

NT4H GUI example user manual

v1.0

1. Introduction

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

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

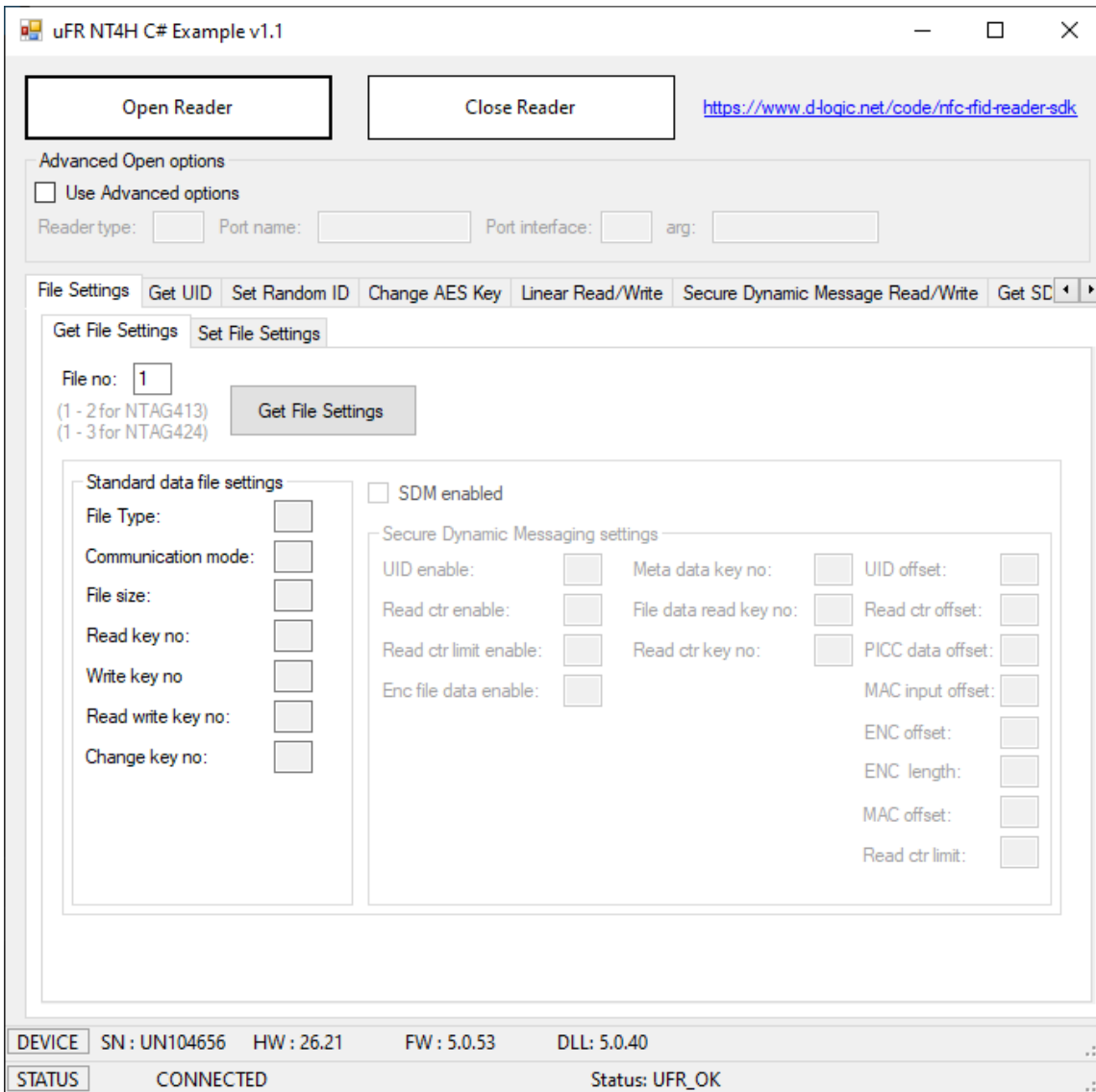
NTAG424 DNA is fully compliant with the NFC Forum Type 4 Tag IC.

