Value through Innovation

PiP User Manual

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FCC warning statement

This device complies with Part 15 of the FCC Rules. Operation 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.

The user manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: The grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

Note: 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. 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 to 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.

This device complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.
The antenna(s) used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter and must be installed to provide a separation distance of at least 20cm from all persons.

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

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 operation.

Cautions and Warnings

	Caution: The PiP should be mounted 1-2 feet away from other PiPs. Can be adjusted based on lane setup.
	Warning: Avoid close proximity to radio transmitters which may reduce the capability of the reader.

Revision History

Date	Rev	Changes	By
10/04/2021	D	Reimplemented Revision History Updated Specifications table Updated Firmware Upgrade screenshots and USDK Demo App link	CB
01/20/2022	E	Added Firmware Commands section detailing Google Pay Smart Tap and Apple VAS firmware commands and ECC Key instructions.	CB
05/12/2022	F	Updated Set Private Key (C7-66), Set Configuration (04-00), and Review Work Mode (01-13).	CB

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1. Overview

The ID TECH PiP is a compact, standalone NFC device, designed to support loyalty programs that register via NFC phones. It is also great as an access control device as it supports Apple VAS and Google Smart Tap as well as Mifare and other closed-loop protocols.

1.1. Universal SDK

A feature-rich Windows-based Universal SDK is available to aid rapid development of applications that talk to PiP. The SDK is available for the C# language on Windows and comes with sample code for demo apps. To obtain the SDK and other useful utilities, demos, and downloads, be sure to check the Downloads link on the ID TECH Knowledge Base (no registration required).

1.2. Encryption

PiP supports ECC.

1.3. Features

PiP supports the following:

- Apple VAS
- Google Pay Smart Tap
- USB HID & KB
- Suitable for retail, entertainment, and other locations that use loyalty value-added services but do not require payment
- Consumer Intuitive: Equipped with an LED and sound to provide visual and audible cues to enable a smooth and seamless experience

This document assumes that users are familiar with their host systems and all related functions.

1.4. Approvals

- Apple VAS & Google SmartTap

1.5. Regulatory

- FCC Part 15
- CE Mark
- UL certified
- REACH

2. PiP Specifications

Hardware	
MTBF	30,000 POH
Transmitter Frequency	13.56 MHz +/- 0.01%
Transmitter Modulation	ISO 14443-2 Type A Rise/Fall Time: 2-3 µsec. Rise, < 1 µsec fall ISO14443-2 Type B Rise/Fall Time: < 2 µsec. each; 8% - 14% ASK
Receiver Subcarrier Frequency	847.5 KHz
Receiver Subcarrier Data	ISO 14443-2 Type A: Modified Manchester ISO 14443-2 Type B: NRZ-L, BPSK ISO 18092 ISO 21481 (PCD & NFC)
Typical Read Range	0-4cm
Physical	
Length	75.77 mm
Width	70.44mm
Depth	14mm
Environmental	
Operating Temperature	0°C to 55°C (32°F to 131°F) [non-condensing]
Storage Temperature	-20°C to 60°C (-4°F to 139°F) [non-condensing]
Operating Humidity	Maximum 95% (non-condensing)
Storage Humidity	Maximum 95% (non-condensing)
Transit Humidity	Maximum 95% (non-condensing)
Operating Environment	Indoor
IK Rating	N/A
IP Rating	N/A
Electrical	
Reader Input Voltage	+5V(USB port-powered)
Working Current	450mA@25℃ Auto polling mode
Battery (for real-time clock)	Minimum of 3 years
Power Consumption	Idle (RF Field off): <275mW During Polling: <1000mW Rated: <900mW

3. PiP Installation

This section provides information on installing a PiP.

