Value through Innovation

iMag, iMag Pro (II)

User Manual

80097503-001-Rev. F
26 September 2019

ID TECH
10721 Walker Street, Cypress, CA 90630-4720
Tel: (714) 761-6368 Fax (714) 761-8880
www.idtechproducts.com support@idtechproducts.com

ID TECH
10721 Walker Street
Cypress, CA 90630
(714) 761-6368
www.idtechproducts.com

Warranty Disclaimer

The services and hardware are provided "as is" and "as-available," and the use of these services and hardware are at the user’s own risk. ID TECH does not make, and hereby disclaims, any and all other express or implied warranties, including, but not limited to warranties of merchantability, title, fitness for a particular purpose, and any warranties arising from any course of dealing, usage, or trade practice. ID TECH does not warrant that the services or hardware will be uninterrupted, error-free, or completely secure.

FCC Regulatory Compliance

Notices Class B Equipment

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. This device complies with part 15 of the FCC rules. Operation is subject to 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.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to the ViVOpay Kiosk III not expressly approved by ID TECH could void the user's authority to operate the ViVOpay Kiosk III.

IC Compliance Warning

Operation is subject to 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 operations.

Cautions and Warnings

⚠	Caution: The ViVOpay Kiosk III should be mounted 1-2 feet away from other ViVOpay Kiosk IIIs. Can be adjusted based on lane setup.
⚠	Caution: Danger of Explosion if battery is incorrectly replaced. Replace only with same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer’s instructions.
⚡	Warning: Avoid close proximity to radio transmitters which may reduce the ability of the reader.

Table of Contents

1. Introduction

ID TECH iMag is a snap-on, magnetic stripe reader designed to work with iPhone and iPod Touch. The iMag Pro works with all Apple mobile devices including the iPad. The reader delivers a superior reading performance because of its ability to encrypt sensitive card data. The data encryption process prevents card holder information from being accessed when the data is stored or in transit, so the data remains secure from beginning until end.

The reader fully supports TDES and AES data encryption using DUKPT key management method.

2. Features

- Compact for comfort and mobility
- No external power supply required
- Mini USB port enables charging Apple devices with external cable
- Bi-directional card reading
- Reads encoded data that meets ANSI/ISO/AAMVA standards and some custom formats such as ISO track 1 format on track 2 or 3
- Reads up to three tracks of card data
- Provides clear text confirmation data including card holder's name and a portion of the PAN as part of the Masked Track Data

3. Specifications

Communication Interface:	**UART**
Power Consumption:	5mA during card swipe, less than 1mA when idle
Magnetic Stripe Reader:	3 track bi-directional reading capabilities
Operating Life:	100,000 cycle minimum
Operating Environment:	0 °C to 55 °C (32 °F to 131 °F) non -condensing
Storage Environment:	-30 °C to 70 °C (-22 °F to 158 °F) non -condensing
Dimensions:	iMag: 95 mm (L) x 30 mm (H) x 71 mm (W) iMag Pro: 59mm (L) x 14 mm (H) x 32 mm (W) iMag Pro II: 59.2mm(L) x 13.1mm(H) x 32.6mm(W)

4. iMag/ iMag Pro II Firmware Command

4.1. Setting Command

The **Setting** command is a collection of many function-setting blocks in the following format:

Command:
`<STX><S><FuncSETBLOCK1>…<FuncBLOCKn><ETX><LRC>`

Response:
`<ACK>` for successful settings or `<NAK>` for the wrong commands such as invalid funcID, length, and value.

Each function-setting block `<FuncSETBLOCK>` has the following format:
`<FuncID><Len><FuncData>`

Where:

- `<FuncID>` is a one-byte ID identifying the function being set.
- `<Len>` is a one-byte length count for the function-setting block `<FuncData>`.
- `<FuncData>` is the current setting for this function. It has the same format as in the sending command for this function.

Example:
Set **DUKPT Key** management
CMD: `\02\53\58\01\31\03\3A`
OUT: `06`

4.2. Get Firmware Version

The **Get Firmware Version** command returns the firmware version back to the application.

Command:
`<STX><R><FmVerID><ETX><LRC 1>`

Response:
`<ACK> <STX><Version String><ETX><LRC 2>`

`<Version String>` is in the format of "ID TECH iMag Swipe Reader x.y.z" where `x.y.z` is the major and minor version number.