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

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

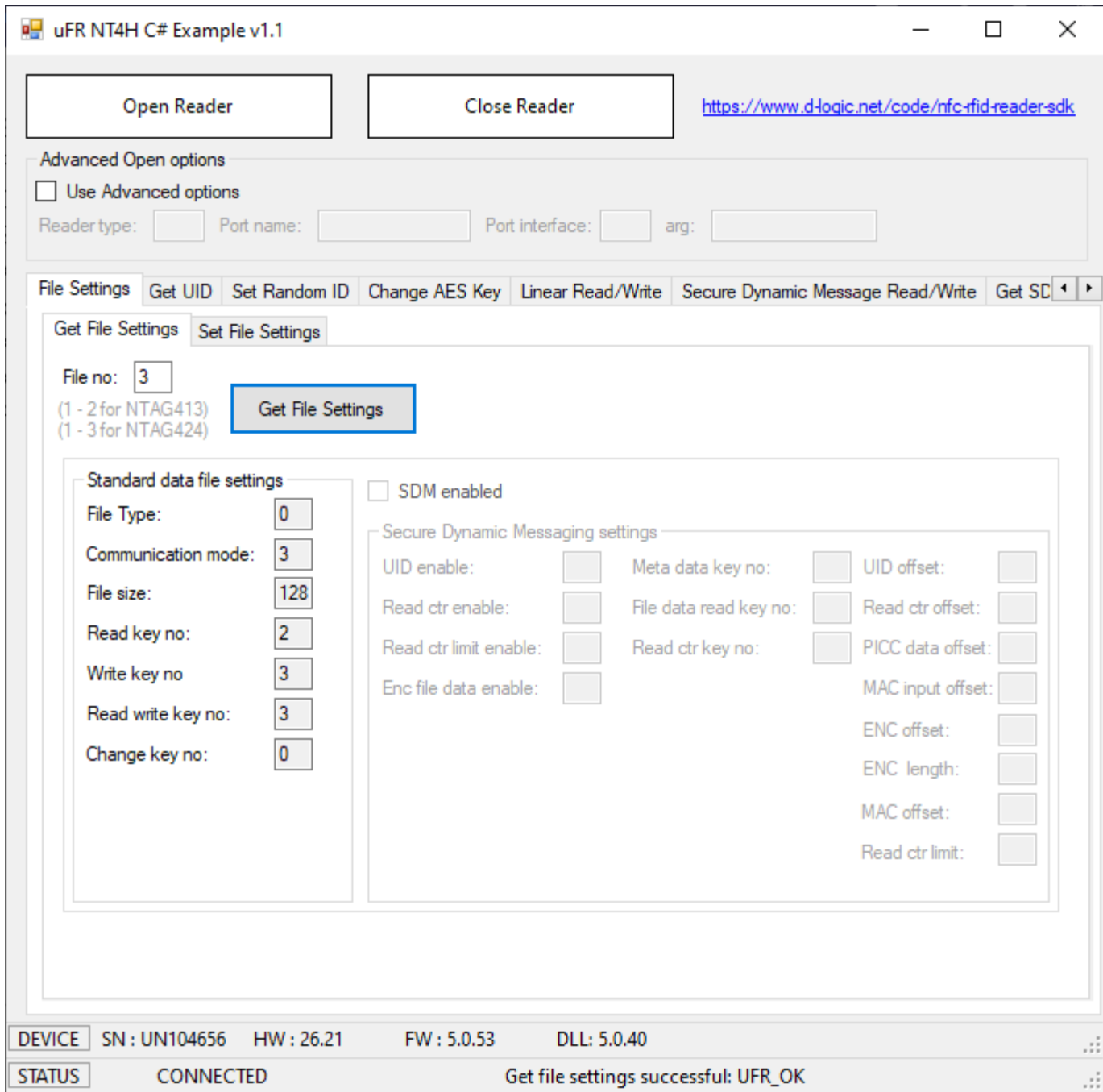
Key number for read is 2

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

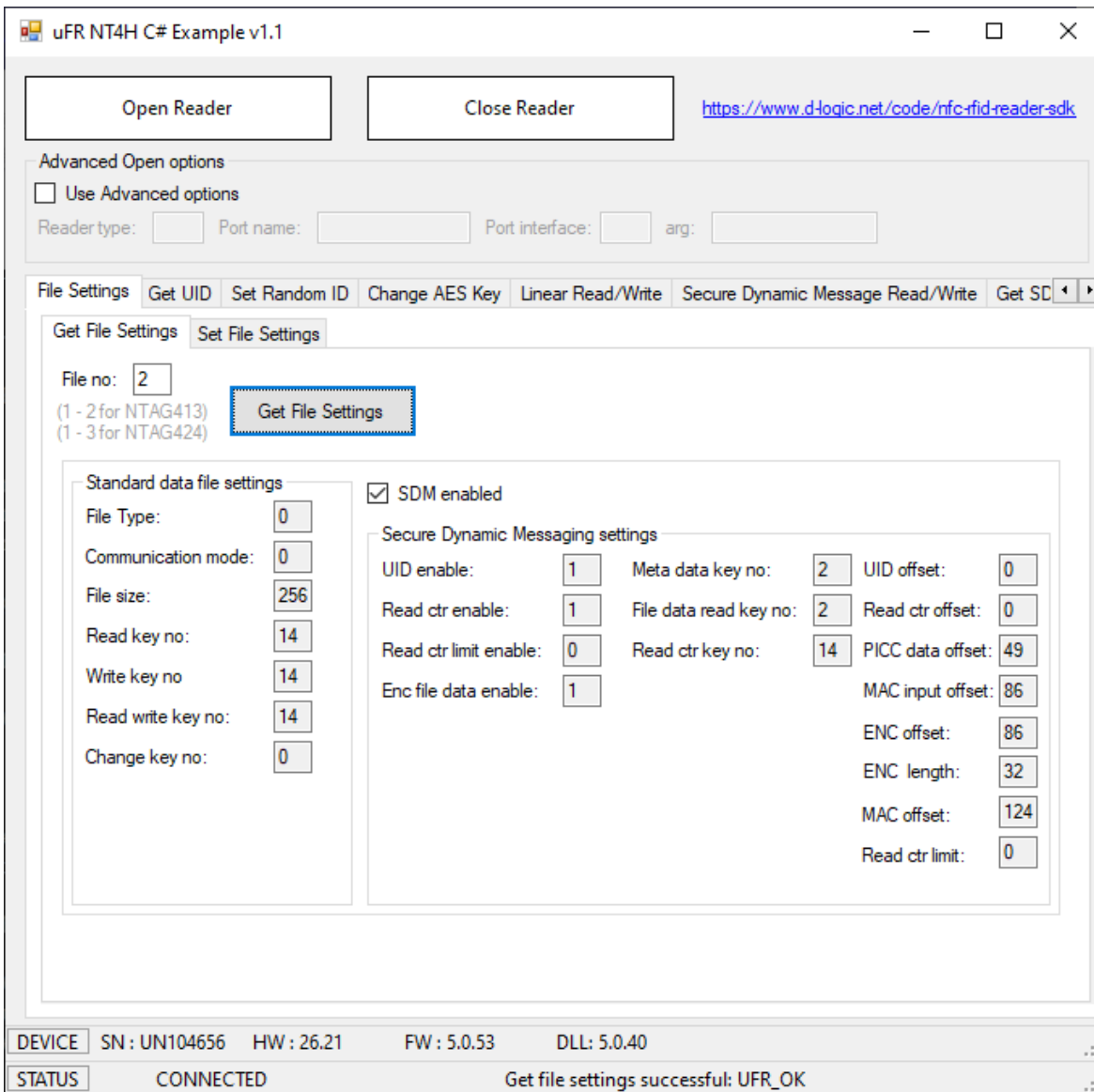
PICC data offset (encrypted UID and SDM reading counter) is 49

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.