3.1. Parts List

Verify that you have the following hardware for installing the PiP:

- PiP
- Micro-USB cable (included)

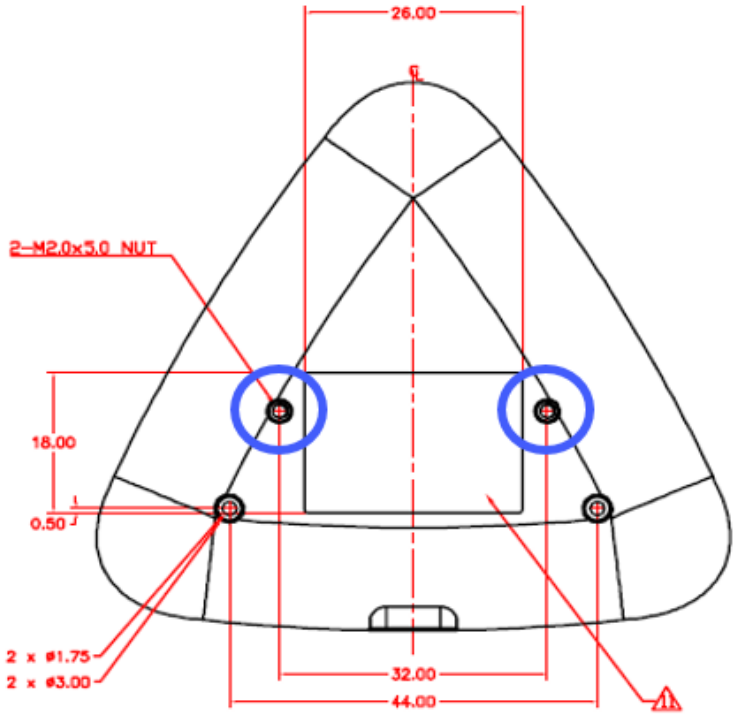
3.2. Mounting the PiP

Warning: The RF field of the PiP is sensitive to the proximity of metal. There are three options for mounting the PiP to a metal surface:

- Mount with the RF emitting surface of the antenna at least 1cm forward of any metal.
- Mount with the RF emitting surface of the antenna at least 1cm behind any metal. This will reduce the effective range of the antenna.
- Mount flush with the metal, but allow a minimum of 1cm distance from the metal

3.2.1. Mounting Screws

The back of the PiP has two holes for mounting screws (circled in blue below). Make sure that the depth of the screws used for mounting does not exceed 4mm.



3.3. Connecting to Power

The PiP is powered through the USB port.

3.4. Communication via USB

The PID is 4480 (hex) and the VID is 0ACD (hex).

3.5. Connecting to the Data Port

The PiP transfers data via the USB connector.

3.6. Using the PiP for Value-Added Services

This tests the PiP's ability to read an NFC phone or closed-loop tap card.

3.7. Making a VAS Transaction

The PiP allows for customer loyalty program services using Contactless (NFC) technology. To make a VAS transaction:

1. Present the phone in close proximity to the front portion of the PiP.
2. Orient the phone so that maximum surface area is parallel to the PiP.
3. The phone used for the test should display a rewards screen (steps for using that screen depend on the phone platform).
4. The PiP beeps once to indicate a successful VAS transaction.

3.8. Notes on Installation Locations

- The PiP is designed to be mounted on a surface and in close proximity to any internal motors and electrical devices that may be operating inside a point of sale area. However, the PiP is susceptible to RF and electromagnetic interference. It is important that the unit not be mounted near (within 3 or 4 feet) large electric motors, computer UPS systems, microwave transmitters (Wi-Fi routers), anti-theft devices, radio transmitters, communications equipment and so on.
- Tie all cables neatly with nylon cable-ties and route them so that they are inaccessible and invisible to customers.
- Test the PiP installation using a test card to perform an end-to-end VAS transaction. Even if the transaction is declined (as it should be with a test card), it will prove connectivity all the way through the system. If possible, a manager or some other responsible party should test each PiP on a regular basis (perhaps at the start of each day or at least once per week) with a test card to ensure continued operation and functionality. If the PiP is rebooted on a regular basis (such as every night), it is important to test the contactless reader as soon as possible afterwards to ensure continued communication to the PiP host.

4. PiP LED Status Indicator

The PiP has an LED indicator on the front of the device to indicate reader status.

Device State	LED
Device connected, read successful	solid
Communicating with host device	flashing
Bad read	solid

5. RF Interference

Q. Why do I need to know about RF interference?

A. Contactless communication uses radio frequency technology to send phone data to a contactless terminal reader.

Q. How can RF interference affect contactless communication?

A. RF interference can cause data errors. If RF interference is present, contactless communication devices may operate intermittently or inconsistently.

