



# NT4H GUI example user manual

## v1.1

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# 1. Introduction

The NT4H is a new series of NX NTAG® cards.

There is NTAG413 DNA, NTAG424 DNA, and NTAG424 TT DNA.

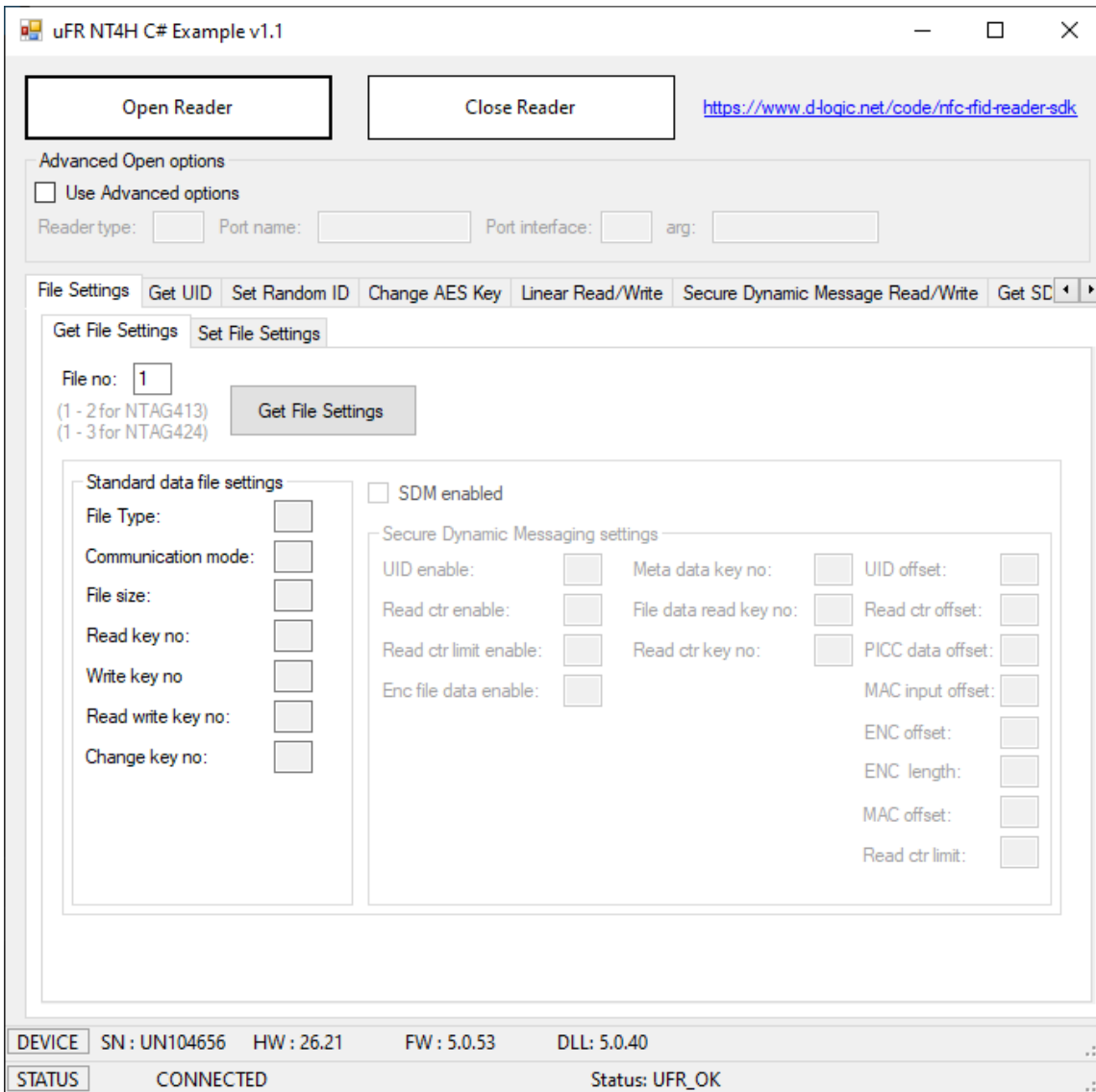
NTAG424 DNA is fully compliant with the NFC Forum Type 4 Tag IC.

They come with AES-128 cryptographic operation and a new Secure Unique NFC (SUN) Message.

# 2. Application overview

Link: [https://www.d-logic.net/code/nfc-rfid-reader-sdk/ufr-examples-c\\_sharp-nt4h](https://www.d-logic.net/code/nfc-rfid-reader-sdk/ufr-examples-c_sharp-nt4h)

In the following picture, is the layout for the application where simple reader opening mode was used..



## 2.1 Get File Settings

The NTAG413 has two standard data files:

- File number 1 is Capability Container file (32 bytes)
- File number 2 is NDEF file (128 bytes)

The NTAG424 has three standard data files:

- File number 1 is Capability Container file (32 bytes)
- File number 2 is NDEF file (256 bytes)
- File number 3 is proprietary file (128 bytes)

Number of returned parameters varies.

If the current file is standard data file with AES secure messaging, then the following information is obtained:

- File type
- Communication mode
- File access rights
- File size

Example:

File number = 3 (NTAG424 proprietary file)

Communication mode is enciphered (0x03)

Secure dynamic messaging is disabled

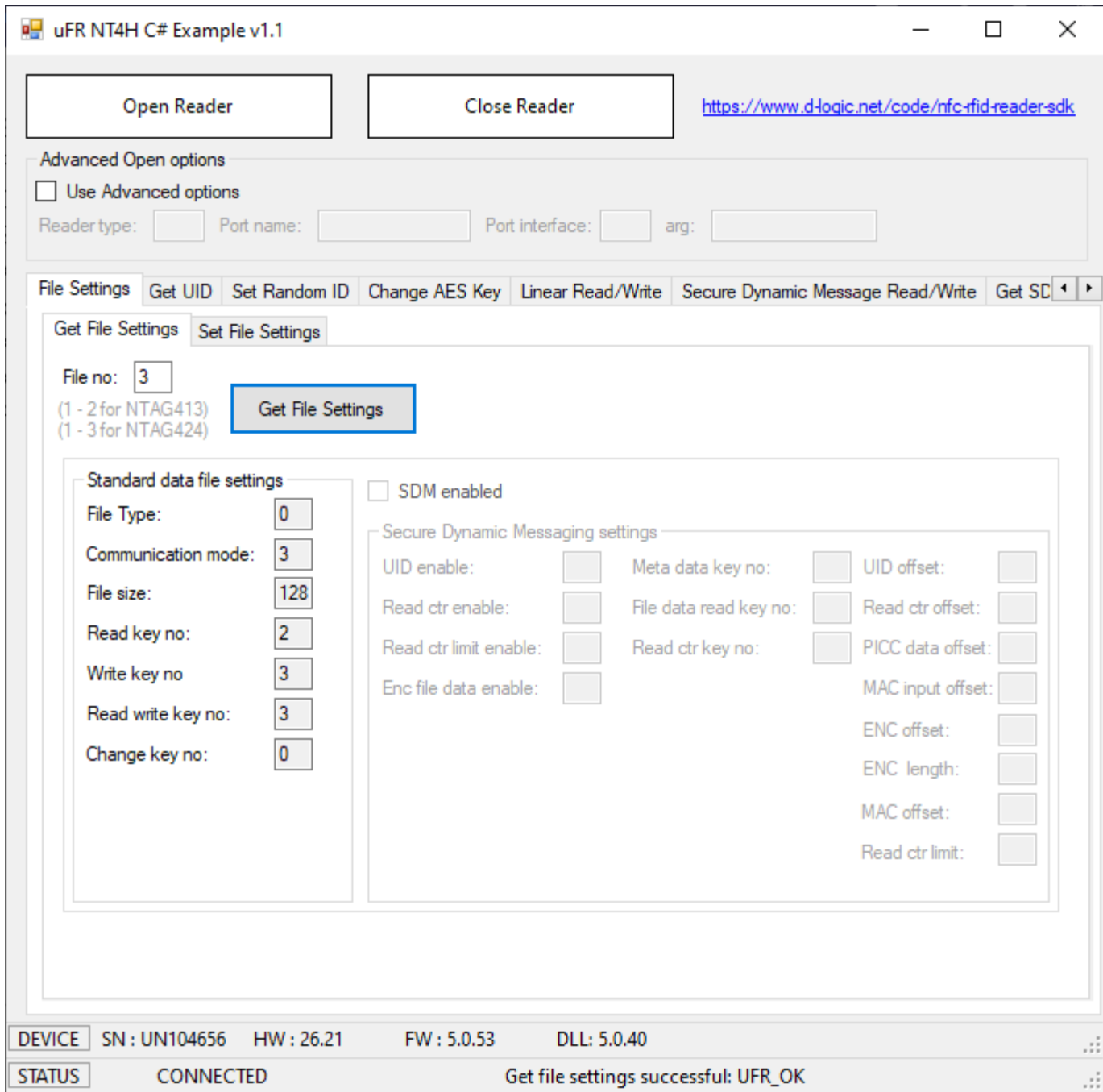
Key number for read is 2

Key number for write is 3

Key number for read/write is 3

Key number for change file settings is 0

File size is 128 bytes



If the current file is a standard data file **with secure dynamic messaging** then there is more information.

Example:

File number is 2 (NDEF file)

Secure dynamic messaging is enabled

Free access for reading and writing operations (key 0x0E)

UID mirroring is enabled

SDM reading counter is enabled

SDM reading counter limit is disabled.

Encrypted part of file data used.

Key number for SDM meta read is 2 (UID, SDM reading counter, PICC data, MAC)

Key number for encrypted part of file data is 2

SDM reading counter can read without authentication

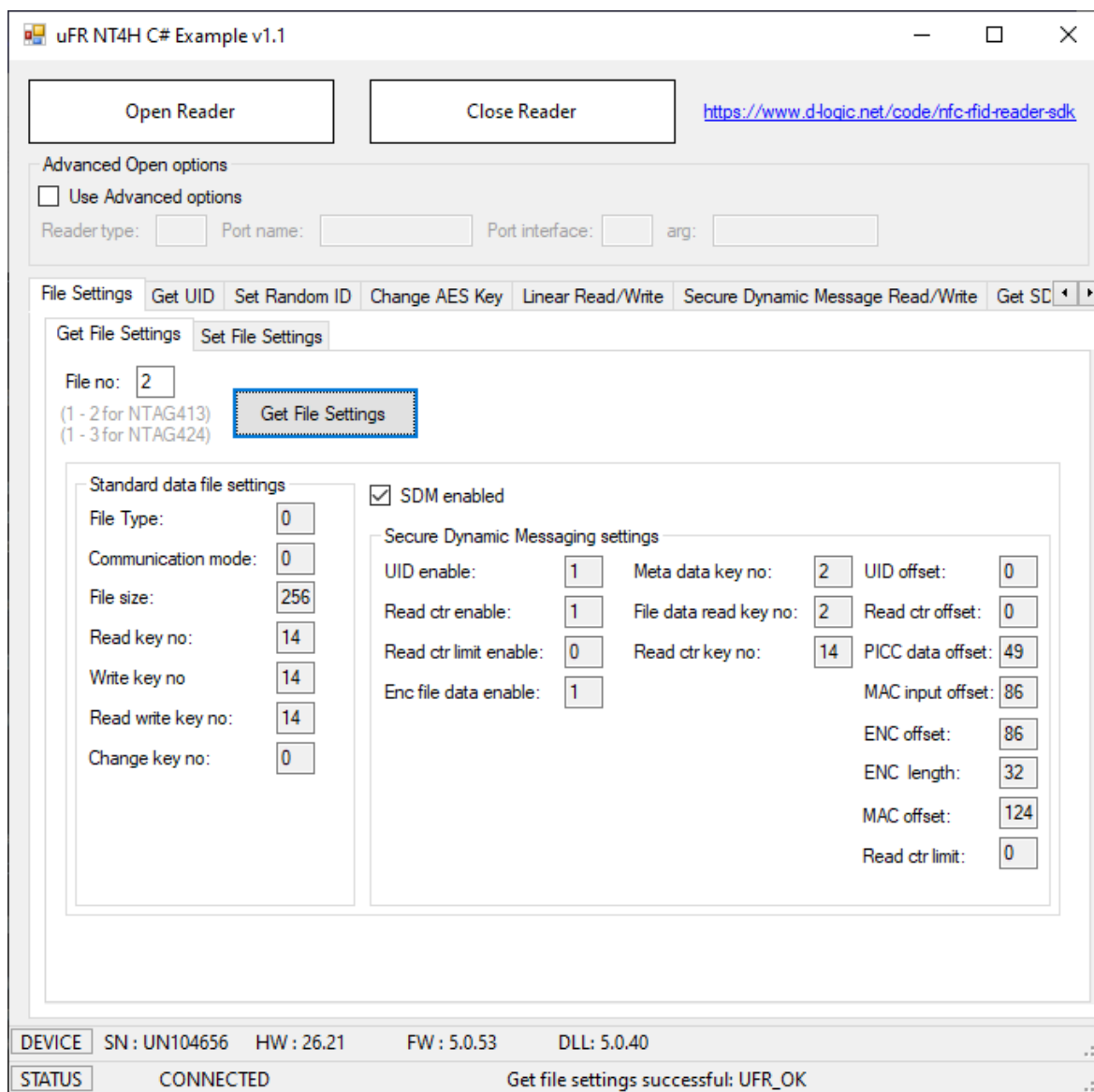
PICC data offset (encrypted UID and SDM reading counter) is 49

