



USER MANUAL

BT Mag

Bluetooth Magnetic Stripe Reader

80125501-001-B
04/10/2013

BT Mag User Manual

Revision History

| Rev | Date | Description of Changes | By |
|-----|------------|---|----|
| A | 8/20/2012 | Initial release | JW |
| B | 04/10/2013 | Add the section 6 “Using the demo software” and section 7 card data output format | CH |

Table of Contents

| | | |
|-----------|--------------------------------------|-----------|
| 1 | Introduction..... | 3 |
| 2 | Applicable Documents..... | 3 |
| 3 | Features and Benefits | 3 |
| 4 | Specifications..... | 4 |
| 5 | Operation..... | 6 |
| 6. | Using the demo software | 8 |
| 7. | Card Data Output Format | 13 |
| 8. | Outline Drawing..... | 18 |

BT Mag User Manual

1 Introduction

The BT Mag is a handheld Magnetic Stripe reader that works with mobile devices or PCs with Bluetooth connectivity. It transfers card data via Bluetooth to POS applications in the host devices.

2 Applicable Documents

| | |
|------------------------|--|
| 80125401-001 Rev.A | BT Mag Requirement Spec |
| ISO 7810 | Identification cards -- Physical characteristics |
| ISO 7811 - 1 through 6 | Identification Cards - Track 1 through 3 |
| ISO 4909 | Magnetic stripe content for track 3 |
| ISO 7812 | Identification Cards – Identification for issuers Part 1 & 2 |
| ISO 7813 | Identification Cards – Financial Transaction Cards |
| AAMVA Specifications | Drivers License Standards - Most recent available |
| 80101502-001 | SPI Securehead manual |

3 Features and Benefits

- Connects to any mobile device with Bluetooth capability
- Keychain holes for convenience
- Reads up to 3 tracks of card data
- Supports TDES and AES encryption using DUKPT Key Management
- Wireless range up to 30 feet
- Battery life: 4 hours active, 8 hours standby
- Micro-USB port for battery charging

4 Specifications

- Interface
 - Class 2 Bluetooth
 - Can also be a standalone USB device for key injection when a Micro-B to A USB cable is connected
 - Bluetooth is disabled during key injection or DFU communication

- Magnetic stripe reader
 - Meets ISO 7811 specification
 - Supports AAMVA formats
 - Support single, dual or triple tracks card
 - Bi-directional swipe
 - TDES, & AES Encryption
 - Media Densities: 75 bpi through 210 bpi on all tracks, F2F Encoding Format
 - Media Speed: 5 to 45 IPS
 - Low Amplitude reading: >30 % @210 bpi, >40% @75 bpi

- Batteries
 - Rechargeable battery
 - Battery life:
 - Up to 8 hours in standby mode
 - Up to 4 hours in active mode
 - Active mode is defined as 10+ swipes per hour
 - Charging through MicroUSB interface external charger
 - The unit is functional if Bluetooth connection is on while charging

- LED
 - One Dual-color Led to indicate Bluetooth/Charging status
 - blue indicates Bluetooth connection status
 - Red indicates Charging
 - Another Dual-color LED to indicate power/MSR read status
 - Red indicates bad read
 - Green on twice indicates good read
 - Green blinking indicates power on/standby

- Reliability
 - Magnetic Head Life: 300,000 passes minimum
 - Rail and Cover Life: 100,000 passes minimum
 - MTBF: 300,000 POH

BT Mag User Manual

- Electro-Static Discharges (ESD)
 - 6kV contact, and 12kV air discharge

- Environmental
Temperature range
 - Operating 0 to 55° C (32 to 131° F) [non-condensing]
 - Storage -30 to 70° C (-22 to 158° F) [non-condensing]
 - Relative humidity: maximum 95% (non-condensing)

BT Mag User Manual

5 Operation

To power on or power off BT Mag, press and hold the power button for 5 seconds. Once the blue LED is blinking, the device is in pairing mode.