Q. Where does RF interference come from?

A. Radio frequency interference (RFI) can originate from a wide number of sources at VAS-related locations. Some examples of sources of RF energy and RF interference include:

- AM/FM radio and TV transmitters
- 2-way radios and pagers
- Mobile telephones
- Power lines and transformers
- Medical equipment
- Microwaves
- Electromechanical switches

Q. What should I do if I suspect RF interference exists in my environment?

A. Begin by inspecting your environment for possible sources of RF interference.

Q. Do equipment manufacturers test their devices for RF interference?

A. Electronic equipment is tested for RFI sensitivity by the manufacturers. These tests are performed in a controlled laboratory environment and will often not replicate the types of devices that would be encountered in your point-of-sale (POS) environment.

Q. What RF levels will impact RF operations?

A. Factors that can cause RF interference vary case-by-case. There are no set rules defining a single RF level that will cause RFI. RFI depends on the sensitivity of the equipment under consideration, or how low an interpreting signal can be in the presence of the equipment and cause problems.

Equipment can be particularly sensitive to very low signal levels of one frequency and yet be quite immune to high signal levels of another frequency - so frequency is an important factor. Some electronic system components are internally shielded and have a very high immunity to interference; but generally, most equipment has not been so engineered.

6. Firmware Commands

The following firmware commands apply to PiP reader configuration. See the *NEO Interface Developer's Guide* for full details.

6.1. ECC Key Management

The section below describes ECC Key management for PiP devices.

6.1.1. ECC Key Pair

Merchants or other administrators who wish to use SmartTap must create and manage the Elliptical Curve Cryptography (ECC) key pair used to for securing communication between the reader and the wallet.

- **Public Key:** administators must communicate the public key to Google. It is public and can be visible to anyone.
- **Private Key:** the private key must be kept private and injected into the ViVOpay device, where it will be stored securely.

6.1.2. How to Create an ECC Key Pair Using Open-SSL

Users have several options for generating the ECC key pair (or the ECDSA digital signature key pair). The example below uses the freely available OpenSSL package to generate a prime256v1 Elliptical Curve Cipher key pair (and to sign messages).

To generate EC private key:

```
openssl> ecparam -out PRIVATE.key.pem -name prime256v1 -genkey
```

To generate EC public key from private key:

```
openssl> ec -in PRIVATE.key.pem -pubout -out PUBLIC.key.pem -conv_form
compressed
```

Sign message:

```
openssl> dgst -sha256 -sign LONG_TERM_PRIVATE.pem message.txt >
signature.bin
```

Verify message:

```
openssl> dgst -sha256 -verify LONG_TERM_PUBLIC.pem -signature
signature.bin message.txt
```

Generate ECDH shared secret:

```
openssl> pkeyutl -derive -inkey TERMINAL_EPHEMERAL_PRIVATE.pem -
peerkey HANDSET_EPHEMERAL_PUBLIC.pem -out secret.bin
```

6.1.3. How To Extract Key Data To Load In The PiP

Having generated the ECC Key Pair, the PiP requires the Private Key data to be loaded so that it can decrypt the pass information sent from the mobile device. To extract the required Key Data, use the following OpenSSL command line:

```
>openssl.exe ec -noout -text -in private_key.pem
```

This will output information to the screen. You should see the below as a minimum:

```
Private-Key: (256 bit)
priv:
    00:f5:36:87:08:93:39:20:55:3b:7b:9f:fb:16:ae:
    ed:9c:77:d5:bf:d9:66:2a:f1:49:a6:b9:f9:65:b7:
    3f:0c:ca
```

Copy the bytes of data and edit them to remove the colon characters. If, as in the example above, there are 33 bytes of data, remove the leading `00` to leave 32 bytes of key data. These are used in the **C7-65** and **C7-66** commands detailed later in this document.

6.2. Google Pay Smart Tap 2.1 Commands

The following commands apply to Google Pay Smart Tap 2.1.