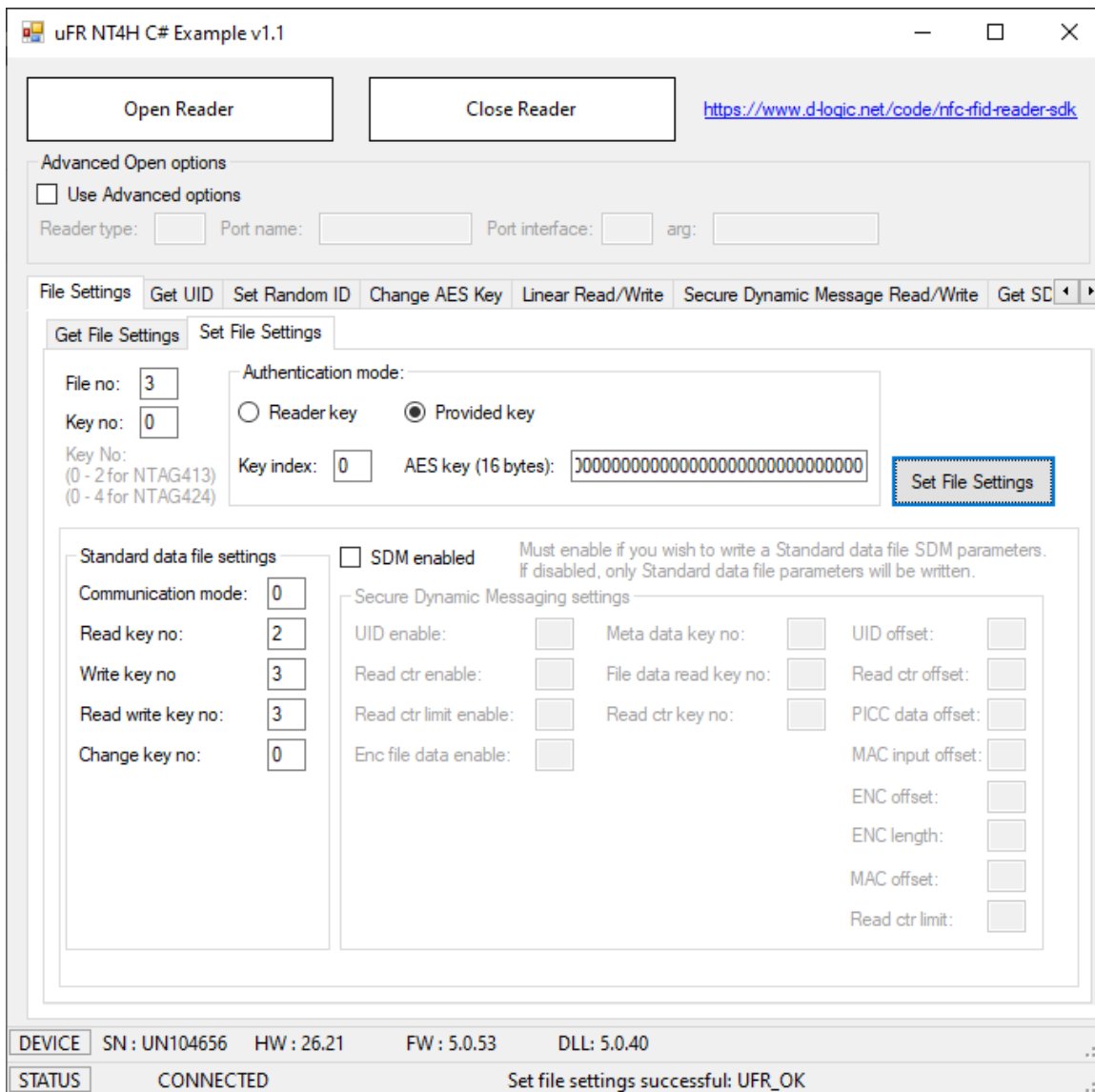
Example 1:

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. It features several control elements:

- Buttons:** 'Open Reader' and 'Close Reader' at the top left. A 'Set File Settings' button is highlighted in the configuration area.
- URL:** <https://www.d-logic.net/code/nfc-fid-reader-sdk>
- Advanced Open options:** A checkbox for 'Use Advanced options' is unchecked. Below are input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'.
- File Settings:** A menu bar with options: '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.
- Configuration Fields:**
 - 'File no: 3' and 'Key no: 0' (with a note: 'Key No: (0 - 2 for NTAG413) (0 - 4 for NTAG424)').
 - 'Authentication mode:' with radio buttons for 'Reader key' and 'Provided key' (selected).
 - 'Key index: 0' and 'AES key (16 bytes): 00000000000000000000000000000000'.
- Standard data file settings:**
 - 'Communication mode: 0' (selected).
 - 'Read key no: 2', 'Write key no: 3', 'Read write key no: 3', and 'Change key no: 0'.
- Secure Dynamic Messaging settings:**
 - 'SDM enabled' checkbox is unchecked. A note states: 'Must enable if you wish to write a Standard data file SDM parameters. If disabled, only Standard data file parameters will be written.'
 - Various other settings like 'UID enable', 'Meta data key no', 'UID offset', etc., are present but disabled.
- Footer:**
 - 'DEVICE' section: SN: UN104656, HW: 26.21, FW: 5.0.53, DLL: 5.0.40.
 - 'STATUS' section: 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