MAC input offset is 86

Encrypted part of the file data offset is 86

Encrypted part of the file data length is 32

MAC offset is 124



## 2.2 Set file settings

Due to the large number of parameters, there are two functions for setting file parameters.

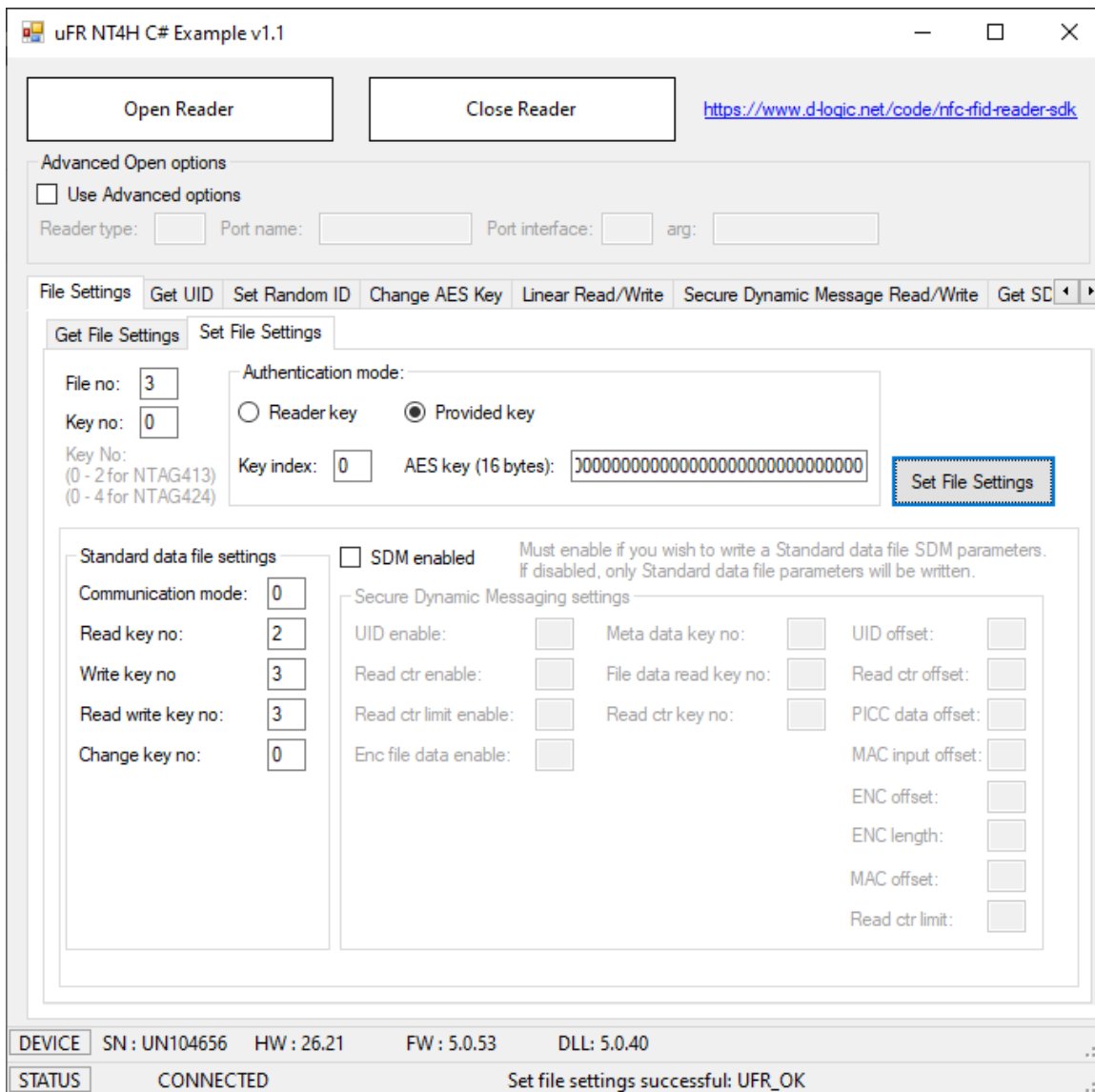
Example 1:

Standard data file

File number (Proprietary file)

Current communication mode is enciphered and the change key number is 0.

New settings are: plain communication mode, read key 2, write key 3, read/write key 3, change key 0, and authentication mode provided key.



The screenshot shows the 'uFR NT4H C# Example v1.1' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/rfc-fid-reader-sdk>. Below this is the 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A menu bar includes 'File Settings', 'Get UID', 'Set Random ID', 'Change AES Key', 'Linear Read/Write', 'Secure Dynamic Message Read/Write', and 'Get SD'. The 'Set File Settings' tab is active, showing 'File no: 3', 'Key no: 0', and 'Key No: (0 - 2 for NTAG413) (0 - 4 for NTAG424)'. The 'Authentication mode' section has 'Reader key' and 'Provided key' (selected) radio buttons, with 'Key index: 0' and 'AES key (16 bytes): 00000000000000000000000000000000'. A 'Set File Settings' button is highlighted. The 'Standard data file settings' section includes 'Communication mode: 0', 'Read key no: 2', 'Write key no: 3', 'Read write key no: 3', and 'Change key no: 0'. The 'SDM enabled' checkbox is unchecked, with a note: 'Must enable if you wish to write a Standard data file SDM parameters. If disabled, only Standard data file parameters will be written.' The 'Secure Dynamic Messaging settings' section contains various enable/disable checkboxes and offset/key number input fields. At the bottom, a status bar shows 'DEVICE SN: UN104656 HW: 26.21 FW: 5.0.53 DLL: 5.0.40' and 'STATUS CONNECTED Set file settings successful: UFR\_OK'.

Example 2:

Standard data file with secure dynamic messaging. NTAG424 TT.

File number 2.

Communication mode plain, SDM enabled, Read key 14 (free access), Write key 14, Read/Write key 14, and the Change key 0.

SDM options:

UID mirroring: enabled

Read counter: enabled

Read counter limit: disabled

Encrypted part of file data: disabled

SDM access rights (0x0E free/plain, 0x0F no access/no data):

SDM meta read: 0x0E

SDM file key: 0x00

SDM reading counter read key: 0x0E

UID offset: 26

Read counter offset: 41

Mac input data offset: 57

MAC offset: 57



uFR NT4H C# Example v1.1

Open Reader      Close Reader      <https://www.d-logic.net/code/nfc-fid-reader-sdk>

Advanced Open options  
 Use Advanced options  
 Reader type:  Port name:  Port interface:  arg:

File Settings    Get UID    Set Random ID    Change AES Key    Linear Read/Write    Secure Dynamic Message Read/Write    Get SD

Get File Settings    Set File Settings

File no:   
 Key no:   
 Key No:  
 (0 - 2 for NTAG413)  
 (0 - 4 for NTAG424)

Authentication mode:  
 Reader key     Provided key

Key index:     AES key (16 bytes):    

Standard data file settings  
 Communication mode:   
 Read key no:   
 Write key no:   
 Read write key no:   
 Change key no:

SDM enabled    Must enable if you wish to write a Standard data file SDM parameters. If disabled, only Standard data file parameters will be written.

Secure Dynamic Messaging settings  
 UID enable:     Meta data key no:     UID offset:   
 Read ctr enable:     File data read key no:     Read ctr offset:   
 Read ctr limit enable:     Read ctr key no:     PICC data offset:   
 Enc file data enable:     MAC input offset:   
 ENC offset:   
 ENC length:   
 MAC offset:   
 Read ctr limit:

DEVICE    SN : UN104656    HW : 26.21    FW : 5.0.53    DLL : 5.0.40

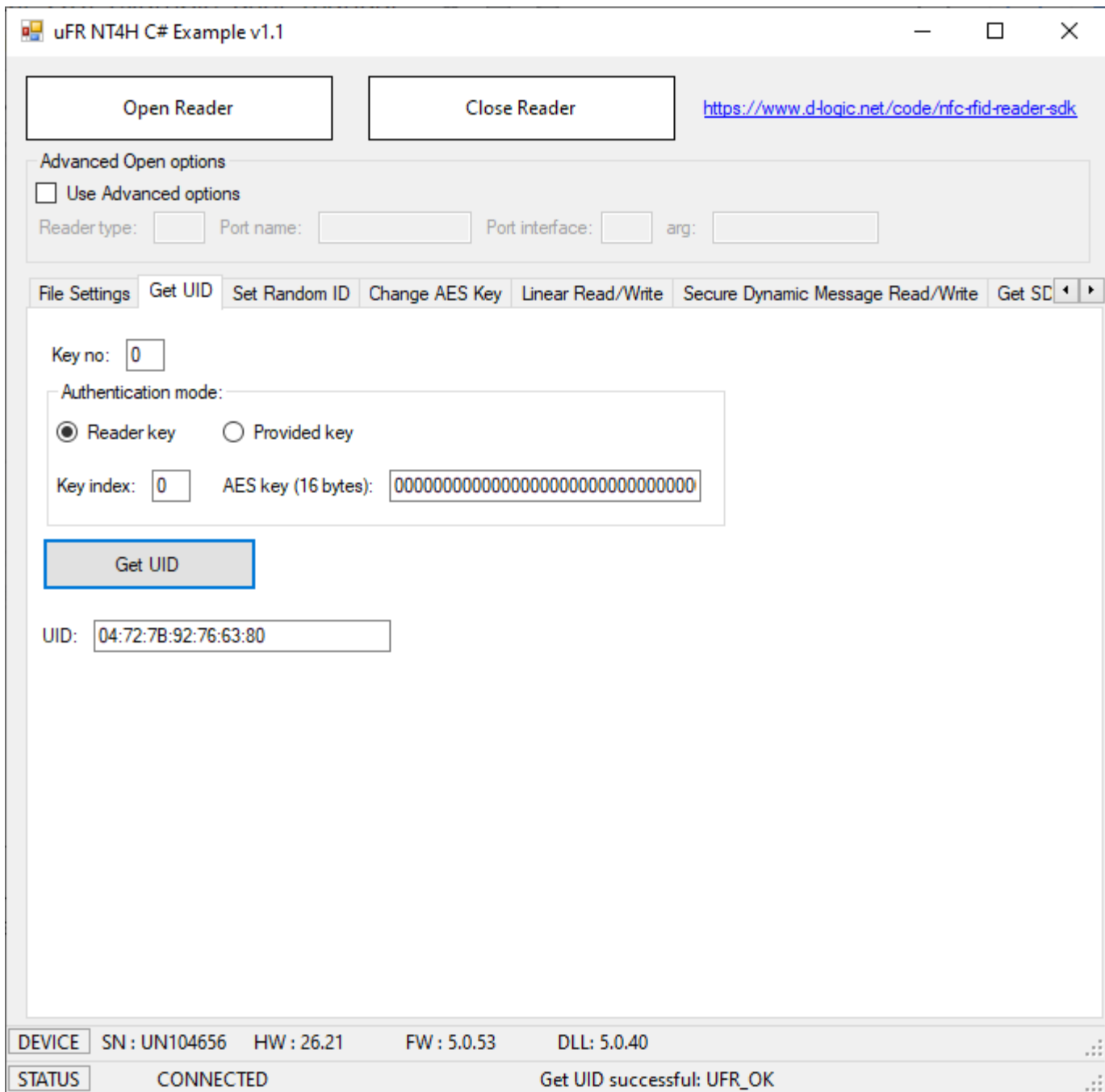
STATUS    CONNECTED    Set file settings successful: UFR\_OK

## 2.3 Get UID

NTAG424 DNA only.