6.2.1. Set Configurable Group (04-03)

The **Set Configurable Group** command creates or modifies a TLV Group. Configure a specific TLV Group by passing the TLVs with the desired functionality and a unique TLV Group Number to the reader. The Google Pay Smart Tap feature is controlled using the Configuration Group 142 (0x8E).

Command Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14 … Byte 14+n-1	Byte 14+n	Byte 15+n
Header Tag & Protocol Version	Command	Sub-Command	Data Length (MSB)	Data Length (LSB)	Data	CRC (LSB)	CRC (MSB)
ViVOtech2\0	04h	03h			TLV Data Objects		

Response Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
Header Tag & Protocol Version	Command	Status Code	Data Length (MSB)	Data Length (LSB)	CRC (MSB)	CRC (LSB)
ViVOtech2\0	04h	See Status Code Table	00h	00h		

6.2.1.1. Example Usage

Further information on the TLV Data Objects that can be set in the command frame are described in detail in the *Google Pay Smart Tap 2.1 In ViVOpay Devices* document. The settings used with ID TECH's Demo Pass are shown below:

FFE4018E .....Group Number 142 (0x8E)
DFEE3B0405318C74 .....Collector ID (87133300)
DFEE3C00.....Store Location ID (Empty)
DFEE3D00.....Terminal ID (Empty)
DFEF2500.....Merchant Name (Empty)
DFED0100.....Merchant Category (Empty)
DFED02050000000001.....PoS Capability Bitmap
DFED030101.....Retry Times (01)
DFED040101.....Select OSE Support (01)
DFED050101.....Skip Second Select Support (01)

DFED060100.....Stop payment if SmartTap 2.1 failed (00)
DFED070100.....Pre-signed support (00)
DFED27010D.....Delimiter for Service Objects (0x0D)
DFED3F0100.....VAS encryption flag (00)
DFED490100.....VAS-only global override (00)
DFEF770100.....Multiple Service Objects enabled/disabled (00)

To set these default values in your PiP, use the USDK Demo App and select the "Send NEO Command option. Set the command fields as below, the press **Execute Command** to set the values:

- Cmd: 04
- Sub: 03
- Hex Data:
  FFE4018EDFEE3B0405318C74DFEE3C00DFEE3D00DFEF2500DFED0100DFED02050000000001DFED030101DFED040101DFED050101DFED060100DFED070100DFED27010DDFED3F0100DFED490100DFEF770100

6.2.2. Set SmartTap LTPK (C7-65)

For direct injection of the LTPK, send firmware command **C7-65** via serial connection to the (offline) device. Developers should observe good cryptographic practices by, for example, injecting devices in a secure setup.

Command Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
Header Tag & Protocol Version	Command	Sub-Command	Data Length (MSB)	Data Length (LSB)	Data	CRC (LSB)	CRC (MSB)
ViVOtech2\0	C7h	65h	0x00	0x24	See Command Data Table		

Command Data

Data Item	Length (bytes)
Version	4
Long term private key	32

Response Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
Header Tag & Protocol Version	Command	Status Code	Data Length (MSB)	Data Length (LSB)	CRC (MSB)	CRC (LSB)
ViVOtech2\0	C7h	See Status Code Table	00h	00h		

6.2.2.1. Example Usage

To load the Google Pay Long Term Private Key in your PiP for use with the ID TECH Demo Pass, the values used are shown below:

Version: `0000000A`

Data:

`F5368708933920553B7B9FFB16AEED9C77D5BFD9662AF149A6B9F965B73F0CCA`

The Data shown was obtained in Section 6.1.3.

To set these default values in your PiP, use the USDK Demo App and select the Send NEO Command option. Set the command fields as below, then press **Execute Command** to set the values:

- Cmd: `C7`
- Sub: `65`
- Hex Data: `F5368708933920553B7B9FFB16AEED9C77D5BFD9662AF149A6B9F965B73F0CCA`

6.3. Apple VAS Firmware Commands

The following commands apply to Apple VAS.

6.3.1. Set Merchant Record (04-11)

The **Set Merchant Record** command sets the merchant the PiP reader uses for loyalty points.