4.3. Get Setting

The **Get Setting** command retrieves the reader's current settings.

Command:
`<STX> <R> <ReviewID> <ETX> <LRC 1>`

Response:
`<ACK> <STX> <FuncID> <Len> <FuncData> <ETX> <LRC 2>`
`<FuncID>, <Len>, and <FuncData>` retrieves the reader's current settings.

Example:

Review all settings:
CMD: `\02\52\1F\03\4C`
OUT: `\06\02\7E\01\31\4C\01\31\58\01\31\03\5B`

4.4. Function ID Table

The available Function IDs with the default setting are shown in **bold**.

Function Name	Function ID	Description
EncryptionID	0x4C	Security Algorithm **'0' Clear Text** '1' Triple DES '2' AES
SecurityLevelID	0x7E	Security Level (Read Only) '0' ~ '3" **Default value '1'**
GetFirmwareVersion	0x22	Returns current firmware version

4.4.1. EncryptionID

Set clear text:
CMD: `02 53 4C 01 30 03 2F`
OUT: `06`

Read EncryptionID:
CMD: `02 52 4C 03 1F`
OUT: `06 02 4C 01 30 03 7C`

Set Triple DES:
CMD: `02 53 4C 01 31 03 2E`
OUT: `06`

Read EncryptionID:
CMD: `02 52 4C 03 1F`

OUT: `06 02 4C 01 31 03 7D`

Set AES:
CMD: `02 53 4C 01 32 03 2D`
OUT: `06`

Read EncryptionID:
CMD: `02 52 4C 03 1F`
OUT: `06 02 4C 01 32 03 7E`

4.4.2. Read SecurityLevel ID

CMD: `02 52 7E 03 2D`
OUT: `06 02 7E 01 33 03 4D`

4.4.3. Get Firmware Version

CMD: `02 52 22 03 71`
OUT: `06 02 49 44 20 54 45 43 48 20 69 4D 61 67 00 31 31 30 03 04`

Firmware Version: ID TECH iMag110

5. Data Output Format

5.1. iMag/ iMag Pro(II) Unencrypted Data Output Format

Track 1:	`<Start Sentinel 1><T`$_1$` Data><End Sentinel><Track Separator>`
Track 2:	`<Start Sentinel 2><T`$_2$` Data><End Sentinel><Track Separator>`
Track 3:	`<Start Sentinel 3><T`$_3$` Data><End Sentinel><Terminator>`

Where:

```
Start Sentinel 1 = % Start
Sentinel 2=;
Start Sentinel 3 =; for ISO, % for AAMVA End Sentinel all tracks
= ?
```

Start or End Sentinel:	Characters in the encoding format come before the first data character (start) and after the last data character (end), indicating the beginning and end of data.
Track Separator:	A designated character that separates data tracks. The default character is NULL.
Terminator:	A designated character that comes at the end of the last track of data, to separate card reads. The default character is CR (Carriage Return).

Example:

```
%B4352378366824999^TFSTEST
/THIRTYONE^05102011000088200882000000?;4352378366824999=05102011000088
2?
```

5.2. iMag/ iMag Pro(II) Encrypted Data Output Format

iMag/ iMag Pro uses ID TECH's enhanced data encryption format where all data tracks are encrypted.

Output Format:

```
<STX><LenL><LenH><Card Data><CheckLRC><CheckSum><ETX>
```

0	STX
1	Data Length low byte
2	Data Length high byte
3	Card Encode Type [1]
4	Track 1-3 Status [2]
5	Track 1 data length
6	Track 2 data length
7	Track 3 data length
8	Clear/mask data sent status[3]
9	Encrypted/Hash data sent status [4]
10	T1 clear/mask data T2 clear/mask data T3 clear/mask data T1 encrypted data T2 encrypted data T3 encrypted data Session ID (8 bytes) (Security

	level 4 only, not used here) T1 hashed (20 bytes each) (if encrypted and hash tk1 allowed) T2 hashed (20 bytes each) (if encrypted and hash tk2 allowed) T3 hashed (20 bytes each) (if encrypted and hash tk3 allowed) KSN (10 bytes) CheckLRC CheckSum ETX

Where:
<STX> = 02h, <ETX> = 03h

Card Type is 8x for an enhanced encryption format and 0x for original encryption format.