LED Definition

| Event | BI-COLOR | | BI-COLOR | | Description |
|---------------------|--|-------------------------|-------------------------|-----|--|
| | GREEN | RED | BLUE | RED | |
| Power on | Flash 3 times ON (200ms) OFF (200ms) | OFF | OFF | X | Only applied when user power on the system or USB plug in. |
| Power off | | | | | Only applied when user shutdown the system or system detect low battery signal. |
| Power Standby/Sleep | ON(30ms) OFF(4970ms) | OFF | ON(30ms) OFF(4970ms) | X | 1.The reader will enter this mode when BT not in Pairing or Connected status |
| BTM Standby/Sleep | | | | | 2. Short press the tact SW will force BT to search and build the Link again |
| MSR - Standby/Sleep | | | | | |
| Pairing | ON(30ms) OFF(4970ms) | OFF | ON(500ms) OFF(500ms) | X | After the reader is power on, that will into the pairing mode. |
| BTM Connected | | | ON(30ms) OFF(2970ms) | | This mode indicates the MSR is connected with application software and waiting to accept the card swiping |
| Charging | X | X | X | ON | N/A |
| Charging Complete | | X | | OFF | N/A |
| Low Battery | | ON(30ms) OFF(2970ms) | | X | The LED is blinking when Battery voltage is lower than 3.3V. The reader will shutdown automatically when the battery voltage is lower than 3.2V |
| MSR - good read | Flash 2 times | OFF | | X | Green indicates good read |

BT Mag User Manual

| | ON(500ms) OFF(500ms) | | ON(30ms) OFF(2970ms) | | |
|----------------|-------------------------|---|-----------------------------|---|------------------------|
| MSR - bad read | OFF | Flash 1 time ON(500ms) OFF(500ms) | ON(30ms) OFF(2970ms) | X | Red indicates bad read |

X: Not applicable

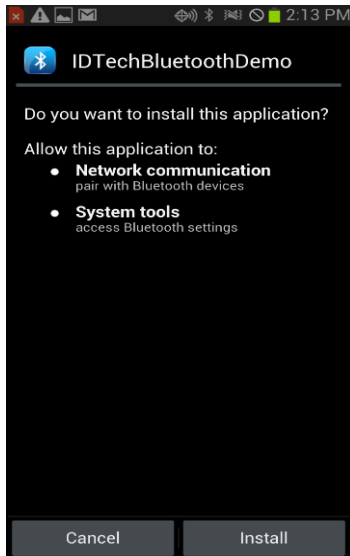
6. Using the demo software

6.1 Android BTMag Demo

1. Install the demo

Copy the “BluetoothDemo.apk” file into the internal memory or SD card of the android phone or tablet.

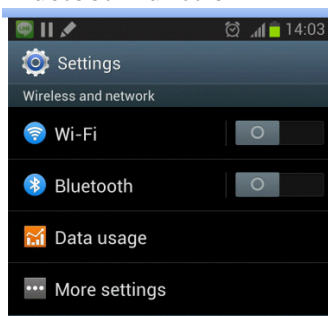
Go to the file browser and click “BluetoothDemo.apk” to install.



2. Pairing

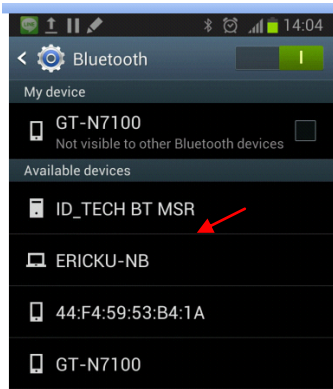
1) Long press power button (about 5 seconds) on the BTMag to power on. When the reader is turned on, the green LED will flash three times.

2) Go to the Settings of the phone. Find the Bluetooth setting button and turn on the Bluetooth function



3) Press “ID_TECH BT MSR” for pairing. Some Android devices may require the password, it is “0000”.

