

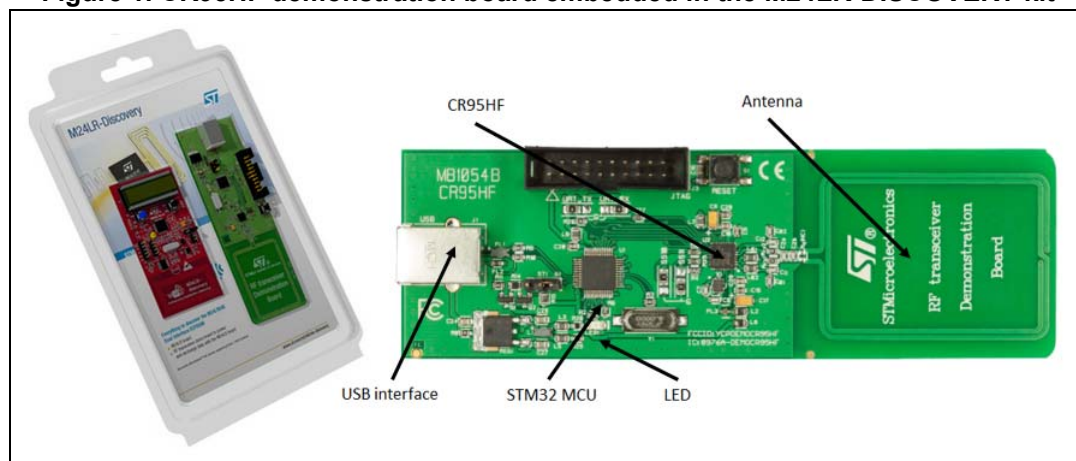
Introduction

The CR95HF development software (STSW-95HF001) is a PC software which allows to configure, evaluate, and communicate with CR95HF 13.56 MHz multi-protocol contactless transceiver.

The software must be used in conjunction with the CR95HF demonstration board (see [Figure 1](#)) which includes a ready-to-use board to interface with the host PC through a USB interface. This CR95HF demonstration board is included in the M24LR-DISCOVERY kit.

The CR95HF demonstration board is powered through the USB bus and no external power supply is required. It includes a CR95HF contactless transceiver, a 48 x 34 mm 13.56 MHz inductive etched antenna and the associated tuning components. The CR95HF communicates with the STM32F103CB 32-bit core MCU via the SPI bus.

Figure 1. CR95HF demonstration board embedded in the M24LR-DISCOVERY kit



Reference documents

- DEMO databrief
- CR95HF datasheet

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1 Installing the CR95HF development software (STSW-95HF001)

To install the CR95HF development software (STSW-95HF001):

1. Download the latest revision of the CR95HF development software from <http://www.st.com>.
2. Unzip the setup.zip file.
3. Execute the setup.exe file to install the CR95HF development software on your computer. Follow the instructions described in [Figure 2](#) to [Figure 10](#) to install the CR95HF development software under C:\Program files, and CR95HFDll.dll system file under C:\WINDOWS\system32.

When the installation process is complete, you can launch the CR95HF development software. Refer to [Section 2](#) for a detailed description of the software functions.

Figure 2. setup.exe welcome message

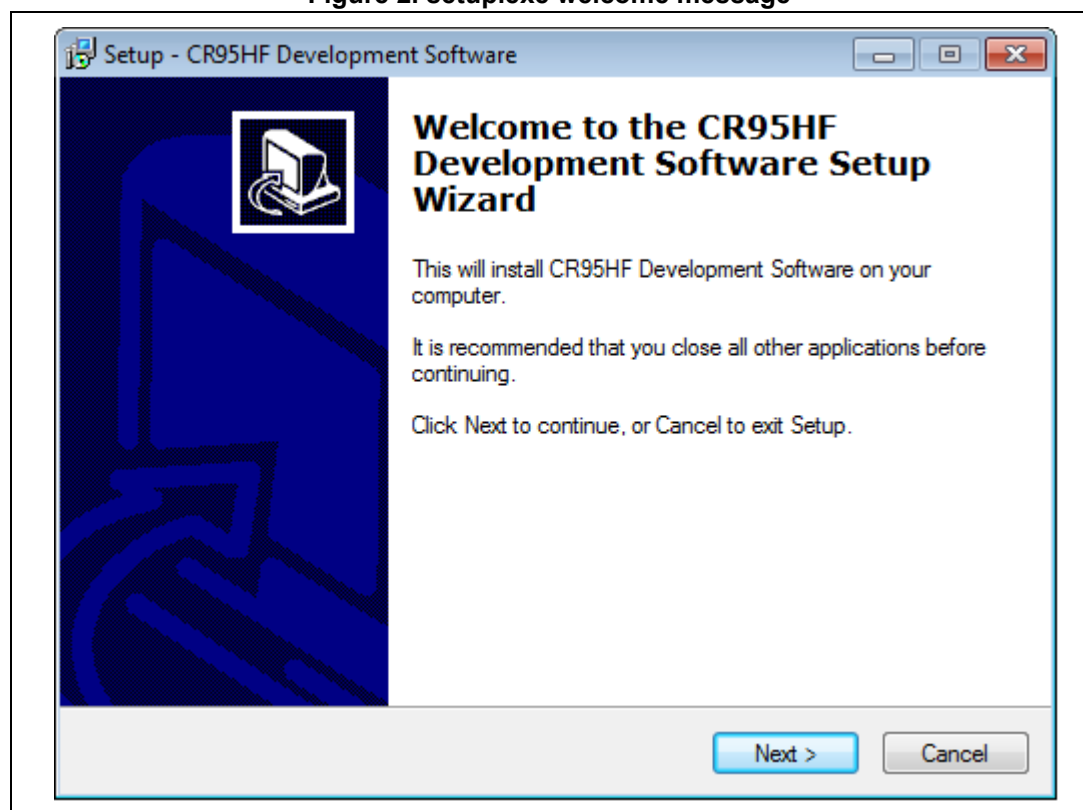


Figure 3. setup.exe license agreement

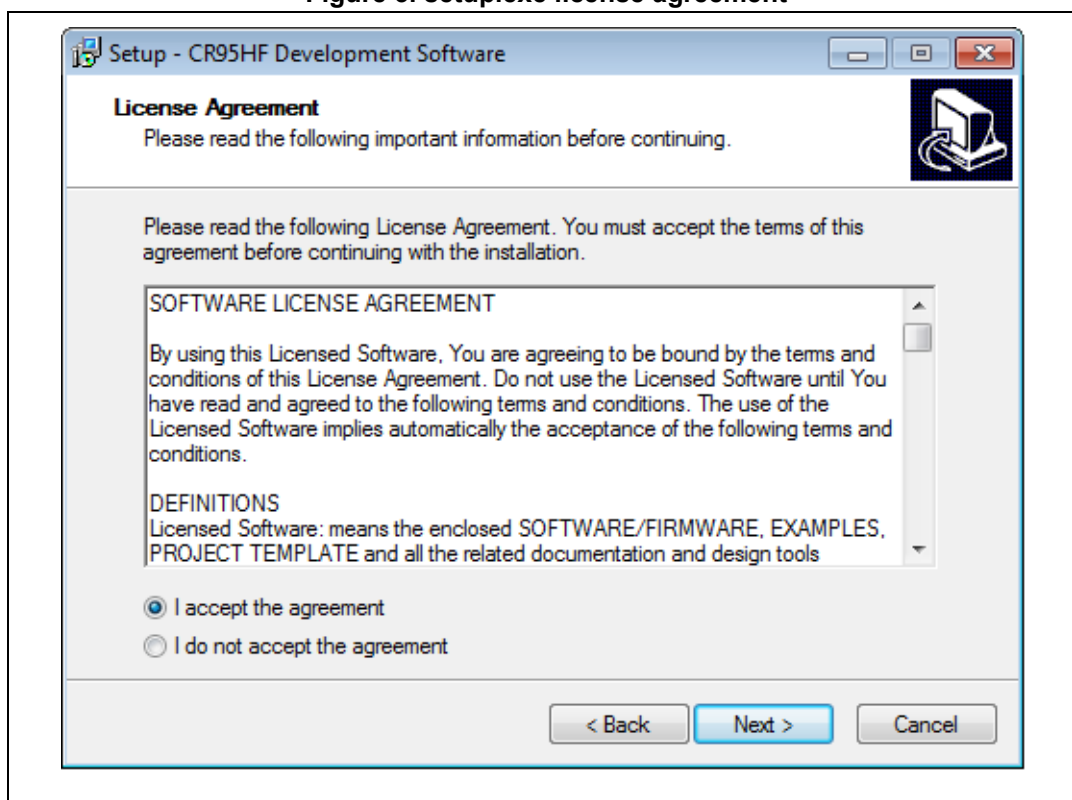


Figure 4. Select the destination folder

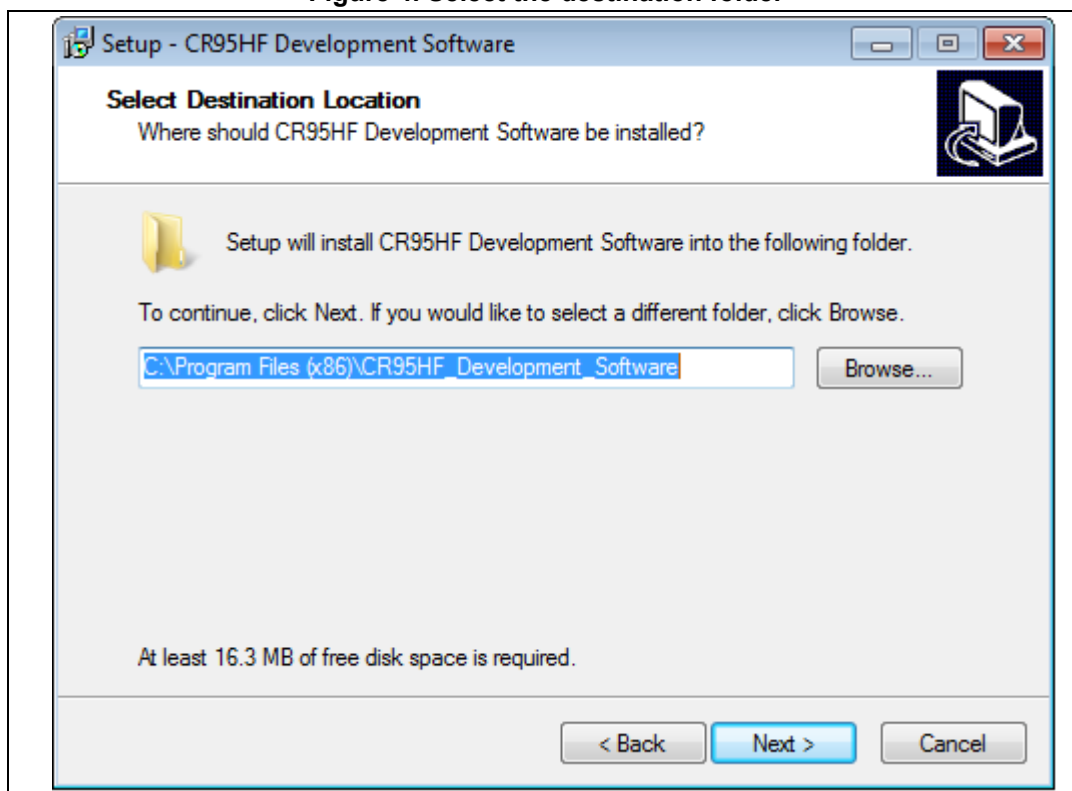


Figure 5. Insert the CR95HF development software from the start menu

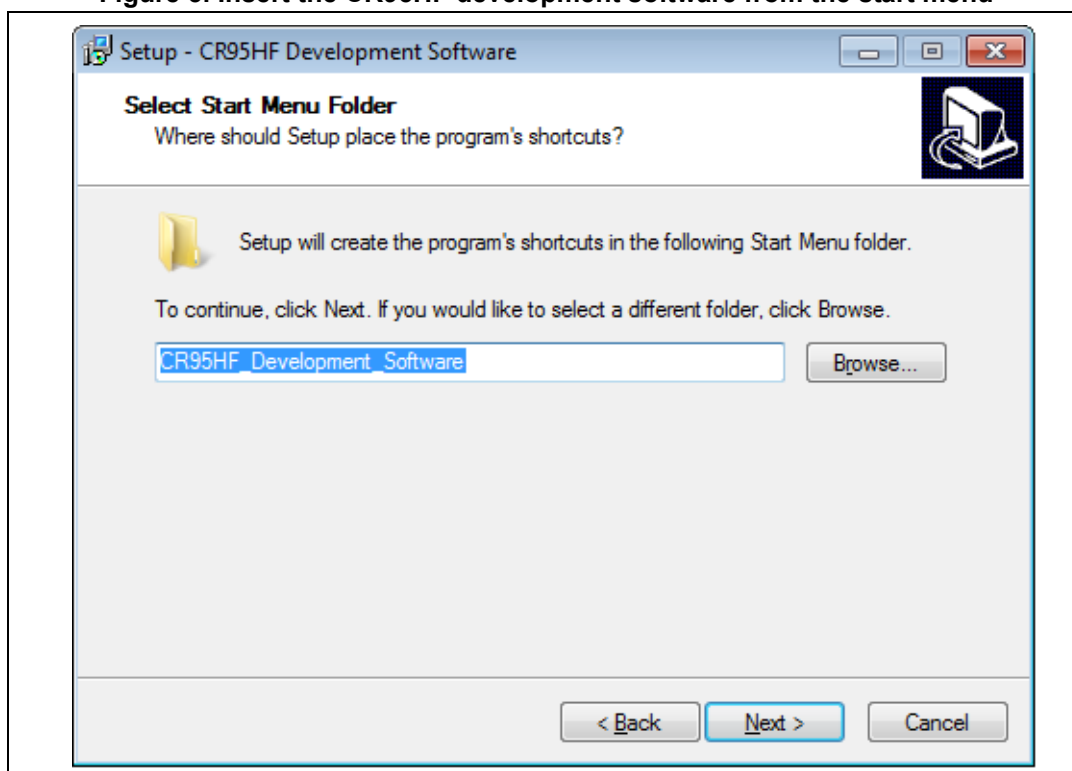


Figure 6. Create desktop or quick launch icons (optional)