Value	Encode Type Description
00h / 80h	ISO/ABA format
01h / 81h	AAMVA format
03h / 83h	Other
04h / 84h	Raw; un-decoded format

For Type 04 or 84 Raw data format, all the tracks are encrypted and no mask data is sent. There are no track indicators of ‘01’, ‘02’, or ‘03’ in front of each track.

Track indicators ‘01’,’02’, and ‘03’ still exist for non-encrypted mode.

Field 4:	
Bit 0:	1—track 1 decoded data present
Bit 1:	1—track 2 decoded data present
Bit 2:	1—track 3 decoded data present
Bit 3:	1—track 1 decoded data present
Bit 4:	1—track 2 decoded data present
Bit 5:	1—track 3 decoded data present
Bit 6,	7—Reserved for future use

Note 2: Track 1 3 status byte.

Decoded bit: 1 for decode success or no sampling data; 0 for decode error (with sampled data but failed to decode)

Sampling bit: 1 for sample data exist; 0 for sample data does not exist.

Note 3: Clear/mask data sent status

Field 8 (clear/mask data sent status) and **Field 9** (encrypted/hash data sent status) is sent out in enhanced encryption format, the default of iMag/ iMag Pro output format.

Field 8: Clear/masked data sent status byte:	
Bit 0:	track 1 clear/mask data present
Bit 1:	track 2 clear/mask data present
Bit 2:	track 3 clear/mask data present
Bit 3:	reserved for future use
Bit 4:	reserved for future use
Bit 5:	reserved for future use

Note 4: Encrypted/Hash data sent status

Field 9: Encrypted data sent status:	
Bit 0:	1— track 1 encrypted data present
Bit 1:	1— track 2 encrypted data present
Bit 2:	1— track 3 encrypted data present
Bit 3:	1— track 1 hash data present
Bit 4:	track 2 hash data present
Bit 5:	track 3 hash data present
Bit 6:	session ID present
Bit 7:	KSN present

General concept for each track:

- The reader will send **No Clear Data** if the data is encrypted.
- If the data is not encrypted the reader will send **Clear Data** and the hash will not send.

6. Decryption Example

The key for all examples is `0123456789ABCDEFFEDCBA9876543210`.

The following is an example of a decrypted three-track ABA card using enhanced encryption format (recognizable due high bit of the fourth byte underlined 80):

```
029801803F48236B03BF252A343236362A2A2A2A2A2A2A393939395E42555348
204A522F47454F52474520572E4D525E2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2
A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A3F2A3B343236362A2A2A2A2A2A2A2
A393939393D2A2A2A2A2A2A2A2A2A2A2A2A2A2A3F2ADA7F2A52BD3F6DD
8B96C50FC39C7E6AF22F06ED1F033BE0FB23D6BD33DC5A1F808512F7AE18D47
A60CC3F4559B1B093563BE7E07459072ABF8FAAB5338C6CC8815FF87797AE3A7
BEAB3B10A3FBC230FBFB941FAC9E82649981AE79F2632156E775A06AEDAFAF6
F0A184318C5209E55AD44A9CCF6A78AC240F791B63284E15B4019102BA6C50581
4B585816CA3C2D2F42A99B1B9773EF1B116E005B7CD8681860D174E6AD316A0E
CDBC687115FC89360AEE7E430140A7B791589CCAADB6D6872B78433C3A25DA9
DDAE83F12FEFAB530CE405B701131D2FBAAD970248A456000933418AC88F65E1
DB7ED4D10973F99DFC8463FF6DF113B6226C4898A9D355057ECAF11A5598F02C
```

STX, Length(LSB, MSB), card type, track status, length track 1, length track 2, length track 3

```
02 9801 80 3F 48-23-6B 03BF
```

The following table breaks down the decrypted three-track ABA card data:

02—	STX character
98—	low byte of total length
01—	high byte of total length
80—	card type byte (interpretation new format ABA card)
3F—	3 tracks of data all good
48—	length of track 1
23—	length of track 2
6B—	length of track 3
03—	tracks 1 and 2 have masked/clear data
BF	— bit 7 **=**1—KSN included
Bit	6=0— no Session ID included so not level 4 encryption
Bit:	5=1–track 3 hash data present
Bit:	4=1—track 2 hash data present
Bit:	3-1—track 1 hash data present
Bit:	2=1—track 3 encrypted data present
Bit:	1=1—track 2 encrypted data present
Bit:	0=1—track 1 encrypted data present

