39 | 27 | Keyboard 0 and) ⁴ | 11 | √ | √ | √ | 4/101/104 |
| 40 | 28 | Keyboard Return (ENTER) ⁵ | 43 | √ | √ | √ | 4/101/104 |
| 41 | 29 | Keyboard ESCAPE | 110 | √ | √ | √ | 4/101/104 |
| 42 | 2A | Keyboard DELETE (Backspace) | 15 | √ | √ | √ | 4/101/104 |
| 43 | 2B | Keyboard Tab | 16 | √ | √ | √ | 4/101/104 |
| 44 | 2C | Keyboard Spacebar | 61 | √ | √ | √ | 4/101/104 |
| 45 | 2D | Keyboard - and (underscore) ⁴ | 12 | √ | √ | √ | 4/101/104 |
| 46 | 2E | Keyboard = and + ⁴ | 13 | √ | √ | √ | 4/101/104 |
| 47 | 2F | Keyboard [and { ⁴ | 27 | √ | √ | √ | 4/101/104 |
| 48 | 30 | Keyboard] and } ⁴ | 28 | √ | √ | √ | 4/101/104 |
| 49 | 31 | Keyboard \ and | 29 | √ | √ | √ | 4/101/104 |
| 50 | 32 | Keyboard Non-US # and ~ ² | 42 | √ | √ | √ | 4/101/104 |
| 51 | 33 | Keyboard ; and : ⁴ | 40 | √ | √ | √ | 4/101/104 |
| 52 | 34 | Keyboard ' and " ⁴ | 41 | √ | √ | √ | 4/101/104 |
| 53 | 35 | Keyboard Grave Accent and Tilde ⁴ | 1 | √ | √ | √ | 4/101/104 |
| 54 | 36 | Keyboard, and < ⁴ | 53 | √ | √ | √ | 4/101/104 |
| 55 | 37 | Keyboard. and > ⁴ | 54 | √ | √ | √ | 4/101/104 |
| 56 | 38 | Keyboard / and ? | 55 | √ | √ | √ | 4/101/104 |
| 57 | 39 | Keyboard Caps Lock ¹¹ | 30 | √ | √ | √ | 4/101/104 |