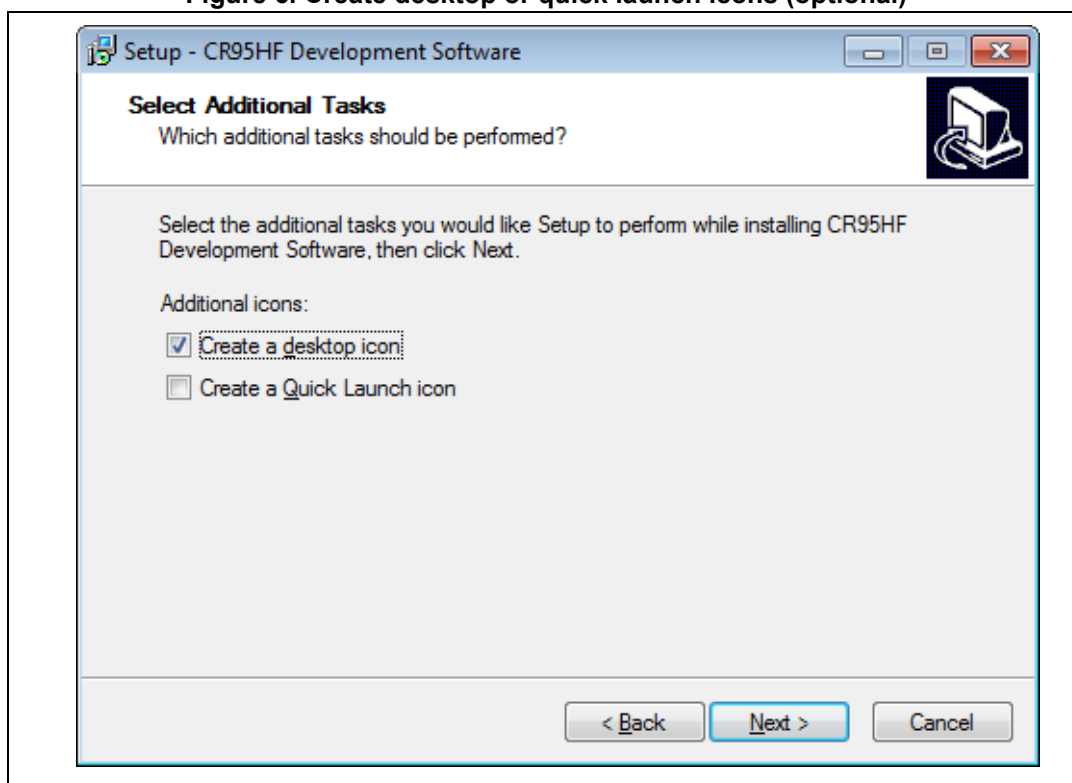


Figure 7. Install the CR95HF development software on your computer

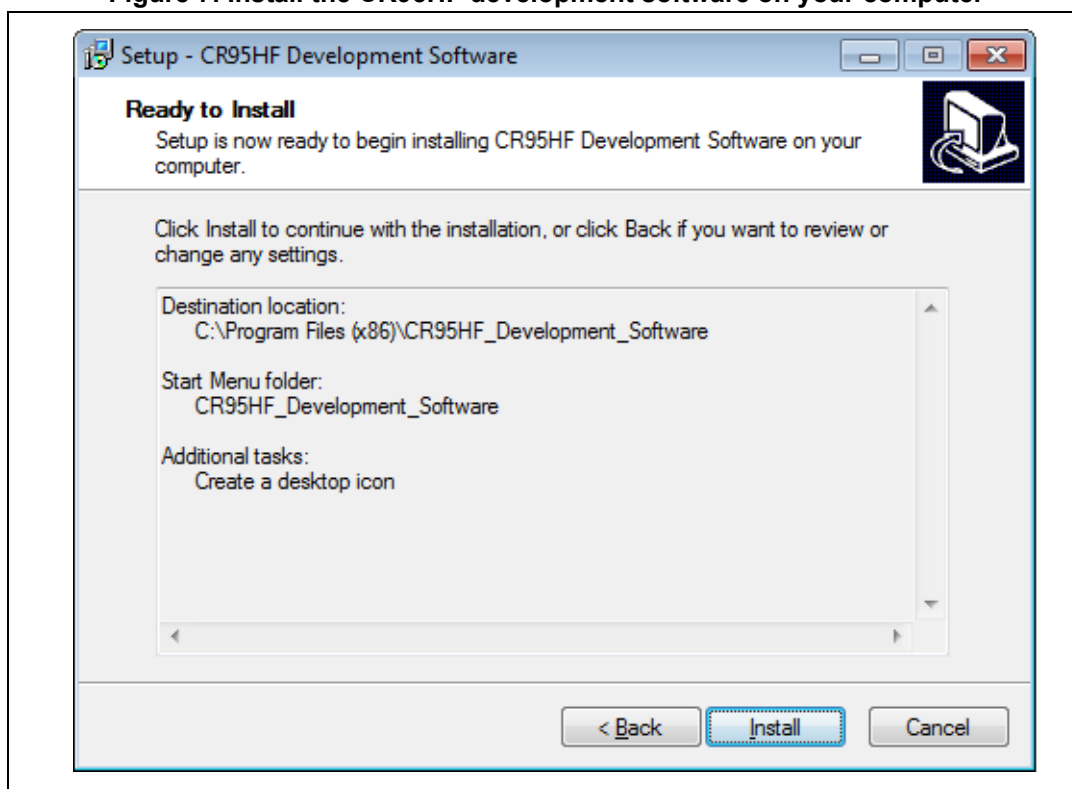


Figure 8. Install the CR95HFdll.dll

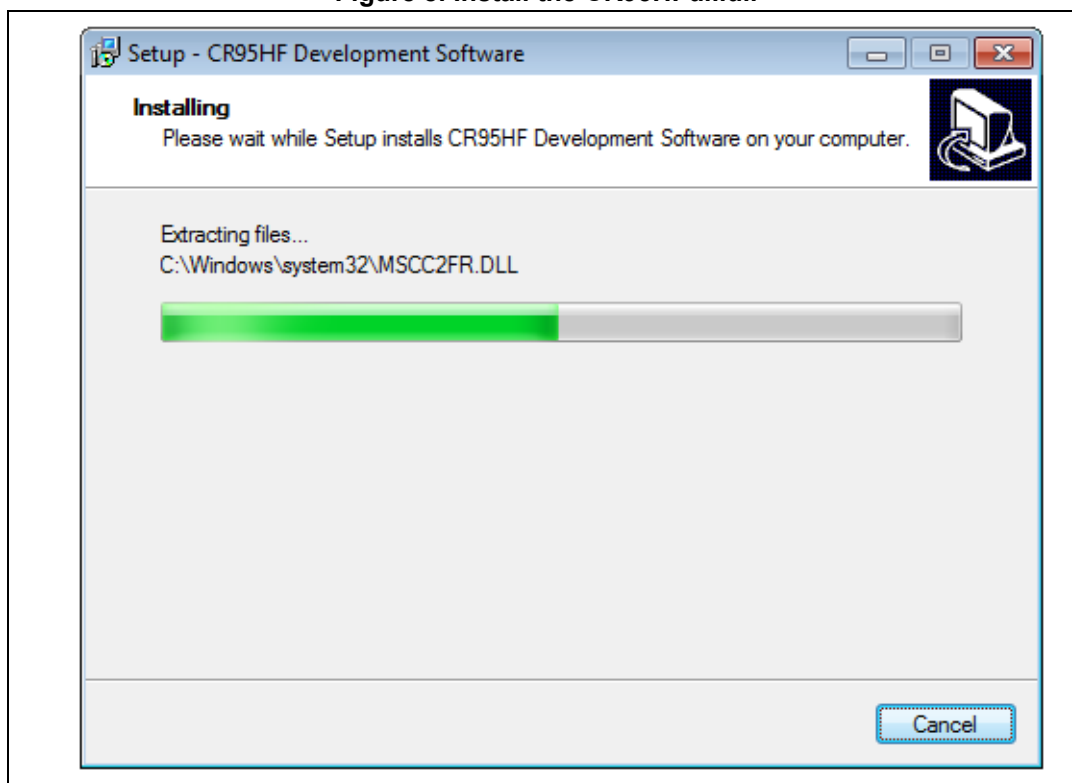


Figure 9. Read the CR95HF development software README

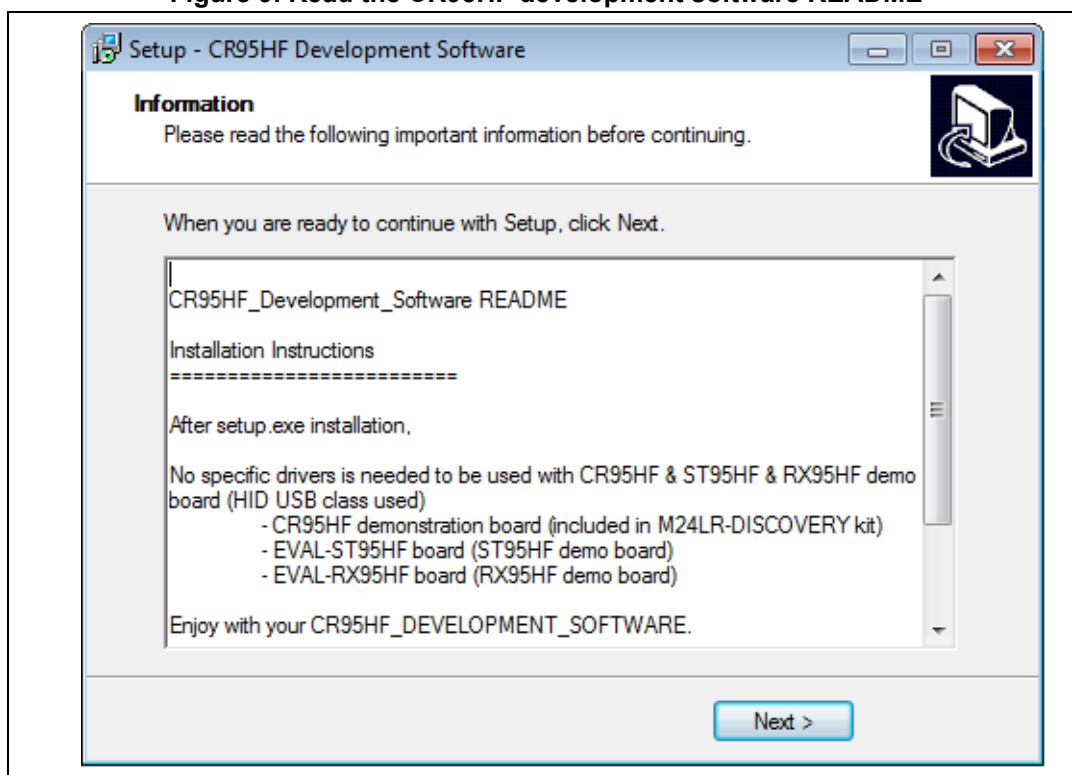
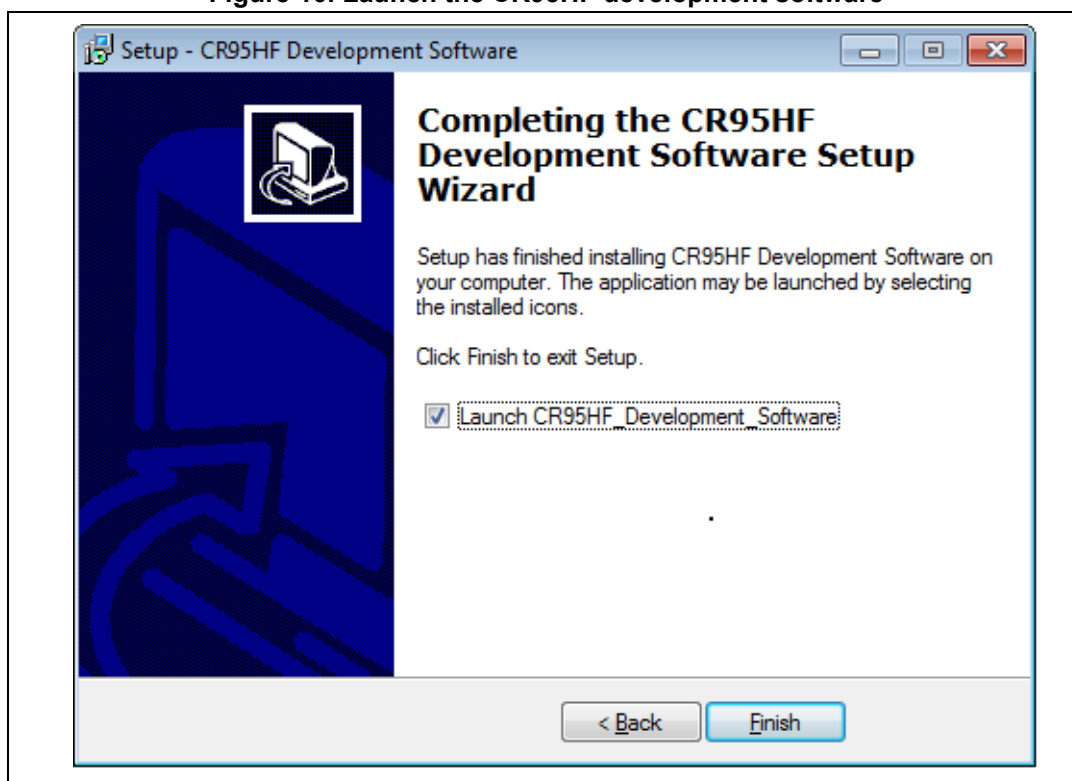


Figure 10. Launch the CR95HF development software



2 Using the CR95HF development software

2.1 Launching the CR95HF development software

Before launching the CR95HF development software, make sure that the CR95HF demonstration board embedded in the M24LR-DISCOVERY kit board is connected to the USB port of your computer.

The on-board LED blinks to indicate that the board works properly.

When the CR95HF development software is launched, a detection process begins (see [Figure 11](#) and [Figure 12](#)) to check:

- the revision of the DLL installed on your computer
- the revision of the STM32 MCU firmware installed on your CR95HF demonstration board
- the CR95HF identification number (IDN)

The objective of these checks is to verify that the DLL installed on your PC is up-to-date, and that your CR95HF demonstration board is ready to be used with the CR95HF development software.

If a problem occurs during the detection, the message shown in [Figure 13](#) is displayed.

Figure 11. Detection message 1/3

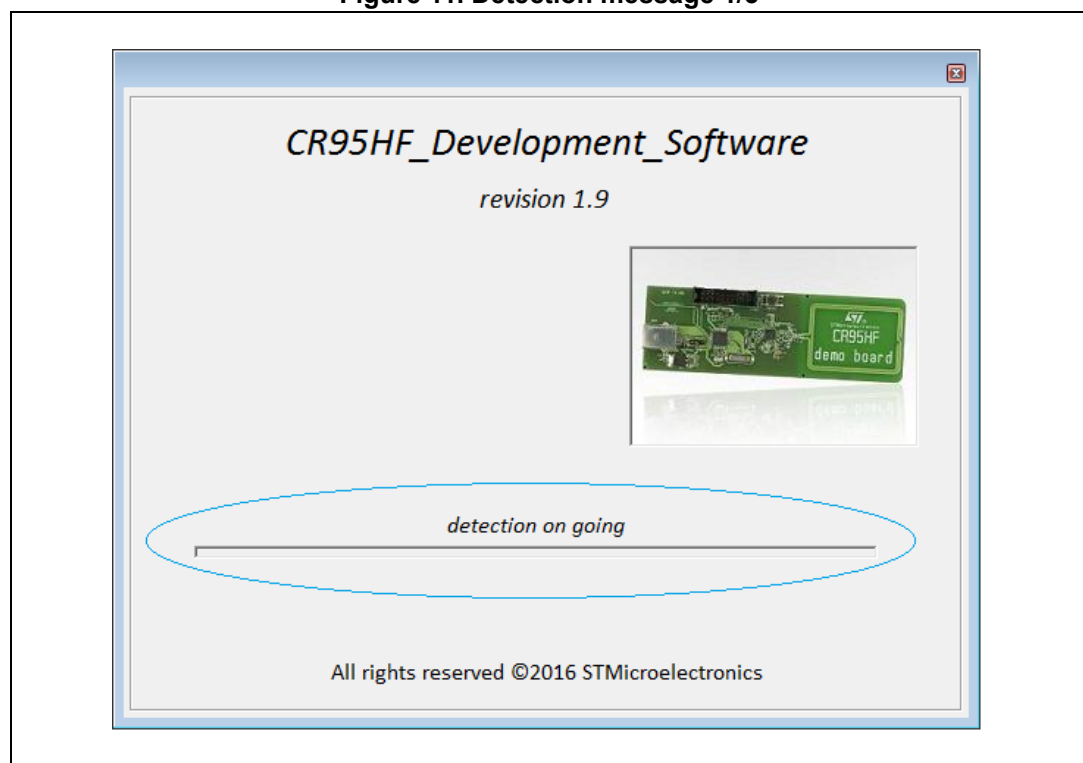


Figure 12. Detection message 2/3

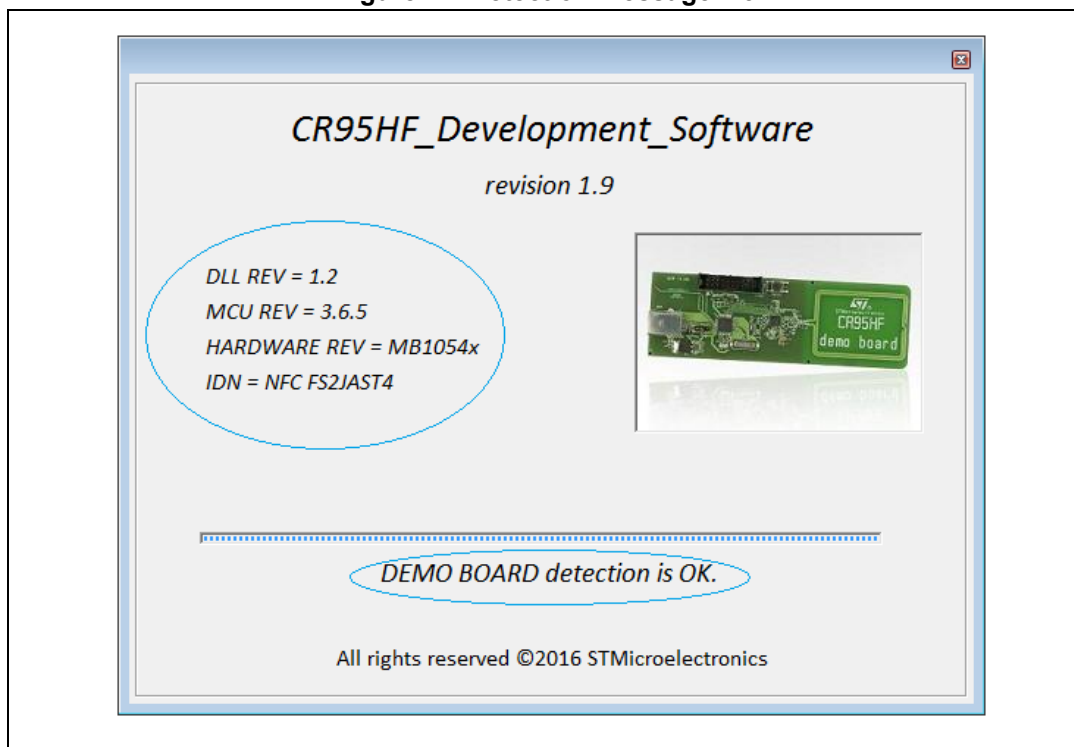
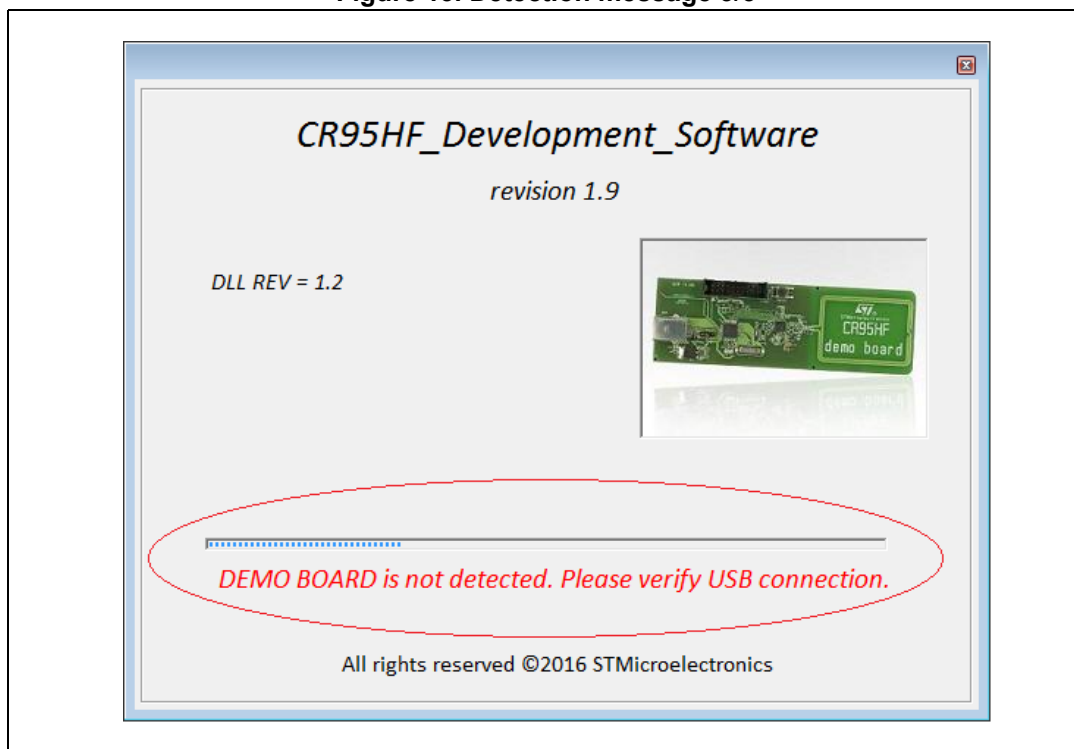


Figure 13. Detection message 3/3

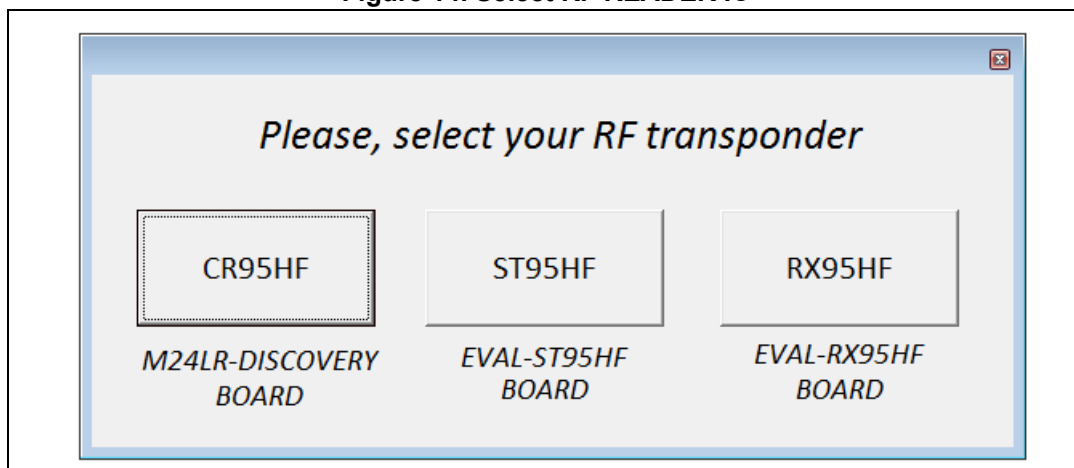


2.2 Main menu

If the software package has been installed correctly and the CR95HF demonstration board is connected to PC USB port, a pop up menu is displayed (see [Figure 14](#)).

The user need to select a RF READER IC between CR95HF, RX95HF or ST95HF.

Figure 14. Select RF READER IC

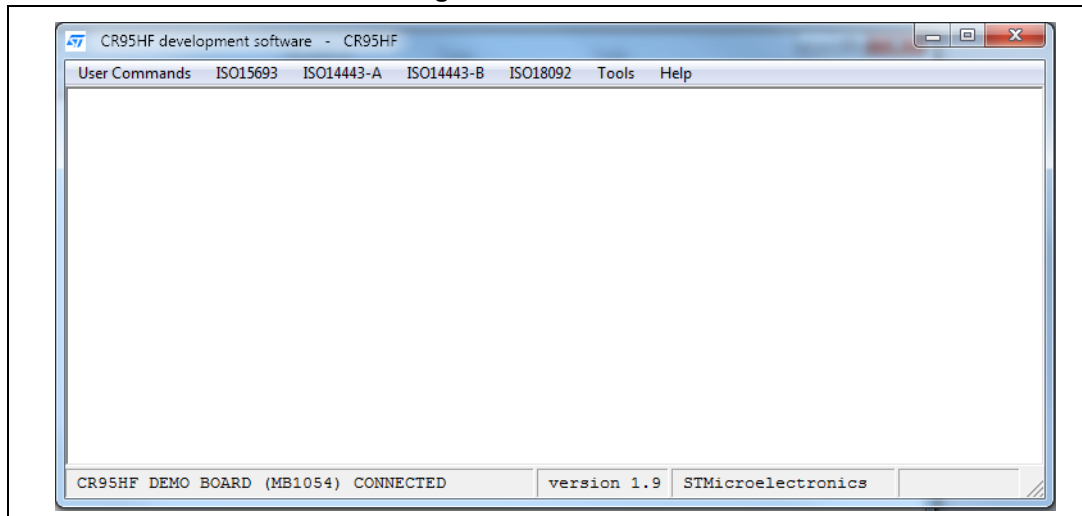


The main menu is displayed depending on the selected IC.

Note: The software release number is shown at the bottom of the menu window.

This menu allows the user to access several sub-menus:

- **User commands** (see [Section 2.3](#))
- **ISO15693** mode (see [Section 2.4](#))
- **ISO14443-A** mode (see [Section 2.5](#))
- **ISO14443-B** mode (see [Section 2.6](#))
- **ISO18092** mode (see [Section 2.7](#))
- **Tools** menu (see [Section 2.8](#))
- **Help** menu (see [Section 2.9](#))

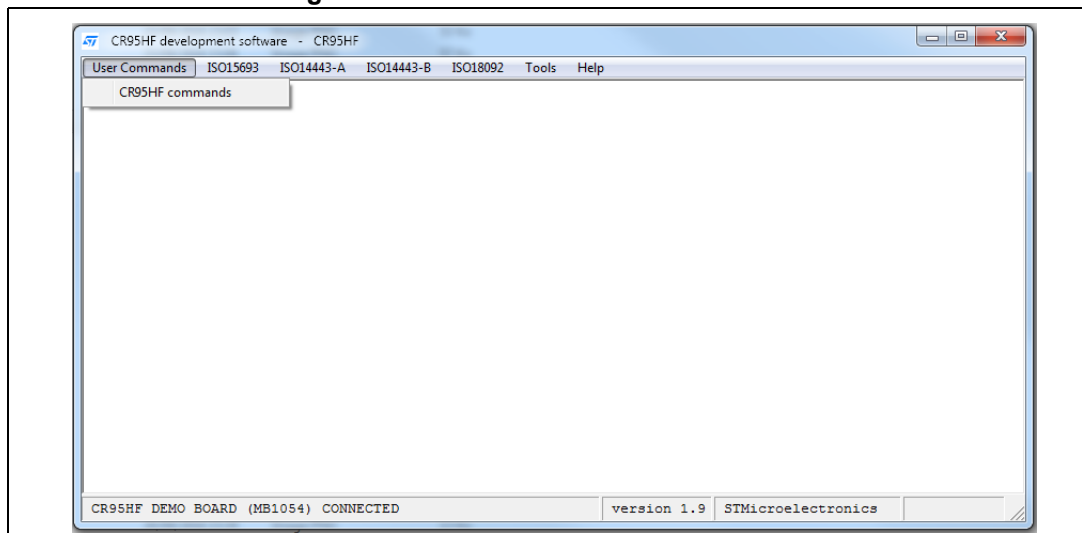
Figure 15. Main menu

2.3 User commands

This first menu allows access to all the commands described on the datasheet of the CR95HF, ST95HF and RX95HF IC (depending on selected IC).

2.3.1 CR95HF commands menu

1. Select CR95HF commands: from the main User command menu to communicate with the CR95HF embedded on your board and use all the commands and parameters described in the CR95HF datasheet (see [Figure 16](#)).

Figure 16. CR95HF user commands menu

2. Select a command from the list (see [Figure 17](#)). The corresponding CR95HF command is sent to the CR95HF demonstration board. The selected parameters together with the

board answer are displayed in the log window located at the bottom of the CR95HF user interface window.

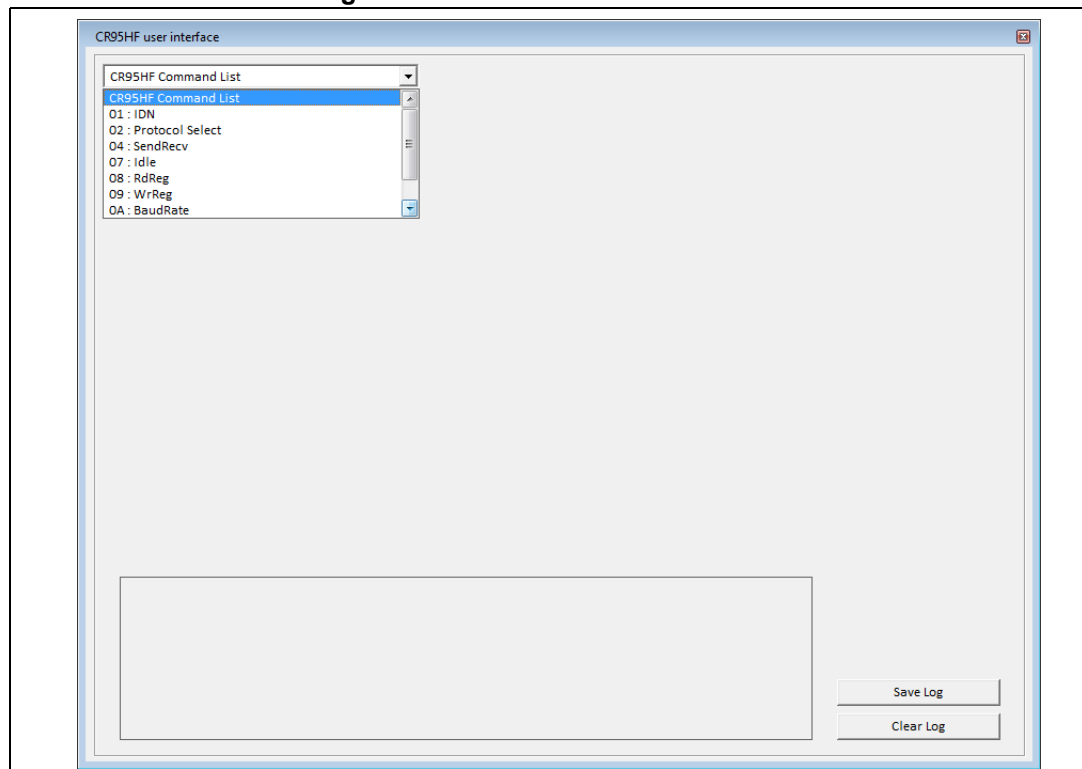
Two buttons are available from this menu:

- **Save Log** can be used to save the log content.
- **Clear Log** clears the log window.