Track 1 Data masked (length 0x48):

```
252A343236362A2A2A2A2A2A2A2A393939395E42555348204A522F47454F5247452\05
72E4D525E2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2
A2A2A2A2A2A2A3F2A
```

Track 1masked data in ASCII:

%*4266********9999^BUSH JR/GEORGE
W.MR^*******************************?*

Track 2 data in hex masked (length 0x23):

```
3B343236362A2A2A2A2A2A2A2A393939393D2A2A2A2A2A2A2A2A2A2A2A2A2
A2A2A3F2A
```

Track 2 Masked data in ASCII:

```
;4266********9999=***************?*
```

There is no clear or masked Track 3 data (the data below is encrypted and hashed):

Track 1 encrypted length 0x48 rounded up to 8 bytes = 0x48 (72 decimal):

```
DA7F2A52BD3F6DD8B96C50FC39C7E6AF22F06ED1F033BE0FB23D6BD33DC5A1 F8
08512F7AE18D47A60CC3F4559B1B093563BE7E07459072ABF8FAAB5338C6CC88
15FF87797AE3A7BE
```

Track 2 encrypted length 0x32 rounded up to 8 bytes =0x38 (56 decimal) :

```
AB3B10A3FBC230FBFB941FAC9E82649981AE79F2632156E775A06AEDAFAF6F0 A
184318C5209E55AD
```

Track 3 encrypted length 0x6B rounded up to 8 bytes =0x70 (64 decimal):

```
44A9CCF6A78AC240F791B63284E15B4019102BA6C505814B585816CA3C2D2F42
A99B1B9773EF1B116E005B7CD8681860D174E6AD316A0ECDBC687115FC89360A
EE7E430140A7B791589CCAADB6D6872B78433C3A25DA9DDAE83F12FEFAB530 CE
405B701131D2FBAAD970248A45600093
```

Track 1 data hashed length 20 bytes:

```
3418AC88F65E1DB7ED4D10973F99DFC8463FF6DF
```

Track 2 encrypted length 0x6B rounded up to 8 bytes =0x70 (64 decimal) :

```
113B6226C4898A9D355057ECAF11A5598F02CA31
```

Track 3 data hashed length 20 bytes:

```
688861C157C1CE2E0F72CE0F3BB598A614EAABB1
```

KSN length 10 bytes

```
62994901190000000002
```

LCR, check sum, and ETX
```
06E203
```

Clear/Masked Data in ASCII:

Track 1: `%*4266********9999^BUSH JR/GEORGE`
```
W.MR^*******************************?*
```

Track 2: `;4266********9999=***************?*`

Key Value:
```
1A 99 4C 3E 09 D9 AC EF 3E A9 BD 43 81 EF A3 34
```

KSN:
```
62 99 49 01 19 00 00 00 00 02
```

6.1. Decrypted Data

Track 1 decrypted:
```
%B4266841088889999^BUSH JR/GEORGE
W.MR^0809101100001100000000004600000?!
```

