TrustedBio™ IDX5601 / IDX6601 General Guide

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IDEX

Introduction

- Extract the IDEX test software (release-xxx.zip) to a local folder, preferably with a short folder name, i.e. C:\Tools\xxx.
- The command line software to use is idex-test.exe.
- This can be located in the “tools\idex-test-x64” folder.
- **Always check that the correct version of idex-test.exe is used for the card.**
- Supported Readers : Omnikey 5422 and Duali DE-620(R).
- The following examples assume “Contact” mode operation. For “Contactless” mode, replace the port option PCSC-C with PCSC-CL.

e.g. Contact : `idex-test.exe --port PCSC-C --get_uid`

Contactless : `idex-test.exe --port PCSC-CL --get_uid`

Overview

- The IDX5601/6601 Biometric Card includes a Java Card Operating System and the IDEX Biometric Authenticator (IBA) Applet.
- The IBA provides the ability to enroll the user's fingerprint into the Biometric Card.
- Please refer to the IDEX Biometric Authenticator Integration Guide for more information on the IBA.
- Essentially, the IBA Applet will interact with one or more applets installed on the card to perform enrollment and verification.

Check the version of idex-test.exe

- Checking the version of idex-test.exe.
- Type the following command:
  - `idex-test.exe --version`

Example only

```
C:\Tools\idex-test-x64>idex-test.exe --version
idex-test Version 7.11.10700 FuzeId 231207-575-10700
```

- In general, use the idex-test.exe software that comes with the Release package as it is constantly being updated to include new features.

Applet Authentication

- Command options:
  - `--en_applet_auth`
  - `--en_applet_auth=readkeys`
- This option establishes mutual authentication with the selected applet on startup before executing the specified idex-test command.
- The “readkeys” option reads the default keys back from the device and then uses them to authenticate with the ISD (Issuer Security Domain).
- Once the ISD keys have been updated from the default ones or the OS is in Rel (SEC) mode, there is no option to read the keys back from the device. In this instance, the configuration file for idex-test.exe will need to be updated with the new ISD keys. Please see an example below.

```
//Example section in the idex-test.cfg file
////////////// 10. SCP03 keys /////////////////
//
// keys that are used during --en_applet_auth
//
////////////////////////////////////////////////
// default values:
SCP03_enc_key = 404142434445464748494A4B4C4D4E4F //change to key on device
SCP03_mac_Key = 404142434445464748494A4B4C4D4E4F //change to key on device
SCP03_host_challenge = 1122334455667788 //doesn’t need to be changed
```

Applet Configuration

- Command option:
  - `--applet_config upload_applet/list/get_version/delete_all_applets/delete_instance/delete_package/install [argument]`

- This option is used to run idex-test JCOS applet configuration commands for applet management.
- The commands include listing applets, uploading applets, installing and deleting applets and installing and deleting packages

- Example:
  - `idex-test.exe --port PCSC-C **--applet_config list** --en_applet_auth=readkeys`
  - `idex-test.exe --port PCSC-C **--applet_config install** ibac_p ibac --en_applet_auth=readkeys`

Applet Status

- Type the following command:
  - `idex-test.exe --port PCSC-C --applet_config list --en_applet_auth=readkeys`
- This command lists all applications, executable load files and executable modules.
- Please note the following :

AID	Applet	State	Notes
A000000905010001	IBA	LOADED	The IBA has been uploaded
A00000090501000101	IBA	PERSONALIZED	The IBA has been through personalization
A000000905010002	IBA Service	LOADED	The IBA Service has been uploaded. The IBA service does not need to be installed.
A000000905010003	IBA Client	LOADED	The IBA Client has been uploaded.
A00000090501000301	IBA Client	SELECTABLE	There is no personalization on the IBA client, so the state remains as "SELECTABLE“.

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Applet Selection

- The `--en_applet_select` option selects the applet that will execute the specified idex-test.exe command.
- The IBA Applet can only be used if the **APDU interface** is enabled.
- Client Applets can only be selected for commands if the shareable interface is enabled in the IBA. By default they are not enabled. If a specific Client Applet's AID has been personalized on the IBA, only that applet can communicate with the IBA.
- These interfaces can be enabled or disabled during the personalization of the IBA.

Applet Selection (Continued)

- Command option:
  - `--en_applet_select=AID`

- AID = the applet id (iba, ibac, iba_p, ibac_p, isd or hexAID)
  - `iba` - IBA applet - A00000090501000101
  - `ibac` - ***Example*** client applet - A00000090501000301
  - `iba_p` - IBA package - A000000905010001
  - `ibac_p` - Example IBA client package - A000000905010003
  - `isd` - Issuer Security Domain - A000000151000000
  - `hexAID` - ID for any other Applets - xxxxxxxxxxxx…
    - Example : if you want to select the first instance of an iba client, with the following AID A00000090501000301, you would use --en_applet_select=A00000090501000301.