The following commands can be sent through the CR95HF user interface:

- 01: IDN
- 02: Protocol Select
- 04: SendRecv
- 07: Idle
- 08: RdReg
- 09: WrReg
- 0A: baud rate
- 55: Echo

Figure 17. CR95HF commands menu



01: IDN

Click **01: IDN** to request short information about the CR95HF and its firmware version (see [Figure 18](#)).

Figure 18. IDN window

command code 01 : IDN

Send frame 01 00

length of data
command code

Request : 0100

Answer : 000F4E4643204653324A41535431004298

00 : result code = OK
0F : length of data (15)
NFC FS2JAST1

02: Protocol Select

Click **02: Protocol Select** to select the communication protocol to be used between the CR95HF and the tags, or to switch the RF field off (see [Figure 19](#)):

- Click **00: Field OFF** to send a Field OFF command that turns the RF field off (see [Figure 20](#)).
- Click **01: ISO15693** to select and configure the ISO15693 communication protocol (see [Figure 21](#)).
- Click **02: ISO14443-A** to select and configure the ISO-14443-A communication protocol (see [Figure 22](#)).
- Click **03: ISO14443-B** to select and configure the ISO-14443-B communication protocol (see [Figure 23](#)).
- Click on **04: ISO18092** to select and configure the ISO-18092 communication protocol (see [Figure 24](#)).

Figure 19. Protocol Select window

command code 02 : Protocol Select

Reader protocol code

☐ 00 : Field OFF
☐ 01 : ISO15693
☐ 02 : ISO14443-A
☐ 03 : ISO14443-B
☐ 04 : ISO18092

Figure 20. Field OFF window

command code 02 : Protocol Select

Reader protocol code

☒ 00 : Field OFF
☐ 01 : ISO15693
☐ 02 : ISO14443-A
☐ 03 : ISO14443-B
☐ 04 : ISO18092

Field Off byte 0 configuration

7	0	RFU
6	0	
5	0	
4	0	
3	0	
2	0	
1	0	
0	0	

byte 0 = 00

send frame

Request : 02020000

Answer : 0000
00 : result code = OK
00 : length of data (0)

Figure 21. ISO15693 window

command code 02 : Protocol Select

Reader protocol code

☐ 00 : Field OFF
☒ 01 : ISO15693
☐ 02 : ISO14443-A
☐ 03 : ISO14443-B
☐ 04 : ISO18092

ISO15693 reader byte 0 configuration

7	0	RFU
6	0	
5	0	00 : 26k
4	0	
3	1	1 : wait for sof
2	1	1 : 10% modulation
1	0	0 : Single Subcarrier
0	1	1 : Append CRC

byte 0 = 0D

send frame

Request : 0202010D

Answer : 0000
00 : result code = OK
00 : length of data (0)

Figure 22. ISO14443-A window

command code 02 : Protocol Select

Reader protocol code

☐ 00 : Field OFF
☐ 01 : ISO15693
☒ 02 : ISO14443-A
☐ 03 : ISO14443-B
☐ 04 : ISO18092

ISO14443-A reader byte 0 configuration

7	0	00 : 106k
6	0	
5	0	00 : 106k
4	0	
3	0	RFU
2	0	
1	0	RFU
0	0	

byte 0 = 00

ISO14443-A reader byte 1 & 2 configuration

☒ AFDT optional bytes 1 & 2

byte 1 = 01 byte 2 = 80

send frame

Request : 020402000180

Answer : 0000
00 : result code = OK
00 : length of data (0)

Figure 23. ISO14443-B window

command code 02 : Protocol Select

Reader protocol code

00 : Field OFF

01 : ISO15693

02 : ISO14443-A

03 : ISO14443-B

04 : ISO18092

ISO14443-B reader byte 0 configuration

7 0

6 0

5 0

4 0

3 0

2 0

1 0

0 1

00 : 106k

00 : 106k

RFU

1 : Append CRC

byte 0 = 01

ISO14443-B reader byte 1 & 2 configuration

AFDT optional bytes 1 & 2

byte 1 = 01 byte 2 = 80

send frame

02 04 03 01 01 80

Request : 020403010180

Answer : 0000

00 : result code = OK

00 : length of data (0)

Figure 24. ISO18092 window

command code 02 : Protocol Select

Reader protocol code

00 : Field OFF

01 : ISO15693

02 : ISO14443-A

03 : ISO14443-B

04 : ISO18092

ISO18092 reader byte 0 configuration

7 0

6 1

5 0

4 1

3 0

2 0

1 0

0 1

01 : 212k

01 : 212k

RFU

1 : Append CRC

byte 0 = 51

ISO18092 reader byte 1 configuration

7 0

6 0

5 0

4 1

3 0

2 0

1 0

0 0

RFU

1 : search for the reply

0 : 1 slot

check to send Slot Counter parameter (byte 1)

byte 1 = 10

ISO18092 reader bytes 2 & 3 configuration

AFDT optional

bytes 2 & 3 = 05 00

send frame

02 05 04 51 10 05 00

Request : 02050451100500

Answer : 0000

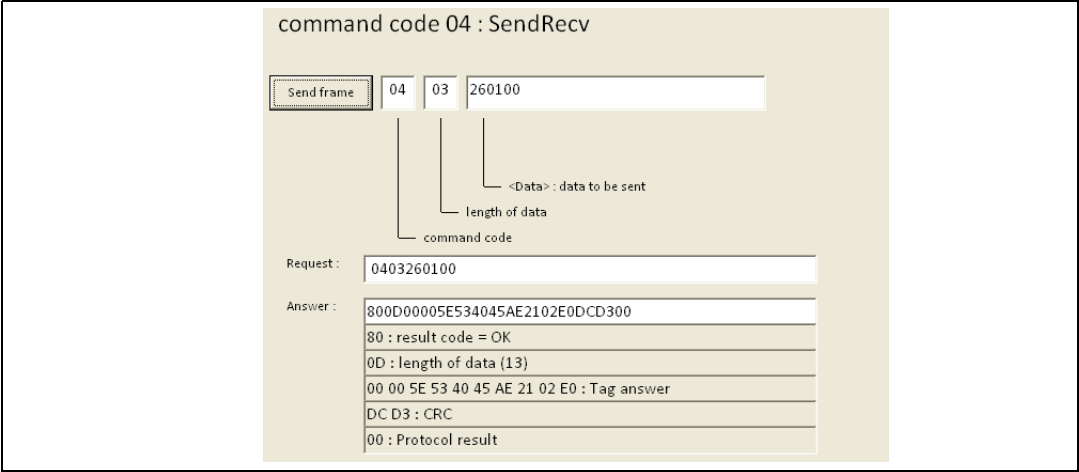
00 : result code = OK

00 : length of data (0)

04: SendRecv

Click **04: SendRecv** to send data and receive the tag response using the previously selected protocol (see [Figure 25](#) for an example).

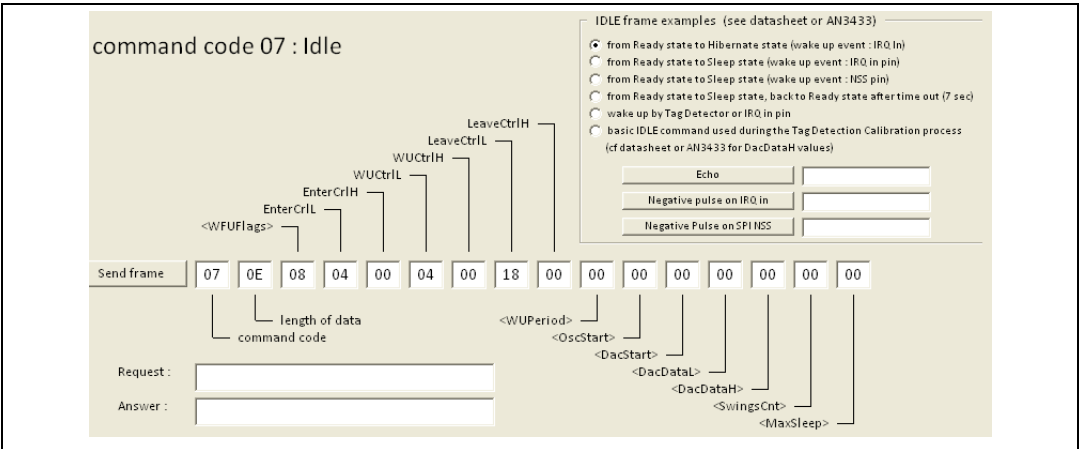
Figure 25. ISO15693 Inventory (260100) transmitted using a SendRecv request



07: Idle

Click **07: Idle** to switch the CR95HF to Tag Detection or Hibernate mode and specify the condition to exit this mode (see [Figure 26](#)).

Figure 26. Idle window



08: RdReg

Click **08: RdReg** to read the Wakeup register (see [Figure 27](#)).

Figure 27. RdReg window
09: WrReg

Click **09: WrReg** to set Analog register and update ARC_B register (see [Figure M](#))

Figure 28. WrReg window
0A: baud rate

Click **0A: Set UART baud rate** to configure the UART data transfer (see [Figure 29](#)).

Note: The CR95HF demonstration board is delivered in SPI version. Contact your nearest ST sales offices to switch it to UART mode.

Figure 29. Set UART baud rate window

command code 0A : Set UART baud rate

* IMPORTANT : DEMO-CR95HF-A delivered in SPI version (please contact ST to switch it to UART mode)

Send frame

0A0100

<BaudRate>

length of data

command code

New baud rate = <BaudRate>*2+2

255 : 13.56/512

254 : 13.56/510

...

117 : 13.56/236

...

2 : 13.56/6 ~2.26Mbps

1 : RFU

0 : RFU

Request :

Answer :

55: Echo

Click **55: Echo** to perform a serial interface echo (see [Figure 30](#)).

Figure 30. Echo window

command code 55 : Echo-code

Send frame

55

command code

Request :

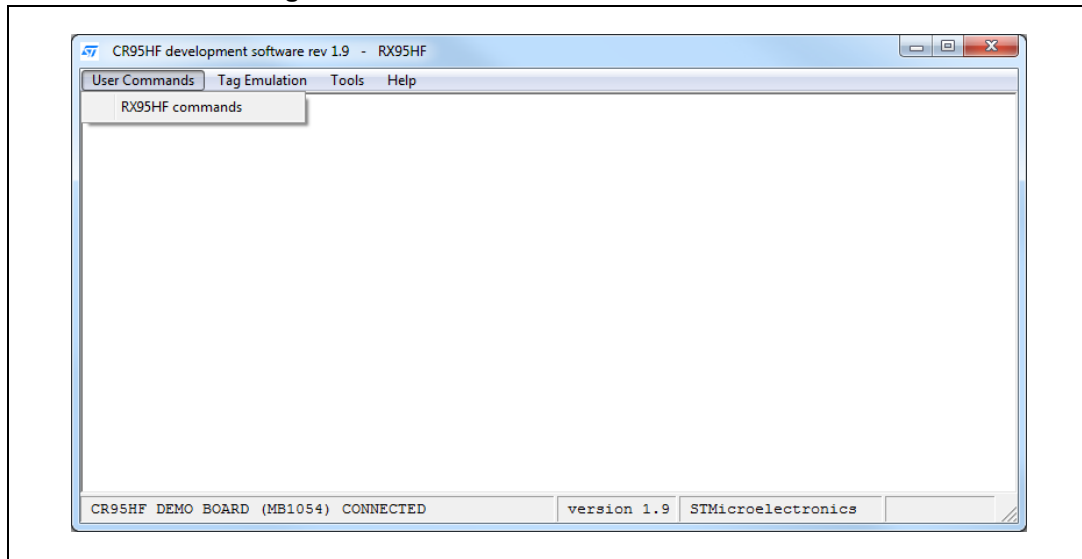
55

Answer :

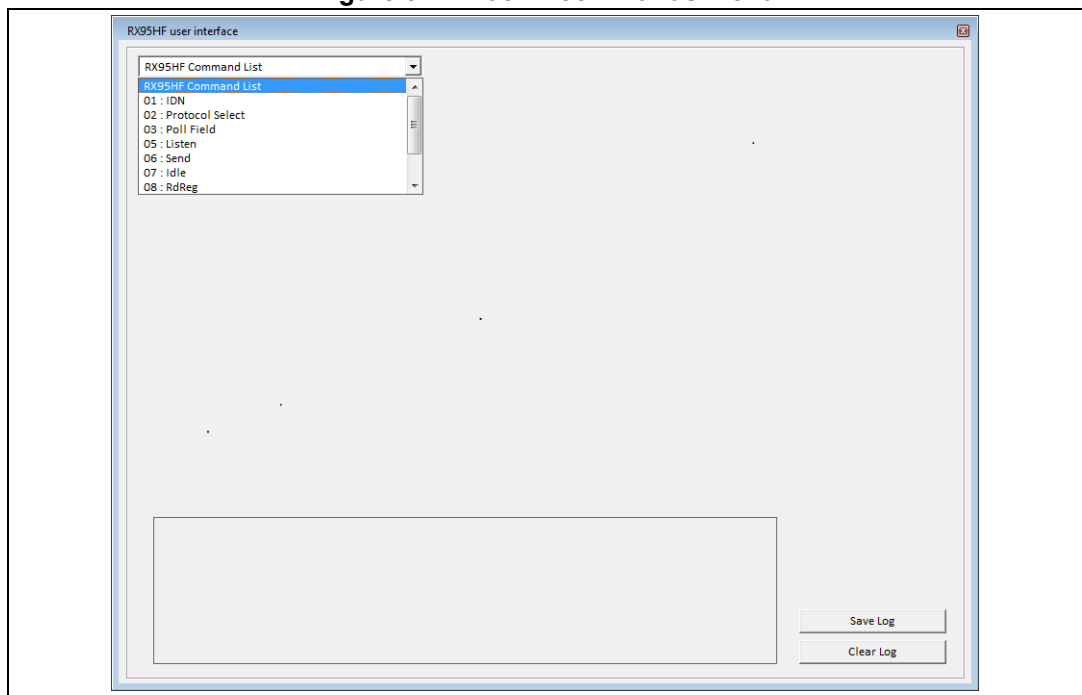
5500

2.3.2 RX95HF commands menu

1. Select RX95HF commands: from the menu User Commands to communicate with the RX95HF embedded on your board and use all the commands and parameters described in the datasheet (see [Figure 31](#)).

Figure 31. User commands menu for RX95HF

2. Select a command from the list (see [Figure 32](#)). The corresponding RX95HF command is sent to the CR95HF demonstration board. The selected parameters together with the board answer are displayed in the log window located at the bottom of the RX95HF user interface window.

Figure 32. RX95HF commands menu

Two buttons are available from this menu:

- Save Log can be used to save the log content.
- Clear Log clears the log window.

The following commands can be sent through the CR95HF user interface:

- 01: IDN
- 02: Protocol Select
- 03: Poll Field
- 05: Listen
- 06: Send
- 07: Idle
- 08: RdReg
- 09: WrReg
- 0D: AC filter
- 55: Echo

01: IDN

Click 01: IDN to request short information about the RX95HF and its firmware version (see [Figure 33](#)).

Figure 33. IDN window

command code 01 : IDN

Send frame 01 00

length of data
command code

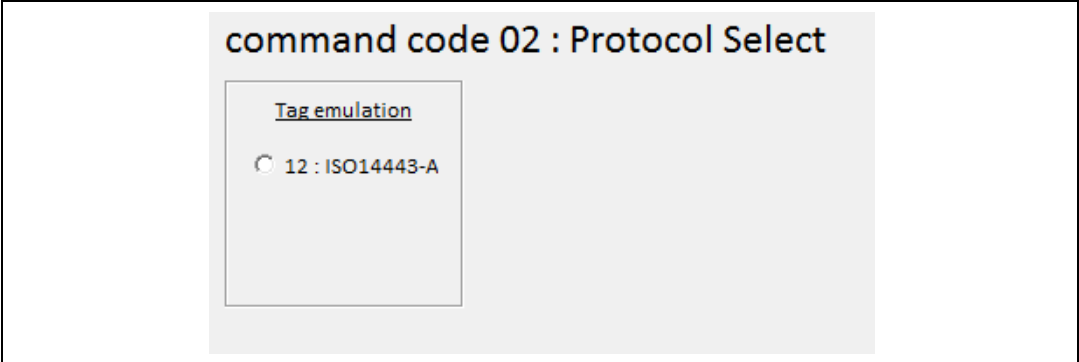
Request : 0100

Answer : 000F4E4643204653324A41535431004298
00 : result code = OK
0F : length of data (15)
NFC FS2JAST1

02: PROTOCOL SELECT

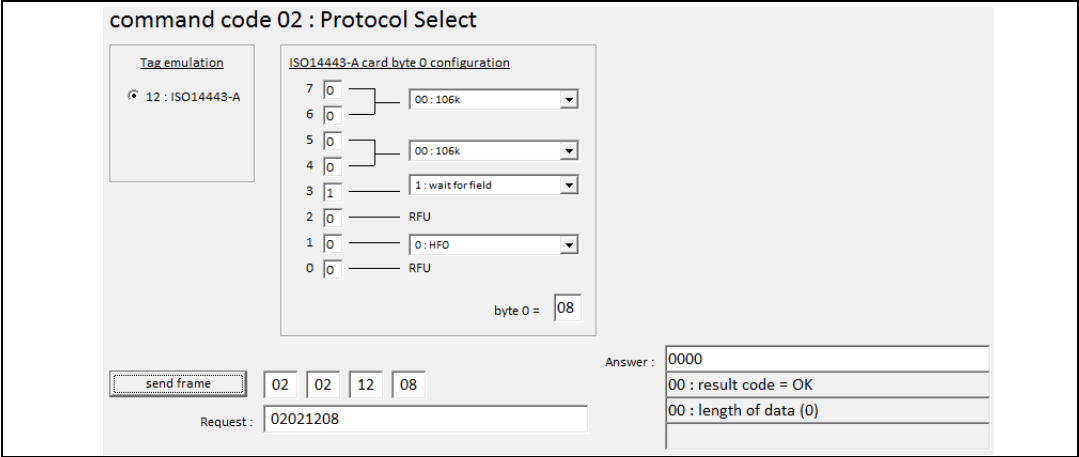
Click 02: Protocol Select to select the communication protocol to be used between the RX95HF and the transceiver (see [Figure 34](#)):

Figure 34. Protocol Select window



Click 12: ISO14443-A to select and configure the ISO-14443-A communication protocol for tag emulation (see [Figure 35](#)).

Figure 35. ISO14443-A windows



03: POLL FIELD

Click 03: Poll Field to be able to send Poll Field command. The result will inform the emulated tag of the presence of RF field. (see [Figure 36](#)):

Figure 36. Poll Field windows

command code 03 : PollField

Send frame

03

00

length of data

command code

Request : 0300

Answer : 000100

00 : result code = OK

01 : length of data (1)

00 : Field is not detected

05: LISTEN

Click 05: Listen to be able to send Listen command. The result will inform if the emulated tag is in Listen mode (see [Figure 37](#)):

Figure 37. Listen window

command code 05 : Listen

Send frame

05

00

length of data

command code

Request : 0500

Answer : 0000

00 : result code = Confirm that the device now is in Listen mode

00 : length of data (0)

Send Echo command

Answer : 5500

CR95HF Polling + Reading

Available in script tool as "CR95HFDLL_POLLING_READING"

Answer : 0000

“Echo” command and “CR95HF Polling + Reading” command has been added to be able to play with Listen mode and control the state of the emulated tag.

06: SEND

Click 06: Send to be able to send Send command with some parameters. The parameters will be the answer of the emulated tag to the transceiver (see [Figure 38](#)):

Figure 38. Send window

command code 06 : Send

Send frame

06 00

<Data> : data to be sent

length of data

command code

Request :

Answer :

07: IDLE

Click 07: Idle to be able to send Idle command with some parameters (see [Figure 39](#)):

Figure 39. Idle window

command code 07 : Idle

IDLE frame examples (see datasheet or AN3433)

- ☒ from Ready state to Hibernate state (wake up event : IRQ in)
- ☐ from Ready state to Sleep state (wake up event : IRQ in pin)
- ☐ from Ready state to Sleep state (wake up event : NSS pin)
- ☐ from Ready state to Sleep state, back to Ready state after time out (7 sec)
- ☐ wake up by Tag Detector or IRQ in pin
- ☐ basic IDLE command used during the Tag Detection Calibration process (cf datasheet or AN3433 for DacDataH values)

Echo

Negative pulse on IRQ in

Negative Pulse on SPI NSS

07 0E 08 04 00 04 00 18 00 00 00 00 00 00 00

<WFUFlags>

EnterCtrl

EnterCtrlH

WUCtrlL

WUCtrlH

LeaveCtrlL

LeaveCtrlH

<WUPeriod>

<OscStart>

<DacStart>

<DacDataL>

<DacDataH>

<SwingsCnt>

<MaxSleep>

length of data

command code

Request :

Answer :

08: RDREG

Click 08: RdReg to be able to Read ACC_A register or to send Wake-up event (see [Figure 40](#)):

Figure 40. Read Register window

command code 08 : RdReg

Send frame

08

03

69

01

00

ST Reserved

Register size

Register address for ACC_A register

length of data

command code

Select register

☐ 0x62 : Wake-up event register
 -> answer = 01 : wake-up by timeout
 -> answer = 02 : wake-up by tag detect

☒ 0x69 : ACC_A register
 -> answer = XY :
 where : X = Depth
 where : Y = Gain

Request :

0803690100

Answer :

000100

00 : result code = OK

01 : length of data (1)

Data : 00

09: WRREG

Click 09: WrReg to be able to set Analog registers and update ACC_A register (see [Figure 41](#)):

Figure 41. Write Register window

command code 09 : WrReg

Send frame

09

03

68

00

01

Index

Flag increment address after write command

Analog Register Configuration address index

length of data

command code

Write register command

☒ Set analog register index to 0x01 (ACC_A)

☐ Update ACC_A value (with value = XY)
 where : X = Demodulator Sensibility
 0x1 = 10%
 0x2 = 100%
 where : Y = Load Modulation
 0x1 = Min
 0x7 = Default
 0xF = Max

Request :

0903680001

Answer :