Command Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14 … Byte 14+n-1	Byte 14+n	Byte15+n
Header Tag & Protocol Version	Command	Sub-Command	Data length (MSB)	Data length (LSB)	Data	CRC (MSB)	CRC (LSB)
ViVOtech2\0	04	11h					

Data Field for Command Frame

Data Field	Length (bytes)	Description
Merchant Record Index	1	The valid value is 1-6. Up to 6 records can be set.
ID Present	1	1: The Merchant ID is valid. 0: The Merchant ID is not valid.
Merchant ID	32	The value of tag 9F25. SHA256 of pass name.
Length of Merchant URL	1	Can be zero, if no URL is used (real Merchant URL Length).
Merchant URL	64	The value of tag 9F29, padded with trailing zeroes to 64 bytes.
Length of Terminal Application Version Number	1	Optional. Can be zero, if no terminal application version number is used (terminal application version number buffer is 2 bytes).
ApplePay Terminal Application Version Number	var	Optional. The value of tag 9F22.

Response Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
Header Tag & Protocol Version	Command	Status	Data length (MSB)	Data length (LSB)	CRC(MSB)	CRC(LSB)
ViVOtech2\0	04h	See Status Code Table	00	00		

6.3.1.1. Example Usage

Further information on the TLV Data Objects that can be set in the command frame are described in detail in the *Apple VAS In ViVOpay Devices* document. The settings used with ID TECH's Demo Pass are shown below:

- Merchant Record ID: `01`
- ID Present: `01`
- Merchant ID: `AD9887C78E412F835E89D0A4F71E423320C7BB53B6FAACD8D1D1EED9E1E38D39`
- Length of Merchant URL: `00`
- Merchant URL: `00000000000000000000000000000000000000000000000000000000000000000`
`000000000000000000000000000000000000000000000000000000000000000`

To set these default values in your PiP, use the SDK Demo App and select the Send NEO Command option. Set the command fields as below, then press Execute Command to set the values:

- Cmd: `04`
- Sub: `11`
- Hex Data: `0101AD9887C78E412F835E89D0A4F71E423320C7BB53B6FAACD8D1D1EED9E1E38`
`D3900000000000000000000000000000000000000000000000000000000000000`
`00000000000000000000000000000000000000000000000000000000000000000`
`000`

6.3.2. Set Private Key (C7-66)

The **Set Private Key** command loads the private key associated with the Merchant's Apple VAS pass into the ViVOpay device. This allows the reader to decrypt the pass data.

Note: The **Set Private Key (C7-66)** command only works on non-SRED readers; PiPs are not SRED.

Command Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14 … Byte 14+n-1	Byte 14+n	Byte15+n
Header Tag & Protocol Version	Command	Sub-Command	Data length (MSB)	Data length (LSB)	Data	CRC (MSB)	CRC (LSB)
ViVOtech2\0	C7	66h	0020h or 0021h		Data		

Command Frame Data Field

Data Field	Length (bytes)	Description
Merchant Record Index	1 or 0 (OTP)	If the Merchant Record Index does not exist, this Private Key is used by all Merchant IDs. If the Merchant Record Index exists, this Private Key is used for the specified Merchant ID. The valid value is 1-6. It can be set for 6 records.
Private Key	32	Apple VAS Private Key.

Response Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14 … Byte 14+n-1	Byte 14+n	Byte15+n
Header Tag & Protocol Version	Command	Status	Data length (MSB)	Data length (LSB)	Data	CRC (MSB)	CRC (LSB)
ViVOtech2\0	C7	See Status Code Table, NEO 2 IDG	00h	00h			

Note 1: The private key should be 32 bytes long. If the private key is injected and tag DFED3F bit 2 set to **1**, the reader will decrypt VAS data (tag 9F27).

6.3.2.1. Example Usage

To load the Apple VAS Private Key in your PiP for use with the ID TECH Demo Pass, the values used are shown below:

- Data: `F5368708933920553B7B9FFB16AEED9C77D5BFD9662AF149A6B9F965B73F0CCA`

The Data shown was obtained in Section 6.1.3.