- This option shall be used with specific idex-test.exe commands, such as:
  - `idex-test.exe --port PCSC-C --iba_match` **`--en_applet_select=ibac`**
  - `idex-test.exe --port PCSC-C --en_enroll guided reset-biometrics` **`--en_applet_select=A00000090501000301`**
  - `idex-test.exe --port PCSC-C --applet_config get_version` **`--en_applet_select=iba`**

Applet Enroll Unlock Code (EUC)

- Command option:
  - `--en_applet_pin=xxxx`

- where xxxx should be replaced with the EUC used for the specified applet.

- This option is only needed if the IBA is personalized to have an Enroll Unlock Code (EUC). It verifies the applet EUC on startup before executing the specified idex-test.exe command.

- The IBA client example provided by IDEX does not implement an EUC. Security should be implemented by the customer in their own client applet.

Additional Options

- The following options are not required by any commands but can be used with any idex-test.exe command to get more information.
- Command options:
  - `-v or –verbose`
  - `-h or --help`

- The “-v” or “--verbose” option sets the verbosity level to DEBUG and enables DEBUG and TRACE statements to be shown for the idex-test.exe command.
- The “-h” or “--help” option shows detailed help for the specified command.

- Examples:
  - `idex-test.exe --port PCSC-C --applet_config list --en_applet_auth=readkeys` **`-h`**
  - `idex-test --port PCSC-CL --en_delete_finger 1 --en_applet_select=ibac` **`-verbose`**
  - `idex-test --port PCSC-C --iba_match --en_applet_select=ibac` **`-v`**

IBA Applet Installation

- The IBA Applet can be installed once it has been loaded. The “iba_p” and “iba” short words can be used, as in option 1 below. These short words use the default AIDs as specified in the slide on Applet Selection. For other applet AIDs, the second option should be used, which specifies the AIDs in full.

```
C:\Tools\internal-test-cs7-kepler-slc38-v7.11-4.231017-34c-15384\tools\idex-test-x64>idex-test.exe
 --port PCSC-C --applet_config install iba_p iba --en_applet_auth=readkeys
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Trying to get SCP ENC key from device...
INFO : Updating SCP ENC key
INFO : Trying to get SCP MAC key from device...
INFO : Updating SCP MAC key
INFO : Initialize Update Enroll Applet for APDU v4 card...
INFO : SCP03_GenerateExtAuth...
INFO : External Authenticate Enroll Applet for APDU v4 card...
INFO : Trying to install AID-package='iba_p' AID-applet='iba' AID-instance='iba' ...
INFO : Applet successfully installed.
RESULT : applet_config : install : SUCCESS
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

- Type one of the following commands:
  - `idex-test.exe --port PCSC-C --applet_config install iba_p iba --en_applet_auth=readkeys`

  Or
  - `idex-test.exe --port PCSC-C --applet_config install A000000905010001 A00000090501000101 A00000090501000101 --en_applet_auth=readkeys`
    - `A000000905010001` = iba package
    - `A00000090501000101` = iba applet
    - `A00000090501000101` = iba applet instance (optional)

IBA Personalization Command

- Personalization can only be done when the IBA applet is in the "SELECTABLE" state. When the IBA applet is in the "PERSONALIZED" state, it is not possible to run any of the personalization commands. The only option is to uninstall the applet, and then install the applet again.

- Personalization is done using the following command format:
  - `idex-test.exe --port PCSC-C **--iba_set_perso perso_id value1 value2 ... [last_store_data]** --en_applet_select=iba --en_applet_auth=readkeys`

    - `perso_id = Perso Tag`
    - `value1 value2 ... = byte array of raw IBA personalization values (hex number without 0x prefix)`
    - `last_store_data = switches the IBA Applet to "Personalized" Mode, usually sent as part of the last personalization command`

- Please refer to the IBA Integration Guide for more information on personalization IDs and values.

IDEX Recommended Configuration For 1 Finger

- For 1 finger, IDEX recommends 1 finger with 6 seed touches and 10 TopUp touches. These values are already set in the default configuration of the IBA. So, only the following personalization command must be run to Enable the APDU and Shareable interface and change the IBA state to "Personalized“.

- Type the following command:
  - `Enable APDU and Shareable interfaces and change the state of the IBA from "Selectable" to "Personalized"`
    - `idex-test.exe --port PCSC-C --iba_set_perso 0x9106 03 last_store_data --en_applet_select=iba --en_applet_auth=readkeys`

- The “`last_store_data`” option is used to indicate this is the last personalization command, changing the IBA applet from the "SELECTABLE" state to the “PERSONALIZED” state.

IDEX Recommended Configuration For 2 Fingers

- For 2 fingers, IDEX recommends 2 fingers with 4 seed touches and 4 TopUp touches. These values are different from those in the default configuration of the IBA. Therefore, the following personalization commands must be run to set up the seed and TopUp touches, enable the shareable interface and change the IBA state to "Personalized“.

- Type the following commands:
  - Fingers and Touches (4 touch 2 fingers)
    - idex-test.exe --port PCSC-C --iba_set_perso 0x9010 12 --en_applet_select=iba --en_applet_auth=readkeys
  - Top up Options (TopUp Power Mode = CL, TopUp touches =4, Top up enabled)
    - idex-test.exe --port PCSC-C --iba_set_perso 0x9020 44 --en_applet_select=iba --en_applet_auth=readkeys
  - Enable APDU and Shareable interfaces and change the state of the IBA from "Selectable" to "Personalized"
    - idex-test.exe --port PCSC-C --iba_set_perso 0x9106 03 last_store_data --en_applet_select=iba --en_applet_auth=readkeys

Other IBA Personalization Examples

- Please refer to the IBA Integration Guide for more information on how to set specific personalization options. The examples below may be useful for Demo purposes
- These should be set before the “last_store_data” option is used to change the IBA Applet from “SELECTABLE” to “PERSONALIZED”

- Select IBA and send Enroll Unlock Code (0x1234)
  - `idex-test.exe --port PCSC-C --iba_set_perso 0x9000 24 12 34 FF FF FF FF FF --en_applet_select=iba --en_applet_auth=readkeys`
- APDU Enroll Options (APDU Enroll and re-enroll enabled, 0 Qual touch)
  - `idex-test.exe --port PCSC-C --iba_set_perso 0x9013 C0 --en_applet_select=iba --en_applet_auth=readkeys`
- Set the Enrollment Limit to “Unlimited” (0xFF)
  - `idex-test.exe --port PCSC-C --iba_set_perso 0x9015 FF --en_applet_select=iba --en_applet_auth=readkeys`
- Change Biometric Try Count Limit to 0x7F (127)
  - `idex-test.exe --port PCSC-C --iba_set_perso 0x9104 7F --en_applet_select=iba --en_applet_auth=readkeys`

Check the IBA version

- Get the version of the IBA Applet installed.
- Type the following command:
  - `idex-test --port PCSC-C --applet_config get_version --en_applet_select=iba`

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --applet_config get_version --en_applet_select=iba
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Trying to get IBA applet version...
RESULT : applet_config : get_version : '1.7.231002-3e4-16113'
RESULT : applet_config : get_version : SUCCESS
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```


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IBA Client Applet Upload

- For testing purposes, an example IBA client is provided by IDEX which can also be uploaded and installed. The IBA client is not part of the release, so would need to be uploaded before installation.