0000

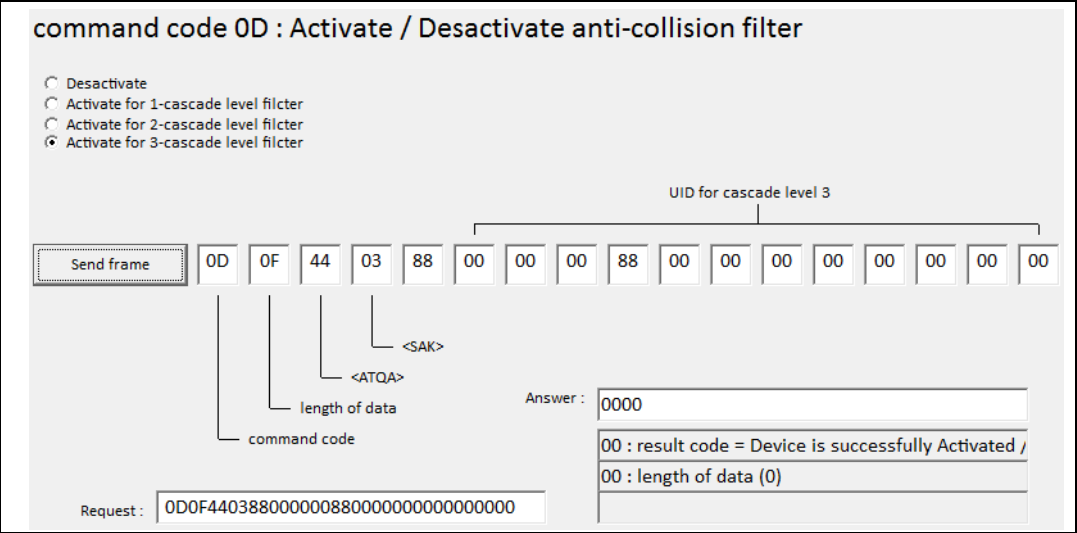
00 : result code = Data was successfully sent

00 : length of data (0)

0D: AC-FILTER

Click 09: AC-Filter to be able to set ATQA, SAK and UID value for anticollision process (see [Figure 42](#)):

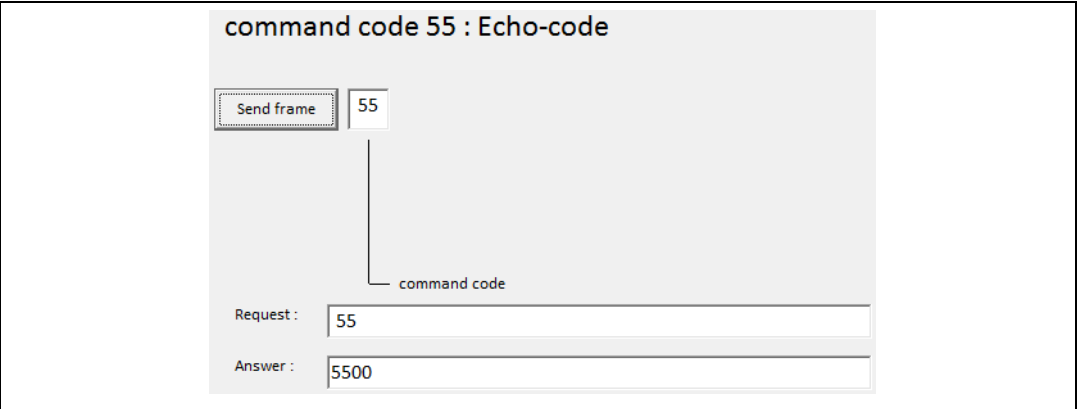
Figure 42. AC-Filter window



55: ECHO

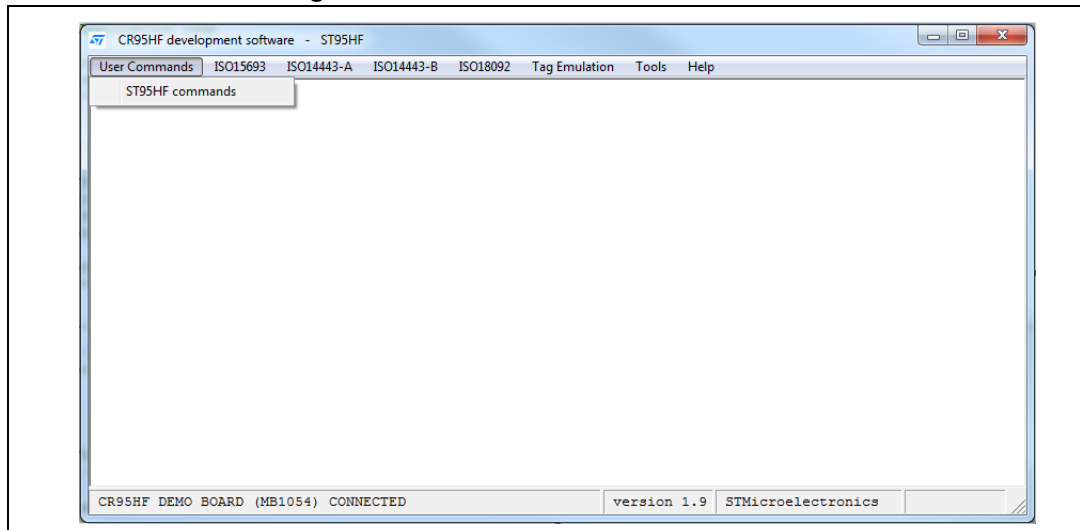
Click 55: Echo to perform a serial interface echo (see [Figure 43](#)).

Figure 43. Echo window

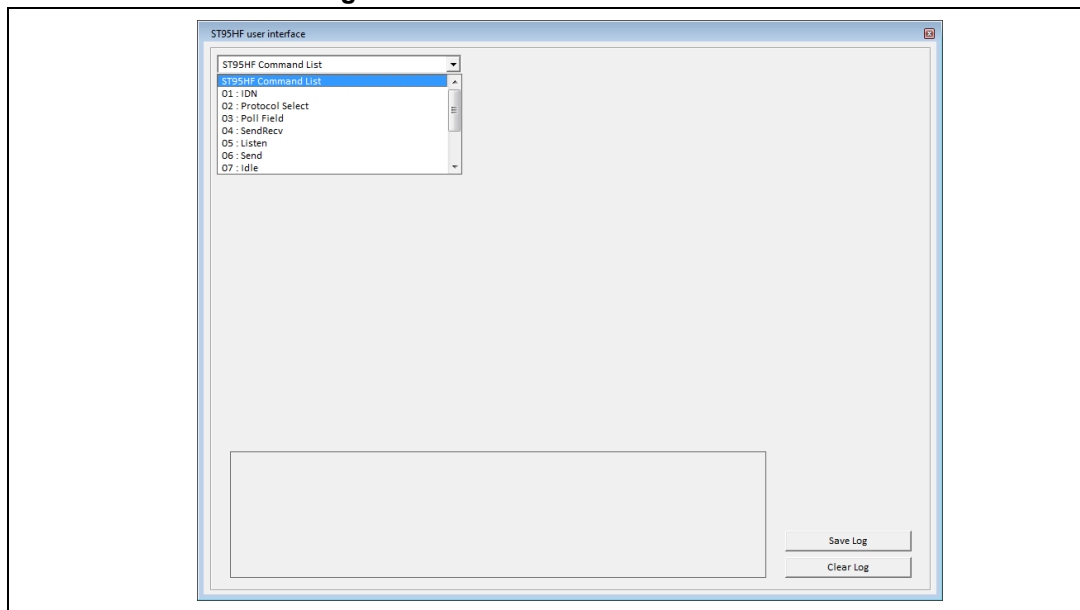


2.3.3 ST95HF commands menu

1. Select ST95HF commands from the menu User Commands to communicate with the ST95HF embedded on your board and use all the commands and parameters described in the datasheet (see [Figure 44](#)).

Figure 44. ST95HF user commands menu

2. Select a command from the list (see [Figure 45](#)). The corresponding RX95HF command is sent to the CR95HF demonstration board. The selected parameters together with the board answer are displayed in the log window located at the bottom of the RX95HF user interface window.

Figure 45. ST95HF commands menu

Two buttons are available from this menu:

- Save Log can be used to save the log content.
- Clear Log clears the log window.

The following commands can be sent through the CR95HF user interface:

- 01: IDN
- 02: Protocol Select
- 03: Poll Field
- 04: SendRecv
- 05: Listen
- 06: Send
- 07: Idle
- 08: RdReg
- 09: WrReg
- 0A: BaudRate
- 0D: AC filter
- 55: Echo

01: IDN

Click **01: IDN** to request short information about the CR95HF and its firmware version (see [Figure 18](#)).

Figure 46. IDN window

command code 01 : IDN

Send frame 01 00

length of data

command code

Request : 0100

Answer : 000F4E4643204653324A41535431004298

00 : result code = OK

0F : length of data (15)

NFC FS2IAST1

02: Protocol Select

Click **02: Protocol Select** to select the communication protocol to be used between the CR95HF and the tags, or to switch the RF field off (see [Figure 19](#)):

- Click **00: Field OFF** to send a Field OFF command that turns the RF field off (see [Figure 20](#)).
- Click **01: ISO15693** to select and configure the ISO15693 communication protocol (see [Figure 21](#)).
- Click **02: ISO14443-A** to select and configure the ISO-14443-A communication protocol (see [Figure 22](#)).
- Click **03: ISO14443-B** to select and configure the ISO-14443-B communication protocol (see [Figure 23](#)).
- Click on **04: ISO18092** to select and configure the ISO-18092 communication protocol (see [Figure 24](#)).

Figure 47. Protocol Select window

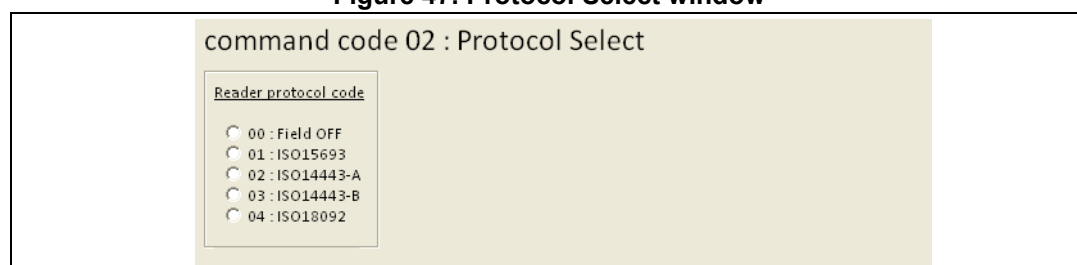


Figure 48. Field OFF window

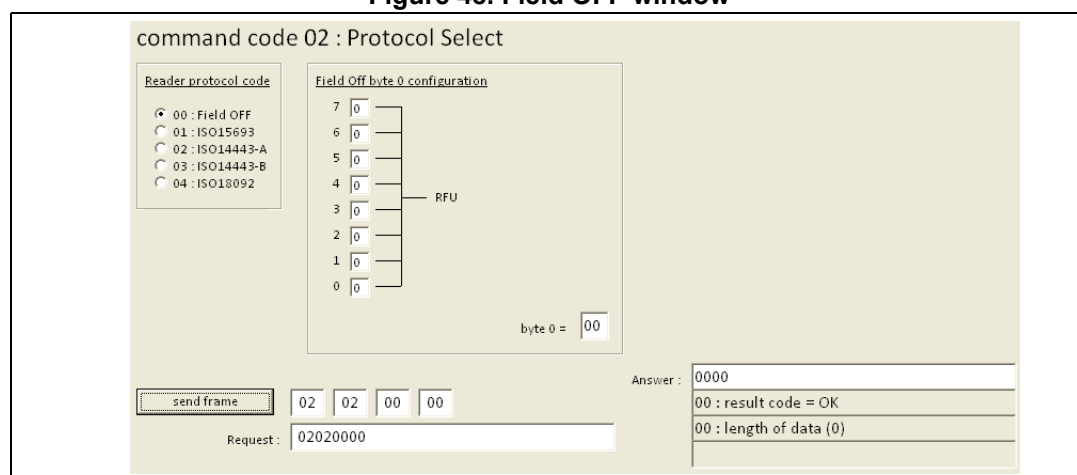


Figure 49. ISO15693 window

command code 02 : Protocol Select

Reader protocol code

☐ 00 : Field OFF
☒ 01 : ISO15693
☐ 02 : ISO14443-A
☐ 03 : ISO14443-B
☐ 04 : ISO18092

ISO15693 reader byte 0 configuration

7	0	RFU
6	0	
5	0	00 : 26k
4	0	1 : wait for sof
3	1	1 : 10% modulation
2	1	0 : Single Subcarrier
1	0	1 : Append CRC
0	1	

byte 0 = 0D

send frame

Request : 02 02 01 0D

Answer : 0000
00 : result code = OK
00 : length of data (0)

Figure 50. ISO14443-A window

command code 02 : Protocol Select

Reader protocol code

☐ 00 : Field OFF
☐ 01 : ISO15693
☒ 02 : ISO14443-A
☐ 03 : ISO14443-B
☐ 04 : ISO18092

ISO14443-A reader byte 0 configuration

7	0	00 : 106k
6	0	
5	0	00 : 106k
4	0	RFU
3	0	
2	0	RFU
1	0	
0	0	

byte 0 = 00

ISO14443-A reader byte 1 & 2 configuration

☒ AFDT optional bytes 1 & 2

byte 1 = 01 byte 2 = 80

send frame

Request : 02 04 02 00 01 80

Answer : 0000
00 : result code = OK
00 : length of data (0)

Figure 51. ISO14443-B window

command code 02 : Protocol Select

Reader protocol code

☐ 00 : Field OFF
☐ 01 : ISO15693
☐ 02 : ISO14443-A
☒ 03 : ISO14443-B
☐ 04 : ISO18092

ISO14443-B reader byte 0 configuration

7	0	00 : 106k
6	0	
5	0	00 : 106k
4	0	RFU
3	0	
2	0	RFU
1	0	
0	1	1 : Append CRC

byte 0 = 01

ISO14443-B reader byte 1 & 2 configuration

☒ AFDT optional bytes 1 & 2

byte 1 = 01 byte 2 = 80

send frame

Request : 02 04 03 01 01 80

Answer : 0000
00 : result code = OK
00 : length of data (0)

Figure 52. ISO18092 window

command code 02 : Protocol Select

Reader protocol code

☐ 00 : Field OFF
☐ 01 : ISO15693
☐ 02 : ISO14443-A
☐ 03 : ISO14443-B
☒ 04 : ISO18092

ISO18092 reader byte 0 configuration

7	0	}	01 : 212k
6	1		
5	0	}	01 : 212k
4	1		
3	0	}	RFU
2	0		
1	0	}	1 : Append CRC
0	1		

byte 0 = 51

ISO18092 reader byte 1 configuration

7	0	}	RFU
6	0		
5	0		
4	1	}	1 : search for the reply
3	0		
2	0	}	0 : 1 slot
1	0		
0	0	}	

☒ check to send Slot Counter parameter (byte 1) byte 1 = 10

ISO18092 reader bytes 2 & 3 configuration

☒ AFDT optional bytes 2 & 3 = 05 00

send frame

02 05 04 51 10 05 00

Request : 02050451100500

Answer : 0000
00 : result code = OK
00 : length of data (0)

03: POLL FIELD

Click 03: Poll Field to be able to send Poll Field command. The result will inform the emulated tag of the presence of RF field. (see [Figure 36](#)):

Figure 53. Poll Field windows

command code 03 : PollField

Send frame

03 00

length of data

command code

Request : 0300

Answer : 000100
00 : result code = OK
01 : length of data (1)
00 : Field is not detected

04: SendRecv

Click **04: SendRecv** to send data and receive the tag response using the previously selected protocol (see [Figure 25](#) for an example).

Figure 54. ISO15693 Inventory (260100) transmitted using a SendRecv request

command code 04 : SendRecv

Send frame 04 03 260100

length of data
command code
<Data> : data to be sent

Request : 0403260100

Answer : 800D00005E534045AE2102E0DCD300
 80 : result code = OK
 0D : length of data (13)
 00 00 5E 53 40 45 AE 21 02 E0 : Tag answer
 DC D3 : CRC
 00 : Protocol result

05: LISTEN

Click **05: Listen** to be able to send Listen command. The result will inform if the emulated tag is in Listen mode (see [Figure 37](#)):

Figure 55. Listen window

command code 05 : Listen

Send frame 05 00

length of data
command code

Request : 0500

Answer : 0000
 00 : result code = Confirm that the device now is in Listen mode
 00 : length of data (0)

Send Echo command

Answer : 5500

CR95HF Polling + Reading

Answer : 0000

Available in script tool as "CR95HFDLL_POLLING_READING"

“Echo” command and “CR5HF Polling + Reading” command has been added to be able to play with Listen mode and control the state of the emulated tag.

06: SEND

Click 06: Send to be able to send Send command with some parameters. The parameters will be the answer of the emulated tag to the transceiver (see [Figure 38](#)):

Figure 56. Send window

command code 06 : Send

Send frame

06

00

length of data

command code

<Data> : data to be sent

Request :

Answer :

07: Idle

Click **07: Idle** to switch the CR95HF to Tag Detection or Hibernate mode and specify the condition to exit this mode (see [Figure 26](#)).

Figure 57. Idle window

command code 07 : Idle

Send frame

07

0E

08

04

00

04

00

18

00

00

00

00

00

00

00

00

<WFUFlags>

EnterCtrlL

EnterCtrlH

WUCtrlL

WUCtrlH

LeaveCtrlL

LeaveCtrlH

length of data

command code

<WUPeriod>

<OscStart>

<DacStart>

<DacDataL>

<DacDataH>

<SwingsCnt>

<MaxSleep>

Request :

Answer :

IDLE frame examples (see datasheet or AN3433)

☒ from Ready state to Hibernate state (wake up event : IRQ in)

☐ from Ready state to Sleep state (wake up event : IRQ in pin)

☐ from Ready state to Sleep state (wake up event : NSS pin)

☐ from Ready state to Sleep state, back to Ready state after time out (7 sec)

☐ wake up by Tag Detector or IRQ in pin

☐ basic IDLE command used during the Tag Detection Calibration process (cf datasheet or AN3433 for DacDataH values)

Echo

Negative pulse on IRQ in

Negative Pulse on SPI NSS

08: RdReg

Click **08: RdReg** to read the Wakeup register (see [Figure 27](#)).

Figure 58. RdReg window

command code 08 : RdReg

Send frame	08	03	62	01	00
------------	----	----	----	----	----

ST Reserved
 Register size
 Register Address
 length of data
 command code

Request :

Answer :

Select register

☒ 0x62 : Wake-up event register

-> answer = 01 : wake-up by timeout

-> answer = 02 : wake-up by tag detect

☐ 0x69 : ARC_B register

-> answer = XY :

where : X = Depth

where : Y = Gain

09: WrReg

Click **09: WrReg** to set Analog register and update ARC_B register (see Figure M)

Figure 59. WrReg window

command code 09 : WrReg

Send frame	09	03	68	00	01
------------	----	----	----	----	----

Index
 Flag increment address after write command
 Analog Register Configuration address index
 length of data
 command code

Request :

Answer :

Write register command

☒ Set analog register index to 0x01 (ARC_B)

☐ Update ARC_B value (with value = XY)

where : X = Modulation Depth

1 = 10%	4 = 30%	D = 95%
2 = 17%	5 = 33%	
3 = 25%	6 = 36%	

where : Y = Receiver Gain

0 = 34 dB	3 = 27 dB	F = 8 dB
1 = 32 dB	7 = 20 dB	

☐ Set HF2RF (enable Reader mode)

☐ Reset HF2RF (disable Reader mode)

☐ Set TimerW value 0x50-0x60 (ISO14443-A)

☐ Enable the AutoDetect filter (ISO18092)

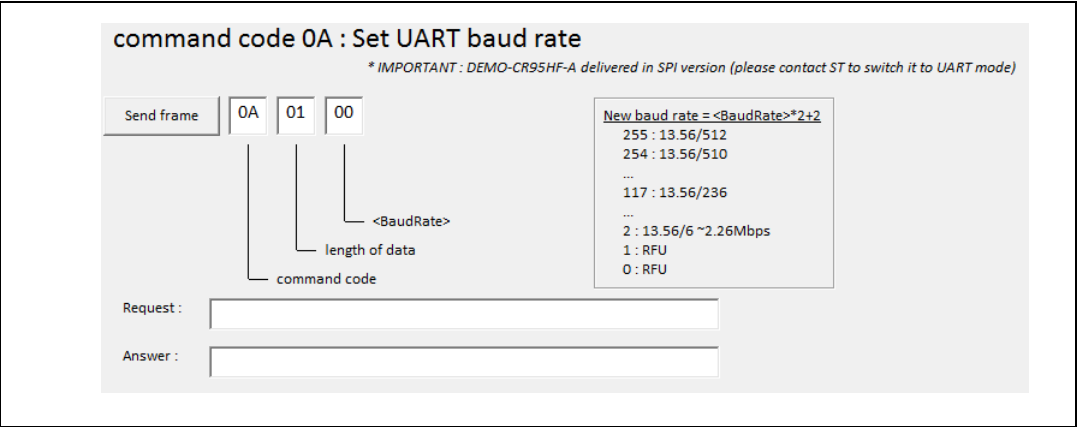
☐ QJD RF Enable

0A: baud rate

Click **0A: Set UART baud rate** to configure the UART data transfer (see [Figure 29](#)).

Note: The CR95HF demonstration board is delivered in SPI version. Contact your nearest ST sales offices to switch it to UART mode.

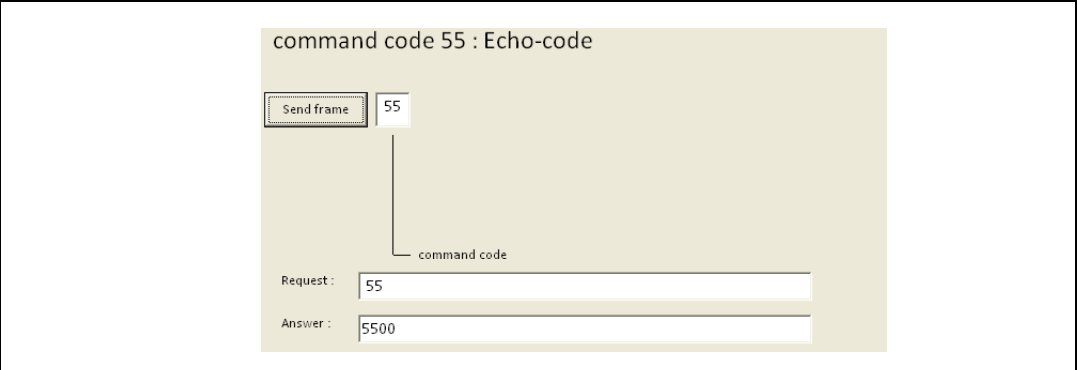
Figure 60. Set UART baud rate window



55: Echo

Click **55: Echo** to perform a serial interface echo (see [Figure 30](#)).