To set these default values in your PiP, use the USDK Demo App and select the Send NEO Command option. Set the command fields as below, then press Execute Command to set the values:

- Cmd: `C7`
- Sub: `66`
- Hex Data: `0000000AF5368708933920553B7B9FFB16AEED9C77D5BFD9662AF149A6B9F965B73F0CCA`

6.3.3. Set Configuration (04-00)

Use this command to set or change the values of the specified Tag Length Value (TLV) data objects in the reader. It can be used to set parameters for Auto Poll as well as Poll on Demand Mode.

When the reader receives this command, it extracts the TLV encoded parameters from the data portion of the command and saves them to the default TLV Group in non-volatile memory. If a TLV data object is incorrectly formatted, the reader stops processing the object. A single command may contain more than one TLV data object. This command can be used to set any EMV TLV object in the reader.

Note: The **Set Configuration** command is the only mechanism for setting global configuration parameter values.

Command Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14 … Byte 14+n-1	Byte 14+n	Byte 15+n
Header Tag & Protocol Version	Command	Sub-Command	Data Length (MSB)	Data Length (LSB)	Data	CRC (LSB)	CRC (MSB)
ViVOtech2\0	04h	00h			TLV Data Objects		

Response Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
Header Tag & Protocol Version	Command	Status Code	Data Length (MSB)	Data Length (LSB)	CRC (MSB)	CRC (LSB)
ViVOtech2\0	04h	See Status Code Table	00h	00h		

6.3.3.1. Tag DFED3F: VAS Encryption

Tag DFED3F controls VAS encryption options. The Tag is set to Group 0.

DFED3F	Optional	VAS encryption on/off flag Bit 0: Encrypt VAS data with device's data encryption key Bit 1: Decrypt Apple VAS data with Apple VAS private key Bit 2 to 7: RFU

For example:

- `56 69 56 4F 74 65 63 68 32 00` ViVOtech2\0
- `04 00` Set configuration
- `00 05` Data length
- `DF ED 3F 01 01` Enable both the encryption of Smart Tap and Apple VAS
- `BF 00` CRC16

6.3.4. Review Work Mode (01-13)

The **Review Work Mode** command reviews the PiP reader's current poll mode, data output mode, and output interface.

Command Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
Header Tag & Protocol Version	Command	Sub-Command	Data Length (MSB)	Data Length (LSB)	CRC (LSB)	CRC (MSB)
ViVOtech2\0	01h	13h	00h	00h		

Response Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
Header Tag & Protocol Version	Command	Status Code	Data Length (MSB)	Data Length (LSB)	Data	CRC (MSB)	CRC (LSB)
ViVOtech2\0	01h	See Status Code Table	00h	01h	Work Mode		

Work Mode

Mode	Poll Mode	Data Output Mode	USB Interface
00h	Auto poll	Normal mode	USBHID
01h	Auto poll	Normal mode	USBKB
02h	Auto poll	Simplified output mode	USBKB
03h	Auto poll	Tags only	USBHID
04h	Auto poll	Tags only	USBKB
05h	Poll on demand	Normal mode	USBHID
06h	Poll on demand	Normal mode	USBKB

6.4. PiP Firmware Commands for Both Platforms

The following commands apply to both Google Pay Smart Tap 2.1 and Apple VAS.

6.4.1. Quick Set Work Mode (01-12)

The **Quick Set Work Mode** command quick sets the polling mode, data output mode, and output interface for a PiP reader. ID TECH recommends using this command to directly set the reader's work mode.

If the parameters of the following commands conflict with the reader's available work modes, the commands fail with a "Command Not Allowed" error status.

- Set Poll Mode (01-01)
- Change USB Interface (01-0B)
- Set Data Output Mode (01-0C)

Command Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15	Byte 16
Header Tag & Protocol Version	Command	Sub-Command	Data Length (MSB)	Data Length (LSB)	Data	CRC (LSB)	CRC (MSB)
ViVOtech2\0	01h	12h	00h	01h	Work Mode		

Work Mode

Mode	Poll Mode	Data Output Mode	USB Interface
00h	Auto poll	Normal mode	USBHID
01h	Auto poll	Normal mode	USBKB
02h	Auto poll	Simplified output mode	USBKB
03h	Auto poll	Tags only	USBHID
04h	Auto poll	Tags only	USBKB
05h	Poll on demand	Normal mode	USBHID
06h	Poll on demand	Normal mode	USBKB

Note: Data output mode is invalid for Mifare output data. When Auto Poll and USB-KB are enabled, the Mifare payload output format changes to ASCII strings.