```
C:\Tools\internal-test-cs7-kepler-slc38-v7.11-4.231017-34c-15384\tools\idex-test-x6
4>idex-test.exe --port PCSC-C --applet_config upload_applet ../../se-sdk/applets/ib
a/ibaclient/applet/com.idex.client.cap --en_applet_auth=readkeys
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Trying to get SCP ENC key from device...
INFO : Updating SCP ENC key
INFO : Trying to get SCP MAC key from device...
INFO : Updating SCP MAC key
INFO : Initialize Update Enroll Applet for APDU v4 card...
INFO : SCP03_GenerateExtAuth...
INFO : External Authenticate Enroll Applet for APDU v4 card...
INFO : Reading CAP file Header.cap ...
INFO : Reading CAP file Directory.cap ...
INFO : Reading CAP file Applet.cap ...
INFO : Reading CAP file Import.cap ...
INFO : Reading CAP file ConstantPool.cap ...
INFO : Reading CAP file Class.cap ...
INFO : Reading CAP file Method.cap ...
INFO : Reading CAP file StaticField.cap ...
INFO : Reading CAP file RefLocation.cap ...
INFO : Sending 7 APDU commands.
RESULT : applet_config : upload_applet : SUCCESS
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

- Type the following command:
  - `idex-test.exe --port PCSC-C --applet_config upload_applet ../../se-sdk/applets/iba/ibaclient/applet/com.idex.client.cap --en_applet_auth=readkeys`