Figure 61. Echo window



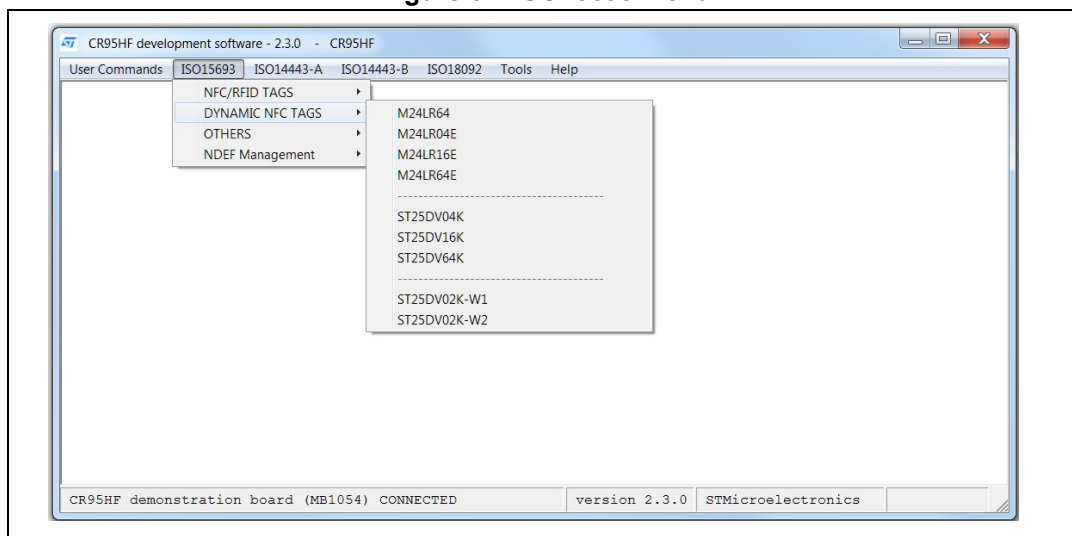
2.4 ISO15693 menu

1. Select **ISO15693** from the main menu to use the CR95HF demonstration board as an ISO15693 reader (see [Figure 62](#)).

The menu allows to select:

- NFC/RFID TAGS
 - LRI1K
 - LRI2K
 - LRIS2K
 - LRIS64K
 - ST25TV512
 - ST25TV02K
 - ST25TV16K
 - ST25TV64K
- DYNAMIC NFC TAGS
 - M24LR64
 - M24LR04E
 - M24LR16E
 - M24LR64E
 - ST25DV04K
 - ST25DV16K
 - ST25DV64K
 - ST25DV02K-W1
 - ST25DV02K-W2
- OTHERS
 - PICOPASS
- NDEF Management
 - Vicinity Tags - NDEF message user interface
 - NFC Type 5 - NDEF message user interface

Figure 62. ISO15693 menu



2. EXAMPLE 1: M24LR64E USER INTERFACE

Select a device from the list (see [Figure 63](#) for an example). The board is then

automatically configured as an ISO15693 reader, and the CR95HF can send/receive ISO15693 frames to/from the tags using the SendRecv command.

ISO15693 communications are configured as follows:

- 10% high data rate
- One subcarrier

The ISO15693 configuration is displayed in the log window.

The upper part of the menu shows buttons which allow to send ISO15693 requests to a tag through the CR95HF demonstration board antenna. The main available requests are:

- Inventory
- Select
- Stay Quiet
- Reset to ready
- Get system info
- Initiate
- Inventory initiated
- Fast initiate
- Fast Inventory initiated

Refer to the CR95HF datasheet for the full list of ISO15693 commands.

By default, the ISO15693 requests are sent in Non-selected/Non-addressed mode, and the requests are decoded by all the tags present in the RF field.

To switch to Addressed mode, follow the steps below:

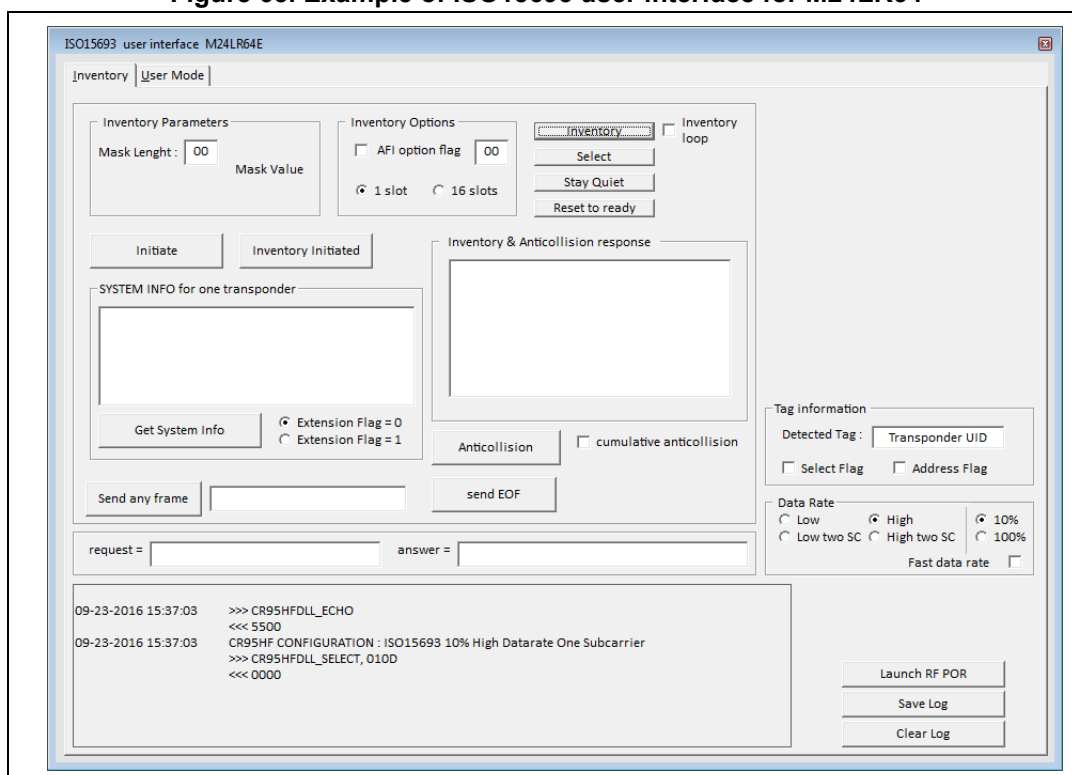
- a) Send an Inventory request to retrieve the tag UID.
- b) Click on the UID displayed in the **INVENTORY response** window to automatically copy the UID into the **Tag information** text box.
- c) Check **Address Flag** to activate the Addressed mode for the coming requests.

The following sequence is required to switch to Selected mode:

- a) Send a Select request in Addressed mode (steps a to c above).
- b) Uncheck **Address Flag**.
- c) Check **Select Flag**.

All the coming requests will be sent to the previously selected tag.

Figure 63. Example of ISO15693 user interface for M24LR64



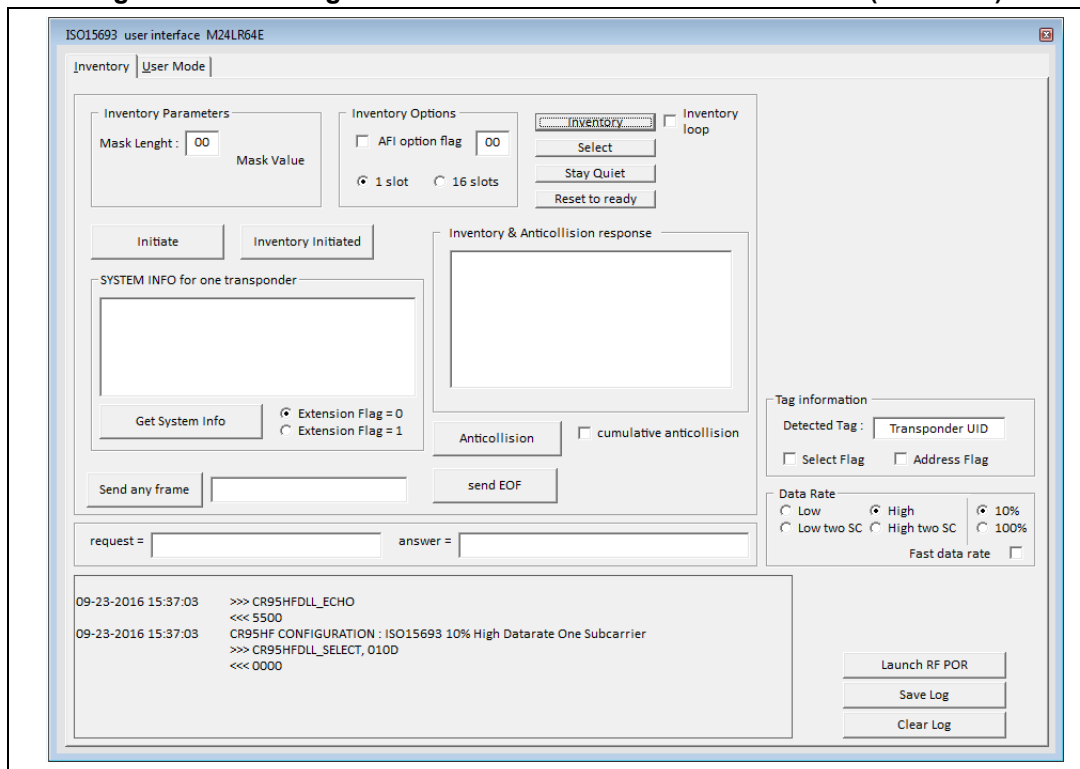
- Click **User Mode** from the toolbar of the device ISO15693 user interface to display the ISO15693 requests that can be sent in User mode (see [Figure 64](#)). The main requests are:

- Read single and multiple block(s)
- Fast read single and multiple block(s)

The CR95HF demonstration board is automatically configured in Fast mode, and put back in normal mode when the request is complete.

Other requests are available (DSFID, AFI, ..). Refer to the device datasheet for the full list of ISO15693 requests available for a given product.

Note: The tag answer to a read request is displayed in the right part of the window.

Figure 64. Selecting User Mode from ISO15693 user interface (M24LR64)

4. EXAMPLE 2 : ST25DV64K USER INTERFACE.

A specific user interface has been build in order to be able to use ST25DV products. This user interface allows to manage all the features of the ST25DV :

- INVENTORY
- EEPROM
- FTM (FAST TRANSFER MODE)
- CONFIGURATION
- PASSWORD
- ENERGY HARVESTING
- DEMOS

a) INVENTORY & ANTICOLLISION COMMANDS

This part of the user interface allows the user to send Inventory commands and manage ISO15693 states:

- Inventory
- Select
- Stay Quiet
- Reset to Ready
- Anticollision button will allow to launch global anticollision process manage by the STM32 and display up to 5 UID's tags.

Figure 65. ST25DV user interface: Inventory

ST25DV user interface ST25DV64K

INVENTORY | AFI DSFID INFO | EEPROM | CONFIG | FTM | PASSWORD | ENERGY HARVESTING & GPO | DEMOS

Inventory command

Inventory Parameters
Mask Length: 00 Mask Value

Inventory Options
☐ AFI option flag 00
☒ 1 slot ☐ 16 slots
 Inventory loop ☐

Inventory & Anticollision response

Anticollision ☐ cumulative anticollision

States
 Select
 Stay Quiet
 Reset to ready
 send EOF

Send any frame

request = answer =

Tag information
 Detected Tag : TRANSPONDER UID
☐ Select Flag
☐ Address Flag ☐ Option flag

Data Rate
☐ Low ☒ High ☐ 10%
☐ Low two SC ☐ High two SC ☐ 100%
☐ Fast data rate

Launch RF POR
 RF OFF RF ON

Save Log Clear Log

- b) AFI, DSFID & SYSTEM INFO COMMANDS (see [Figure 66](#)):
- Write DSFID
 - LOCK DSFID
 - Write AFI
 - LOCK AFI
 - Get System Info
 - Extended Get System Info

Figure 66. ST25DV user interface: AFI DSFID INFO

ST25DV user interface ST25DV64K

INVENTORY | **AFI DSFID INFO** | EEPROM | CONFIG | FTM | PASSWORD | ENERGY HARVESTING & GPO | DEMOS

DSFID: Write [00] Lock

AFI: Write [00] Lock

SYSTEM INFO

Get System Info

Extended Get System Info Request Field [3F]

Click to change Request Field values

FLAG NAME	VALUE
b0 DSFID requested	1
b1 AFI requested	1
b2 MemSize requested	1
b3 ICRef requested	1
b4 MOI requested	1
b5 VICC CmdList requested	1
b6 CSI Info not requested	0
b7 ReqFieldSize 1 Byte	0

request = [] answer = []

Tag information

Detected Tag : TRANSPONDER UID

☐ Select Flag ☐ Address Flag ☐ Option flag

Data Rate

☐ Low ☒ High ☐ 10%
☐ Low two SC ☐ High two SC ☐ 100%

☐ Fast data rate

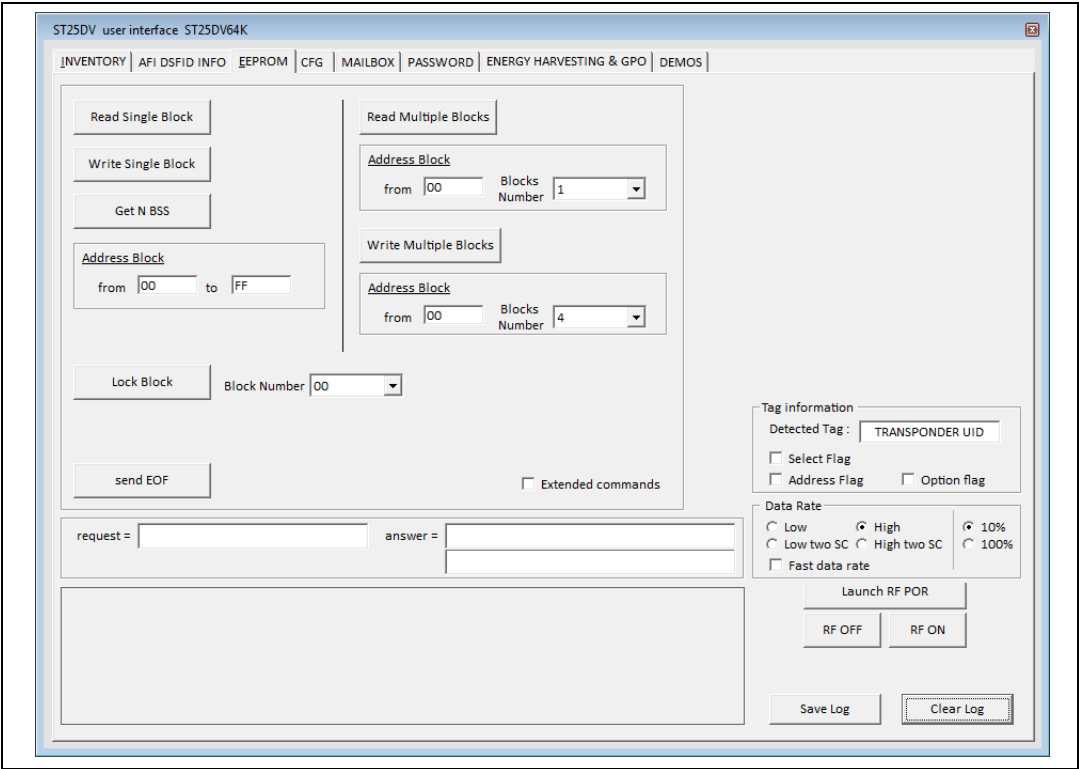
Launch RF POR

RF OFF RF ON

Save Log Clear Log

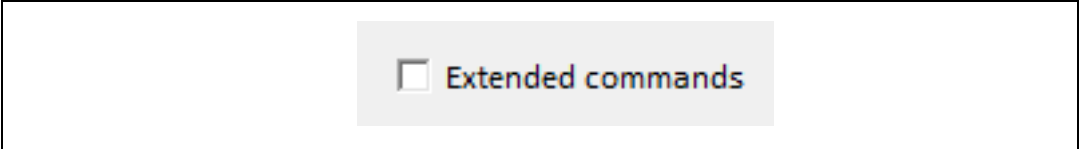
- c) EEPROM commands (see [Figure 67](#)):
- Read Single Block
 - Write Single Block
 - Read Multiple Blocks
 - Write Multiple Block
 - Get N BSS
 - Lock Block (block 0 or Block 1)

Figure 67. ST25DV user interface: EEPROM



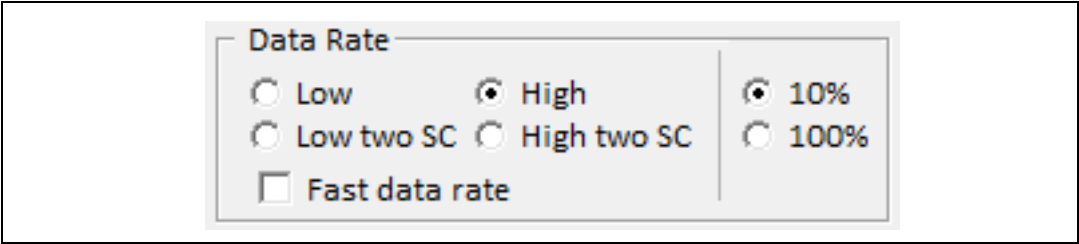
To be able to access to Extended commands, the user will need to click on "Extended commands" check box (see [Figure 68](#)).

Figure 68. ST25DV user interface: display Extended commands



To be able to access to Fast commands, the user will need to click on "Fast data rate" check box (see [Figure 69](#)).

Figure 69. ST25DV user interface: ISO15693 Data Rate management



- d) CONFIGURATION commands (see [Figure 7](#)):
- Read CONFIG bytes
 - Write CONFIG bytes

Figure 70. ST25DV user interface: static configuration

ST25DV user interface ST25DV64K

INVENTORY | AFI DSFID INFO | EEPROM | **CONFIG** | FTM | PASSWORD | ENERGY HARVESTING & GPO | DEMOS

Read ALL CFG | Read CFG | Address CFG: 00 | Write CFG

INDEX	LABEL	DATA
0x00	GPO	
0x01	IT_DURATION	
0x02	EH	
0x03	RFMNGT	
0x04	RFZ1SS	
0x05	EndZ1	
0x06	RFZ2SS	
0x07	EndZ2	
0x08	RFZ3SS	
0x09	EndZ3	
0x0A	RFZ4SS	
0x0D	MB	
0x0E	MB_WDG	
0x0F	LCK_CFG	

request = answer =

Tag information
Detected Tag : TRANSPONDER UID
☐ Select Flag
☐ Address Flag ☐ Option flag

Data Rate
☐ Low ☒ High ☒ 10%
☐ Low two SC ☐ High two SC ☐ 100%
☐ Fast data rate

Launch RF POR
RF OFF RF ON

Save Log Clear Log

- e) FTM commands (see [Figure 71](#)):
- Read Len
 - Read Message
 - Write Message
 - Read DYNAMIC register
 - Write DYNAMIC register

Figure 71. ST25DV user interface: Fast Transfer Mode interface

ST25DV user interface ST25DV64K

INVENTORY | AFI DSFID INFO | EEPROM | CONFIG | **FTM** | PASSWORD | ENERGY HARVESTING & GPO | DEMOS

Read LEN: 00 Read MSG: 00 from 1 Bytes Nb

Write MSG: 1 Bytes Nb

	FUNCTION
b0	MBEN
b1	HostPutMsg
b2	RFPutMsg
b3	STReserved
b4	HostMissMsg
b5	RFMissMsg
b6	HostCurrentMsg
b7	RFCurrentMsg

READ DYN CFG (MB) Write DYN CFG 0x0D

request = answer =

Tag information
Detected Tag: TRANSPONDER UID
☐ Select Flag
☐ Address Flag ☐ Option flag

Data Rate
☐ Low ☒ High ☒ 10%
☐ Low two SC ☐ High two SC ☐ 100%
☐ Fast data rate

Launch RF POR
RF OFF RF ON

Save Log Clear Log

- f) PASSWORD commands (se [Figure 72](#)):
- Present Password
 - Write Password

Figure 72. ST25DV user interface: Password management

The screenshot displays the 'ST25DV user interface ST25DV64K' window. The 'PASSWORD' tab is selected in the top navigation bar. The interface includes a 'Present Password' button and a 'Write Password' button. A 'Password number' dropdown menu is set to '1'. Below these buttons are input fields for 'request =' and 'answer ='. On the right side, the 'Tag information' section shows 'Detected Tag : TRANSPONDER UID' with checkboxes for 'Select Flag', 'Address Flag', and 'Option flag'. The 'Data Rate' section has radio buttons for 'Low', 'High', 'Low two SC', 'High two SC', 'Fast data rate', '10%', and '100%', with 'High' and '100%' selected. At the bottom right, there are buttons for 'Launch RF POR', 'RF OFF', 'RF ON', 'Save Log', and 'Clear Log'.

- g) ENERGY HARVESTING & GPO commands
 - Read DYNAMIC register
 - WRITE DYNAMIC register
 - Send Interrupt
 - Set GPO
 - Reset GPO

Figure 73. ST25DV user interface: Energy Harvesting and GPO management

The screenshot displays the ST25DV user interface with the 'ENERGY HARVESTING & GPO' tab selected. The interface includes a menu bar at the top with options: INVENTORY, AFI DSFID INFO, EEPROM, CONFIG, FTM, PASSWORD, ENERGY HARVESTING & GPO, and DEMOS. The main area is divided into two primary sections: 'READ DYN CFG (MAILBOX)' on the left and 'MANAGE GPO COMMAND' on the right. The 'READ DYN CFG (MAILBOX)' section contains a table with 8 rows (b0 to b7) and 2 columns (FUNCTION, VALUE). The 'MANAGE GPO COMMAND' section contains three buttons: 'Send Interrupt Generated by GPO', 'GPO set (OD : 0 / CMOS : 1)', and 'GPO reset (OD : 1 / CMOS : 0)'. Below these sections, there is a 'Write DYN CFG 0x02' button and a text input field. At the bottom, there are fields for 'request =' and 'answer =', and a large empty text area. On the right side, there is a 'Tag information' section with a 'Detected Tag' dropdown set to 'TRANSPONDER UID' and checkboxes for 'Select Flag', 'Address Flag', and 'Option flag'. Below this is a 'Data Rate' section with radio buttons for 'Low', 'High', 'Low two SC', 'High two SC', 'Fast data rate', '10%', and '100%'. At the bottom right, there are buttons for 'Launch RF POR', 'RF OFF', 'RF ON', 'Save Log', and 'Clear Log'.

	FUNCTION	VALUE
b0	EH_EN	
b1	EH_ON	
b2	Field_ON	
b3	REG_VCC_ON	
b4	STReserved	
b5	STReserved	
b6	STReserved	
b7	STReserved	

Write DYN CFG 0x02

request = answer =

Tag information
Detected Tag: TRANSPONDER UID
☐ Select Flag
☐ Address Flag ☐ Option flag

Data Rate
☐ Low ☒ High ☐ 10%
☐ Low two SC ☐ High two SC ☐ 100%
☐ Fast data rate

Launch RF POR
RF OFF RF ON
Save Log Clear Log

- h) DEMOS (see [Figure 74](#)).
 This demos can be played with ST25DV-DISCOVERY boards.
 Refers to user manual UM2062 for more informations about this demos.