Appendix A. Usage ID Definitions

| Usage ID (Dec) | Usage ID (Hex) | Usage Name | Ref: Typical AT-101 Position | PC-AT | Mac | UNIX | Boot |
|----------------|----------------|---|------------------------------|-------|-----|------|-----------|
| 58 | 3A | Keyboard F1 | 112 | √ | √ | √ | 4/101/104 |
| 59 | 3B | Keyboard F2 | 113 | √ | √ | √ | 4/101/104 |
| 60 | 3C | Keyboard F3 | 114 | √ | √ | √ | 4/101/104 |
| 61 | 3D | Keyboard F4 | 115 | √ | √ | √ | 4/101/104 |
| 62 | 3E | Keyboard F5 | 116 | √ | √ | √ | 4/101/104 |
| 63 | 3F | Keyboard F6 | 117 | √ | √ | √ | 4/101/104 |
| 64 | 40 | Keyboard F7 | 118 | √ | √ | √ | 4/101/104 |
| 65 | 41 | Keyboard F8 | 119 | √ | √ | √ | 4/101/104 |
| 66 | 42 | Keyboard F9 | 120 | √ | √ | √ | 4/101/104 |
| 67 | 43 | Keyboard F10 | 121 | √ | √ | √ | 4/101/104 |
| 68 | 44 | Keyboard F11 | 122 | √ | √ | √ | 101/104 |
| 69 | 45 | Keyboard F12 | 123 | √ | √ | √ | 101/104 |
| 70 | 46 | Keyboard PrintScreen ¹ | 124 | √ | √ | √ | 101/104 |
| 71 | 47 | Keyboard Scroll Lock ¹¹ | 125 | √ | √ | √ | 4/101/104 |
| 72 | 48 | Keyboard Pause ¹ | 126 | √ | √ | √ | 101/104 |
| 73 | 49 | Keyboard Insert ¹ | 75 | √ | √ | √ | 101/104 |
| 74 | 4A | Keyboard Home ¹ | 80 | √ | √ | √ | 101/104 |
| 75 | 4B | Keyboard PageUp ¹ | 85 | √ | √ | √ | 101/104 |
| 76 | 4C | Keyboard Delete Forward ^{1,14} | 76 | √ | √ | √ | 101/104 |
| 77 | 4D | Keyboard End ¹ | 81 | √ | √ | √ | 101/104 |
| 78 | 4E | Keyboard PageDown ¹ | 86 | √ | √ | √ | 101/104 |
| 79 | 4F | Keyboard RightArrow ¹ | 89 | √ | √ | √ | 101/104 |
| 80 | 50 | Keyboard LeftArrow ¹ | 79 | √ | √ | √ | 101/104 |
| 81 | 51 | Keyboard DownArrow ¹ | 84 | √ | √ | √ | 101/104 |
| 82 | 52 | Keyboard UpArrow ¹ | 83 | √ | √ | √ | 101/104 |
| 83 | 53 | Keypad Num Lock and Clear ¹ | 90 | √ | √ | √ | 101/104 |
| 84 | 54 | Keypad / ¹ | 95 | √ | √ | √ | 101/104 |
| 85 | 55 | Keypad * | 100 | √ | √ | √ | 4/101/104 |
| 86 | 56 | Keypad - | 105 | √ | √ | √ | 4/101/104 |
| 87 | 57 | Keypad + | 106 | √ | √ | √ | 4/101/104 |
| 88 | 58 | Keypad ENTER5 | 108 | √ | √ | √ | 101/104 |
| 89 | 59 | Keypad 1 and End | 93 | √ | √ | √ | 4/101/104 |
| 90 | 5A | Keypad 2 and Down Arrow | 98 | √ | √ | √ | 4/101/104 |
| 91 | 5B | Keypad 3 and PageDn | 103 | √ | √ | √ | 4/101/104 |
| 92 | 5C | Keypad 4 and Left Arrow | 92 | √ | √ | √ | 4/101/104 |
| 93 | 5D | Keypad 4 and Left Arrow | 97 | √ | √ | √ | 4/101/104 |
| 94 | 5E | Keypad 4 and Left Arrow | 102 | √ | √ | √ | 4/101/104 |
| 95 | 5F | Keypad 7 and Home | 91 | √ | √ | √ | 4/101/104 |
| 96 | 60 | Keypad 8 and Up Arrow | 96 | √ | √ | √ | 4/101/104 |
| 97 | 61 | Keypad 9 and PageUp | 101 | √ | √ | √ | 4/101/104 |
| 98 | 62 | Keypad 0 and Insert | 99 | √ | √ | √ | 4/101/104 |
| 99 | 63 | Keypad . and Delete | 104 | √ | √ | √ | 4/101/104 |