IBA Client Applet Installation

- The IBA Client Applet can be installed once it has been loaded. The “ibac_p” and “ibac” short words can be used, as shown below. Multiple instances of the IBA Client Applets can be configured with different instance AIDs.
- As part of the IBA personalization, the client applet access can be restricted to one AID only or all of them.

```
C:\Tools\internal-test-cs7-kepler-slc38-v7.11-4.231017-34c-15384\tools\idex-test-x64>idex
-test.exe --port PCSC-C --applet_config install ibac_p ibac --en_applet_auth=readkeys
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Trying to get SCP ENC key from device...
INFO : Updating SCP ENC key
INFO : Trying to get SCP MAC key from device...
INFO : Updating SCP MAC key
INFO : Initialize Update Enroll Applet for APDU v4 card...
INFO : SCP03_GenerateExtAuth...
INFO : External Authenticate Enroll Applet for APDU v4 card...
INFO : Trying to install AID-package='ibac_p' AID-applet='ibac' AID-instance='ibac' ...
INFO : Applet successfully installed.
RESULT : applet_config : install : SUCCESS
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

- Type one of the following commands:
  - `idex-test.exe --port PCSC-C --applet_config install ibac_p ibac --en_applet_auth=readkeys`
  - `idex-test.exe --port PCSC-C --applet_config install A000000905010003 A00000090501000301 A00000090501000301 --en_applet_auth=readkeys`
    - `A000000905010003` = iba client package
    - `A00000090501000301` = iba client applet
    - `A00000090501000301` = iba client applet instance (optional)

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IBA Applet Delete

- The following command resets the system and deletes all applets installed on the card.
- Type the following command:
  - `idex-test.exe --port PCSC-C --applet_config delete_all_applets --en_applet_auth=readkeys`

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --applet_config delete_all_applets --en_applet_auth=readkeys
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Trying to get SCP ENC key from device...
INFO : Updating SCP ENC key
INFO : Trying to get SCP MAC key from device...
INFO : Updating SCP MAC key
INFO : Initialize Update Enroll Applet for APDU v4 card...
INFO : SCP03_GenerateExtAuth...
INFO : External Authenticate Enroll Applet for APDU v4 card...
INFO : Deleting all applets...
INFO : All applets are successfully deleted.
RESULT : applet_config : delete_all_applets : SUCCESS
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

Sensor ID and FW version

- Get the Sensor ID and FW version.
- Type the corresponding command:
  - `idex-test.exe --port PCSC-C --get_uid`
  - `idex-test.exe --port PCSC-C --get_component_version 0`
- The unique Sensor ID is noted by the Sensor UID string returned.
- The Firmware version on the Sensor is returned by the module_version string.

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --get_uid
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Trying to detect device type.
INFO : Detected Greylock device
RESULT : get_uid : sensor uid : [003231000000003D2400000030743063511000000 4FCE1400
10000200000]
RESULT : get_uid : hw uid : [312369D75E312998889AE35AD935685C]
RESULT : get_uid : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK

C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --get_component_version 0
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Requesting version for component 0 (MCU).
RESULT : get_component_version : MCU : module_prefix  : [GLBA_G07]
RESULT : get_component_version : MCU : module_version : 7.11.221209-368-4605
RESULT : get_component_version : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

Secure Channel

- This command establishes a permanent, secure channel between the SE and sensor, such that all subsequent communications are encrypted. This need only be done once.
- This command can only be run before applying operating system locks.
- Type the following command:
  - `idex-test --port PCSC-C --set_factory_keys`

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --set_factory_keys
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
RESULT : set_factory_keys : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

Calibration

- After the card is manufactured, the Sensor must be calibrated.
- Before running calibration, ensure the Sensor surface is clean and there is nothing on the surface or within 3cm of the Sensor.