Figure 74. ST25DV user interface: Fast Transfer Mode demo

ST25DV user interface ST25DV64K

INVENTORY | AFI DSFID INFO | EEPROM | CONFIG | FTM | PASSWORD | ENERGY HARVESTING & GPO | DEMOS

FAST TRANSFER MODE DEMO

1) PLEASE SELECT A BINARY FILE

LOAD BINARY FILE FILE SIZE = BYTES

CRC OF FILE =

2) PASSWORD FOR FWU DEMO

1 2 3 4 5 6 7 8

3) LAUNCH NUCLEO SOFTWARE

4) CLICK TO LAUNCH FIRMWARE UPGRADE DEMO

START R2H DATA TRANSFER

request = answer =

☐ R2H Data Transfer
☒ R2H Firmware Upgrade
☐ R2H Image Transfer
☐ H2R Data transfer

NB BYTES BY FRAME = 243

TEMPO = 2

☐ START
☐ Configure MAILBOX
☐ Send Password (FWU Demo)
☐ Transfer Data through MAILBOX
☐ Compare CRC
☐ END

Tag information

Detected Tag : TRANSPONDER UID

☐ Select Flag
☐ Address Flag ☐ Option flag

Data Rate

☐ Low ☒ High ☐ 10%
☐ Low two SC ☐ High two SC ☐ 100%

Launch RF POR

LOG MANAGEMENT

☐ Always display Log
☐ Displayed Log at the end of the demo.
☒ Do not display log

Save Log Clear Log

5. NFC type 5: NDEF Message User Interface.
 - a) READ & WRITE CC file (see [Figure 75](#))
 - Read CC File
 - Write CC File

Figure 75. Read and write NFC Type 5 CC file

NFC Type 5 - NDEF Message user interface

NFC Type 5 - NDEF Message user interface

READ WRITE CC FILE READ NDEF MESSAGE PREPARE NDEF MESSAGE WRITE NDEF MESSAGE

BLOCK 0 Byte0 Byte1 Byte2 Byte3

E1 40 40 01

☐ use 8 bytes Capacity Container

Additional informations

☐ bit4: Special Frame format

☐ bit3: support Lock Block commands

☒ bit0: support Multiple Block commands

Magic Number

☒ E1

☐ E2 (Extended cmd supported)

MLen \ 8

512bit = 0x08

1kbit = 0x10

2kbit = 0x20

4kbit = 0x40

Size >= 16kbit : 0x00 and use 8 bytes Capacity Container

READ CC FILE

WRITE CC FILE *

* Write CCfile will modify your tag CC file

09-29-2016 13:51:46 INVENTORY

>>> CR95HFDLL_SENDRECEIVE, 260100

<<< 800D0000507C1065CD5C02E0D87A00

Inventory : UID = E0025CCD65107C50

09-29-2016 13:51:46 READ CC FILE: Block 0

>>> CR95HFDLL_SENDRECEIVE, 0A200000

<<< 800800E1404001DF3600

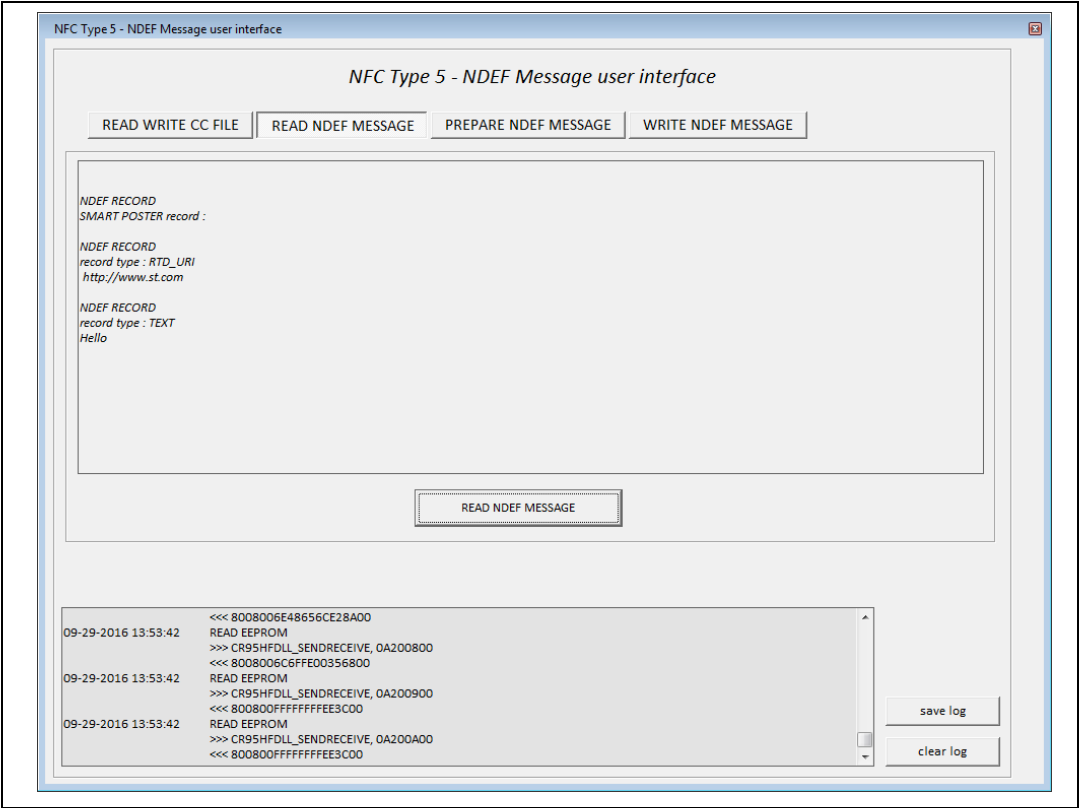
CC FILE block 0 : E1 40 40 01

save log

clear log

b) READ NDEF MESSAGE

Figure 76. Read NFC Type 5 NDEF message



- c) **PREPARE NDEF MESSAGE**
Use User interface to prepare your NDEF message by selecting one of the NDEF recrd format (Text, Uri, Smartposter, vcard, Bluetooth pairing).
Click on ADD RECORD TO MESSAGE button, will add the record in the NDEF message.

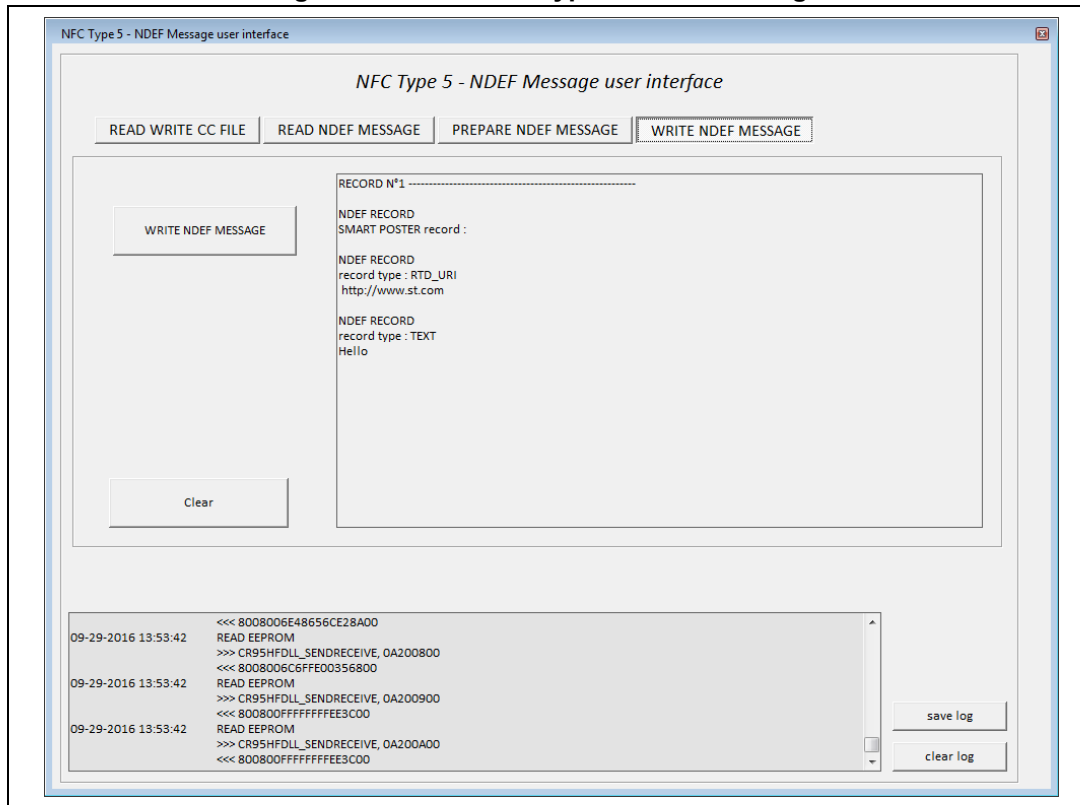
Figure 77. Prepare NFC Type 5 NDEF message

The screenshot shows the 'NFC Type 5 - NDEF Message user interface' window. At the top, there are four tabs: 'READ WRITE CC FILE', 'READ NDEF MESSAGE', 'PREPARE NDEF MESSAGE' (which is selected), and 'WRITE NDEF MESSAGE'. Below the tabs, on the left, is a list of NDEF record formats: 'Text', 'Uri', 'SmartPoster' (selected), 'MIME vcard', 'MIME Bluetooth Pairing', 'MIME MEDIA', and 'MIME various'. Below this list is a button labeled 'ADD RECORD TO MESSAGE'. On the right side, under the heading 'Smart Poster message', there are three input fields: 'Please type in your text :' with the value 'Hello', 'Please type in your url :' with the value 'http://www.st.com', and a 'List of available prefix :' dropdown menu showing 'http://www.', 'https://www.', and 'http://'. A note below the dropdown states '* if no prefix is used, all characters are written in the message'. At the bottom of the window, there is a log area showing a series of hexadecimal data and timestamps (e.g., '09-29-2016 13:53:42 <<< 8008006E48656CE28A00'). To the right of the log are 'save log' and 'clear log' buttons.

d) WRITE NDEF MESSAGE

The prepared NDEF MESSAGE with embedded NDEF records is displayed.
If you need to change anything on the NDEF MESSAGE, click on Clear and go back to PREPARE NDEF MESSAGE to create a new one.
Click on WRITE NDEF MESSAGE to write the NDEF message to the NFC Tag.

Figure 78. Write NFC Type 5 NDEF message



2.5 ISO14443-A menu

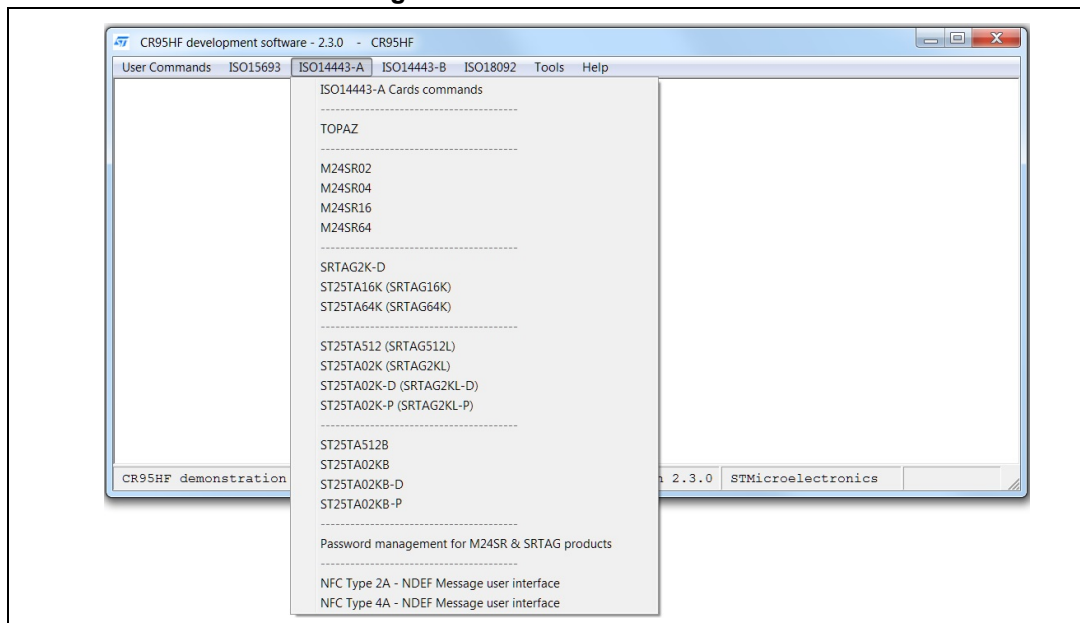
Select the ISO14443-A from the main menu to use the CR95HF demonstration board as an ISO14443-A reader. The menu allows to select:

- ISO14443-A Cards commands: (see [Section 2.5.1](#)).
This menu allows the user to send any ISO14443-A requests
- TOPAZ (see [Section 2.5.2](#)).
This menu allows the user to send any ISO14443-A requests to TOPAZ product
- M24SR02, M24SR04, M24SR16, M24SR64 (see [Section 2.5.3](#)).
This menu allows the user to send any ISO14443-A requests or APDU request to M24SR product
- SRTAG2K-D, ST25TA16K, ST25TA64K (see [Section 2.5.3](#)).
This menu allows the user to send any ISO14443-A requests or APDU request to SRTAG product.
- ST25TA512, ST25TA02K, ST25AT02K-D, ST25TA02K-P, ST25TA512B, ST25TA02KB, ST25AT02KB-D, ST25TA02KB-P (see [Section 2.5.3](#)).

This menu allows the user to send any ISO14443-A requests or APDU request to ST25TA product.

- Password management for M24SR and ST25TA products (see [Section 2.5.4](#)).
This menu allows the user to manage password and access rights on M24SR and SRTAG products
- Type_2A NDEF Message user interface
This menu allows the user to read and write NDEF message to Tag Type 2A
- Type_4A NDEF Message user interface (see [Section 2.5.5](#)).
This menu allows the user to read and write NDEF message to Tag Type 4A

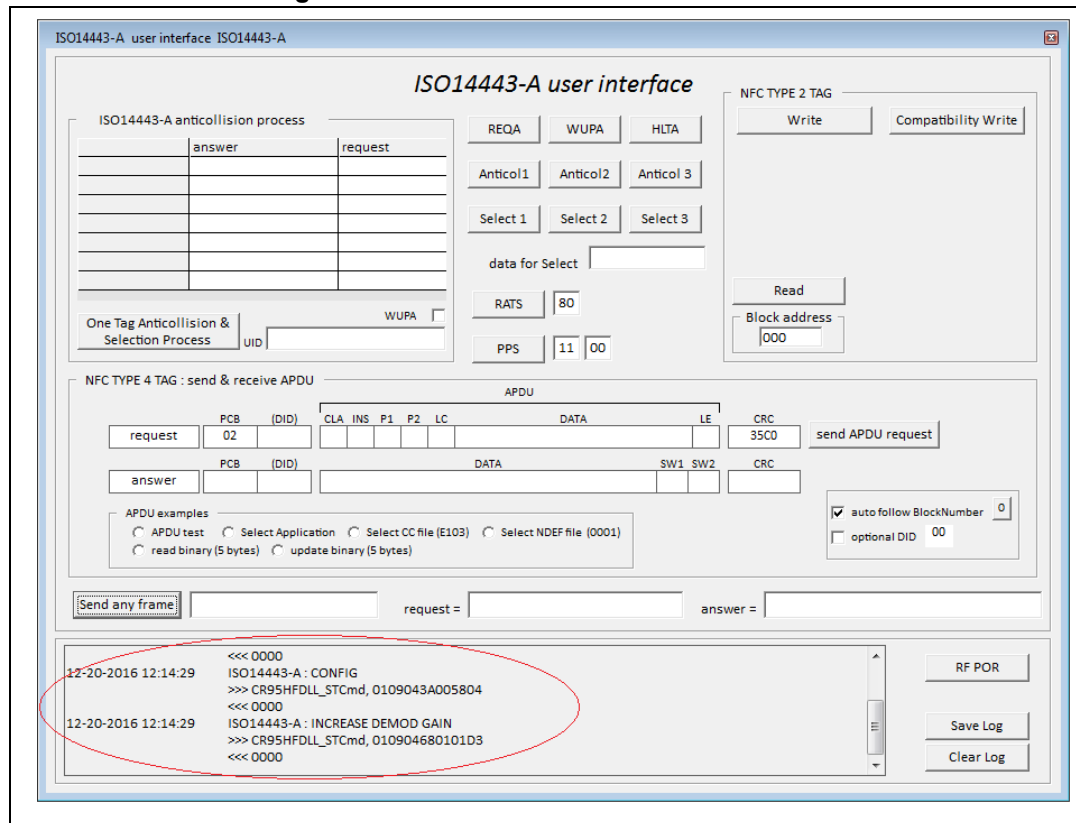
Figure 79. ISO14443-A menu



2.5.1 ISO14443-A Cards commands

Select ISO14443-A from the list (see [Figure 80](#) for an example). This automatically configures the board as an ISO14443-A reader and displays all the ISO14443-A requests.

Figure 80. ISO14443-A selected from the list



The ISO14443-A configuration is displayed in the log window as shown in [Figure 80](#).

The upper part of the window contains buttons allowing to send ISO14443-A requests to tags through the CR95HF demonstration board.

Refer to the device datasheet for the full list of ISO14443-A requests available for a given product.

Anticollision process will try to communicate with your Tag and try to select it. This automatic process is only for 1 tag.

It sends successively:

- ReqA
- Anticol1
- Select1
- Anticol2
- Select2
- Anticol3
- Select3

The process will be stopped as soon as an error occurs or if the anticollision process is finished (4 bytes or 7 bytes or 10 bytes UID).

Other commands can be sent such as:

- RATS
- PPS
- READ
- WRITE

Send Receive APDU can be used to send APDU requests.

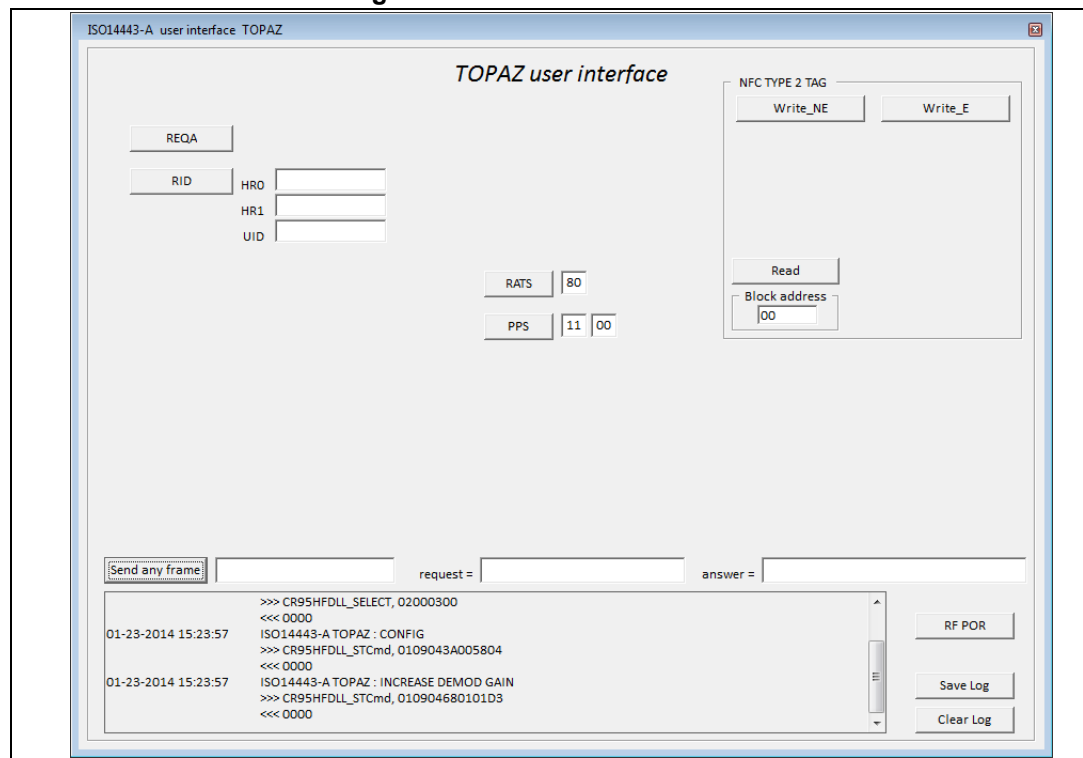
2.5.2 TOPAZ user interface

The TOPAZ configuration is displayed in the log window as shown in [Figure 81](#)

Some basic commands are available to be able to play with TOPAZ cards such as :

- REQA
- RID
- RATS
- PPS
- READ
- WRITE_NE
- WRITE_E

Figure 81. TOPAZ user interface



2.5.3 M24SR, SRTAG and ST25TA user interface

The selected product user interface has been separated into two different windows to improve the visibility of the tool.

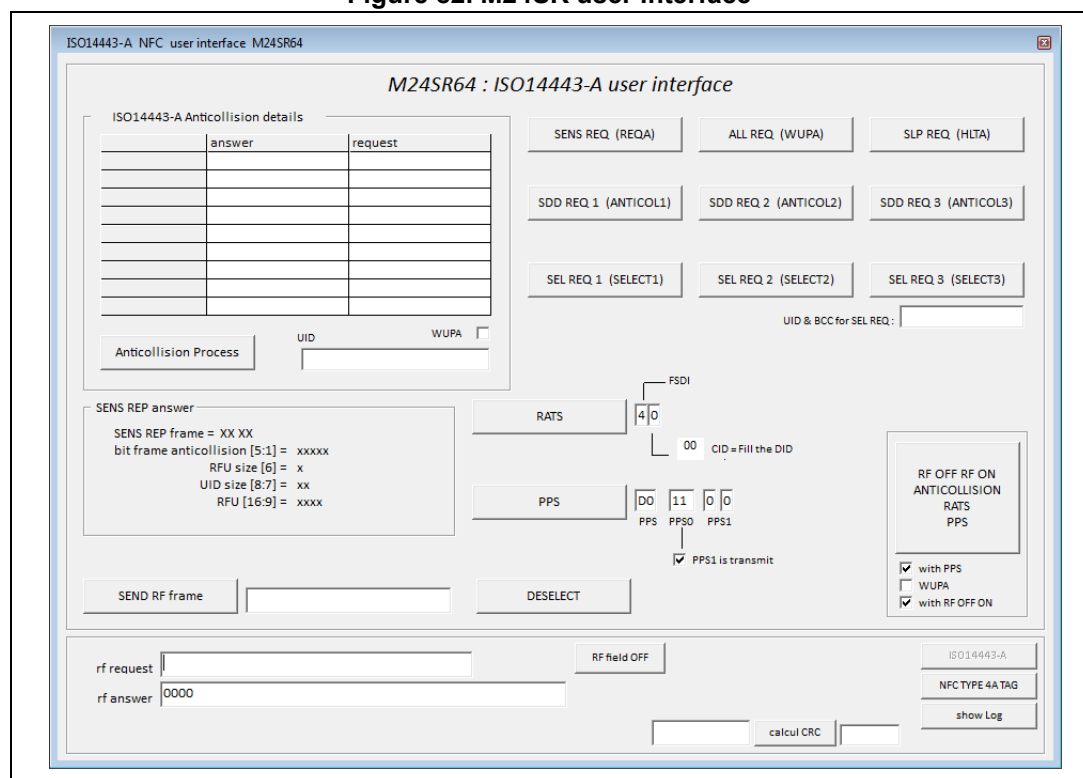
We have separated this two windows following the “life” of the selected product (see [Figure 82](#)):

- after a RF POR or a deselect command, the selected product is in the ISO14443-A world
- after RATS or PPS command, the selected product enter in the NFC world.