BT Mag User Manual



4) After paired, it will be listed under the Paired devices.



Note:

Pairing process should be completed within 1min after power on, otherwise BTMag will enter sleep mode (Green and Blue LED will flash together.)

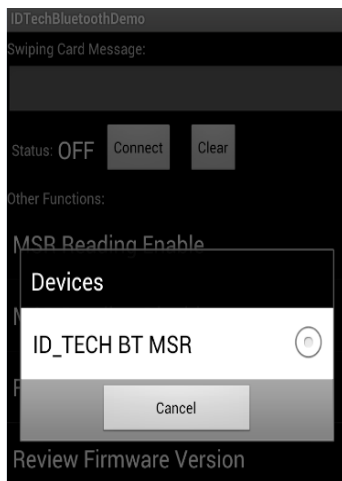
Once the BTMag enter sleep mode, short press the power button to wake up BTMag from the sleep mode and repeat pairing process.

3. Connect with Demo

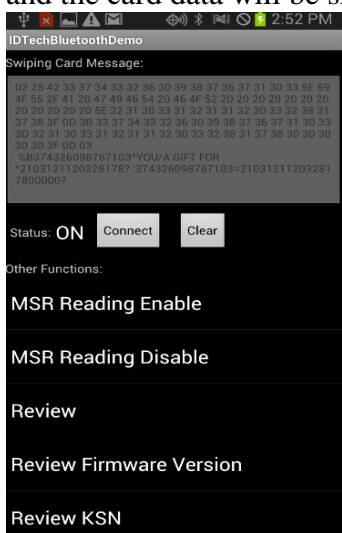
1) Open the “IDTechBluetoothDemo”.

2) Press [Connect] button, it will pop out a small window to allow you to select the device. Please click “ID_Tech BT MSR” to connect. If the connection succeeds, it will show “connect success”.

BT Mag User Manual



3) Press [MSR Reading Enable], the status will be “ON”. Then the user can swipe a card, and the card data will be showed in the text filed on the top of the application.



4) Click the [Clear] button, the text in the window will be cleared.

6.2 IOS BTMag Demo

1. Install the demo

Install the “BTmsrDemo.ipa” to the Apple device by iTunes, or use the XCode to build the source code directly.

2. Paring

1) Go to the setting to turn on the Buletooth

BT Mag User Manual



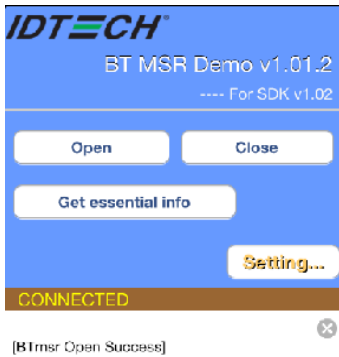
- 2) Click the [ID_TECH BT MSR] to pair
- 3) Enter the password 0000



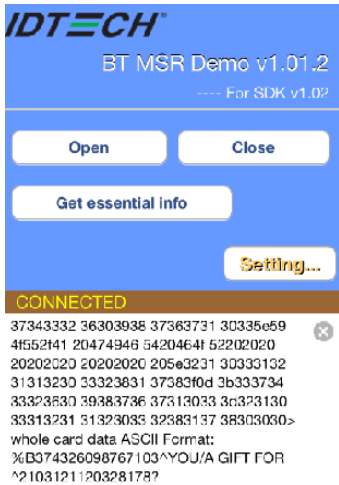
3. Connect with demo

- 1) Click the [open] button to build connection with BT Mag. If open succeeds, it will show “BTmsr Open Success”.

BT Mag User Manual



2) Swipe a card through the reader, the card data will be showed in the demo



If you want to read or set some settings of the reader, click [setting...] button to go to the setting page.