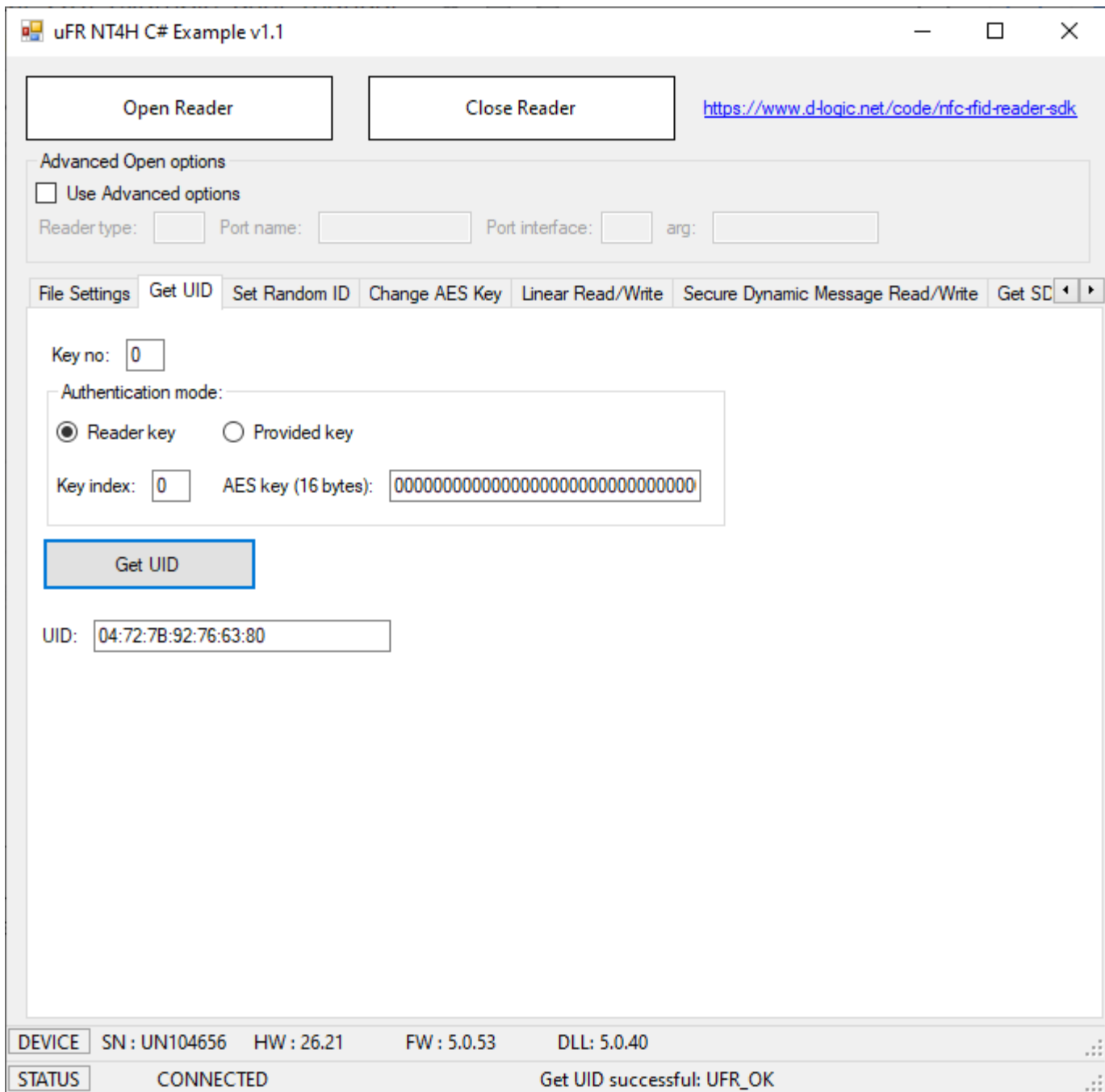
STATUS CONNECTED Set file settings successful: UFR_OK