Response Frame

Byte 0-9	Byte 10	Byte 11	Byte 12	Byte 13	Byte 14	Byte 15
Header Tag & Protocol Version	Command	Status Code	Data Length (MSB)	Data Length (LSB)	CRC (MSB)	CRC (LSB)
ViVOtech2\0	01h	See Status Code Table	00h	00h		

6.5. Poll On Demand and Auto Poll Settings

For Poll On Demand, the Apple VAS & Google Pay Smart Tap 2.1 container tags must be included in the parameters for the **Activate Contactless Transaction** command. When using Auto Poll, the container tags must be set in Configuration Group 0.

Apple VAS: `FF EE 06 18 9F 22 02 01 00 9F 26 04 00 00 00 02 9F 2B 05 01 00 00 00 00 DF 01 01 03`

Google Pay Smart Tap 2.1: `FF EE 08 0A DF EF 1A 01 0A DF ED 28 01 00`

6.6. Non-Payment Card Switching Support

PiP readers can read several card formats without needing to be manually switched.

The ACT command and the template in the FFEE0E Tag handles reading EMV cards and Mifare cards using a single command.

Note: The FFEE0E container tag is used in the same manner as FFEE06 and FFEE08 for Apple VAS and Google Pay Smart Tap 2.1 in relation to Poll On Demand/Auto Poll behavior.

Tags used:

- **FFEE0E** provides the template, which includes DFED3A, DFED3B, and DFED3C.
    - **DFED3A** defines which blocks to read. One block is a byte. For example, **DFED3A 04 02 12 18 22** reads blocks 02, 12, 18, and 22.
    - **DFED3C** defines the block and the corresponding data to write to it. For example, **DFED3C 11 06 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10** means write data "`01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10`" into block 06.
    - 0801FFFFFFFFFFFF means from block 08, key-A, use "`FFFFFFFFFFFF`". Mode `01` is **KEY-A**, `02` is **KEY-B**.

Example:

ACT(02 40): 0A 9C 01 00 9F 02 06 00 00 00 00 15 00 FF EE 06 18 9F 22 02 01 00 9F 26 04 00 00 00 01 9F 2B 05 01 00 00 00 00 DF 01 01 01 FF EE 08 02 81 00 FF EE 0E 41 DF ED 3B 08 01 01 FF FF FF FF FF FF DF ED 3B 08 04 01 FF FF FF FF FF FF DF ED 3B 08 08 01 FF FF FF FF FF FF DF ED 3C 11 06 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 DF ED 3A 04 01 03 07 09

This ACT parameter defines the following operations:

- Read blocks 01, 03, 07, and 09
- Write to block 06 with "01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10" as the data
- The key from block 01 is KEY-A "FFFFFFFFFFFF"
- The key from block 04 is KEY-A "FFFFFFFFFFFF"
- The key from block 08 is KEY-A "FFFFFFFFFFFF"

Return Data: FFEE0E length Error_Code Card_Type TLV_UID Card_Data
Where **length** is the length of [Error_Code Card_Type Card_Data].

Error_Code is defined as:

0xE0	#define ERROR_NO_ERROR
0xE1	#define ERROR_TIMEOUT_ERROR
0xE2	#define ERROR_AUTHENTICATE_ERROR
0xE3	#define ERROR_READ_ERROR
0xE4	#define ERROR_WRITE_ERROR

Card_Type is defined as:

0x04	MifareUltraLight
0x03	Classic Mifare

TLV_UID: DFED44
Card_Data is the data read from the card designated by DFED3A. The delimiter is **[0D 0A]**.