Function returns 7 bytes long card UID. This is useful if the Random ID option is activated.

Valid authentication with any card key is required.



uFR NT4H C# Example v1.1

Open Reader Close Reader <https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

Use Advanced options

Reader type:  Port name:  Port interface:  arg:

File Settings Get UID Set Random ID Change AES Key Linear Read/Write Secure Dynamic Message Read/Write Get SC

Key no:

Authentication mode:

Reader key  Provided key

Key index:  AES key (16 bytes):

Get UID

UID:

DEVICE SN : UN104656 HW : 26.21 FW : 5.0.53 DLL : 5.0.40

STATUS CONNECTED Get UID successful: UFR\_OK

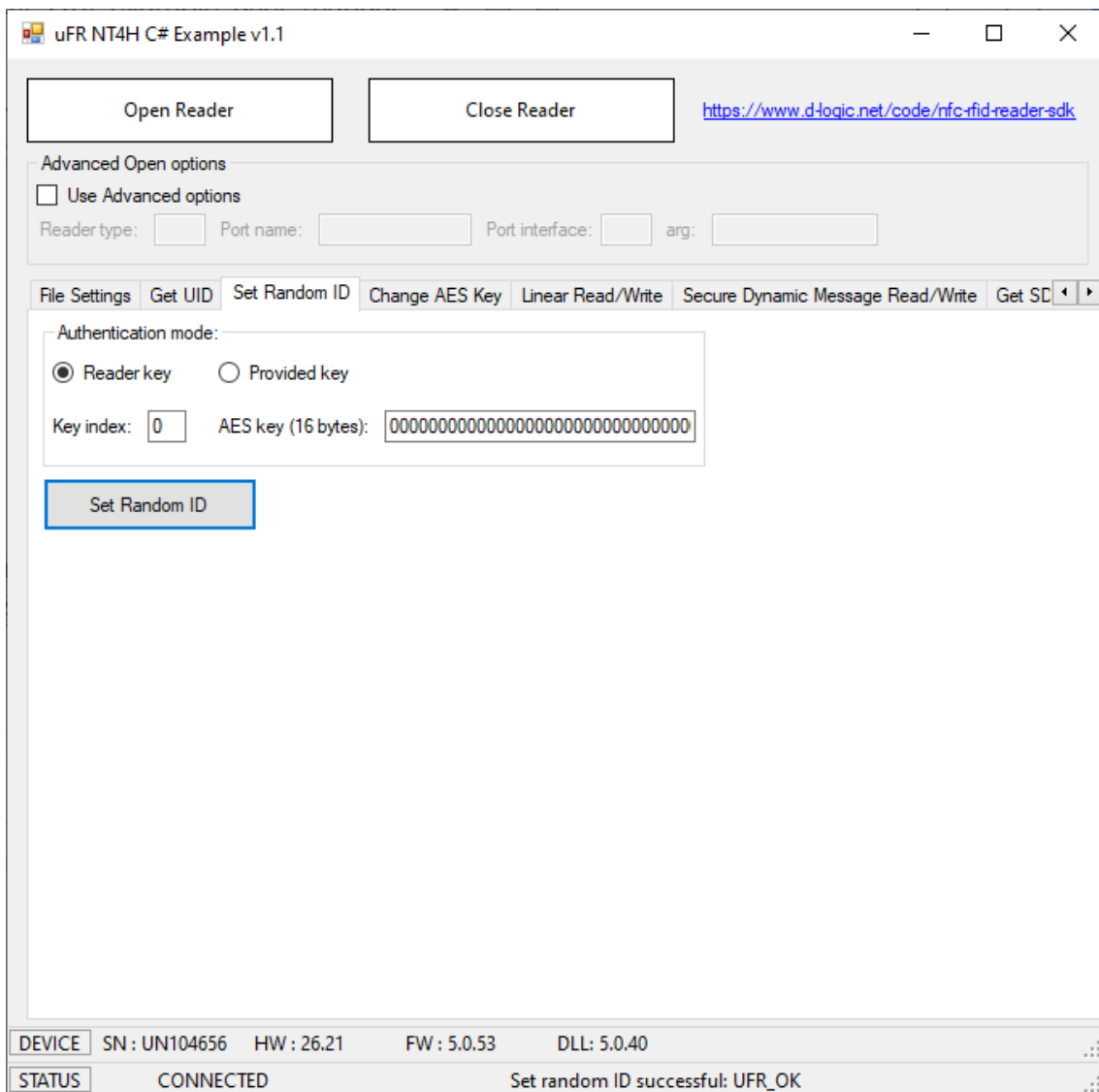
## 2.4 Set Random ID

NTAG424 DNA only.

The card returns 4 bytes random ID instead of 7 bytes unique ID.

Warning: this operation is irreversible.

Authentication with application master key (number 0) is required.



## 2.5 Change AES key

Authentication with application master key (number 0) is required.  
If the key which will be changed is not the master key, then the old key value is required.

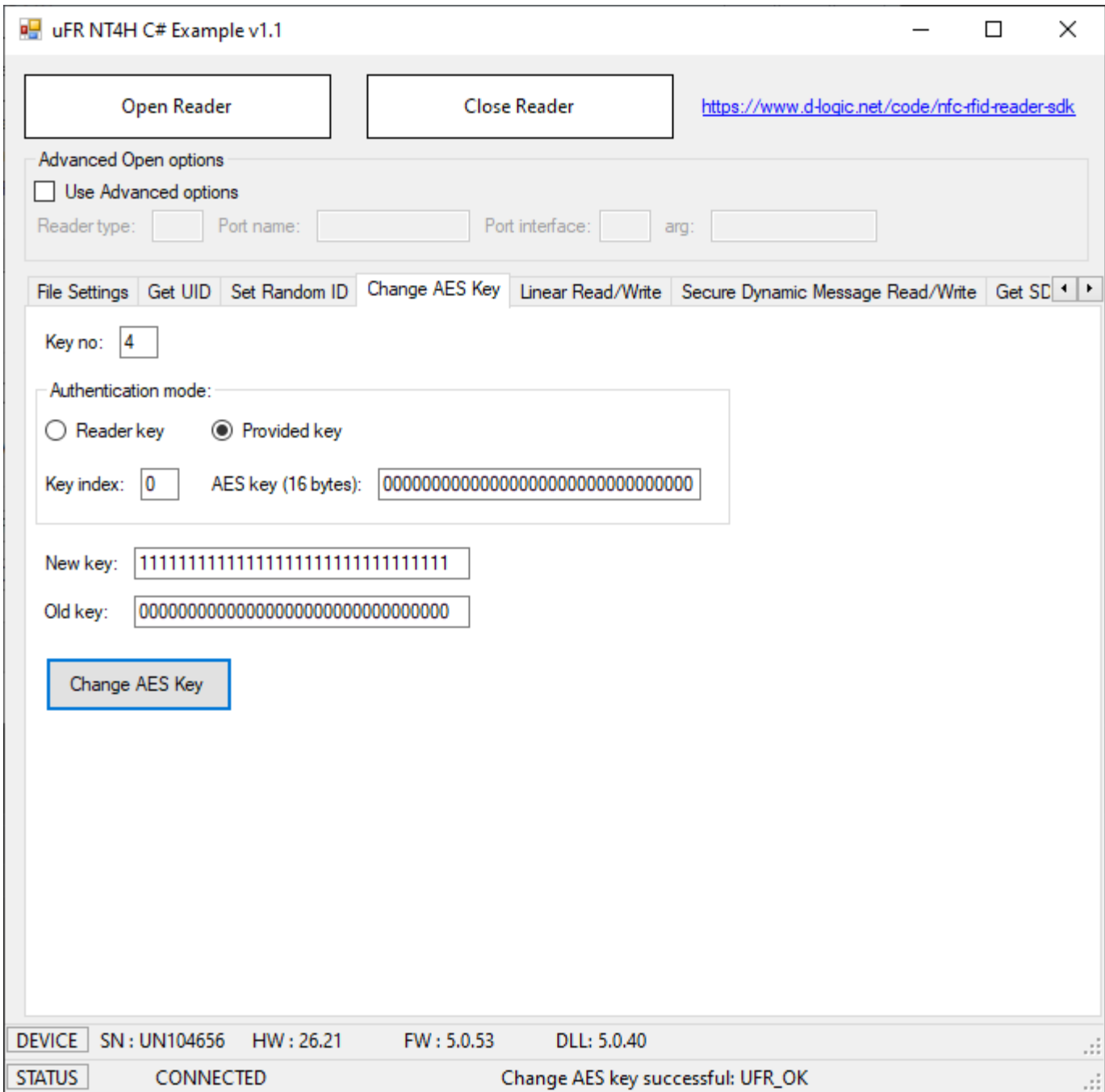
Example:

Key number 4.