P-Series USB Insertion Reader

| Usage ID (Dec) | Usage ID (Hex) | Usage Name | Ref: Typical AT-101 Position | PC-AT | Mac | UNIX | Boot |
|----------------|----------------|--|------------------------------|-------|-----|------|-----------|
| 100 | 64 | Keyboard Non-US \ and ^{3,6} | 45 | √ | √ | √ | 4/101/104 |
| 101 | 65 | Keyboard Application ¹⁰ | 129 | √ | | √ | 104 |
| 102 | 66 | Keyboard Power ⁹ = | | | √ | √ | |
| 103 | 67 | Keypad = | | | √ | | |
| 104 | 68 | Keyboard F13 | 62 | | √ | | |
| 105 | 69 | Keyboard F14 | 63 | | √ | | |
| 106 | 6A | Keyboard F15 | 64 | | √ | | |
| 107 | 6B | Keyboard F16 | 65 | | | | |
| 107 | 6C | Keyboard F17 | | | | | |
| 109 | 6D | Keyboard F18 | | | | | |
| 110 | 6E | Keyboard F19 | | | | | |
| 111 | 6F | Keyboard F20 | | | | | |
| 112 | 70 | Keyboard F21 | | | | | |
| 113 | 71 | Keyboard F22 | | | | | |
| 114 | 72 | Keyboard F23 | | | | | |
| 115 | 73 | Keyboard F24 | | | | | |
| 116 | 74 | Keyboard Execute | | | | √ | |
| 117 | 75 | Keyboard Help | | | | √ | |
| 118 | 76 | Keyboard Menu | | | | √ | |
| 119 | 77 | Keyboard Select | | | | √ | |
| 120 | 78 | Keyboard Stop | | | | √ | |
| 121 | 79 | Keyboard Again | | | | √ | |
| 122 | 7A | Keyboard Undo | | | | √ | |
| 123 | 7B | Keyboard Cut | | | | √ | |
| 124 | 7C | Keyboard Copy | | | | √ | |
| 125 | 7D | Keyboard Paste | | | | √ | |
| 126 | 7E | Keyboard Find | | | | √ | |
| 127 | 7F | Keyboard Mute | | | | √ | |
| 128 | 80 | Keyboard Volume Up | | | | √ | |
| 129 | 81 | Keyboard Volume Down | | | | √ | |
| 130 | 82 | Keyboard Locking Caps Lock ¹² | | | | √ | |
| 131 | 83 | Keyboard Locking Num Lock ¹² | | | | √ | |
| 132 | 84 | Keyboard Locking Scroll Lock ¹² | | | | √ | |
| 133 | 85 | Keypad Comma ²⁷ | 107 | | | | |
| 134 | 86 | Keypad Equal Sign ²⁹ | | | | | |
| 135 | 87 | Keyboard International1 ¹⁵⁻²⁸ | 56 | | | | |
| 136 | 88 | Keyboard International2 ¹⁶ | | | | | |
| 137 | 89 | Keyboard International3 ¹⁷ | | | | | |
| 138 | 8A | Keyboard International4 ¹⁸ | | | | | |
| 139 | 8B | Keyboard International5 ¹⁹ | | | | | |
| 140 | 8C | Keyboard International6 ²⁰ | | | | | |
| 141 | 8D | Keyboard International7 ²¹ | | | | | |

| Usage ID (Dec) | Usage ID (Hex) | Usage Name | Ref: Typical AT-101 Position | PC-AT | Mac | UNIX | Boot |
|----------------|----------------|---|------------------------------|-------|-----|------|------|
| 142 | 8E | Keyboard International ⁸ ²² | | | | | |
| 143 | 8F | Keyboard International ⁹ ²² | | | | | |
| 144 | 90 | Keyboard Lang ¹ ²⁵ | | | | | |
| 145 | 91 | Keyboard Lang ² ²⁶ | | | | | |
| 146 | 92 | Keyboard Lang ³ ³⁰ | | | | | |
| 147 | 93 | Keyboard Lang ⁴ ³¹ | | | | | |
| 148 | 94 | Keyboard Lang ⁵ ³² | | | | | |
| 149 | 95 | Keyboard Lang ⁶ ⁸ | | | | | |
| 150 | 96 | Keyboard Lang ⁷ ⁸ | | | | | |
| 151 | 97 | Keyboard Lang ⁸ ⁸ | | | | | |
| 152 | 98 | Keyboard Lang ⁹ ⁸ | | | | | |
| 153 | 99 | Keyboard Alternate Erase ⁷ | | | | | |
| 154 | 9A | Keyboard Sys/Req Attention ¹ | | | | | |
| 155 | 9B | Keyboard Cancel | | | | | |
| 156 | 9C | Keyboard Clear | | | | | |
| 157 | 9D | Keyboard Prior | | | | | |
| 158 | 9E | Keyboard Return | | | | | |
| 159 | 9F | Keyboard Separator | | | | | |
| 160 | A0 | Keyboard Out | | | | | |
| 161 | A1 | Keyboard Oper | | | | | |
| 162 | A2 | Keyboard Clear/Again | | | | | |
| 163 | A3 | Keyboard Cr/Sel/Props | | | | | |
| 164 | A4 | Keyboard Ex Sel | | | | | |
| 165-175 | A5-CF | Reserved | | | | | |
| 176 | B0 | Keypad 00 | | | | | |
| 177 | B1 | Keypad 000 | | | | | |
| 178 | B2 | Thousands Separator ³³ | | | | | |
| 179 | B3 | Decimal Separator ³³ | | | | | |
| 180 | B4 | Currency Unit ³⁴ | | | | | |
| 181 | B5 | Currency Sub-unit ³⁴ | | | | | |
| 182 | B6 | Keypad (| | | | | |
| 183 | B7 | Keypad) | | | | | |
| 184 | B8 | Keypad { | | | | | |
| 185 | B9 | Keypad } | | | | | |
| 186 | BA | Keypad Tab | | | | | |
| 187 | BB | Keypad Backspace | | | | | |
| 188 | BC | Keypad A | | | | | |
| 189 | BD | Keypad B | | | | | |
| 190 | BE | Keypad C | | | | | |
| 191 | BF | Keypad D | | | | | |
| 192 | C0 | Keypad E | | | | | |
| 193 | C1 | Keypad F | | | | | |