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

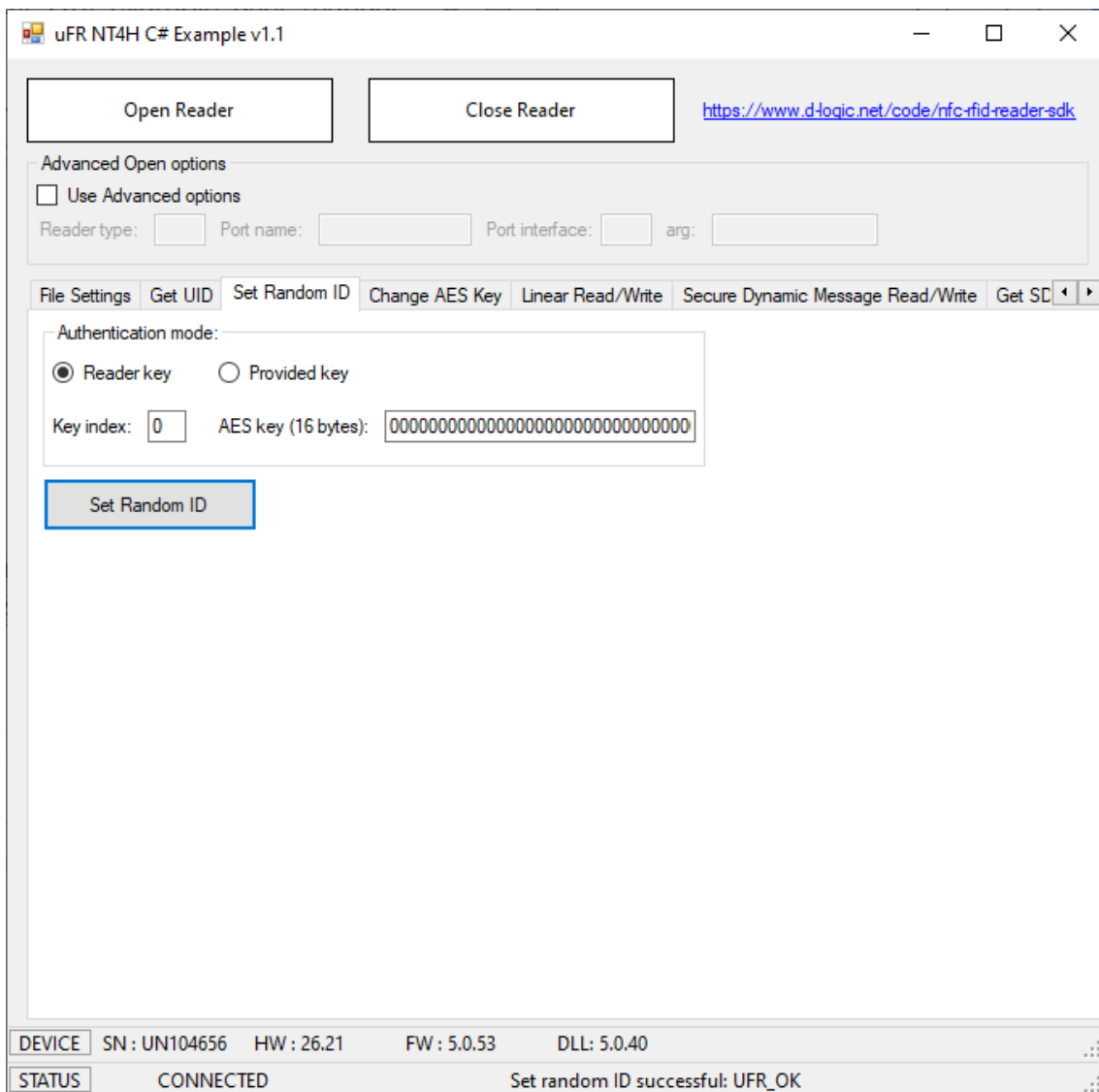
2.4 Set Random ID

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.

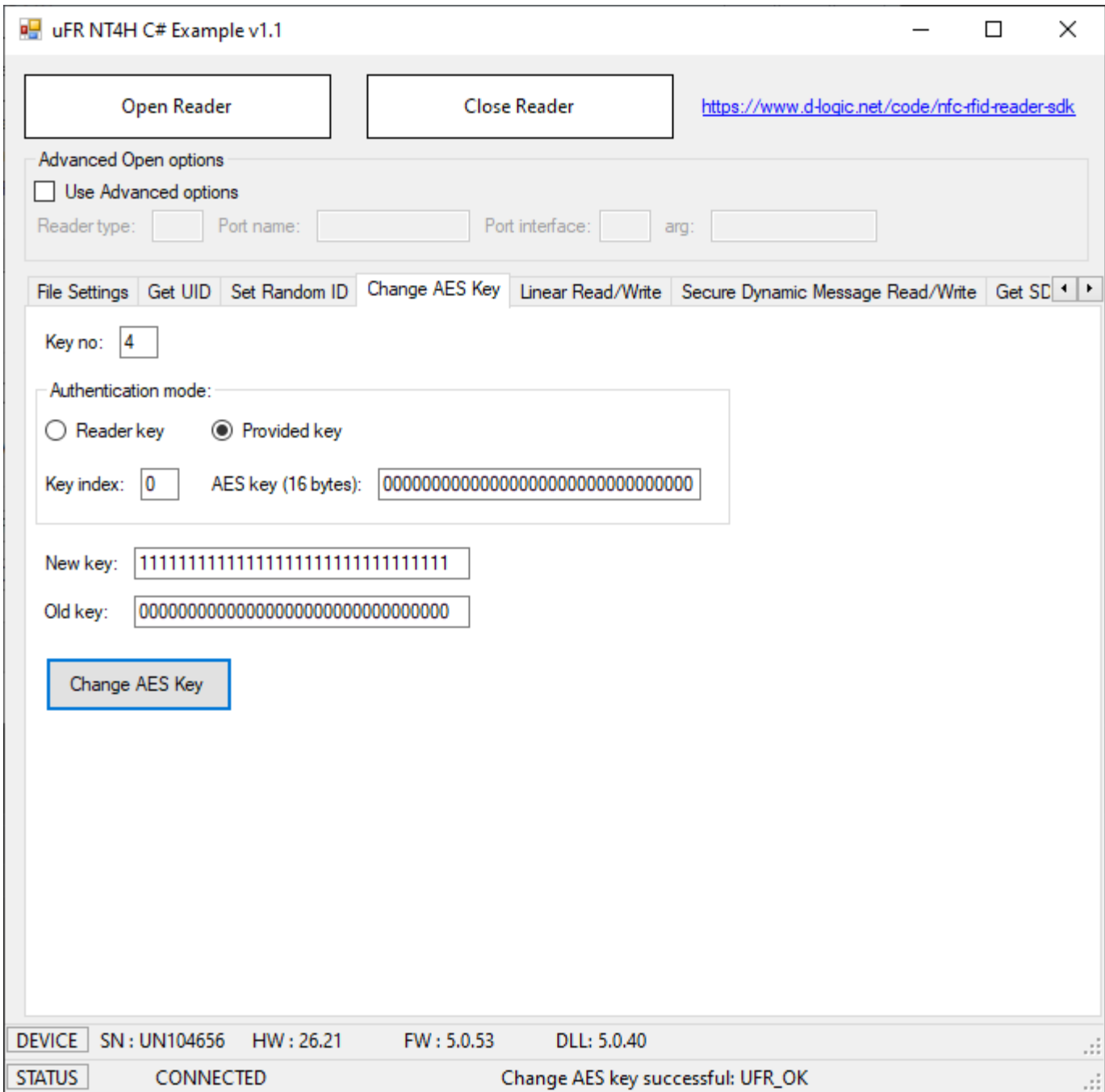
Example:

Key number 4.