First, selected product among the liost of products (M24SR, SRTAG, ST25TA).

When selecting the device, the ISO14443-A window appears.

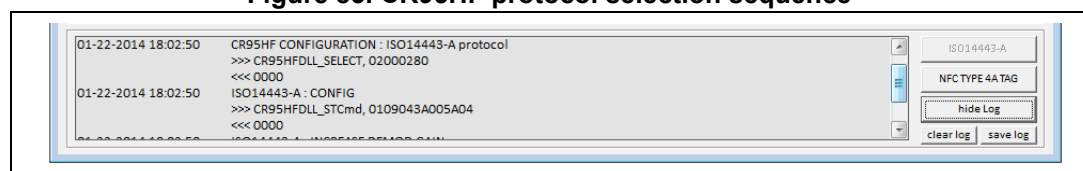
Figure 82. M24SR user interface



As soon as the windows appears, the ISO14443-A protocol selection is done in background.

Click on show log to display the log window and see the CR95HF protocol selection sequence (see [Figure 83](#))

Figure 83. CR95HF protocol selection sequence



ISO1443-A screen

The first screen (see [Figure 82](#)) is displayed when the M24SR is selected in the option menu. Several buttons are displayed in this window. The buttons represent all the available commands in the ISO1443-A world:

Some buttons are used to send single commands:

- **SENS REQ (REQA)**: send a REQA to the M24SR
- **ALL REQ (WUPA)**: send WUPA command to the M24SR
- **SLP REQ (HLTA)**: send HLTA command to the M24SR
- **SDD REQ 1 2 3 (ANTICOL 1 2 3)**: send Anticol command to the M24SR
- **SEL REQ 1 2 3 (SELECT 1 2 3)**: send Select command to the M24SR
- **RATS**: send RATS command to the M24SR
- **PPS**: send PPS command to the M24SR
- **DESELECT**: send Deselect command to the M24SR

Two additional buttons allow to accelerate the communication with the M24SR:

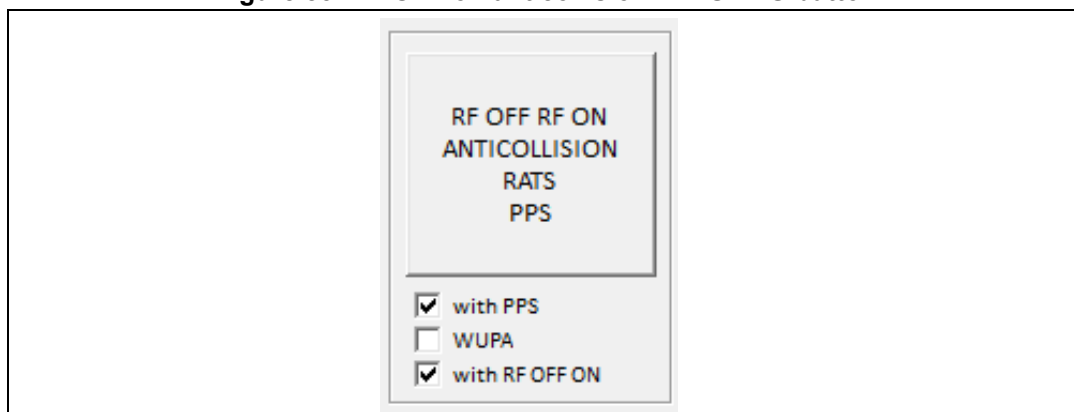
- **Anticollision Process** button
can be used to detect a Tag and read the UID of this tag when clicking on this button, the anticollision sequence is sent (beginning by a REQA or WUPA) depending of the Option button.
The REQA/WUPA answer is detailed in SENS REQ answer screen.
The anticollision sequence is summarized in the array.
The sequence is launched and stopped when an error occurred.
At the end of the sequence, if no error is found, the UID of the selected M24S is displayed in UID field as show on [Figure 84](#)

Figure 84. Anticollision process results

ISO1443-A Anticollision details		
REQ A	26	4200
ANTICOL 1	9320	880286000C
SELECT 1	9370880286000CC620	04DA17
ANTICOL 2	9520	0042C5098E
SELECT 2	95700042C5098ED927	20FC70
<div> <div>Anticollision Process</div> <div> <div>UID</div> <div>0286000042C509</div> </div> <div>WUPA <input type="checkbox"/></div> </div>		

- **RF OFF RF ON ANTICOLLISION RATS PPS** button
can be used the whole anticollision process with RATS with PPS to reach NFC type 4A world.
This button can be configured by enabling or disabling
 - RF OFF/ON
 - Replace REQA command by WUPA command
 - PPS request added to the sequence

Figure 85. RF OFF on anticollision RATS PPS button



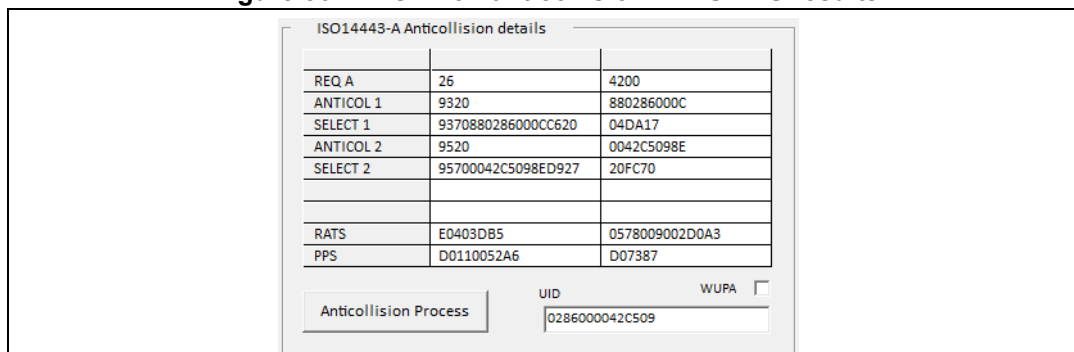
The sequence is launched and stopped when an error occurred.

At the end of the sequence, if no error is found,

- The UID of the selected M24SR is displayed in UID field.
- RATS answer
- PPS Answer (if option selected)
- The log windows is filled with RF request & RF answer

As shown on [Figure 86](#)

Figure 86. RF OFF on anticollision RATS PPS results

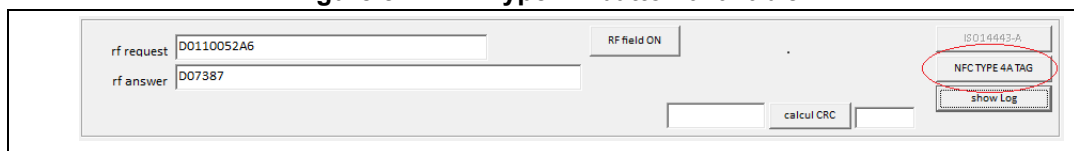


At the end of this action, if no error is occurred and M2SR answers are Ok, the window will automatically switch to the windows called **NFC Type 4A**.

How to access to ISO14443-A command and NFC Type 4A commands:

- When the ISO14443-A windows is displayed, the “NFC Type 4A” button is available to switch to NFC Type 4A window.
See [Figure 87](#)

Figure 87. NFC Type 4A button available



- When the NFC Type 4A windows is displayed, the **ISO14443-A** button is available to switch to iso14443-A window.

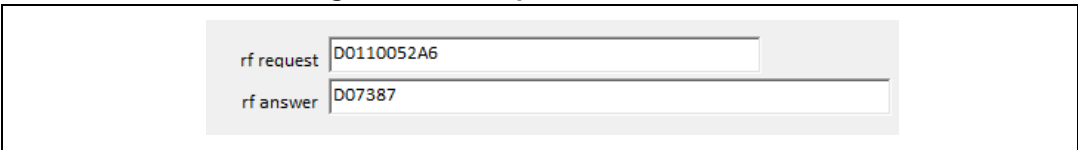
See [Figure 88](#)

Figure 88. ISO14443-A button available



As already explained in the user manual, the “RF request” and “RF answer” fields contains the send command and the answer from M24SR.

Figure 89. RF request and RF answer



The **show log** button is available to be able to see the history of RF request and RF answer. See [Figure 90](#) and [Figure 91](#).

Figure 90. “Show Log” button

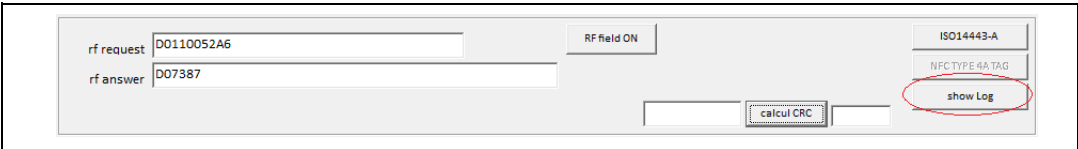


Figure 91. Log windows of RF request/answer



The formatted request (ex: CR95HFDLL_STCmd, 010904680101DF) can be used in script tool.

NFC Type 4A screen

This window will allows to send NFC APDU requests to be able to play with the M24SR tag in NFC world (see [Figure 92](#)). This window is automatically reached when the "RF OFF RF ON ANTICOLLISION RATS PPS" button is used and all the processes are done successfully or when the user click on "NFC Type A" button.

Figure 92. NFC Type 4A user interface

The middle part of the window is used to generate the RF frame to be sent to the M24SR: I_Block, R_Block, S(DES)_Block and S(WTX)_Block request.

All this field can be changed by clicking and modifying data

Four buttons are available to send I_Block, R_Block, S_Block requests.

Figure 93. I_Block, R_Block, S_Block requests

The answer of the M24SR is filled in I_Block, R_Block, S_Block answer fields depending on the request sent to the M24SR.

Figure 94. I_Block, R_Block, S_Block answer

The higher part of the window can be used to automatically fill the I_Block request.

The goal is to facilitate the communication with the M24SR (following NFC forum and M24SR datasheet).

Several option buttons are available:

- **NDEF Tag Application select**
When this option is selected, the I_Block frame is filled with adequate data.

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.

- **Capacity Container file**

Selecting Capacity Container File option will allow other option to appear clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 95. Capacity container file selected

- **Select command:**
fill data with CC file Select command
- **Read binary (length) command**
fill data with read binary command on CC file in order to read the length of the cc file
- **Read binary command**
fill data with read binary command on CC file

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button “send I_Block” to send RF frame.

- **Select & read sequence** button will launch automatically all the procedure and will display it in a CC file result window

Select cc file

Read cc file length

Read cc file data

Display data in a specific CC file array (available only if no error detected)

Figure 96. Specific CC file array

CC file		
File offset	Meaning	Value
0x0000	CC file length	000F
0x0002	Mapping version	20
0x0003	Max bytes (read)	00F6
0x0005	Max bytes (written)	00F6
0x0007	T field	04
0x0008	L field	06
0x0009	Field ID	0001
0x000B	Max NDEF file size	0200
0x000D	Read access	00
0x000E	Write access	00

- **System file**
Selecting System File option will allow other option to appear.
Clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 97. System file selected

The screenshot shows a software interface with the following elements:

- File Selection:** Radio buttons for "NDEF Tag Application Select", "Capacity Container File", "System File" (selected), and "NDEF File".
- Buttons:** "select & read sequence" and "click to copy PWD storage".
- Data Field:** A text box containing a long string of zeros: "00000000000000000000000000000000".
- Command Selection:** Radio buttons for "Select" (selected), "Read Binary (length)", and "Read Binary".
- Advanced Options:**
 - Verify (check if pwd required) / Verify (present password)
 - Change reference data
 - Enable Verification Requirement / Disable Verification Requirement
 - Enable Permanent State
 - Send Interrupt GPO
 - State Control : Set GPO
 - State Control : Reset GPO

- **Select command:**
fill data with System file Select command
- **Read binary (length) command:**
fill data with read binary command on System file in order to read the length of the system file
- **Read binary command:**
fill data with read binary command on System file
- **Send Interrupt GPO**
- **State control: Set GPO**
- **State control: Reset GPO**

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button send I_Block to send RF frame.

- **Select & read sequence** button will launch automatically all the procedure and will display it in System file result window
 - Select system file
 - Read system file length
 - Read system file data
 - Display data in a specific System file array (available only if no error detected)

Figure 98. Specific system file array

SYSTEM file	
<input type="radio"/> length	0012
<input type="radio"/> i2c protect	01
<input type="radio"/> i2c wdg	00
<input type="radio"/> GPO	11
<input type="radio"/> ST reserved	00
<input type="radio"/> RF enable	81
<input type="radio"/> NDEF File Nb	00 (1 files)
<input type="radio"/> UID	0286000042C509
<input type="radio"/> Memory Size	01FF
<input type="radio"/> Product Code	86
<input checked="" type="radio"/> read all system file	

- **NDEF file**

Selecting NDEF File option will allow other option to appear.

Clicking on one of this option will fill, the I_Block frame is filled with adequate data.

Figure 99. NDF file is selected

☐ NDEF Tag Application Select
☐ Capacity Container File
☐ System File
☒ **NDEF File**

☐ Verify (check if pwd required)
☐ Verify (present password)
☐ Change reference data

☐ Enable Verification Requirement
☐ Disable Verification Requirement
☐ Enable Permanent State

☒ Select
☐ Read Binary (length)
☐ Read Binary
☐ Extended Read Binary

- **Select command:**
fill data with NDEF file Select command
- **Read binary (length) command:**
fill data with read binary command on NDEF file in order to read the length of the cc file
- **Read binary command**
fill data with read binary command on NDEF file
- **Extended Read binary command**
fill data with extended read binary command on NDEF file
- **Update Binary command**
Fill data with update binary command on NDEF file

In case of M24SR request a WTX , this button will automatically manage it. The M24SR will reply with a Window Extension request (that will be displayed in S(WTX) answer array), then the tool will automatically send a S(WTX) request to the M24SR

All this request / answer communication will be displayed in Log window.

Once the command option is selected, the data in I_Block rf frame are filled, you can press the button "send I_Block" to send RF frame.

- **Select & read sequence** button will launch automatically all the procedure and will display it in NDEF file result window (NDEF file can be decoded)

Select NDEF file

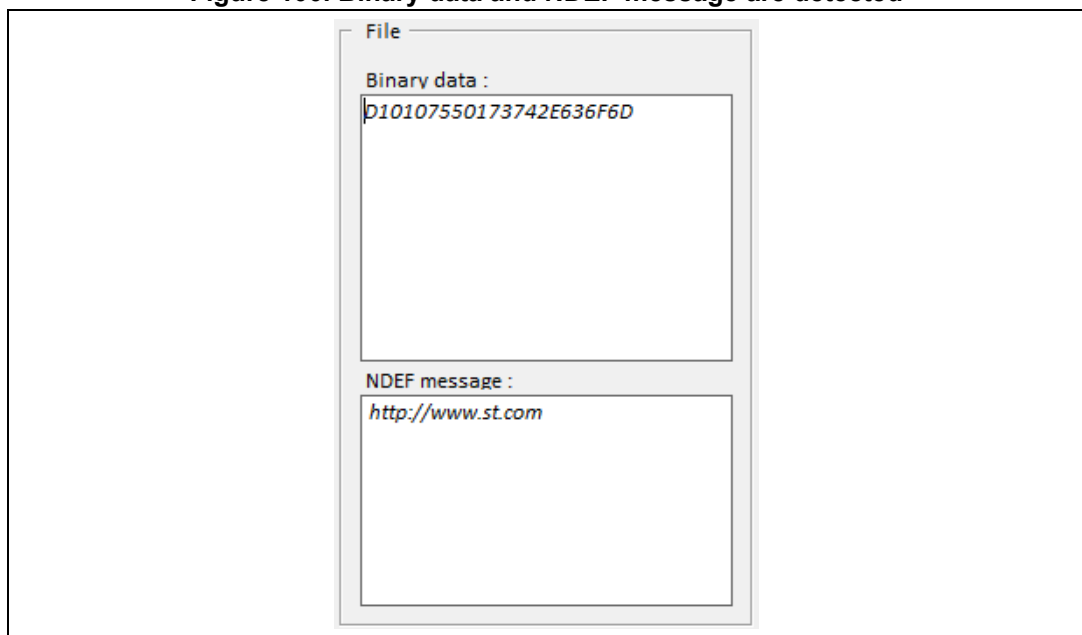
Read NDEFfile length

Read NDEF file data

Display binary data in a field (available only if no error detected)

Display decoded NDEF message if any is in a field (available only if no error detected)

Figure 100. Binary data and NDEF message are detected



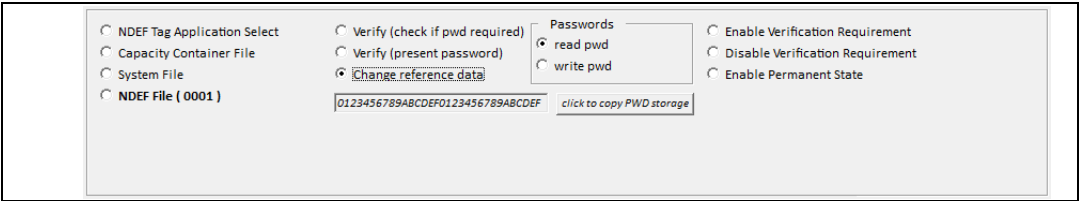
- **Commands to manage Password and Access Rights**

Three command can be used to manage Passwords (Read password or Write password).

- **Verify (check if password is required)**
fill data with Verify command
- **Verify (present password)**
fill data with Verify command
- **Change reference data (change password value)**
fill data with Verify command

Note: Notes that a NDEF file has to be selected previously (see Datasheet)
The command sent will be applied to selected NDEF file

Figure 101. Password management button

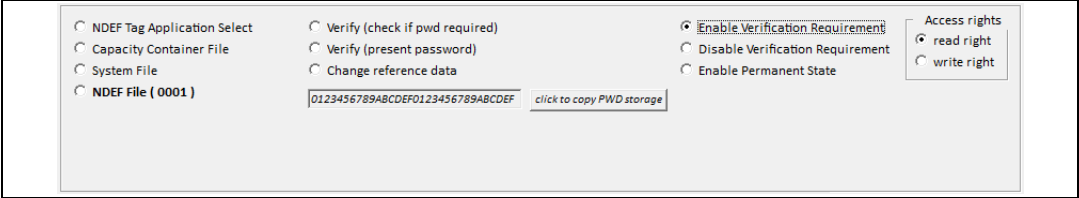


Three commands can be used to manage Access right and M24SR state (see [Figure 101](#)).

- **Enable Verification requirement**
fill data with Verify command
- **Disable Verification requirement**
fill data with Verify command
- **Enable Permanent State**
fill data with Verify command

Note: Notes that a NDEF file has to be selected previously (see Datasheet)
The command sent will be applied to selected NDEF file

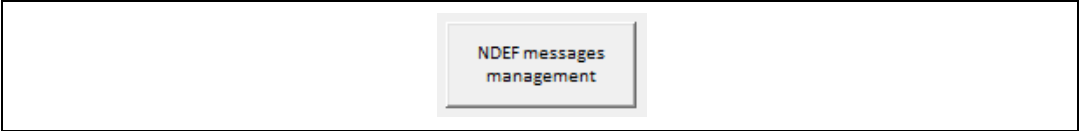
Figure 102. Password management buttons



NDEF Messages management button

It allows directly access to Type_4A NDEF Message user interface (see [Section 2.5.5](#))

Figure 103. NDEF message management button



2.5.4 Password management for M24SR and SRTAG products

This tool allows to manage Password and access rights.

Figure 104. Password management user interface

The screenshot displays the 'Password Management user interface' window. It is divided into three main sections:

- READ & WRITE ACCESS RIGHTS MANAGEMENT ON NDEF FILE**: This section contains two sub-sections:
 - READ ACCESS RIGHT MANAGEMENT ON NDEF FILE :** Includes buttons for 'LOCK READ ACCESS WITH PASSWORD *', 'UNLOCK READ ACCESS *', 'PERMANENT LOCK READ ACCESS *', and 'Check if READ password is required for read on NDEF file'. Each button has a corresponding 'RESULT' field and a note indicating that a password is required for the operation.
 - WRITE ACCESS RIGHT MANAGEMENT ON NDEF FILE :** Includes buttons for 'LOCK WRITE ACCESS WITH PASSWORD *', 'UNLOCK WRITE ACCESS *', 'PERMANENT LOCK WRITE ACCESS *', and 'Check if WRITE password is required for write on NDEF file'. Each button has a corresponding 'RESULT' field and a note indicating that a password is required for the operation.
- CHANGE READ & WRITE PASSWORD :** Includes buttons for 'CHANGE READ PASSWORD **' and 'CHANGE WRITE PASSWORD ***'. Each button has a corresponding 'RESULT' field and a note indicating that a password is required for the operation.

At the bottom right, there is a 'clear log' button.