P-Series USB Insertion Reader

| Usage ID (Dec) | Usage ID (Hex) | Usage Name | Ref: Typical AT-101 Position | PC-AT | Mac | UNIX | Boot |
|-------------------|-------------------|-------------------------------------|---------------------------------------|-------|-----|------|------|
| 194 | C2 | Keypad XOR | | | | | |
| 195 | C3 | Keypad ^ | | | | | |
| 196 | C4 | Keypad % | | | | | |
| 197 | C5 | Keypad < | | | | | |
| 198 | C6 | Keypad > | | | | | |
| 199 | C7 | Keypad & | | | | | |
| 200 | C8 | Keypad && | | | | | |
| 201 | C9 | Keypad | | | | | |
| 202 | CA | Keypad | | | | | |
| 203 | CB | Keypad : | | | | | |
| 204 | CC | Keypad # | | | | | |
| 205 | CD | Keypad Space | | | | | |
| 206 | CE | Keypad @ | | | | | |
| 207 | CF | Keypad ! | | | | | |
| 208 | D0 | Keypad Memory Store | | | | | |
| 209 | D1 | Keypad Memory Recall | | | | | |
| 210 | D2 | Keypad Memory Clear | | | | | |
| 211 | D3 | Keypad Memory Add | | | | | |
| 212 | D4 | Keypad Memory Subtract | | | | | |
| 213 | D5 | Keypad Memory Multiple | | | | | |
| 214 | D6 | Keypad Memory Divide | | | | | |
| 215 | D7 | Keypad +/- | | | | | |
| 216 | D8 | Keypad Clear | | | | | |
| 217 | D9 | Keypad Clear Entry | | | | | |
| 218 | DA | Keypad Binary | | | | | |
| 219 | DB | Keypad Octal | | | | | |
| 220 | DC | Keypad Decimal | | | | | |
| 221 | DD | Keypad Hexadecimal | | | | | |
| 222-223 | DE-DF | Reserved | | | | | |
| 224 | E0 | Keyboard LeftControl | 58 | √ | √ | √ | |
| 225 | E1 | Keyboard LeftShift | 44 | √ | √ | √ | |
| 226 | E2 | Keyboard LeftA;t | 60 | √ | √ | √ | |
| 227 | E3 | Keyboard Left GUI ^{10;23} | 127 | √ | √ | √ | |
| 228 | E4 | Keyboard RightControl | 64 | √ | √ | √ | |
| 229 | E5 | Keyboard RightShift | 57 | √ | √ | √ | |
| 230 | E6 | Keyboard RightAlt | 62 | √ | √ | √ | |
| 231 | E7 | Keyboard Right GUI ^{10;24} | 128 | √ | √ | √ | |
| 232 – 65535 | E8-FFFF | Reserved | | | | | |