- Calibration should only be done in Contact mode.
- This command can only be run before applying operating system locks.
- Type the following command:
  - `idex-test.exe --port PCSC-C --calibrate performCal force`

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --calibrate performCal force
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Trying to detect device type.
INFO : Detected Greylock device.
INFO : Executing calibration command with flags 0x03.
RESULT : calibrate : status_byte : 0x03
RESULT : calibrate : calibration :  performed
RESULT : calibrate : calibration_status :  success
RESULT : calibrate : response_data_length : 62
RESULT : calibration-results : cal_state : 000007f9
RESULT : calibrate : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```


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Built In Self Test (BIST) Pixel Testing

- Perform a Pixel test.
- Type the following command:
  - `idex-test.exe --port PCSC-C --calibrate performPixelTest bist_limits=bist-limits.cfg --en_applet_select=iba`
  - Note the number of bad pixels, which should be zero

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --calibrate performPixelTest bist_limits=bist-limits.cfg --en_applet_select=iba
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Loading production limits from file (bist-limits.cfg)...
INFO : Production limits successfully loaded from file.
INFO : Executing calibration command with flags 0x26.
INFO : Executing pixel-test with provided production limits.
RESULT : calibrate : status_byte : 0x20
RESULT : calibrate : pixel-test :  success
RESULT : calibrate : response data length : 62
RESULT : pixel-test-data : badPixelsCount : 0
RESULT : calibrate : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

Built In Self Test (BIST) Open Short Testing

- Perform an Open Short test.
- Type the following command:
  - `idex-test.exe --port PCSC-C --calibrate performOpenShort bist_limits=bist-limits.cfg --en_applet_select=iba`
  - Note the number of bad nodes, which should be zero

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --calibrate performOpenShort bist_limits=bist-limits.cfg --en_applet_select=iba
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Loading production limits from file (bist-limits.cfg)...
INFO : Production limits successfully loaded from file.
INFO : Executing calibration command with flags 0x16.
INFO : Executing open-short with provided production limits.
RESULT : calibrate : status_byte : 0x10
RESULT : calibrate : open-short :  success
RESULT : calibrate : response data length : 62
RESULT : open-short-data : totalBadNodes : 0
RESULT : open-short-data : meanColNodes : 215
RESULT : open-short-data : meanRowNodes : 205
RESULT : calibrate : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```


IDEX

Fingerprint Enrollment

- The system is set up to enroll the number of fingers, touches and qualification touches, defined in the personalization stage of the IBA applet. By default, it is set up to enroll 1 finger, 6 touches.

- Type one of the following commands:
  - `idex-test --port PCSC-C --en_enroll guided reset-biometrics --en_applet_select=iba --en_applet_pin=xxxx`
  - `idex-test --port PCSC-C --en_enroll guided reset-biometrics --en_applet_select=ibac`

- Place the finger on the Sensor and wait until prompted to enroll the next touch.
- Repeat this until all touches are captured.
- See the slide on Applet Selection for information on which of the commands can be used with the IBA

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --en_enroll guided
 reset-biometrics --en_applet_select=iba
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Sma
rtcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Requested 'reset-biometrics' option. Trying to delete all
existing templates prior to starting enrollment...
INFO : Acquire and enroll single finger: 1, touch 1
RESULT : en_single_enroll : Enrolled touch 1
```

```
INFO : Enrollment for finger 1 completed.
INFO : Skip qualification phase - number_of_qualification_passes_left is 0.
INFO : Enrollment successfully completed.
RESULT : en_enroll : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```


IDEX

Fingerprint Match

- Type the following command (Match command):
  - `idex-test --port PCSC-C --iba_match --en_applet_select=ibac`