Application master key value: 0x

Old key 4 value: 0x00000000000000000000000000000000

New key 4 value: 0x11111111111111111111111111111111

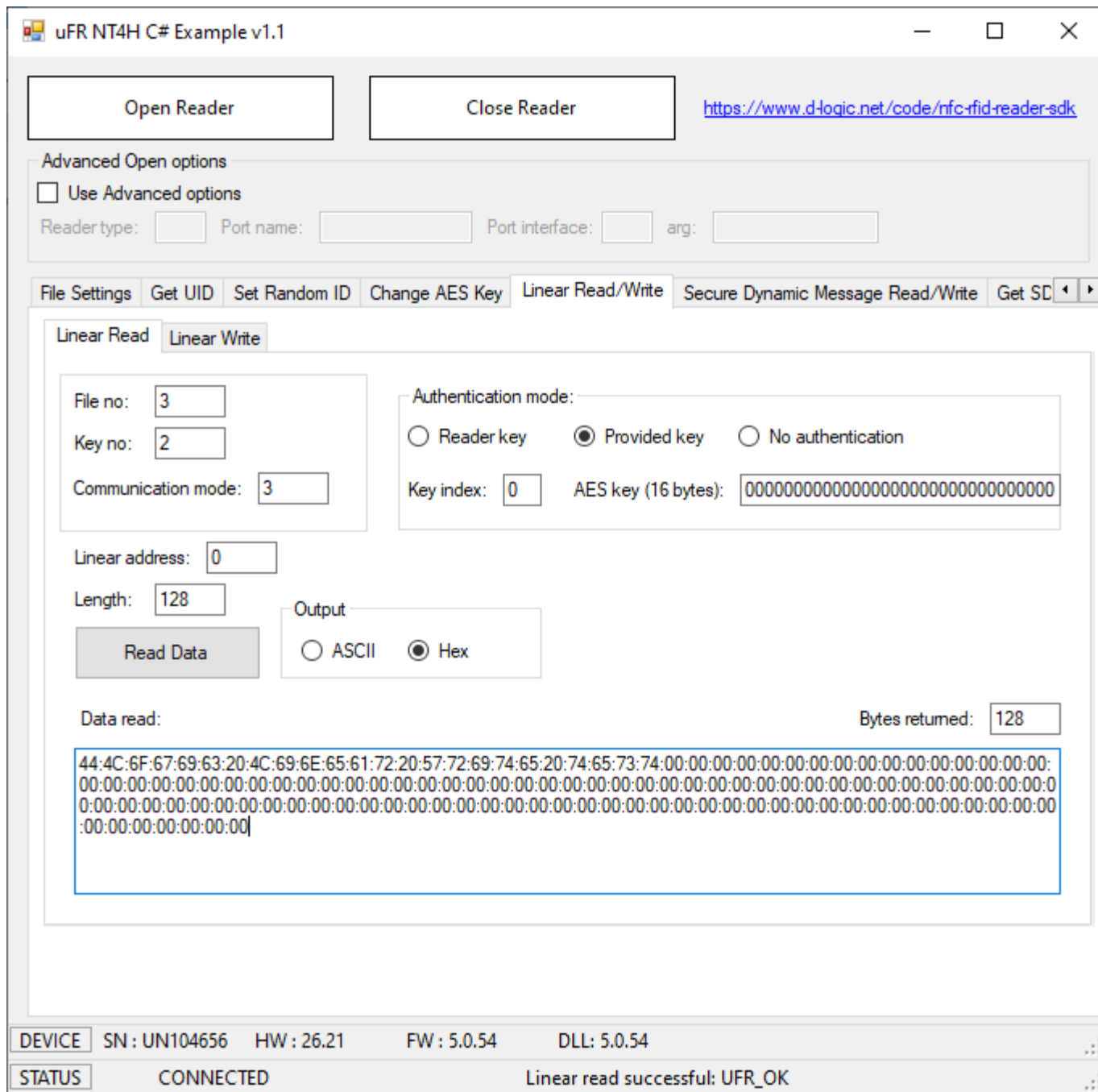


2.6 Linear read

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



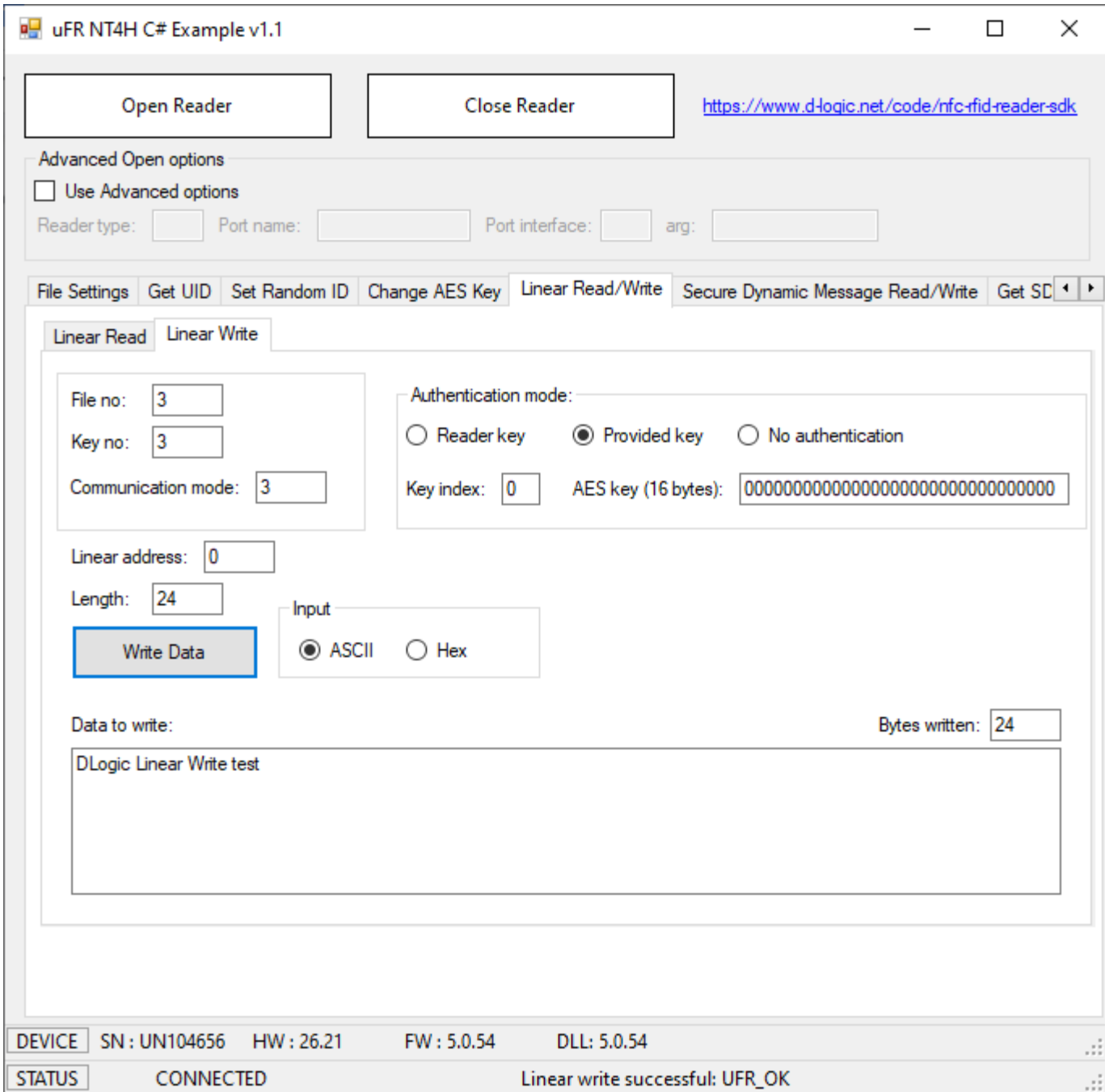
2.7 Linear write

Function writes data to 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