Application master key value: 0x

Old key 4 value: 0x00000000000000000000000000000000

New key 4 value: 0x11111111111111111111111111111111



## 2.6 Linear read

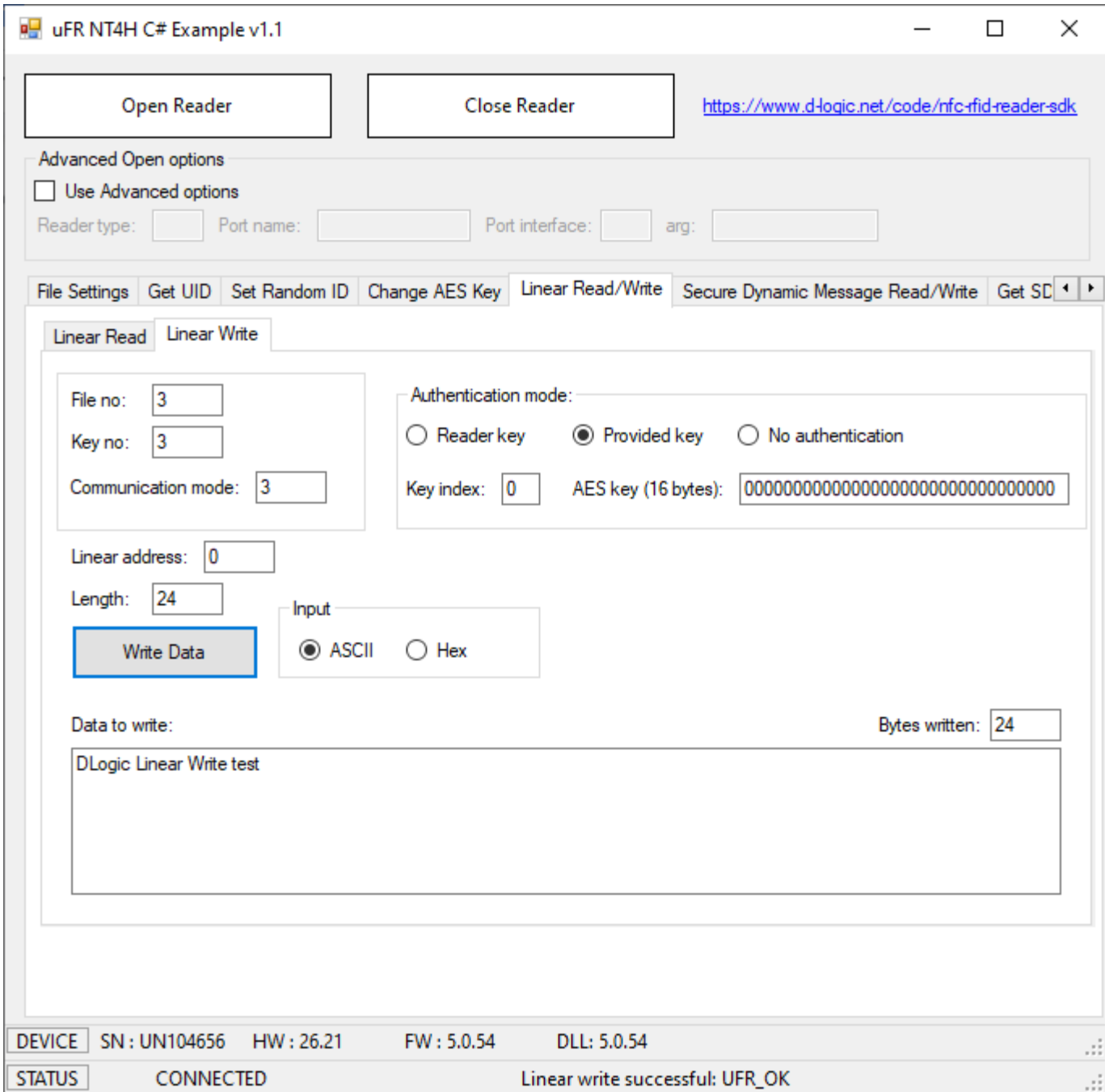
Function reads data from the file.

Required parameters are

- File number
- Key number for read, or read/write access
- Communication mode
- Authentication mode (if read key is 14 then no authentication required)
- Start address (0 - max address)
- Length of data



- Authentication mode (if read key is 14 then no authentication required)
- Start address (0 - max address)
- Length of data

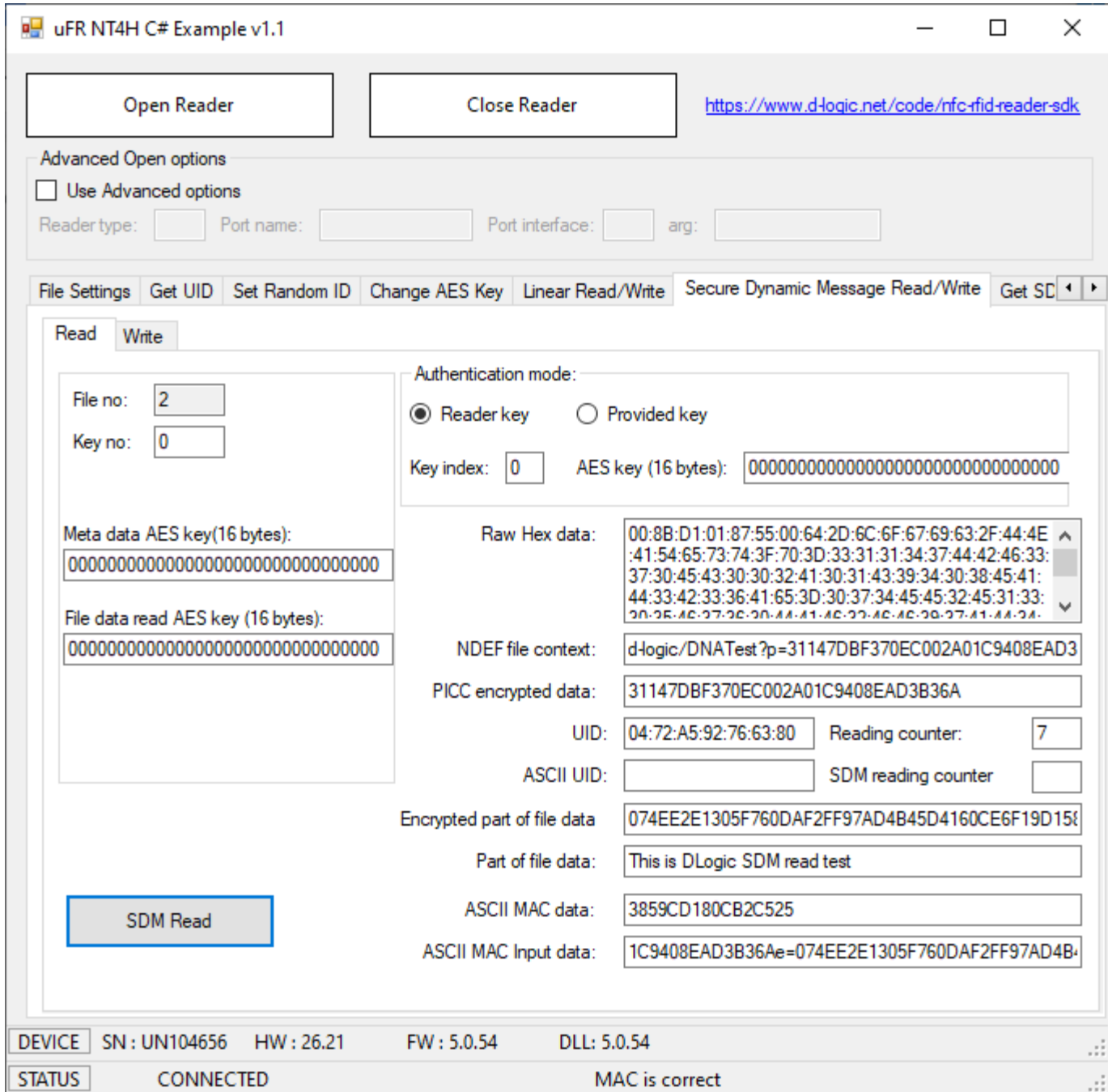


The screenshot shows the 'uFR NT4H C# Example v1.1' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/nfc-fid-reader-sdk>. Below this is an 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A menu bar contains 'File Settings', 'Get UID', 'Set Random ID', 'Change AES Key', 'Linear Read/Write', 'Secure Dynamic Message Read/Write', and 'Get SD'. The 'Linear Read/Write' menu is open, showing 'Linear Read' and 'Linear Write' tabs. The 'Linear Write' tab is active, displaying fields for 'File no: 3', 'Key no: 3', and 'Communication mode: 3'. The 'Authentication mode' section has radio buttons for 'Reader key', 'Provided key' (selected), and 'No authentication'. Below this are 'Key index: 0' and 'AES key (16 bytes): 00000000000000000000000000000000'. The 'Linear address' is 0, and 'Length' is 24. An 'Input' section has radio buttons for 'ASCII' (selected) and 'Hex'. A 'Write Data' button is highlighted. The 'Data to write' field contains 'DLogic Linear Write test'. The 'Bytes written' field shows 24. At the bottom, a status bar displays: 'DEVICE SN: UN104656 HW: 26.21 FW: 5.0.54 DLL: 5.0.54' and 'STATUS CONNECTED Linear write successful: UFR\_OK'.

## 2.8 Secure Dynamic Message Read

File must be in Secure dynamic message mode (SDM enabled), and read access must be free (key no 14, no authentication required)

Example for NTAG424



The screenshot shows the 'uFR NT4H C# Example v1.1' application window. It features a top navigation bar with buttons for 'Open Reader', 'Close Reader', and a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below this is a section for 'Advanced Open options' with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A menu bar includes 'File Settings', 'Get UID', 'Set Random ID', 'Change AES Key', 'Linear Read/Write', 'Secure Dynamic Message Read/Write', and 'Get SD'. The 'Secure Dynamic Message Read/Write' menu item is selected, and the 'Read' sub-tab is active.

The 'Read' configuration area includes:
 

- File no: 2
- Key no: 0
- Authentication mode:  Reader key,  Provided key
- Key index: 0
- AES key (16 bytes): 00000000000000000000000000000000
- Meta data AES key (16 bytes): 00000000000000000000000000000000
- File data read AES key (16 bytes): 00000000000000000000000000000000
- Raw Hex data: 00:8B:D1:01:87:55:00:64:2D:6C:6F:67:69:63:2F:44:4E:41:54:65:73:74:3F:70:3D:33:31:31:34:37:44:42:46:33:37:30:45:43:30:30:32:41:30:31:43:39:34:30:38:45:41:44:33:42:33:36:41:65:3D:30:37:34:45:45:32:45:31:33:20:2E:AC:27:2C:20:AA:A1:AC:27:AC:AC:20:27:A1:AA:2A
- NDEF file context: d-logic/DNATest?p=31147DBF370EC002A01C9408EAD3
- PICC encrypted data: 31147DBF370EC002A01C9408EAD3B36A
- UID: 04:72:A5:92:76:63:80
- Reading counter: 7
- ASCII UID: (empty)
- SDM reading counter: (empty)
- Encrypted part of file data: 074EE2E1305F760DAF2FF97AD4B45D4160CE6F19D15f
- Part of file data: This is DLogic SDM read test
- ASCII MAC data: 3859CD180CB2C525
- ASCII MAC Input data: 1C9408EAD3B36Ae=074EE2E1305F760DAF2FF97AD4B