- Then place your finger on the Sensor.
- Note that if the finger is not on the Sensor when the Match command is issued, the System will wait until this happens before proceeding with the command.
- The waiting time is a parameter that can be personalized. The default is 100ms for Contactless transactions and 4 seconds for Contact transactions.
- **The match command can only be run using an IBA Client Applet.**
- See the slide on Applet Selection for more information on the “--en_applet_select” option and the different ways to specify an IBA Client Applet.

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --iba_match --en_applet_select=ibac
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'ibac' for APDU v4 card...
INFO : Trying to verify...
RESULT : iba_match : verify : Status Byte [0xCA] : The last verification was a 'mat
ch'
INFO : Trying to check verify results...
RESULT : iba_match : check_verify_results : Status Byte [0xCA] : The last verificat
ion was a 'match'
INFO : IBA_VERIFY_RESULT_CHECK pass.
RESULT : iba_match : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

Check the number of enrolled templates

- Type one of the following commands:
  - `idex-test --port PCSC-C --en_get_status --en_applet_select=iba --en_applet_pin=1234`
    - The `--en_applet_pin=xxxx` is optional and should be added if an Enroll Unlock Code (EUC) has been configured. For more information see the slide on Applet Enroll Unlock Code.
  - `idex-test --port PCSC-C --en_get_status --en_applet_select=ibac`

- See the next slide for more information on the biometric mode stated for each finger.
- See the slide on Applet Selection for information on which of the commands can be used, depending on which interfaces are enabled in the IBA.

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --en_get_status --en_applet_select=iba
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
RESULT : en_get_status : API version                    : 1
RESULT : en_get_status : greylock uid                   : 0032310000000003D2400000030
7430635110000004FCE140010000200000
RESULT : en_get_status : total fingers enroll           : 1
RESULT : en_get_status : F1 seed enrolled touches       : 0
RESULT : en_get_status : F1 seed touches left to enroll : 6
RESULT : en_get_status : F1 topup enrolled touches      : 0
RESULT : en_get_status : F1 qualification touches left  : 0
RESULT : en_get_status : F1 qualification passes left   : 0
RESULT : en_get_status : F1 biometric mode              : enroll (0)
RESULT : en_get_status : F1 topup touches left to enroll  : 10
RESULT : en_get_status : F1 topup attempts left         : 255
RESULT : en_get_status : reenroll attempts left         : 255
RESULT : en_get_status : finger to enroll next          : 1
RESULT : en_get_status : verify mode                    : false (0)
RESULT : en_get_status : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

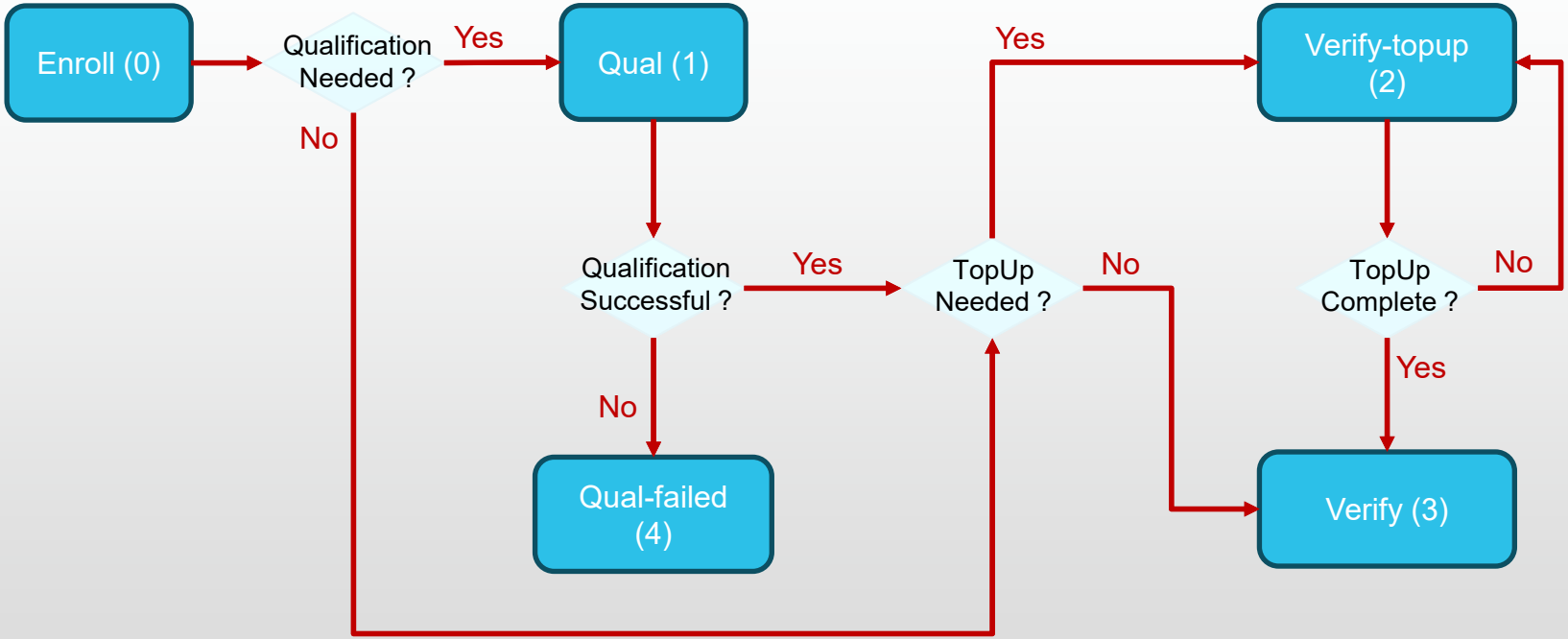
Finger Biometric Modes

- The biometric modes for fingers are as follows:
  - `0x00 = Enrollment (Enroll (0))`
    - In this mode, seed touches can still be enrolled for the finger, but no matching can be done.
    - Once all seed touches have been enrolled for the finger, the finger will move to the next mode.
  - `0x01 = Qualification (Qual (1))`
    - If qualification touches have been set during personalization, the finger will enter this mode after enrollment completes.
    - In this mode biometric verification against the stored finger templates can be performed as “trial” verifications before switching to the verification mode.
    - To move to the verification modes, the number of successful qualification touches must match the Qualification Touch Pass Threshold, before the Qualification Touch Count Limit (attempts) is reached.
    - If the Qualification Touch Count Limit has been reached, the finger will move to Qualification Failed mode (4).
  - `0x02 = Verification with top-up (Verify-topup (2))`
    - If TopUp touches have been set during personalization, the finger will enter this mode after Enrollment and Qualification has completed successfully (if configured).
    - In this mode matches can be performed with the finger and for each successful match, a TopUp template will be stored. There can be a limit to the maximum number of Top-Up attempts. This is configured during personalization.