Footnotes

1. Usage of keys is not modified by the state of the Control, Alt, Shift or Num Lock keys. That is, a key does not send extra codes to compensate for the state of any Control, Alt, Shift or Num Lock keys.
2. Typical language mappings: US: \|\ Belg: µ`£ FrCa: <> Dan: * Dutch: <> Fren: *µ Ger: #` Ital: ù\$ LatAm: }`] Nor:,* Span: }Ç Swed: ,* Swiss: \$£ UK: #~.
3. Typical language mappings: Belg:<> FrCa:<°> Dan:<> Dutch:][Fren:<> Ger:<> Ital:<> LatAm:<> Nor:<> Span:<> Swed:<> Swiss:<> UK:\| Brazil: \|.
 4. Typically remapped for other languages in the host system.
 5. Keyboard Enter and Keypad Enter generate different Usage codes.
 6. Typically near the Left-Shift key in AT-102 implementations.
 7. Example, Erase-Eaze™ key.
 8. Reserved for language-specific functions, such as Front End Processors and Input Method Editors.
 9. Reserved for typical keyboard status or keyboard errors. Sent as a member of the keyboard array. Not a physical key.
 10. Windows key for Windows 95, and "Compose."
 11. Implemented as a non-locking key; sent as member of an array.
 12. Implemented as a locking key; sent as a toggle button. Available for legacy support; however, most systems should use the non-locking version of this key.
 13. Backs up the cursor one position, deleting a character as it goes.
 14. Deletes one character without changing position.
 - 15-20. See additional foot notes in Universal Serial Bus HID Usage Tables, Copyright © 1996-2005, USB Implementers Forum.
 21. Toggle Double-Byte/Single-Byte mode.
 22. Undefined, available for other Front End Language Processors.
 23. Windowing environment key, examples are Microsoft Left Win key, Mac Left Apple key, Sun Left Meta key
 24. Windowing environment key, examples are Microsoft® RIGHT WIN key, Macintosh® RIGHT APPLE key, Sun® RIGHT META key.
 25. Hangeul/English toggle key. This usage is used as an input method editor control key on a Korean language keyboard.
 26. Hanja conversion key. This usage is used as an input method editor control key on a Korean language keyboard.
 27. Keypad Comma is the appropriate usage for the Brazilian keypad period (.) key. This represents the closest possible match, and system software should do the correct mapping based on the current locale setting.
 28. Keyboard International1 should be identified via footnote as the appropriate usage for the Brazilian forward-slash (/) and question-mark (?) key. This usage should also be renamed to either "Keyboard Non-US / and ?" or to "Keyboard International1" now that it's become clear that it does not only apply to Kanji keyboards anymore.
 29. Used on AS/400 keyboards.
 30. Defines the Katakana key for Japanese USB word-processing keyboards.
 31. Defines the Hiragana key for Japanese USB word-processing keyboards.
 32. Usage 0x94 (Keyboard LANG5) "Defines the Zenkaku/Hankaku key for Japanese USB word-processing keyboards.
 33. The symbol displayed will depend on the current locale settings of the operating system. For example, the US thousands separator would be a comma, and the decimal separator would be a period.
 34. The symbol displayed will depend on the current locale settings of the operating system. For example the US currency unit would be \$ and the sub-unit would be ¢.

APPENDIX B. MODIFIER BYTE DEFINITIONS

This appendix is from the following document found on www.usb.org: Device Class Definition for Human Interface Devices (HID) Version 1.11, and specifically for this manual, Section 8.3 Report Format for Array Items.