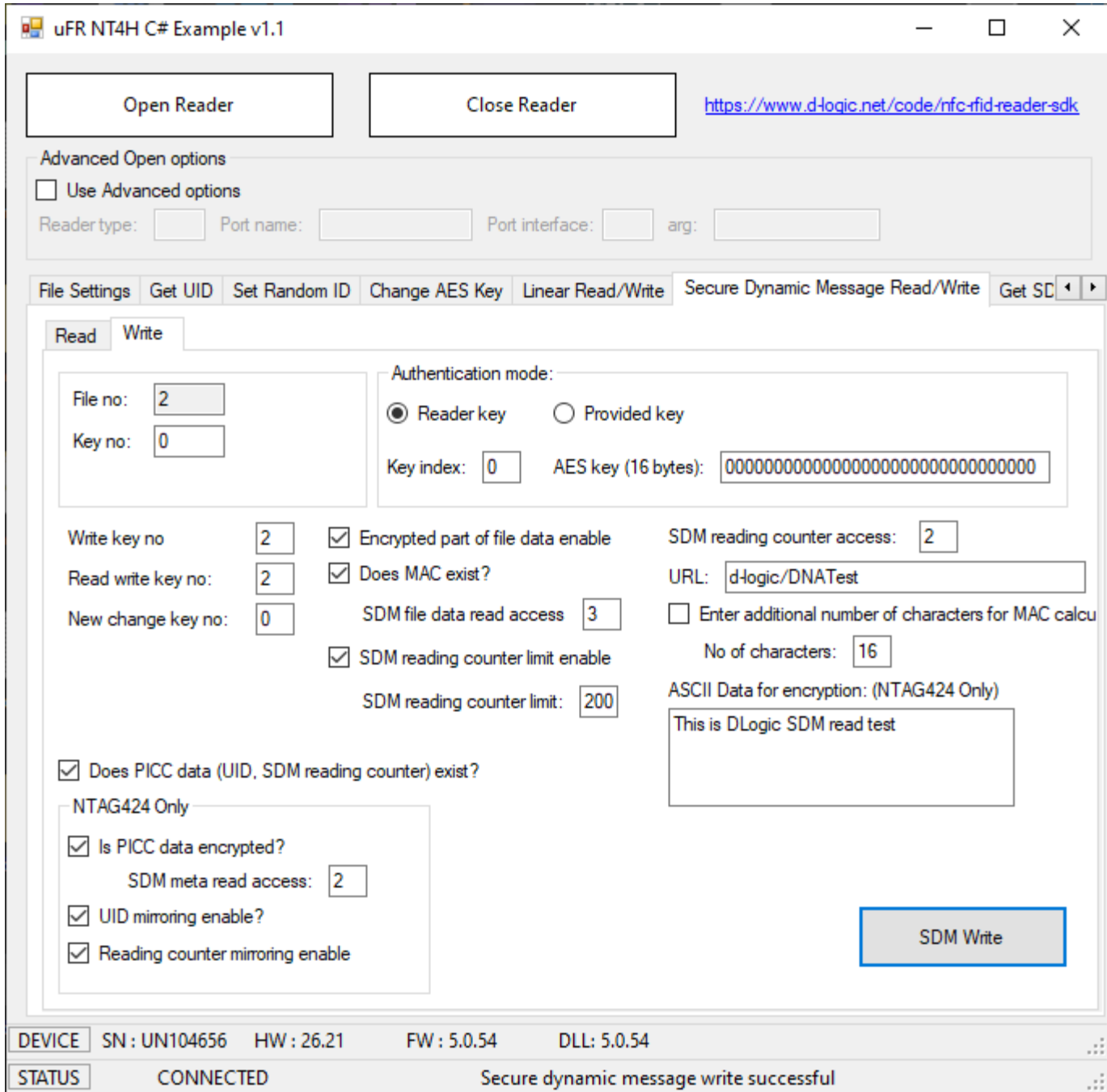
A 'SDM Read' button is located at the bottom left of the configuration area. The bottom status bar displays:
 

- DEVICE: SN : UN104656 HW : 26.21 FW : 5.0.54 DLL : 5.0.54
- STATUS: CONNECTED MAC is correct



## 2.9 Secure Dynamic Message Write

File must be in Secure dynamic message mode (SDM enabled), and read access must be free (key no 14, no authentication required)



The screenshot shows the 'uFR NT4H C# Example v1.1' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, along with a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below this is the 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A menu bar contains 'File Settings', 'Get UID', 'Set Random ID', 'Change AES Key', 'Linear Read/Write', 'Secure Dynamic Message Read/Write', and 'Get SD'. The 'Secure Dynamic Message Read/Write' menu item is selected, and the 'Write' tab is active. The 'Write' configuration area includes:
 

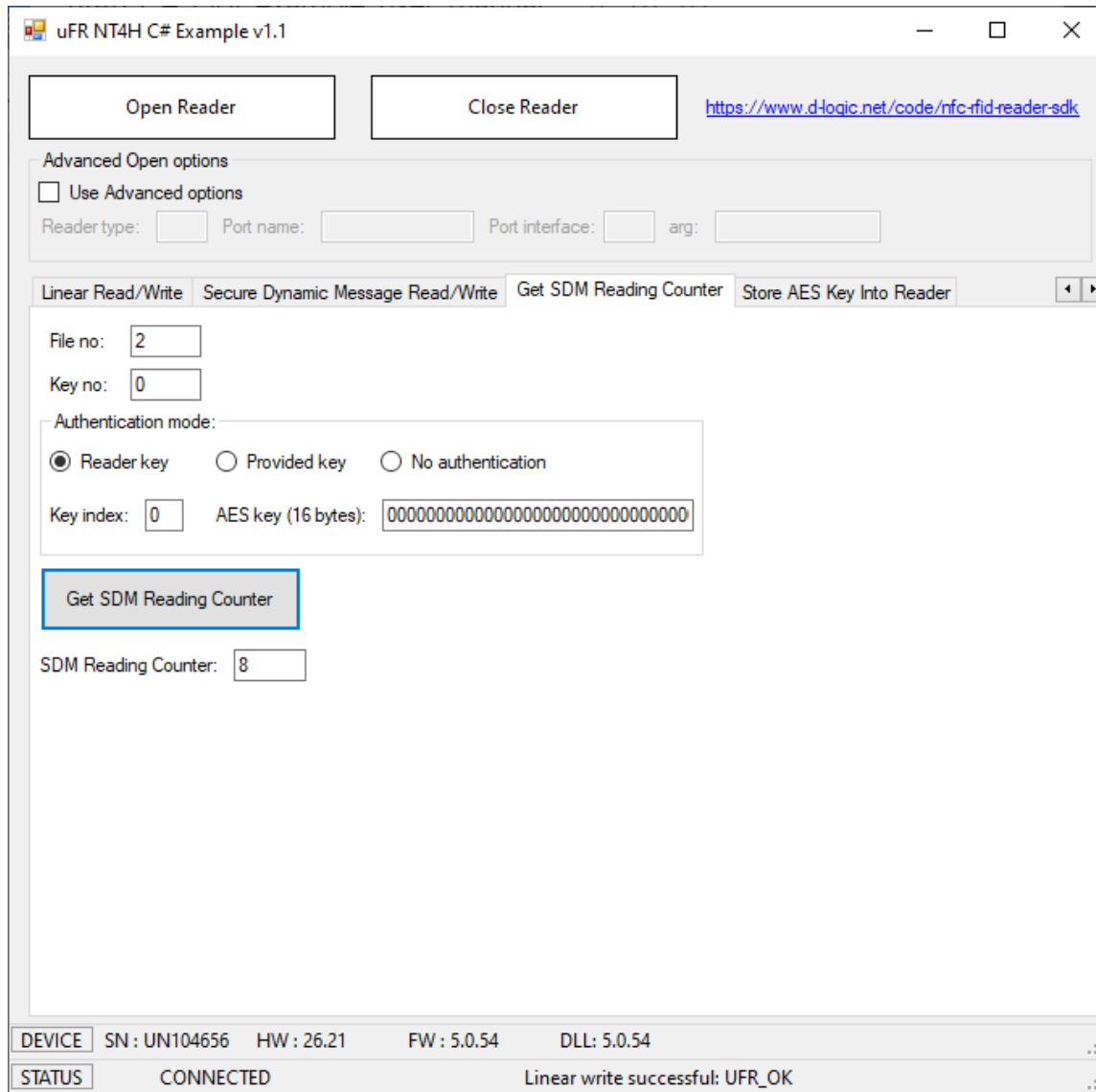
- File no: 2, Key no: 0
- Authentication mode:  Reader key,  Provided key
- Key index: 0, AES key (16 bytes): 00000000000000000000000000000000
- Write key no: 2, Read write key no: 2, New change key no: 0
- Encrypted part of file data enable
- Does MAC exist?
- SDM file data read access: 3
- SDM reading counter limit enable
- SDM reading counter limit: 200
- SDM reading counter access: 2
- URL: d-logic/DNATest
- Enter additional number of characters for MAC calcul
- No of characters: 16
- ASCII Data for encryption: (NTAG424 Only)
- This is DLogic SDM read test
- Does PICC data (UID, SDM reading counter) exist?
- NTAG424 Only:
  - Is PICC data encrypted? SDM meta read access: 2
  - UID mirroring enable?
  - Reading counter mirroring enable
- SDM Write button

 At the bottom, a status bar shows:
 

- DEVICE: SN : UN104656 HW : 26.21 FW : 5.0.54 DLL : 5.0.54
- STATUS: CONNECTED Secure dynamic message write successful

## 2.10 Get SDM Reading Counter

The Secure dynamic message reading counter exists only if SDM is enabled in file settings. It depends on the setting of SDM reading counter acces, authentication required or not.



## 2.11 Tag Tamper Enable

Added in software v1.2

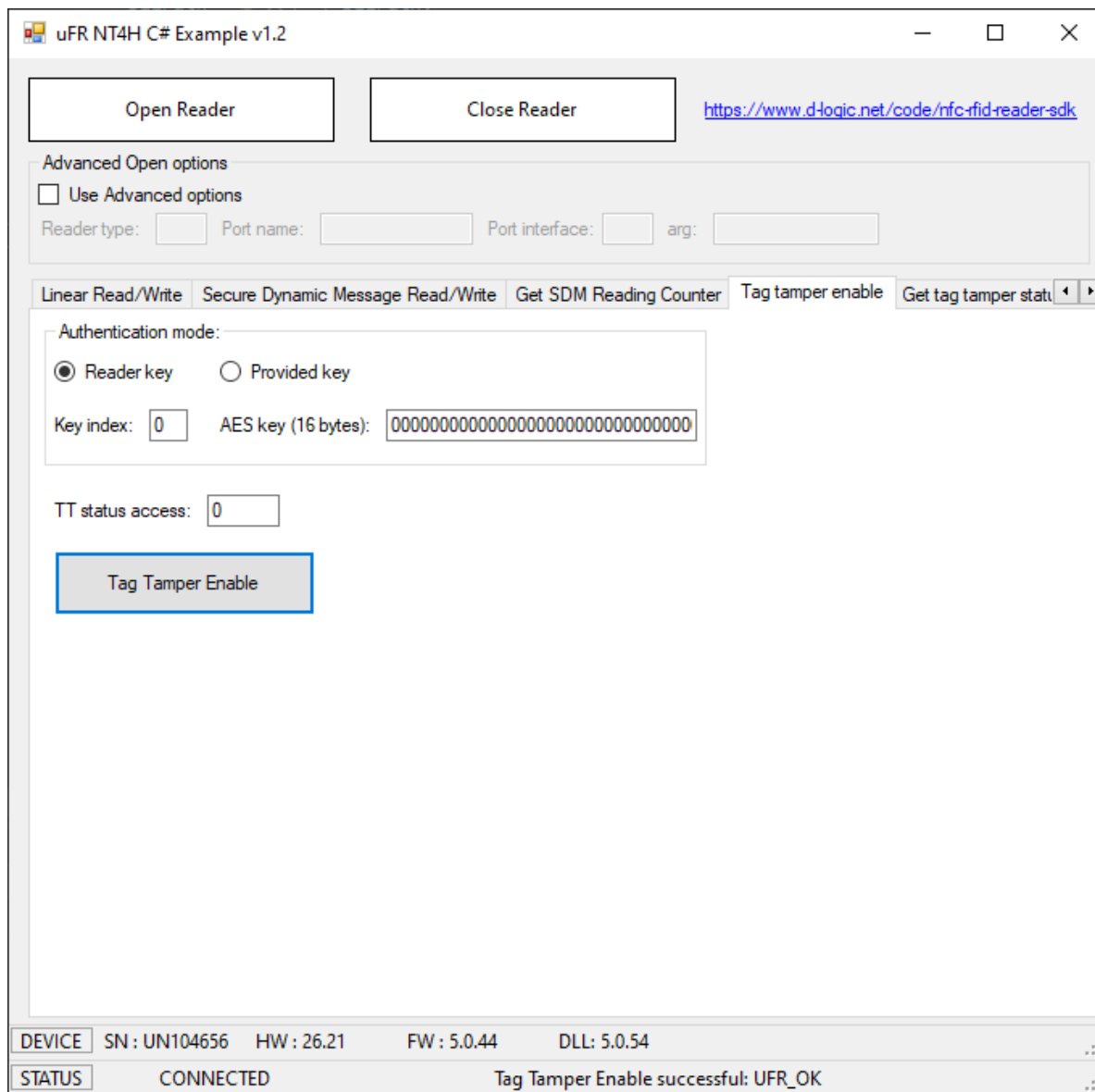
NTAG424 DNA TT only.

Used for enabling the Tag Tamper feature.