7. Card Data Output Format

7.1 Unencrypted Data Output Format

Magnetic Track Basic Decoded Data Format

Track 1: <SS1><T1 Data><ES><Track Separator>

Track 2: <SS2><T2 Data><ES><Track Separator>

Track 3: <SS3><T3 Data><ES><Terminator>

Where: SS1 (start sentinel track 1) = %

SS2 (start sentinel track 2) = ;

SS3 (start sentinel track 3) = ; for ISO, % for AAMVA

ES (end sentinel all tracks) = ?

Track Separator = Carriage Return

Terminator = Carriage Return

For example:

```
%B4352378366824999^TFSTEST /THIRTYONE
^05102011000088200882000000?;4352378366824999=051020110000882?<CR>
```

7.2 Encrypted Data Output Format

7.2.1 Original Encryption Format

For ISO cards, both masked clear and encrypted data are sent, no clear data will be sent.

For other cards, only clear data is sent.

A card swipe returns the following data:

Card data is sent out in format of

<STX><LenL><LenH><Card Data><CheckLRC><Checksum><ETX>

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

<LenL><LenH> is a two byte length of <Card Data>.

<CheckLRC> is a one byte Exclusive-OR sum calculated for all <Card Data>.

<Checksum> is a one byte Sum value calculated for all <Card data>.

<Card Data> card data format is shown below.

ISO/ABA Data Output Format:

- card encoding type (0: ISO/ABA, 4: for Raw Mode)

BT Mag User Manual

- track status (bit 0,1,2:T1,2,3 decode, bit 3,4,5:T1,2,3 sampling)
- track 1 unencrypted length (1 byte, 0 for no track1 data)
- track 2 unencrypted length (1 byte, 0 for no track2 data)
- track 3 unencrypted length (1 byte, 0 for no track3 data)
- track 1 masked (Omitted if in Raw mode)
- track 2 masked (Omitted if in Raw mode)
- track 3 data (Omitted if in Raw mode)
- track 1 encrypted (AES/TDES encrypted data)
- track 2 encrypted (AES/TDES encrypted data)
- track 3 encrypted (Only used in Raw mode)
- track 1 hashed (20 bytes SHA1-Xor)
- track 2 hashed (20 bytes SHA1-Xor)
- DUKPT serial number (10 bytes)

Non ISO/ABA Data Output Format

- card encoding type (1: AAMVA, 3: Others)
- track status (bit 0,1,2:T1,2,3 decode, bit 3,4,5:T1,2,3 sampling)
- track 1 length (1 byte, 0 for no track1 data)
- track 2 length (1 byte, 0 for no track2 data)
- track 3 length (1 byte, 0 for no track3 data)
- track 1 data
- track 2 data
- track 3 data

Description:

Track 1, Track 2 and Track 3 Unencrypted Length

This one-byte value is the length of the original Track data. It indicates the number of bytes in the Track masked data field. It should be used to separate Track 1, Track 2 and Track 3 data after decrypting Track encrypted data field.

Track 3 Unencrypted Length

This one-byte value indicates the number of bytes in Track 3 data field.

Track 1 and Track 2 Masked

BT Mag User Manual

Track data masked with the MaskCharID (default is '*'). The first PrePANID (up to 6 for BIN, default is 4) and last PostPANID (up to 4, default is 4) characters can be in the clear (unencrypted).

Track 1, Track 2 and Track 3 Encrypted

This field is the encrypted Track data, using either TDES-CBC or AES-CBC with initial vector of 0. If the original data is not a multiple of 8 bytes for TDES or a multiple of 16 bytes for AES, the reader right pads the data with 0.

The key management scheme is DUKPT or Fixed key. For DUKPT, the key used for encrypting data is called the Data Key. Data Key is generated by first taking the DUKPT Derived Key exclusive or'ed with 0000000000FF0000 0000000000FF0000 to get the resulting intermediate variant key. The left side of the intermediate variant key is then TDES encrypted with the entire 16-byte variant as the key. After the same steps are preformed for the right side of the key, combine the two key parts to create the Data Key.