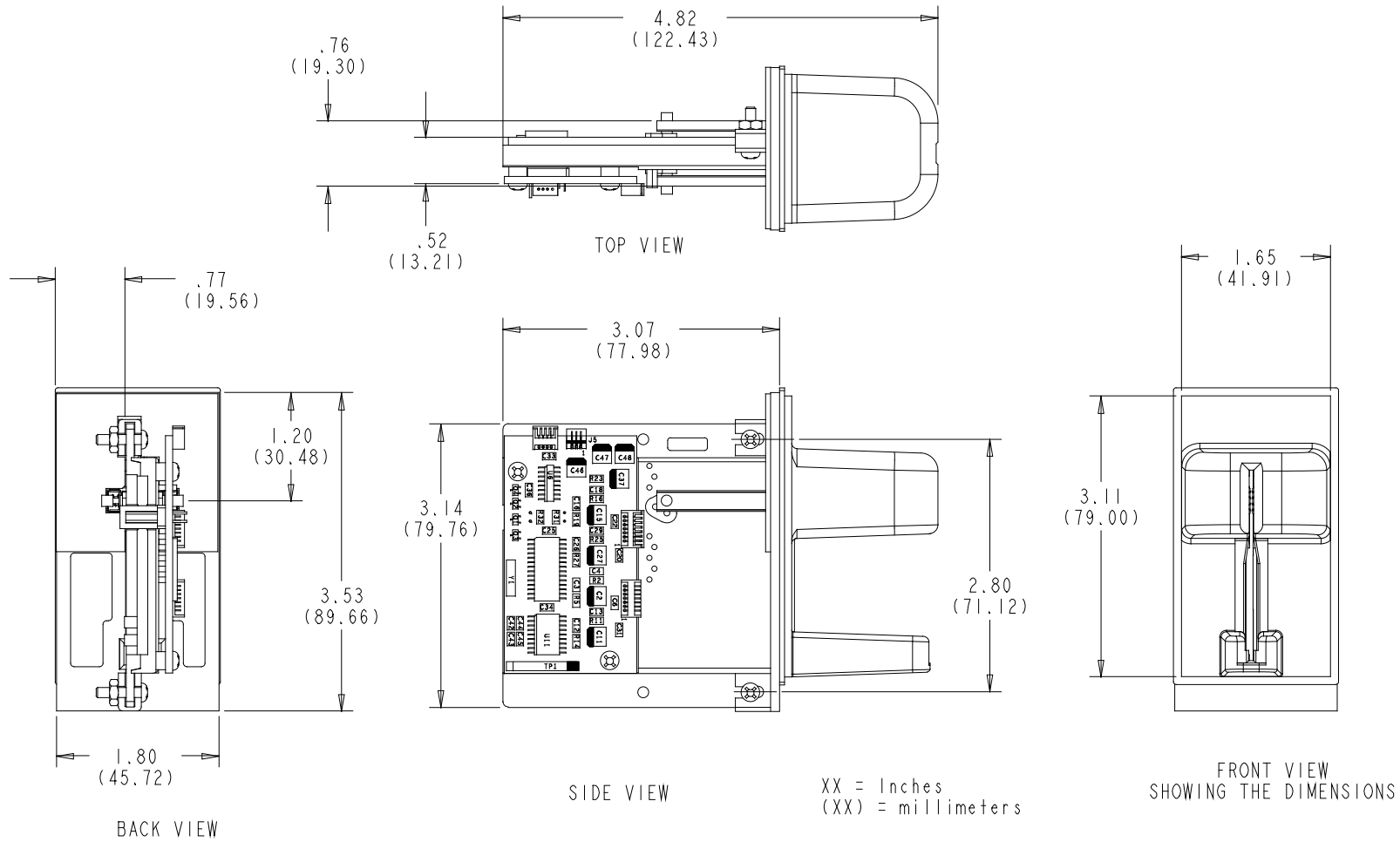
The modifier byte is defined as follows:

Table B-1. Modifier Byte

| Bit | Key |
|-----|-------------|
| 0 | LEFT CTRL |
| 1 | LEFT SHIFT |
| 2 | LEFT ALT |
| 3 | LEFT GUI |
| 4 | RIGHT CTRL |
| 5 | RIGHT SHIFT |
| 6 | RIGHT ALT |
| 7 | RIGHT GUI |

APPENDIX C. MECHANICAL DRAWING FOR MOUNTING

The engineering drawing shows dimensions for mounting:



P/N 99800016.DRW (REV 1)
P/N 21065095.ASM

Figure C-1. Dimensions for Mounting