    - To move to the next mode, the total number of successful TopUp templates must equal the TopUp touches defined during personalization.
    - Once the number of TopUp touches needed has been collected, the finger will also move to Verification mode (3). No more TopUp touches can be stored after this.

Finger Biometric Modes (Continued)

- The biometric modes for fingers are as follows:
  - `0x03 = Verification without top-up / top-up complete (Verify (3))`
    - Once all seed, qualification and TopUp touches have been completed as defined during personalization, the finger will enter this mode. In this mode the user can match the specified finger with no more templates to be added.
  - `0x04 = Qualification Failed (delete finger required) (Qual-failed (4))`
    - If the Qualification Touch Count Limit (attempts) has been reached before the Qualification Touch Pass Threshold has been reached, i.e. there are no more qualification attempts left, the finger will enter this mode.
    - This mode indicates a Failed Enrollment.
    - To retry enrollment, a reset_biometrics or delete finger command for this finger must be sent. This will put the finger back into mode 0 (Enrollment).

Finger Biometric Modes Flowchart



Read the Biometric Try Counter (BTC) from the IBA

- The Get BTC APDU is a debug command that returns the Biometric Try Count from the IBA applet.
- This indicates the remaining biometric attempts available before the card will be locked from any further biometric transactions.
- During personalization the Biometric Try Limit (BTL) is set and the BTC changes during operation. Once there is a successful match, the BTC is reset to BTL.
- If the BTC reaches zero, then biometrics are blocked until a Biometric Try Counter reset command is sent.

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --apdu 00 CA 02 00 00 --en_applet_select=iba
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Sending 5 bytes via APDU interface:
INFO : => Send : 00 CA 02 00 00
INFO : <= Recv : 7F 90 00
RESULT : apdu : apdu_response_code : 0x9000
RESULT : apdu : apdu_response_length : 3
RESULT : apdu : apdu_processing_time : 5 : milliseconds
RESULT : apdu : SUCCESS
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

- Type the following command:
  - `idex-test --port PCSC-C --apdu 00 CA 02 00 00 --en_applet_select=iba`

- The BTL can be in the range from 1 to 127, inclusive. In the example above the BTC is set to 0x7F or 127.
- Note: if the BTC is read before personalization, the value will read as 0x7F.
- For more information see the IBA Integration Guide.

IDEX

Resetting various Counters on the IBA

- To reset the Biometric Try Counter (BTC), Enroll and Lifetime counters on the IBA, use the corresponding command listed below:
  - `idex-test --port PCSC-C --iba_reset_unblock biometric --en_applet_select=iba --en_applet_auth=readkeys`
  - `idex-test --port PCSC-C --iba_reset_unblock enroll --en_applet_select=iba --en_applet_auth=readkeys`
  - `idex-test --port PCSC-C --iba_reset_unblock lifetime --en_applet_select=iba --en_applet_auth=readkeys`
- A secure channel must be established before sending this command to the applet. If not, the command will be rejected. For more information on establishing a secure channel, please refer to the Secure Channel slide.

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --iba_reset_unblock biometric --en_
applet_select=iba --en_applet_auth
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 54
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Initialize Update Enroll Applet for APDU v4 card...
INFO : SCP03_GenerateExtAuth...
INFO : External Authenticate Enroll Applet for APDU v4 card
INFO : reset_unblock tagId=0x9105...
INFO : TagId 0x9105 successfully reseted.
RESULT : iba_reset_unblock : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --iba_reset_unblock enroll --en_app
let_select=iba --en_applet_auth
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 54
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Initialize Update Enroll Applet for APDU v4 card...
INFO : SCP03_GenerateExtAuth...
INFO : External Authenticate Enroll Applet for APDU v4 card
INFO : reset_unblock tagId=0x9009...
INFO : TagId 0x9009 successfully reseted.
RESULT : iba_reset_unblock : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