Encrypted Data Length

Track 1 and Track 2 data are encrypted as a single block. In order to get the number of bytes for encrypted data field, we need to get Track 1 and Track 2 unencrypted length first. The field length is always a multiple of 8 bytes for TDES or multiple of 16 bytes for AES. This value will be zero if there was no data on both tracks or if there was an error decoding both tracks. Once the encrypted data is decrypted, all padding 0 need to be removed. The number of bytes of decoded track 1 data is indicated by track 1 unencrypted length field. The remaining bytes are track 2 data, the length of which is indicated by track 2 unencrypted length filed.

Track 1 and Track 2 Hashed

BTMag reader uses SHA-1 to generate hashed data for both track 1 and track 2 unencrypted data. It is 20 bytes long for each track. This is provided with two purposes in mind: One is for the host to ensure data integrity by comparing this field with a SHA-1 hash of the decrypted Track data, prevent unexpected noise in data transmission. The other purpose is to enable the host to store a token of card data for future use without keeping the sensitive card holder data. This token may be used for comparison with the stored hash data to determine if they are from the same card.

7.2.2 Enhanced Encryption Format

Card data is sent out in the following 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/masked data sent status ³ |
| 9 | Encrypted/Hash data sent status ⁴ |
| 10 | Track 1 clear/mask data |
| | Track 2 clear/mask data |
| | Track 3 clear/mask data |
| | Track 1 encrypted data |
| | Track 2 encrypted data |
| | Track 3 encrypted data |
| | Session ID (8 bytes) (Security level 4 only) |
| | Track 1 hashed (20 bytes each) (if encrypted and hash track 1 allowed) |
| | Track 2 hashed (20 bytes each) (if encrypted and hash track 2 allowed) |
| | Track 3 hashed (20 bytes each) (if encrypted and hash track 3 allowed) |
| | KSN (10 bytes) |
| | CheckLRC |
| | Checksum |
| | ETX |

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

Note 1 : Card Encode Type

Card Type will be 8x for 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 |

BT Mag User Manual

04h / 84h Raw; un-decoded format

For Type 04 or 84 Raw data format, all tracks are encrypted and no mask data is sent. No track indicator '01', '02' or '03' in front of each track. Track indicator '01', '02' and '03' will still exist for non-encrypted mode.

Note 2: Track 1-3 status byte

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

Note 3: Clear/mask data sent status

Field 8 (Clear/mask data sent status) and field 9 (Encrypted/Hash data sent status) will only be sent out in enhanced encryption format.

Field 8: Clear/masked data sent status byte:

Bit 0: 1 —track 1 clear/mask data present
Bit 1: 1— track 2 clear/mask data present
Bit 2: 1— track 3 clear/mask data present
Bit 3: 0— reserved for future use
Bit 4: 0— reserved for future use
Bit 5: 0— reserved for future use