Warning: this operation is irreversible.

Authentication with application master key (0) is required.

Example for free tag tamper status read.

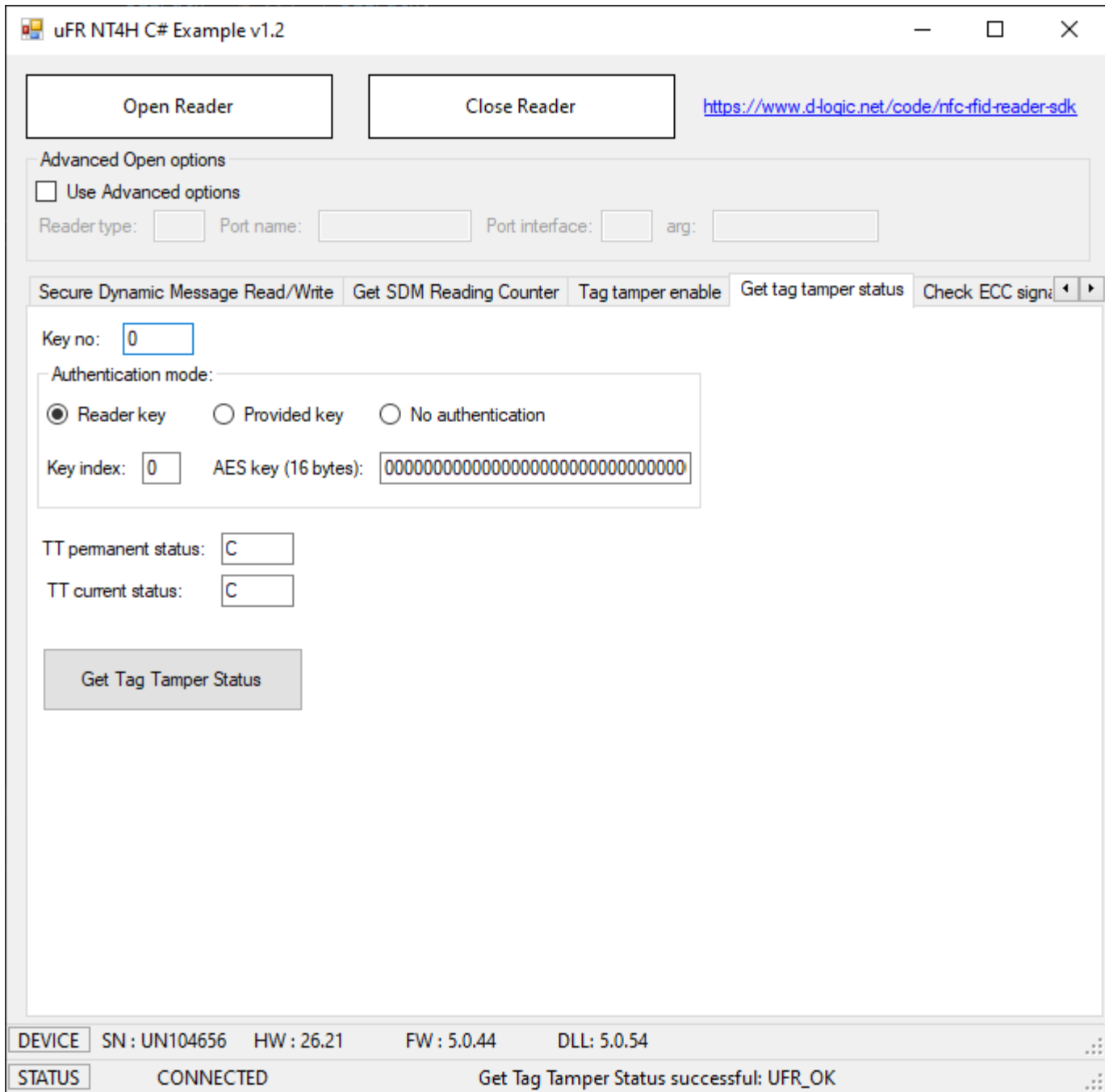


## 2.12 Get tag tamper status

Added in software v1.2

NTAG424 DNA TT only.

Example when the seal is still closed.



The screenshot shows the 'uFR NT4H C# Example v1.2' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below these is an 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A tabbed interface is visible with the following tabs: 'Secure Dynamic Message Read/Write', 'Get SDM Reading Counter', 'Tag tamper enable', 'Get tag tamper status' (selected), and 'Check ECC signi'. The 'Get tag tamper status' tab contains the following controls: 'Key no:' with a text box containing '0'; 'Authentication mode:' with three radio buttons: 'Reader key' (selected), 'Provided key', and 'No authentication'; 'Key index:' with a text box containing '0'; and 'AES key (16 bytes):' with a text box containing '00000000000000000000000000000000'. Below these are 'TT permanent status:' and 'TT current status:' both with text boxes containing 'C'. A 'Get Tag Tamper Status' button is located at the bottom of the main control area. At the very bottom of the window, there is a status bar with the following information: 'DEVICE' SN : UN104656 HW : 26.21 FW : 5.0.44 DLL : 5.0.54; 'STATUS' CONNECTED; and 'Get Tag Tamper Status successful: UFR\_OK'.

Open

uFR NT4H C# Example v1.2
— □ ×

Open Reader

Close Reader

<https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

Use Advanced options

Reader type:  Port name:  Port interface:  arg:

Secure Dynamic Message Read/Write
Get SDM Reading Counter
Tag tamper enable
Get tag tamper status
Check ECC signa

Key no:

Authentication mode:

Reader key  
  Provided key  
  No authentication

Key index:   
 AES key (16 bytes):

TT permanent status:

TT current status:

Get Tag Tamper Status

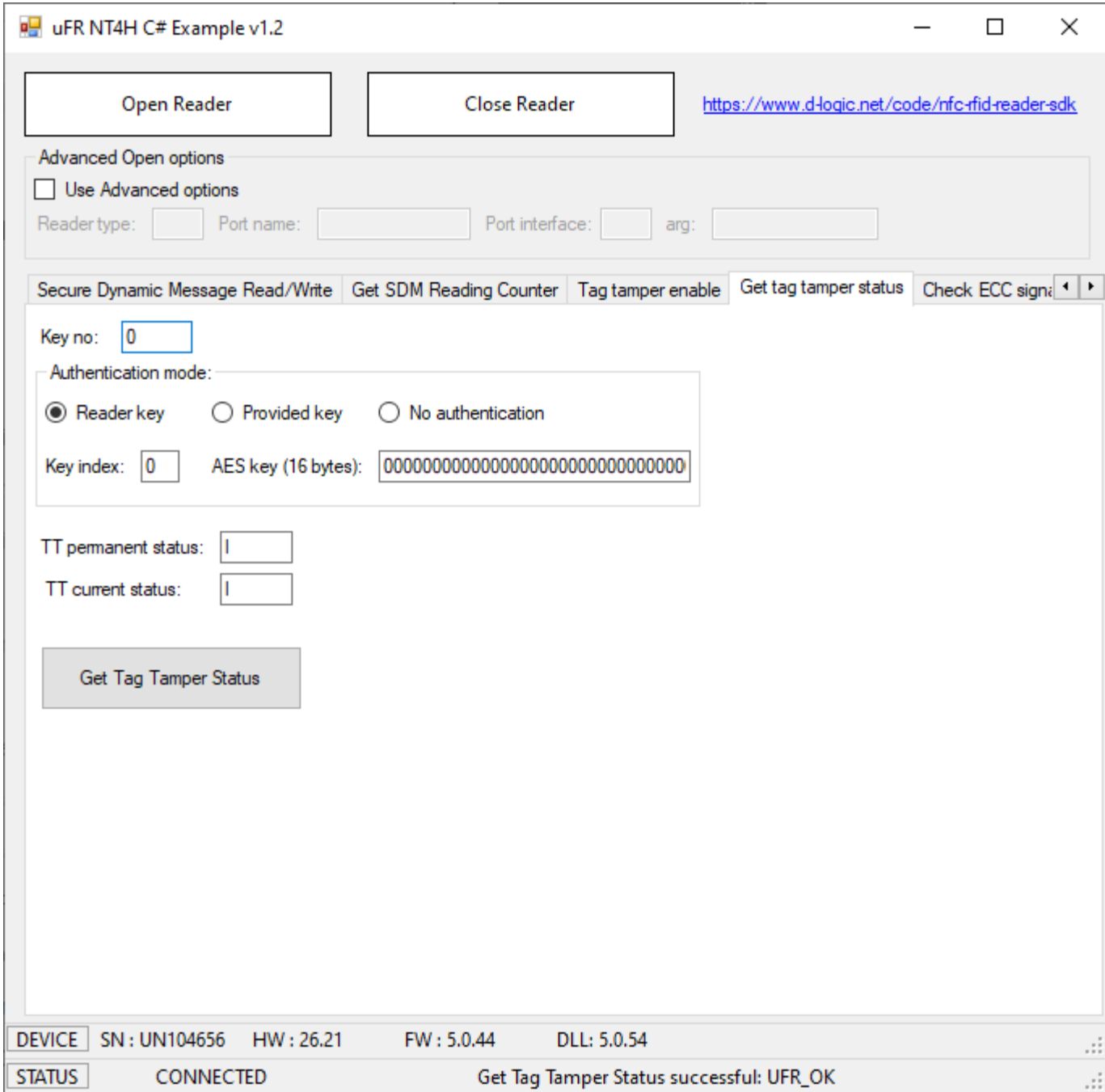
DEVICE

SN : UN104656   HW : 26.21   FW : 5.0.44   DLL: 5.0.54

STATUS

CONNECTED   Get Tag Tamper Status successful: UFR\_OK

Invalid

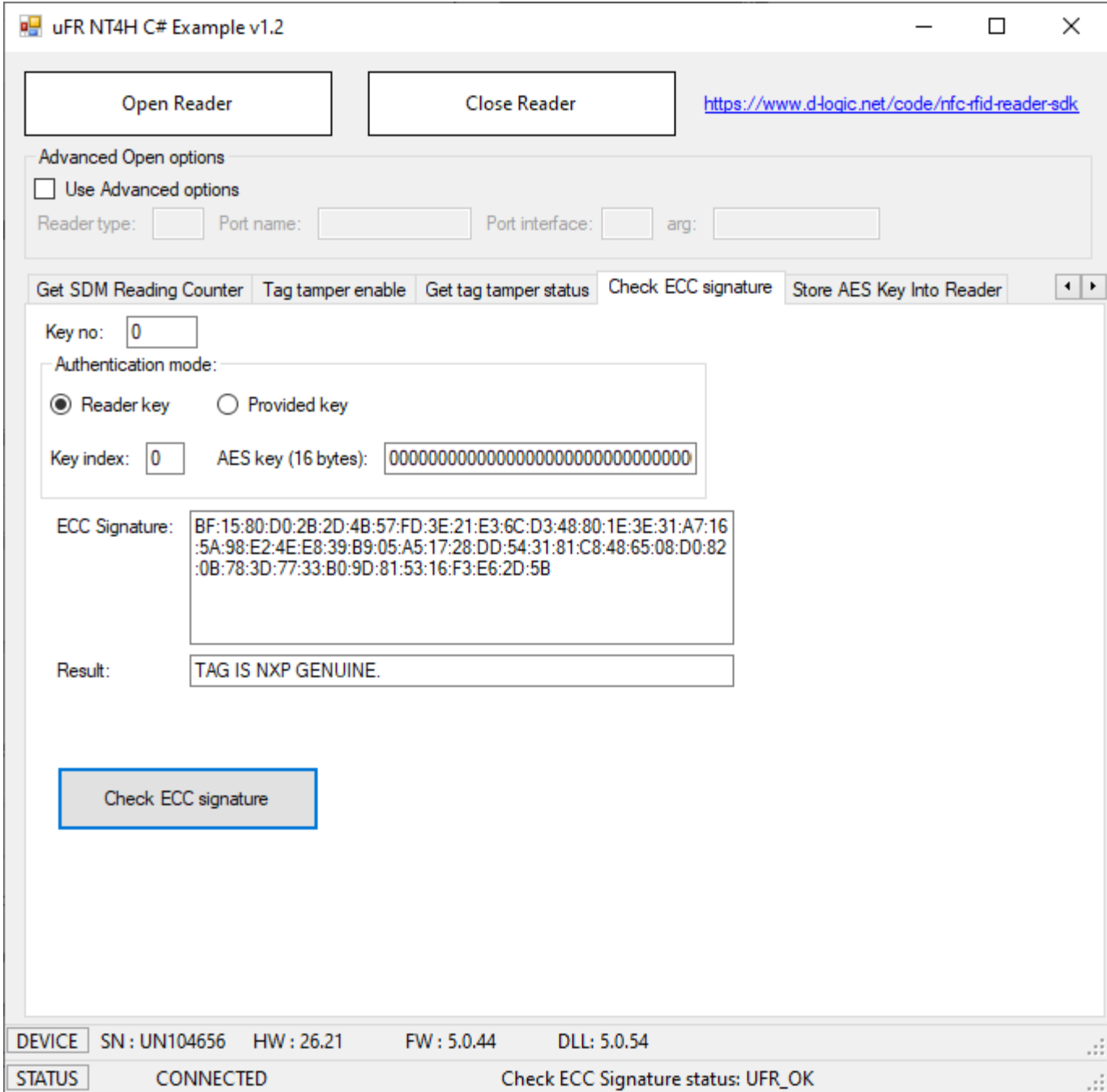


The screenshot shows the 'uFR NT4H C# Example v1.2' application window. It features two main buttons: 'Open Reader' and 'Close Reader'. A URL <https://www.d-logic.net/code/nfc-rfid-reader-sdk> is displayed. Below these is an 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A row of tabs includes 'Secure Dynamic Message Read/Write', 'Get SDM Reading Counter', 'Tag tamper enable', 'Get tag tamper status', and 'Check ECC signi'. The 'Get tag tamper status' tab is active, showing a 'Key no:' field with '0', an 'Authentication mode' section with radio buttons for 'Reader key' (selected), 'Provided key', and 'No authentication', a 'Key index:' field with '0', and an 'AES key (16 bytes):' field with a long string of zeros. Below this are 'TT permanent status:' and 'TT current status:' fields, both containing '1'. A 'Get Tag Tamper Status' button is present. At the bottom, a status bar shows: 'DEVICE SN : UN104656 HW : 26.21 FW : 5.0.44 DLL : 5.0.54' and 'STATUS CONNECTED Get Tag Tamper Status successful: UFR\_OK'.

## 2.13 Check ECC signature

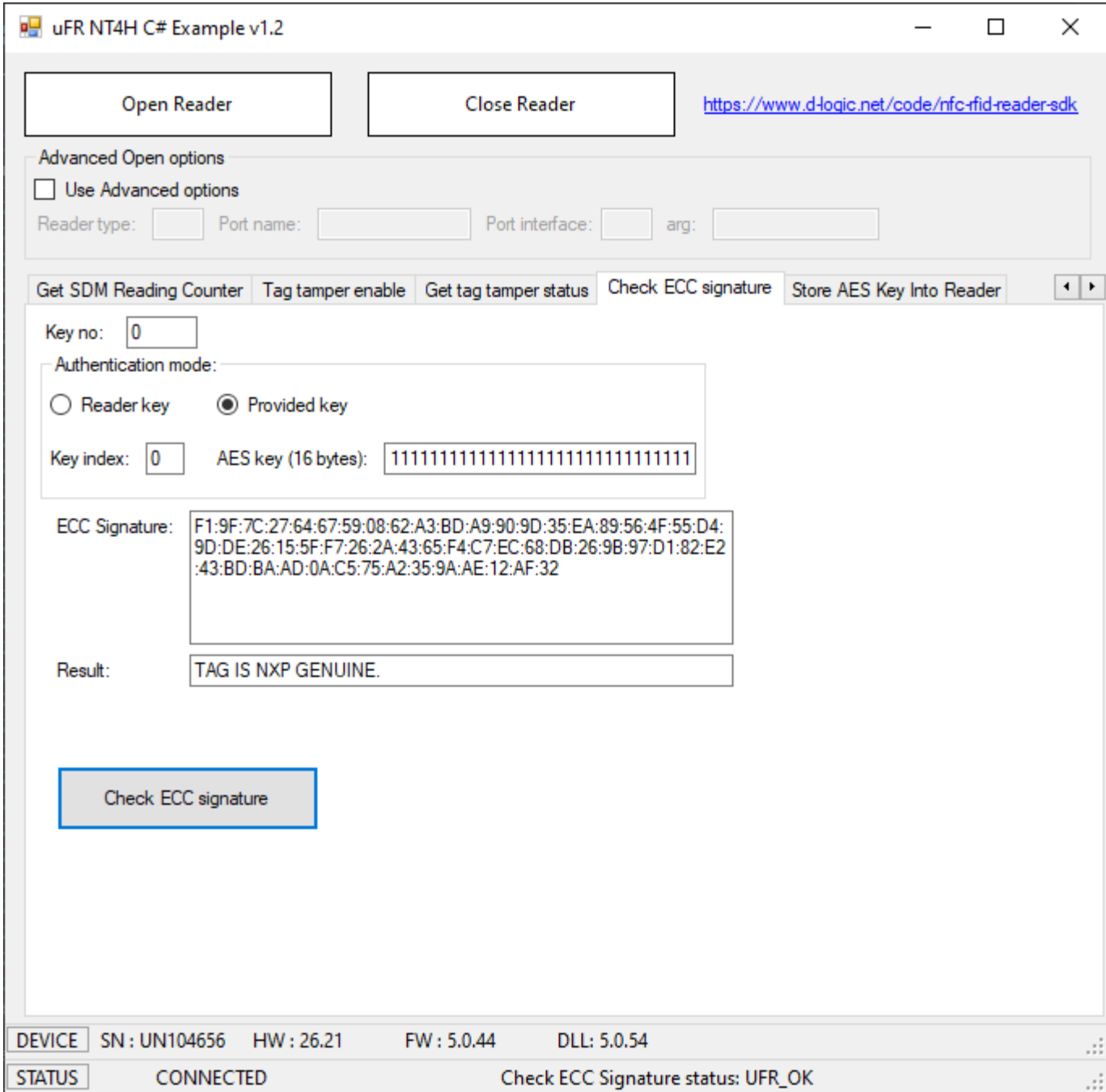
Added in software v1.2

Example for cards with UID. Authentication isn't required.



The screenshot shows the 'uFR NT4H C# Example v1.2' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/nfc-fid-reader-sdk>. Below this is an 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A row of buttons includes 'Get SDM Reading Counter', 'Tag tamper enable', 'Get tag tamper status', 'Check ECC signature', and 'Store AES Key Into Reader'. The 'Check ECC signature' button is highlighted. The interface shows 'Key no: 0', 'Authentication mode' with 'Reader key' selected, 'Key index: 0', and 'AES key (16 bytes): 00000000000000000000000000000000'. The 'ECC Signature' field contains the hexadecimal string: BF:15:80:D0:2B:2D:4B:57:FD:3E:21:E3:6C:D3:48:80:1E:3E:31:A7:16:5A:98:E2:4E:E8:39:B9:05:A5:17:28:DD:54:31:81:C8:48:65:08:D0:82:0B:78:3D:77:33:B0:9D:81:53:16:F3:E6:2D:5B. The 'Result' field displays 'TAG IS NXP GENUINE.'. A 'Check ECC signature' button is highlighted in blue. At the bottom, a status bar shows 'DEVICE SN: UN104656 HW: 26.21 FW: 5.0.44 DLL: 5.0.54' and 'STATUS CONNECTED Check ECC Signature status: UFR\_OK'.

Example for cards with Random ID. Authentication with valid key required.



The screenshot shows the 'uFR NT4H C# Example v1.2' application window. It features several control elements:

- Buttons:** 'Open Reader' and 'Close Reader' at the top left. A 'Check ECC signature' button is located at the bottom left.
- URL:** A blue hyperlink <https://www.d-logic.net/code/nfc-rfid-reader-sdk> is positioned at the top right.
- Advanced Open options:** A section with a checkbox for 'Use Advanced options' and input fields for 'Reader type:', 'Port name:', 'Port interface:', and 'arg:'.
- Function Buttons:** A row of buttons including 'Get SDM Reading Counter', 'Tag tamper enable', 'Get tag tamper status', 'Check ECC signature', and 'Store AES Key Into Reader'.
- Key Configuration:** A 'Key no:' field with the value '0'. Below it, 'Authentication mode:' has two radio buttons: 'Reader key' (unselected) and 'Provided key' (selected). A 'Key index:' field has the value '0', and an 'AES key (16 bytes):' field contains a string of 16 '1's.
- ECC Signature:** A text box displaying the signature: 'F1:9F:7C:27:64:67:59:08:62:A3:BD:A9:90:9D:35:EA:89:56:4F:55:D4:9D:DE:26:15:5F:F7:26:2A:43:65:F4:C7:EC:68:DB:26:9B:97:D1:82:E2:43:BD:BA:AD:0A:C5:75:A2:35:9A:AE:12:AF:32'.
- Result:** A text box showing 'TAG IS NXP GENUINE.'
- Status Bar:** At the bottom, it displays 'DEVICE SN : UN104656 HW : 26.21 FW : 5.0.44 DLL : 5.0.54' and 'STATUS CONNECTED Check ECC Signature status: UFR\_OK'.