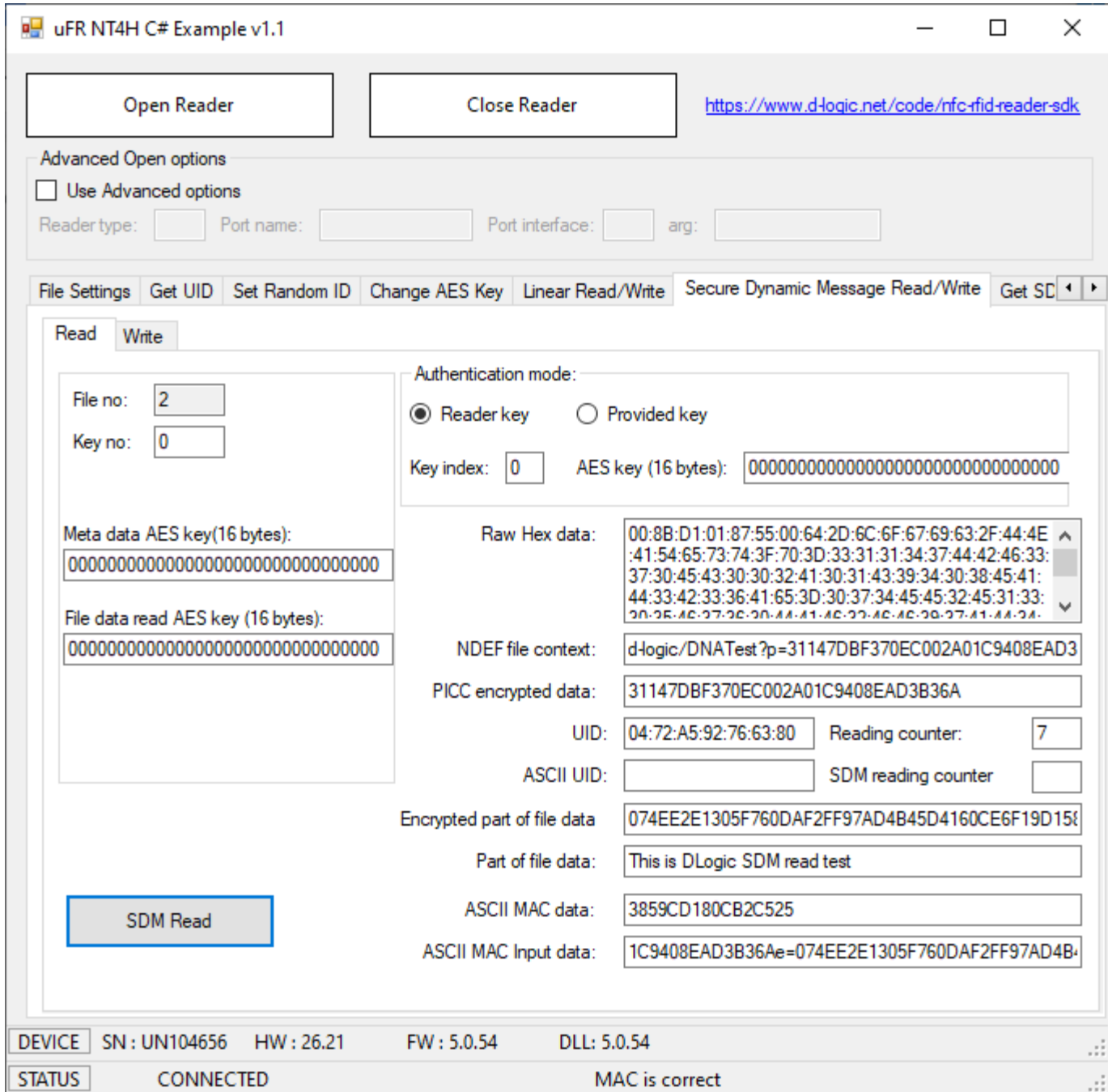


The screenshot shows the 'uFR NT4H C# Example v1.1' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/nfc-fid-reader-sdk>. Below these are 'Advanced Open options' with a checkbox for 'Use Advanced options' and input fields for '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 '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