Note 4: Encrypted/Hash data sent status

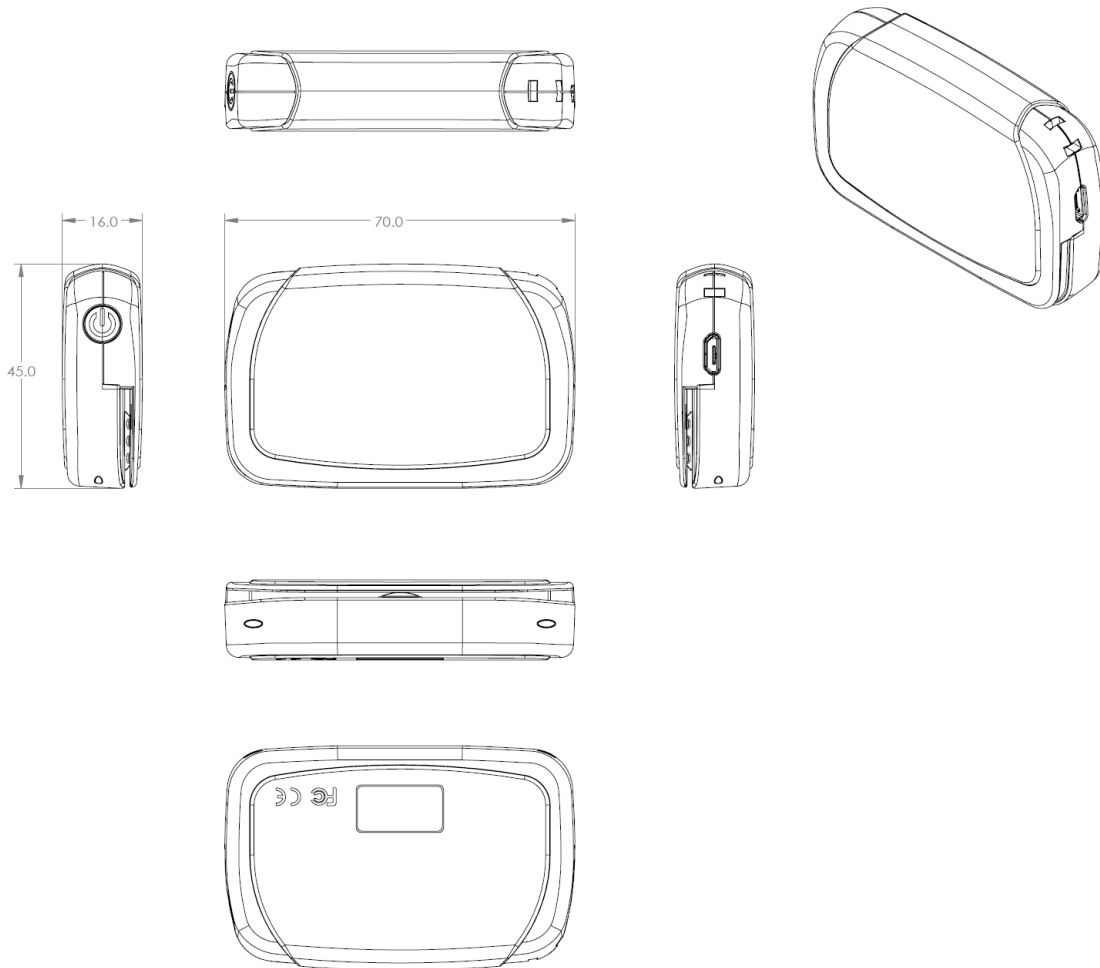
Field 9: Encrypted data sent status

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: 1— track 2 hash data present
Bit 5: 1— track 3 hash data present
Bit 6: 1—session ID present
Bit 7: 1—KSN present

BT Mag User Manual

For the detailed encrypted data parsing example, please refer to Appendix A.

8. Outline Drawing



BT Mag User Manual

Decrypted Data in ASCII:
%B4266841088889999^BUSH JR/GEORGE
W.MR^0809101100001100000000046000000?!.4266841088889999=080910110000046
?0
;33333333337676760707077676763333333333767676070707767676333333333376767
607070776767633333333337676760707?

Decrypted Data in Hex:
2542343236363834313038383838393939395E42555348204A522F47454F52474520572
E4D525E30383039313031313030303031313030303030303030303034363030303030303F
213B343236363834313038383838393939393D3038303931303131303030303034363F3
0000000000

Decryption - Enhanced Encryption Format

Enhanced encryption Format (this can be recognized because the high bit of the fourth byte underlined (80) is 1).