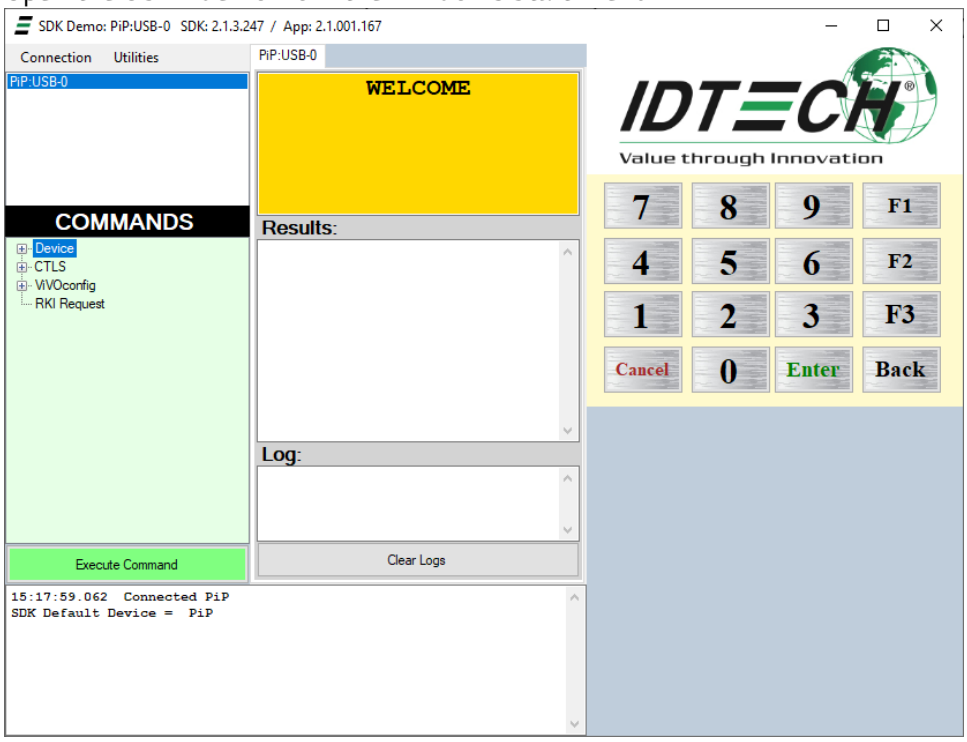
For the ACT command, if a key is not necessary or the key is KEY-A "FF FF FF FF FF FF", Tag DFED3B can be omitted.

7. Firmware Upgrade

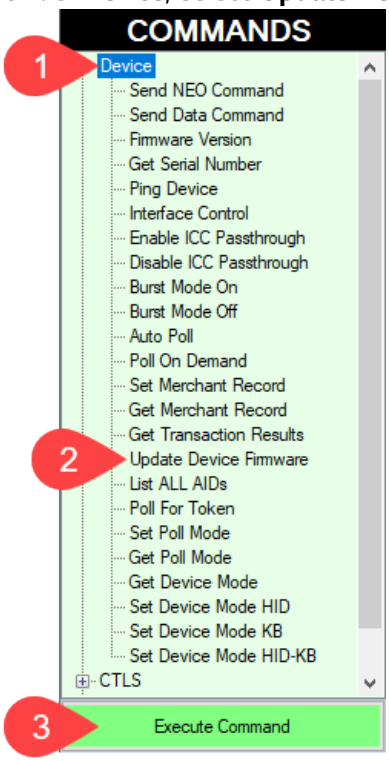
The steps below describe the process for updating PiP firmware via the Universal SDK Demo.

Note: Before you begin, contact your ID TECH representative to receive the most recent PiP firmware. Download the ZIP file and extract it to your computer.

1. Connect the PiP to your PC via USB or serial port.
2. Download and install the latest USDK Demo app from the ID TECH Knowledge Base (if you cannot access the link, please contact support).
3. Open the USDK demo from the Windows Start menu.



4. Under **Device**, select **Update Device Firmware**, then click **Execute Command**.



5. Navigate to and select the PiP firmware you downloaded earlier and click **Open**.
6. The PiP will reboot and enter the bootloader, at which point the USDK demo begins updating the device.
7. When the firmware update completes, the PiP will reboot again and the USDK demo will prompt **Firmware Update Successful**.

8. Customer Support

If you are unable to resolve any technical issues, please contact support@idtechproducts.com (sending an e-mail to this address will automatically open a support ticket).