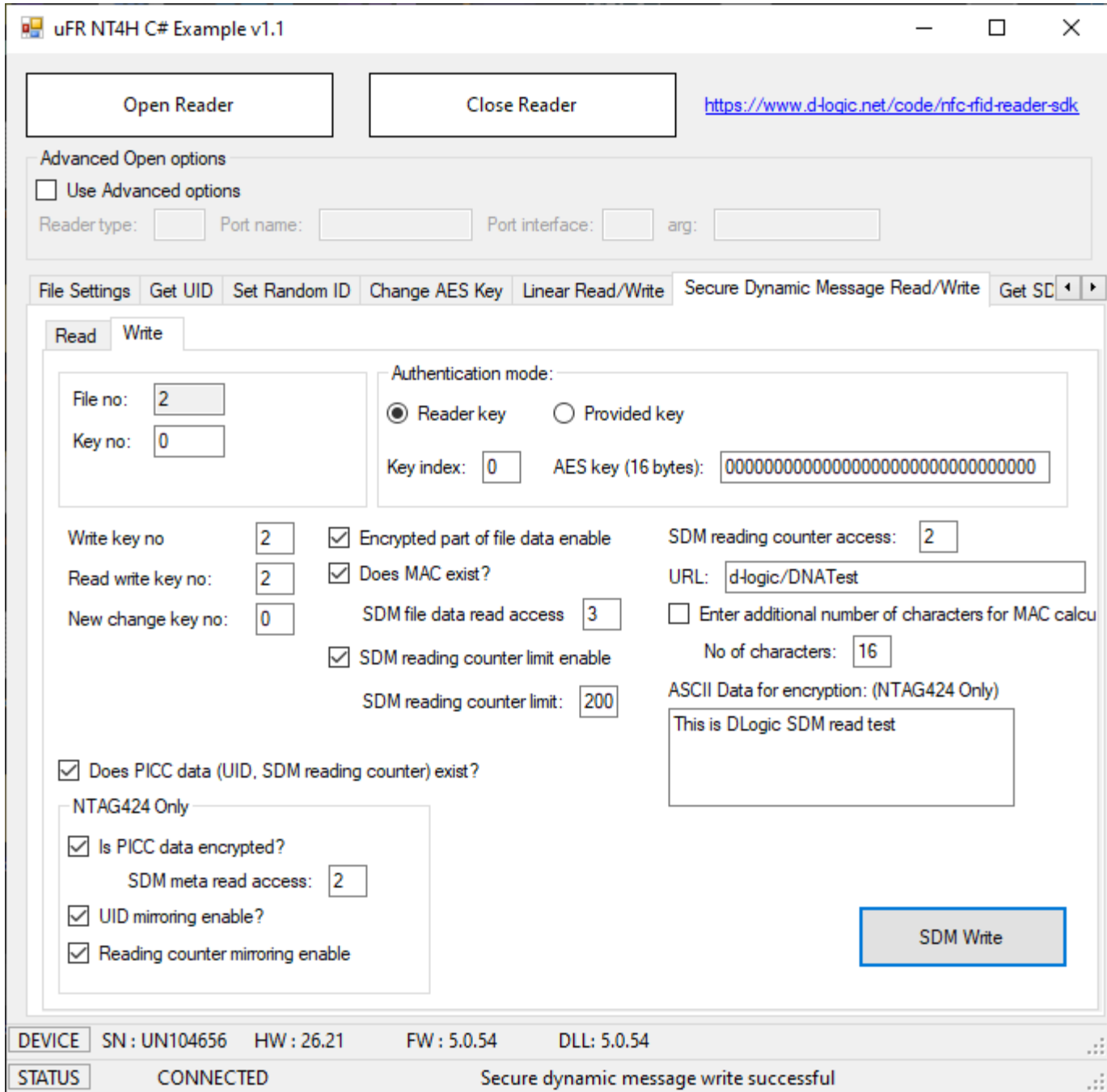
The screenshot shows the 'uFR NT4H C# Example v1.1' application window. The 'Secure Dynamic Message Read/Write' tab is active, with the 'Read' sub-tab selected. The configuration includes:

- File no:** 2
- Key no:** 0
- Authentication mode:** Reader key (selected)
- 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:** dlogic/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

The 'SDM Read' button is highlighted in blue. At the bottom, the device status is shown as 'CONNECTED' with '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, and 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 is active, showing 'Read' and 'Write' tabs. The 'Write' tab is selected, displaying the following configuration options:

- 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 calcu
- 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

At the bottom right of the configuration area is an 'SDM Write' button. The status bar at the bottom shows: DEVICE SN : UN104656 HW : 26.21 FW : 5.0.54 DLL : 5.0.54 and STATUS CONNECTED Secure dynamic message write successful.

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:

Linear Read/Write Secure Dynamic Message Read/Write **Get SDM Reading Counter** Store AES Key Into Reader

File no:
Key no:
Authentication mode:
 Reader key Provided key No authentication
Key index: AES key (16 bytes):

Get SDM Reading Counter

SDM Reading Counter:

DEVICE SN : UN104656 HW : 26.21 FW : 5.0.54 DLL: 5.0.54
STATUS CONNECTED Linear write successful: UFR_OK

Revision history

Date	Version	Comment
2019-10-31	1.0	Base document