029801803F48236B03BF252A343236362A2A2A2A2A2A2A393939395E42555348
204A522F47454F52474520572E4D525E2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2
A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A3F2A3B343236362A2A2A2A2A2A2A
A393939393D2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A3F2ADA7F2A52BD3F6DD
8B96C50FC39C7E6AF22F06ED1F033BE0FB23D6BD33DC5A1F808512F7AE18D47
A60CC3F4559B1B093563BE7E07459072ABF8FAAB5338C6CC8815FF87797AE3A7
BEAB3B10A3FBC230FBFB941FAC9E82649981AE79F2632156E775A06AEDAF6AF6
F0A184318C5209E55AD44A9CCF6A78AC240F791B63284E15B4019102BA6C50581
4B585816CA3C2D2F42A99B1B9773EF1B116E005B7CD8681860D174E6AD316A0E
CDBC687115FC89360AEE7E430140A7B791589CCAADB6D6872B78433C3A25DA9
DDAE83F12FEFAB530CE405B701131D2FBAAD970248A456000933418AC88F65E1
DB7ED4D10973F99DFC8463FF6DF113B6226C4898A9D355057ECAF11A5598F02C
A31688861C157C1CE2E0F72CE0F3BB598A614EAABB16299490119000000000206E
203

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 above broken down and interpreted
- 02—STX character
- 98—low byte of total length
- 01—high byte of total length
- 80—card type byte (interpretation new format ABA card)

BT Mag User Manual

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 security 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
 0572E4D525E2A2
 A2A2A2A2A2A2A3F2A

Track 1 masked data in ASCII
 %*4266*****9999^BUSH JR/GEORGE
 W.MR^*****?*

Track 2 data in hex masked (length 0x23)
 3B343236362A2A2A2A2A2A2A2A393939393D2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2A2
 A2A2A3F2A

Track2 masked data in ASCII
 ;4266*****9999=*****?*

In this example there is no Track 3 data either clear or masked (encrypted and hashed data is below)

Track 1 encrypted length 0x48 rounded up to multiple of 8 bytes = 0x48 (72 decimal)
 DA7F2A52BD3F6DD8B96C50FC39C7E6AF22F06ED1F033BE0FB23D6BD33DC5A1
 F808512F7AE18D47A60CC3F4559B1B093563BE7E07459072ABF8FAAB5338C6CC
 8815FF87797AE3A7BE

Track 2 encrypted length 0x23 rounded up to multiple of 8 bytes =0x28 (40 decimal)
 AB3B10A3FBC230FBFB941FAC9E82649981AE79F2632156E775A06AEDAF6F0
 A184318C5209E55AD

BT Mag User Manual

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

44A9CCF6A78AC240F791B63284E15B4019102BA6C505814B585816CA3C2D2F42
A99B1B9773EF1B116E005B7CD8681860D174E6AD316A0ECDBC687115FC89360A
EE7E430140A7B791589CCAADB6D6872B78433C3A25DA9DDAE83F12FEFAB530
CE405B701131D2FBAAD970248A45600093

Track 1 data hashed length 20 bytes

3418AC88F65E1DB7ED4D10973F99DFC8463FF6DF

Track 2 data hashed length 20 bytes

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 02

Decrypted Data:

Track 1 decrypted

%B4266841088889999^BUSH JR/GEORGE

W.MR^080910110000110000000046000000?!

Track 2 decrypted

;4266841088889999=080910110000046?0

Track 3 decrypted

;33333333337676760707077676763333333333767676070707767676333333333376767607070776767633333333337676760707?2

Track 1 decrypted data in hex including padding zeros (but there are no pad bytes here)

BT Mag User Manual

2542343236363834313038383838393939395E42555348204A522F47454F52474520572
E4D525E3038303931303131303030303131303030303030303034363030303030303F
21

Track 2 decrypted data in hex including padding zeros

3B343236363834313038383838393939393D3038303931303131303030303034363F300
000000000

Track 3 decrypted data in hex including padding zeros

3B333333333333333333333333333333337363736373630373037303737363736373633333333333333
33333333373637363736303730373037373637363736333333333333333333333333333333373637363
736303730373037373637363736333333333333333333333333333333373637363736303730373F32
000000000