Track 2 decrypted:
```
4266841088889999=080910110000046?0
```

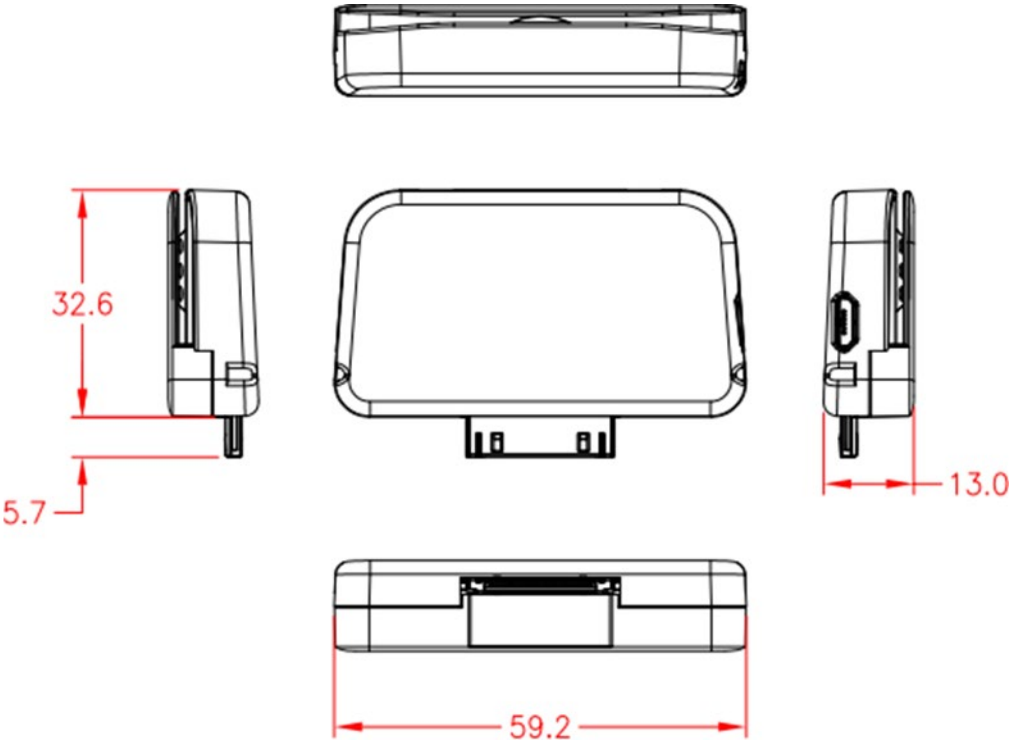
Track 3 decrypted:
```
3333333333767676070707767676333333333376767607070776767633333333337676
7607070776767633333333337676760707?2
```

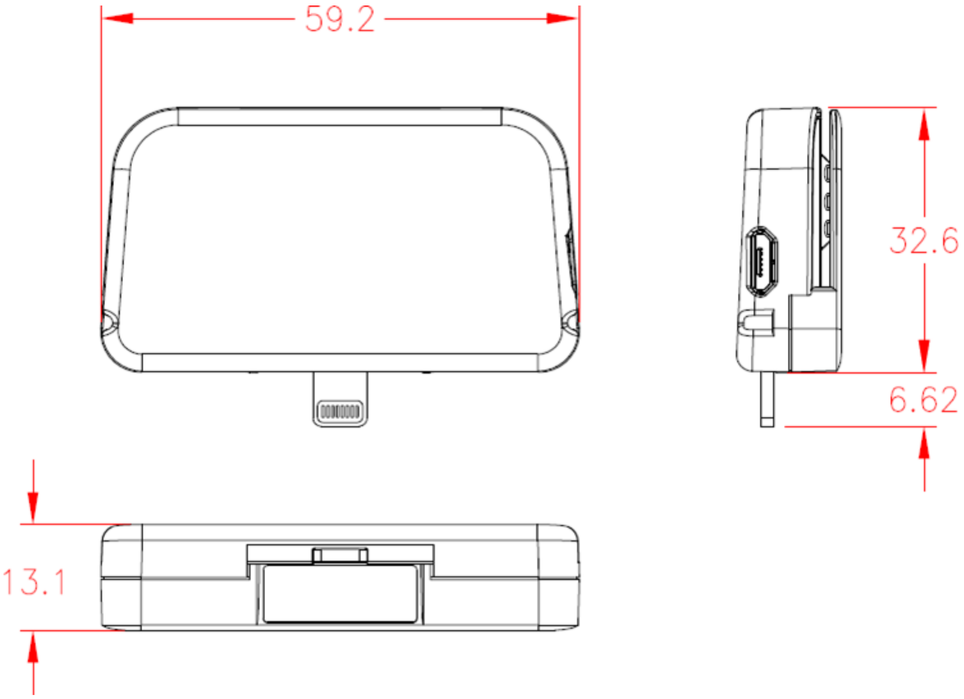
Track 1 decrypted data in hex including padding zeros (but there are no pad bytes here):
```
2542343236363834313038383838393939395E42555348204A522F47454F5247452057
2E4D525E3038303931303131303030303131303030303030303030303436303030303030
3F21
```

Track 2 decrypted data in hex including padding zeros:
```
3B343236363834313038383838393939393D3038303931303131303030303034363F30
0000000000
```

Track 3 decrypted data in hex including padding zeros:
```
3B33333333333333333333373637363736303730373037373637363736333333333333
3333333337363736373630373037303737363736373633333333333333333333373637
3637363037303730373736373637363333333333333333333337363736373630373037
3F320000000000
```

7. iMag Pro-Envelope Drawing


32.6
5.7
13.0
59.2


59.2
32.6
6.62
13.1