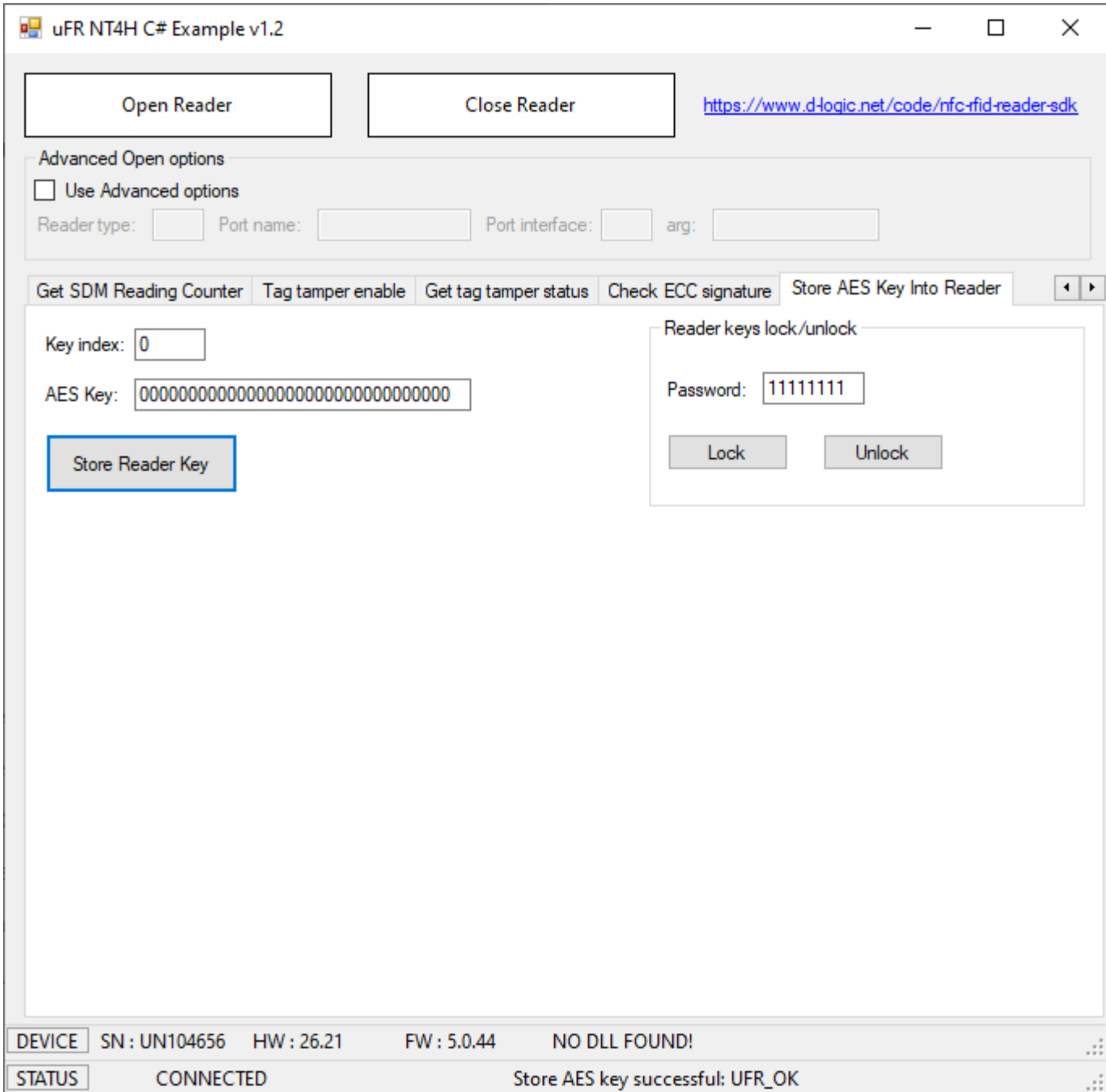


## 2.14 Store AES key into reader

The reader may store 16 AES keys. Key index range 0-15

Example:

Store key 0x00000000000000000000000000000000 into reader on address 0.

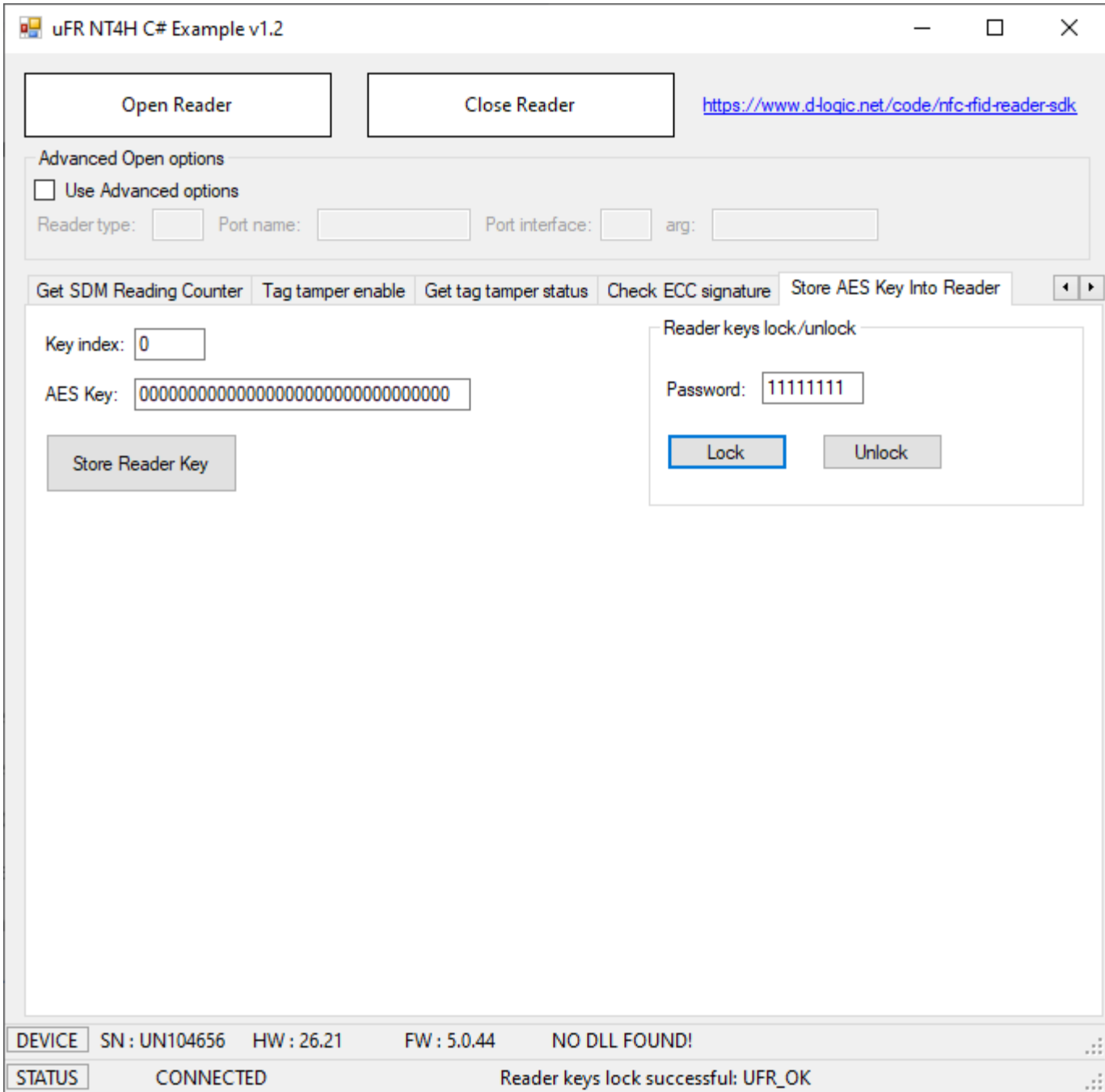


The screenshot shows the 'uFR NT4H C# Example v1.2' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below these is an 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type:', 'Port name:', 'Port interface:', and 'arg:'. A tabbed interface at the bottom includes 'Get SDM Reading Counter', 'Tag tamper enable', 'Get tag tamper status', 'Check ECC signature', and 'Store AES Key Into Reader' (which is selected). The 'Store AES Key Into Reader' tab contains a 'Key index:' field with '0', an 'AES Key:' field with '00000000000000000000000000000000', and a 'Store Reader Key' button. To the right, a 'Reader keys lock/unlock' section has a 'Password:' field with '11111111' and 'Lock' and 'Unlock' buttons. At the bottom, a status bar shows: 'DEVICE SN : UN104656 HW : 26.21 FW : 5.0.44 NO DLL FOUND!' and 'STATUS CONNECTED Store AES key successful: UFR\_OK'.

You can lock the key into the reader with an 8 character password. By default, keys are unlocked, and you can enter any password for locking.

Example:

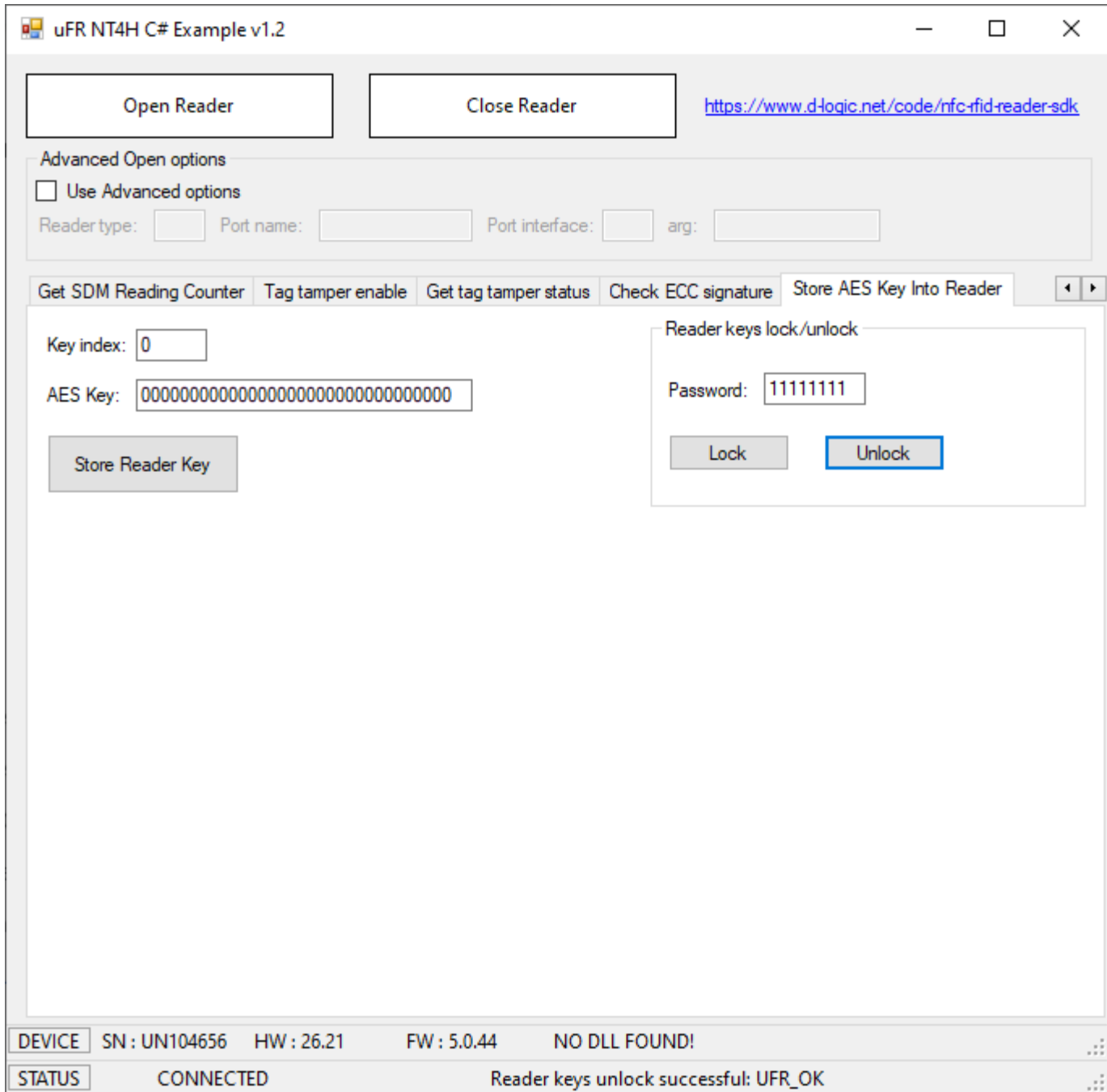
Set password "11111111"



If the keys are locked, you must unlock them before inputting new keys into the reader.  
To unlock the reader, you must use the same password that was used for locking the reader.

Example:

Unlock the reader keys with previously used password "11111111"



The screenshot shows the 'uFR NT4H C# Example v1.2' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below this is an 'Advanced Open options' section with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A tabbed interface is visible with tabs for 'Get SDM Reading Counter', 'Tag tamper enable', 'Get tag tamper status', 'Check ECC signature', and 'Store AES Key Into Reader'. The 'Store AES Key Into Reader' tab is active, showing a 'Key index' field with '0' and an 'AES Key' field with a long string of zeros. A 'Store Reader Key' button is present. A 'Reader keys lock/unlock' dialog box is open, containing a 'Password' field with '11111111' and 'Lock' and 'Unlock' buttons. The 'Unlock' button is highlighted. At the bottom, a status bar shows: 'DEVICE SN : UN104656 HW : 26.21 FW : 5.0.44 NO DLL FOUND!' and 'STATUS CONNECTED Reader keys unlock successful: UFR\_OK'.

## Revision history

Date	Version	Comment
2021-09-16	1.1	Added NTAG424 DNA TT specific functions & examples
2021-09-14	1.0	Base document