```
C:\Tools\idex-test-x64>idex-test --port PCSC-C --iba_reset_unblock lifetime --en_a
pplet_select=iba --en_applet_auth
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
INFO : Initialize Update Enroll Applet for APDU v4 card...
INFO : SCP03_GenerateExtAuth...
INFO : External Authenticate Enroll Applet for APDU v4 card...
INFO : reset_unblock tagId=0x9016...
INFO : TagId 0x9016 successfully reseted.
RESULT : iba_reset_unblock : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```


IDEX

Delete Finger Templates

- The templates for a finger (or all fingers) can be erased after enrollment.
- This command only works if it has been enabled during personalization (Non-Sleeve Enroll Options : Delete Enable and Enroll Enable). Please refer to the IBA Integration Guide for more information.
- For a 2 finger enrollment, if a single finger is removed but the other finger remains, then it will still be possible to perform biometric user verification using the remaining finger.

```
C:\Tools\idex-test-x64>idex-test --port PCSC-CL --en_delete_finger 1 --en_applet_sele
ct=iba
INFO : v4 APDUs version will be used to support applet commands.
INFO : Trying to connect to 'PCSC-CL' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422CL Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Select Applet type 'iba' for APDU v4 card...
RESULT : en_delete_finger : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

- Type one of the following commands, where N is the number of the finger you want to delete the templates from:
  - `idex-test --port PCSC-CL --en_delete_finger N --en_applet_select=iba --en_applet_pin=1234`
  - `idex-test --port PCSC-CL --en_delete_finger N --en_applet_select=ibac`
  - `If N is set to 0 all existing templates currently enrolled for all fingers will be removed.`

Reset Biometrics

- This command resets all templates for all fingers. This puts all fingers back into the enroll (0) biometric mode. The number of seed touches left to enroll for all fingers resets back to the value defined by the IBA and the seed touches enrolled is set back to 0 for all fingers.
- Type the following command:
  - `idex-test.exe --port PCSC-C --reset_biometrics`

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --reset_biometrics
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Sending RESET_BIOMETRICS command...
RESULT : reset_biometrics : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

Reset

- If the SE and Sensor are out of sync, issue a reset command. This command erases the secure channel keys and resets the templates.
- Type the following command:
  - `idex-test.exe --port PCSC-C --reset`

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --reset
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Sending RESET_KEY command...
RESULT : reset : DONE
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

Set new Contactless UID for ATQA

- The following commands can be used to program a 4 byte fixed UID SAK=08 in Contact Mode. See below example setting a UID of 0123:
  - `idex-test.exe --port PCSC-C --apdu b1 05 30 80 07 7F 01 04 9f 11 01 C4`
  - `idex-test.exe --port PCSC-C --apdu b1 05 30 80 0A 7F 01 07 9f 1a 04 00 11 22 33`
  - `idex-test.exe --port PCSC-C --apdu b1 05 30 80 07 7F 01 04 9f 22 01 08`
- The following commands can be used to program a 7 byte Fixed UID SAK=08 in Contact Mode. See below example setting a UID of 0123456:
  - `idex-test.exe --port PCSC-C --apdu b1 05 30 80 07 7F 01 04 9f 11 01 C8`
  - `idex-test.exe --port PCSC-C --apdu b1 05 30 80 0D 7F 01 0a 9f 1a 07 00 11 22 33 44 55 66`
  - `idex-test.exe --port PCSC-C --apdu b1 05 30 80 07 7F 01 04 9f 22 01 08`

- Need to add note about ISO1443 CL compatibility after these changes … i.e. it will not work with a standard reader anymore

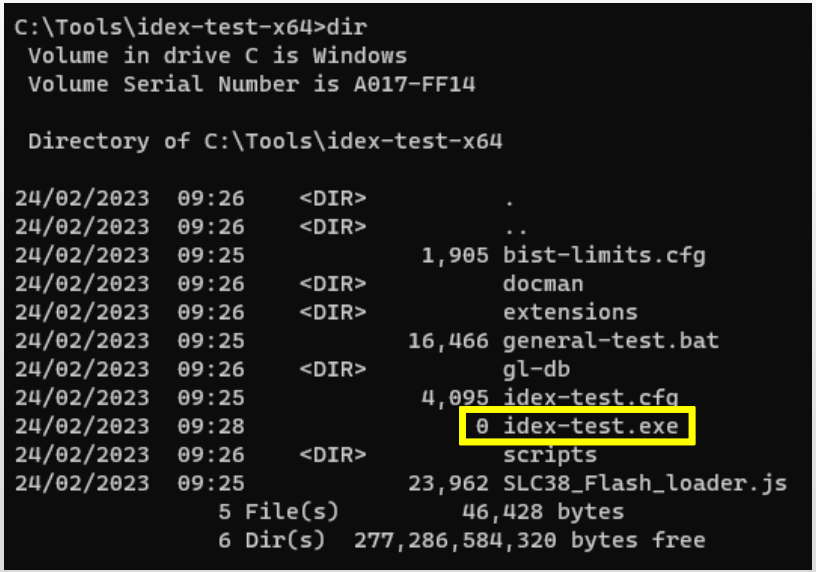
Set new Contactless UID for ATQA

- Re-read the value of Contactless UID for ATQA:
  - `idex-test.exe --port PCSC-C --apdu b1 05 30 01 02 9f 1A`
- The example below shows a UID of 0123456:

```
C:\Tools\idex-test-x64>idex-test.exe --port PCSC-C --apdu b1 05 30 01 02 9f 1A
INFO : Trying to connect to 'PCSC-C' device...
INFO : SCardEstablishContext : SCard OK
INFO : SCardListReaders : SCard OK
INFO : Selected Reader: [SN unknown] [HID Global OMNIKEY 5422 Smartcard Reader 0]
INFO : SCardGetStatusChange : SCard OK
INFO : Card present.
INFO : SCardConnect : SCard OK
INFO : Card Activated via  T=1 protocol
INFO : Sending 7 bytes via APDU interface:
INFO : => Send : B1 05 30 01 02 9F 1A
INFO : <= Recv : 9F 1A 0A 00 11 22 33 44 55 66 00 00 00 90 00
RESULT : apdu : apdu_response_code : 0x9000
RESULT : apdu : apdu_response_length : 15
RESULT : apdu : apdu_processing_time : 3 : milliseconds
RESULT : apdu : SUCCESS
INFO : Disconecting from card reader (dwDisposition=0).
INFO : SCardDisconnect : SCard OK
```

FAQs

- If idex-test.exe is not working, do a “dir” command and check that the size of idex-test.exe is not 0 bytes. If it is, then delete and re-extract it from the ZIP.



Version error in CPLC data

- There is a minor discrepancy in the CPLC data field in the Operating System
- To get the correct version of the OS, please use the idex-test.exe command below
  - `idex-test.exe --port PCSC-CL --cos get_version`

idex-test.exe --port PCSC-CL --cos get_version	idex-test.exe --port PCSC-CL --cos get_cplc
RESULT : cos : get_version : Product Name : IOT-IDEX (IPA2) RESULT : cos : get_version : Product Version : 4.0.8 RESULT : cos : get_version : Java Card Version : JC-3.0.5 RESULT : cos : get_version : Global Platform Version : GP-2.3.1	RESULT : cos : get_cplc : ic fabricator : 4090 : RESULT : cos : get_cplc : ic type : 3822 : RESULT : cos : get_cplc : os id : 4A4E : 'JN' RESULT : cos : get_cplc : os date : 3339 : 05 Dec 2023 RESULT : cos : get_cplc : os level : 4007 : 4.0.7

Correct version showing

Not correct

Thank you

IDEX