- READ access right commands are available:
 - LOCK UNLOCK
 - PERMANENT LOCK
 - CHECK
- WRITE ACCESS RIGHT commands are available:
 - LOCK
 - UNLOCK
 - PERMANENT LOCK
 - CHECK on WRITE
- CHANGE PASSWORD commands are available to change password:
 - READ password
 - WRITE password

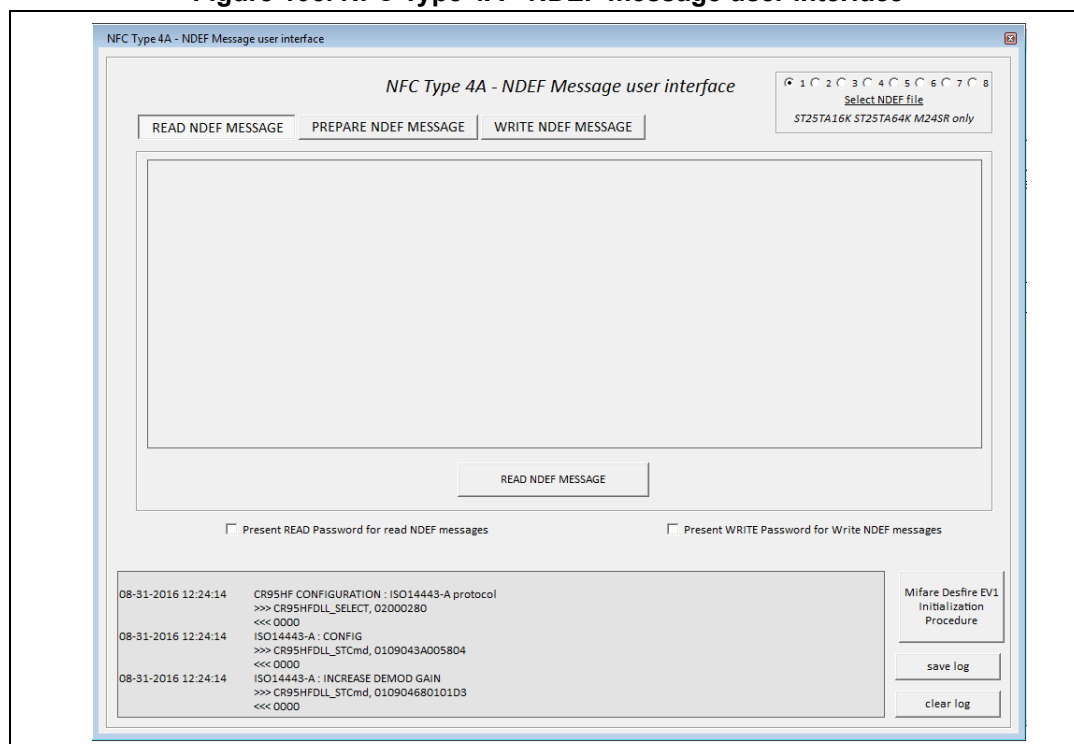
2.5.5 NFC Type 4A - NDEF Message user interface

This tool allows to read or write a NDEF file.

This user interface can manage Type 2A and type 4A, type 4B, type 3, type 5 and Vicinity cards. It can be accessed by selecting the item in the menu.

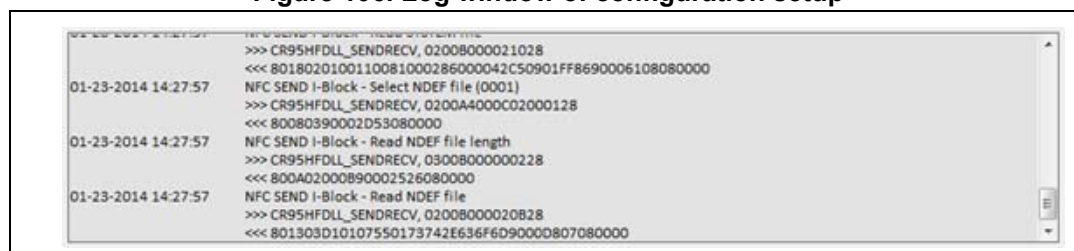
Once the NDEF message management menu is selected, the CR95HF is set following the selected RF protocol (Configuration) and the User interface appears.

Figure 105. NFC Type 4A - NDEF message user interface



When this tool is selected, the CR95HF is configured as a ISO14443-A reader. See the log window to know the configuration set up.

Figure 106. Log window of configuration setup



READ NDEF MESSAGE button

The READ NDEF message button is used to launch all the procedure to select the device and read the NDEF message. This whole process is described below.

READ NDEF MESSAGE process:

- The RF field is disabled in order to deselect the tag (RF Por).
- The RF field is enabled.
- The Anticollision sequence is launched (ReqA, Anticol, select, RATS, PPS). The result is that the device is put in the NFC world.
- Select Application launched
- Read CC file process is launched (select, read length, read CC file)
The goal is to identify NDEF file ID
- Read NDEF file process is launched (select, read length, read NDEF message)
- Decoding of NDEF message
- The available message is displayed on the screen (see [Figure 107](#))

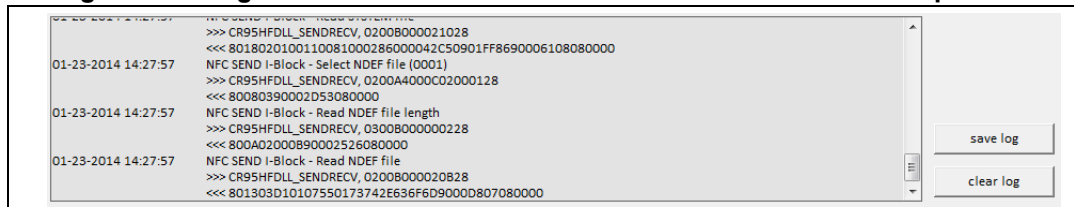
Figure 107. NDEF message is displayed



This process is automatically stopped if any error or “no answer” is detected.

The Log window at the bottom of the screen will help to understand the issue in case of error.

Figure 108. Log window when occur error on READ NDEF MESSAGE process



PREPARE NDEF MESSAGE

This item will allow to create a NDEF Message with a single NDEF record or several NDEF record.

Notes that the NDEF message will not be written to the Tag. To be able to write the NDEF message to the Tag, you will need to click on WRITE NDEF MESSAGE

Figure 109. Prepare TEXT NDEF record

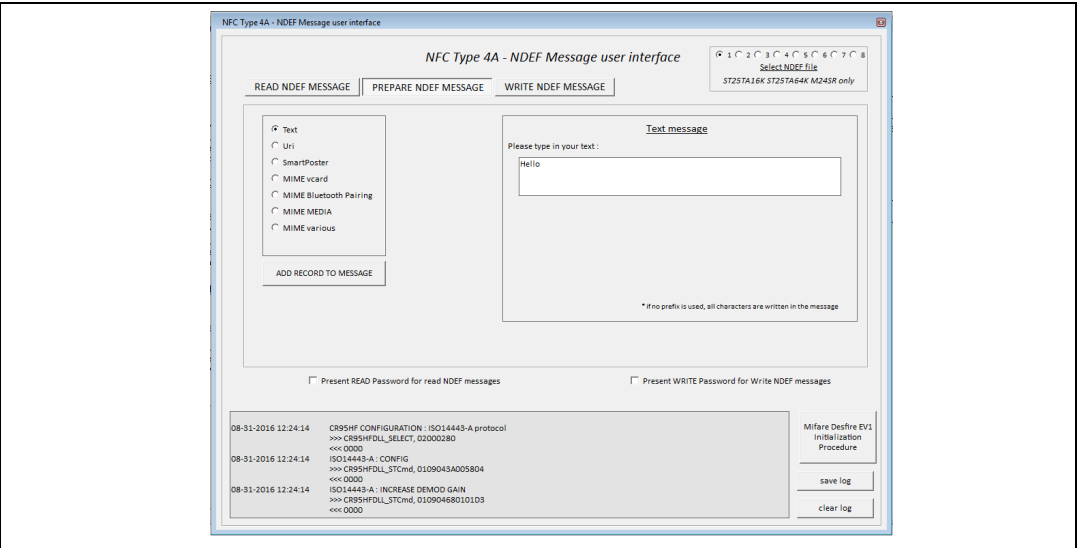


Figure 110. Prepare URI NDEF record

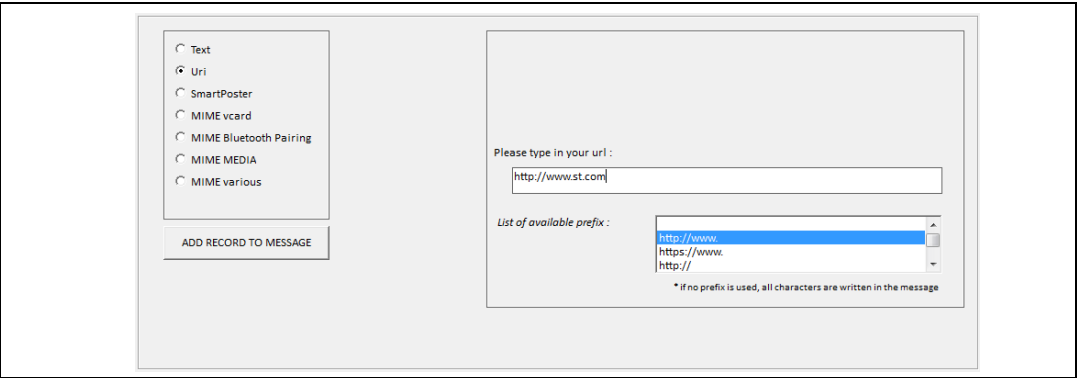


Figure 111. Prepare SMARTPOSTER NDEF record

Figure 112. Prepare MIME VCARD NDEF record

Figure 113. Prepare MIME BLUETOOTH PAIRING NDEF record

Figure 114. Prepare MIME MEDIA NDEF record

Figure 115. Prepare MIME VARIOUS NDEF record

WRITE NDEF MESSAGE

Once one or more NDEF records have been selected, The user are able to write the whole NDEF message in the tag selecting WRITE NDEF MESSAGE ITEM.

The user can now check NDEF message. Then click on WRITE NDEF MESSAGE to write it.

If the user want to change message, he can click on CLEAR then return on PREPARE NDEF MESSAGE to build a new one.

At the right of the window, the user will be able to prepare and write a NDEF message from a list of NDEF message types:

- Text

Figure 116. Write Text NDEF message

Text message

Please type in your text :

Hello world !

* if no prefix is used, all characters are written in the message

☒ Text ☐ Uri ☐ SmartPoster ☐ MIME Bluetooth Pairing ☐ MIME vcard ☐ Proprietary data

WRITE NDEF MESSAGE

- URL

Figure 117. Write URL NDEF message

Please type in your url :

http://www.st.com

List of available prefix :

http://www.
https://www.
http://

* if no prefix is used, all characters are written in the message

☐ Text ☒ Uri ☐ SmartPoster ☐ MIME Bluetooth Pairing ☐ MIME vcard ☐ Proprietary data

WRITE NDEF MESSAGE

- **SmartPoster**

Figure 118. Write SmartPoster NDEF message

Smart Poster message

Please type in your text :
Hello world !

Please type in your url :
http://www.st.com

List of available prefix :
http://www.
https://www.
http://

* if no prefix is used, all characters are written in the message

☐ Text ☐ Uri ☒ SmartPoster ☐ MIME Bluetooth Pairing ☐ MIME vcard ☐ Proprietary data

WRITE NDEF MESSAGE

- **MIME Bluetooth pairing**

Figure 119. Write BT pairing NDEF message

Configure with your Bluetooth device informations

Bluetooth device address : CA : 22 : 4B : 32 : A1 : 18

☒ Bluetooth local name : Logitech Boombox

☒ Class of Device : 24 24 14
 Minor Device class
 Major Device class
 Service class

☒ 16-bit Service Class UUID list : 110B
 Example of existing UUID

[set default values for BT pairing demo](#) [Simplified Tag format for a single Bluetooth Carrier](#)

☐ Text ☐ Uri ☐ SmartPoster ☒ MIME Bluetooth Pairing ☐ MIME vcard ☐ Proprietary data

WRITE NDEF MESSAGE

- **MIME vcard**

Figure 120. Write vCard NDEF message

☐ Import your Outlook profile : vcard file(*.vcf) import vcard (*.vcf)
☒ or, fill the needed fields bellow :

Title: Address details
 Name:
 First name: Street:
 email: City:
 Organisation: State/Province:
 Groupe Division: ZIP/Postal code:
 Job title: Country/Region:
 Phone number:
 Fax number:
 Url:

☐ Text ☐ Uri ☐ SmartPoster ☐ MIME Bluetooth Pairing ☒ MIME vcard ☐ Proprietary data

WRITE NDEF MESSAGE

- **Proprietary data** (that is not NDEF message but can be use to fill the memory with hexadecimal data)

Figure 121. Write proprietary data

BINARY content

Please type in your BINARY data (Hexadecimal) :

Hexadecimal data will be written in NDEF file without header (NDEF length will be updated)

☐ Text ☐ Uri ☐ SmartPoster ☐ MIME Bluetooth Pairing ☒ Proprietary data ☐ MIME vcard

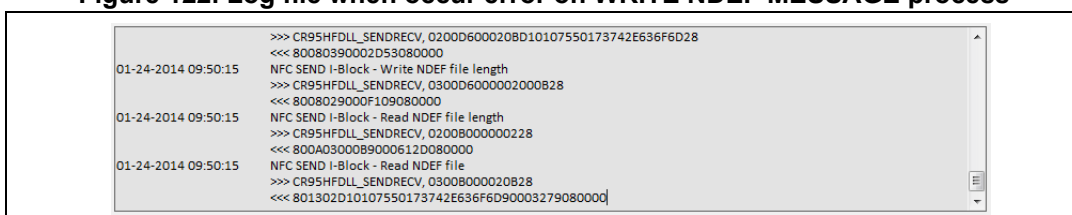
WRITE PROPRIETARY MESSAGE

WRITE NDEF MESSAGE process:

- The RF field is disabled in order to deselect the tag (RF Por).
- The RF field is enabled.
- The Anticollision sequence is launched (ReqA, Anticol, select, RATS, PPS). The result is that the device is put in the NFC world.
- Select Application launched
- Read CC file process is launched (select, read length, read CC file)
The goal is to identify NDEF file ID
- Write the Encoded NDEF message This process is automatically stopped if any error or “no answer” is detected.

The Log window at the bottom of the screen will help to understand the issue In case of error.

Figure 122. Log file when occur error on WRITE NDEF MESSAGE process



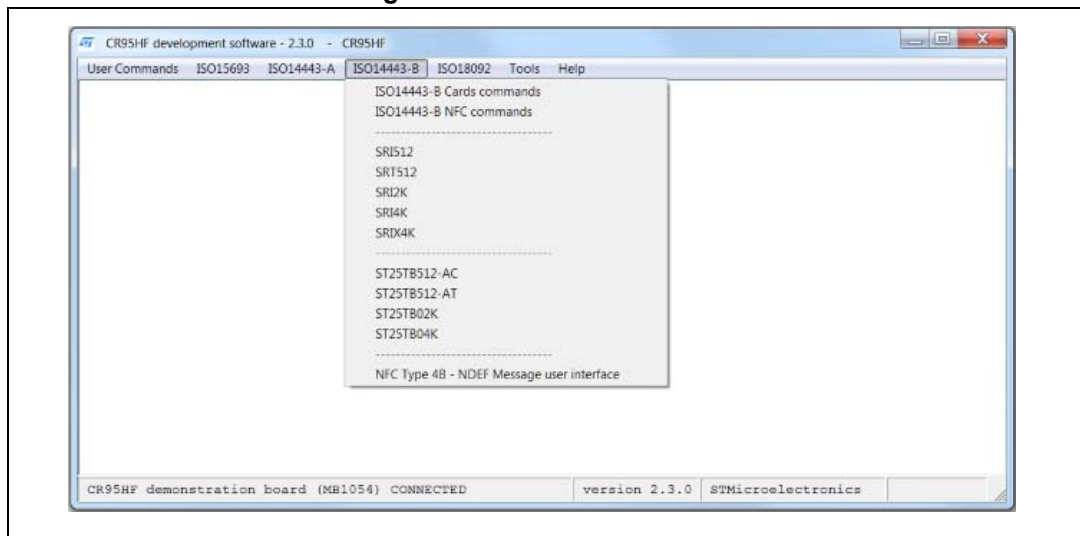
2.6 ISO14443-B menu

This section allows to communicate with ISO14443-B tags.

Select ISO14443-B from the main menu to use the CR95HF demonstration board as an ISO14443-B reader. You can then choose between:

- ISO14443-B cards
- ISO14443-B with NFC features
- SRIxx and SRTxx devices
- ST25TBxxx devices

Figure 123. ISO14443-B menu



Select a device from the list (see [Figure 124](#) and [Figure 125](#) for an example). This automatically configures the board as an ISO14443-B reader and displays all the ISO14443-B requests.

ISO14443-B communications are configured as follows:

- 106 kbits/s data rate for both transmission and reception
- CRC appended

The ISO14443-B configuration is displayed in the log window.

The upper part of the window contains buttons allowing to send ISO14443-B requests to tags through the CR95HF demonstration board antenna (refer to the device datasheet).

Select the ISO14443-B menu to launch one of the following user interface (see [Figure 125](#)):

- ISO14443-B Cards commands: (see [Section 2.6.1](#))
This menu allows the user to send any ISO14443-B requests
- ISO14443-B NFC commands: (see [Section 2.6.2](#))
This menu allows the user to send any ISO14443-B requests
- SRI512, SRT512, SRI2K, SRI4K, SRI4K, ST25Tb512-AC, ST25TB512-AT, ST25Tb02K, ST25TB04K (see [Section 2.6.4](#))
This menu allows the user to send any ISO14443-B requests to SRXxx and ST25TBxxx products
- Type_4B NDEF Message user interface (see [Section 2.6.3](#))
This menu allows the user to read and write NDEF message to Tag Type 4B

2.6.1 ISO14443-B Cards commands

This window allows to communicate to any ISO14443-B card.

When selecting the ISO14443-B Card commands, the user interface is displayed, as shown in [Figure 125](#)

Figure 124. Example of ISO14443-B user interface

The protocol selection is launched immediately. The summary of the commands sent to the CR95HF are included in the log window. Click on “show log” to display it (see [Figure 126](#))

Figure 125. Log file

Some basic commands are available to be able to play with TOPAZ cards such as:

- REQB
- WPUB
- ATTRIB

Log window can be displayed by clicking on “Show log” button.

2.6.2 ISO14443-B NFC commands

Figure 126. ISO14443-B user interface

The protocol selection is launched immediately. The summary of the commands sent to the CR95HF are included in the log window. Click on “show log” to display it (see [Figure 126](#))

Figure 127. Protocol select for ISO14443-B

This screens allow to send ISO14443-A commands:

- REQB
- WUPB
- ATTRIB

REQB & ATTRIB commands are mandatory to put the ISO14443-B NFC card into NFC world.

As soon as this commands have been sent successfully, you will be able to send NFC commands.

This commands are available on a second window. To show this window, please click on NFC TYPE 4B TAG button.

This window will allows to send NFC APDU in order to play with the NFC Type 4B tag.

Figure 128. ISO14443-B NFC user interface

For more informations about the use of each button, please refers to [Section 2.5.3](#).

2.6.3 SRIxx/SRTxx/ST25TBxxx products

Figure 129. Example of ISO14443-B user interface for SRIxxx

The ISO14443-B configuration is displayed in the log window as shown in figure.

The window allows to send all the command of the datasheet for this products :

- Reset to Inventory
- Initiate
- Select
- Slot Marker
- Pcall16
- Completion
- Get UID
- Read Single Block
- Read System area (address 0xFF)
- Write Single Block
- A single button allows to launch all ths Anticollision sequence.

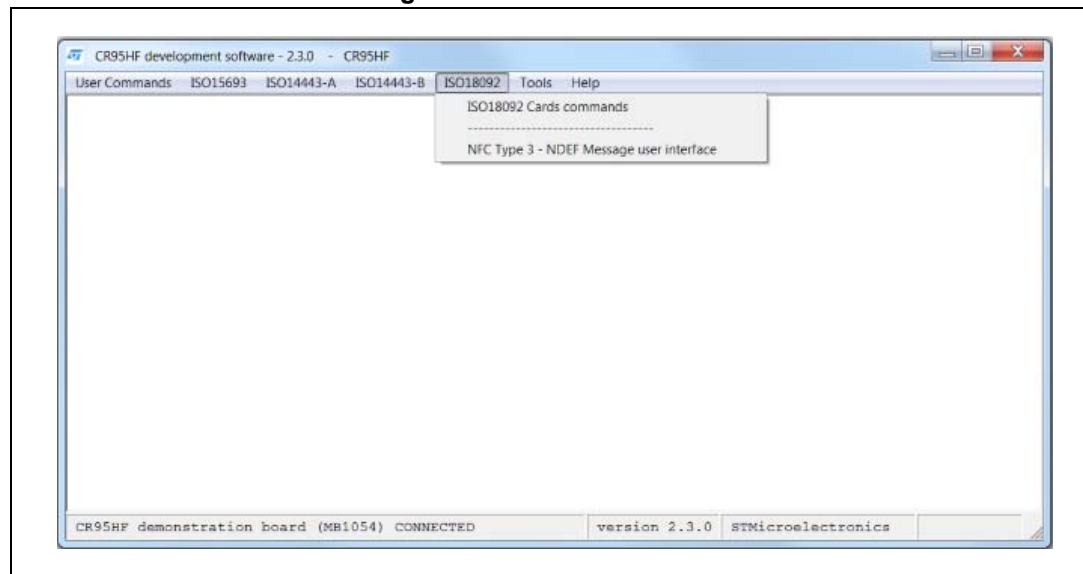
2.6.4 Type_4B NDEF Message user interface

The functionality of this tool is the same as the NFC TYPE 4A TAG that can be found in ISO14443-A (see to [Section 2.5.5](#) for more informations about how to use it).

2.7 ISO18092 menu

1. Select ISO18092 from the main menu to use the CR95HF demonstration board as an ISO18092 reader (see [Figure 130](#)).

Figure 130. ISO18092 menu



2. Select ISO18092 Cards commands from the list. This automatically configures the board as an ISO18092 reader and displays all the ISO18092 requests.

The ISO18092 configuration is displayed in the log window as shown in [Figure 131](#).

Figure 131. ISO18092 log window

The screenshot shows the 'ISO18092 user interface' window. It contains several sections for interacting with an ISO18092 card:

- POLLING command:** Fields for '00', 'FF', 'FF', '00', and a dropdown for '00: Max number of slots = 1'. A legend indicates: 00: no request, 01: System Code request, 02: Performance Parameter request. Below are fields for 'Answer: 01', '0119011013130E00', and '0120220427674EFF'. A note says '* Click to use this Manufacture ID'.
- READ command:** Fields for '06', '0119011013130E00', '01', '0900', '01', and '8000'. Below is 'Answer: 07', '0119011013130E00', '0000', '01', and '11223344556677889900AABBCCDDEEFF'.
- WRITE command:** Fields for '08', '0119011013130E00', '01', '0900', '01', '8000', and '11223344556677889900AABBCCDDEEFF'. Below is 'Answer: 09', '0119011013130E00', and '0000'.
- Send any frame:** A text input field.
- request =** '060119011013130E00010900018000' and **answer =** '801D070119011013130E0000000111223344556677889900AABBCCDDE'.
- Log window:** A scrollable area showing a log of commands and responses. A red oval highlights the log entries for the WRITE and READ commands. The log shows:
 - 12-20-2016 12:18:03 WRITE: >>> CR95HFDLL_SENDRECEIVE, 060119011013130E00010900018000, <<< 800C090119011013130E00000000
 - 12-20-2016 12:18:05 READ: >>> CR95HFDLL_SENDRECEIVE, 060119011013130E00010900018000, <<< 801D070119011013130E0000000111223344556677889900AABBCCDDEEFF00
- Buttons:** 'Launch RF POR', 'Save Log', and 'Clear Log'.

Polling command can be done to communicate with an ISO18092 card. The response of the tag will be displayed in several fields.

ManufactureID is displayed in the second field. Click on this field to fill the Read & Write commands with this mandatory field.

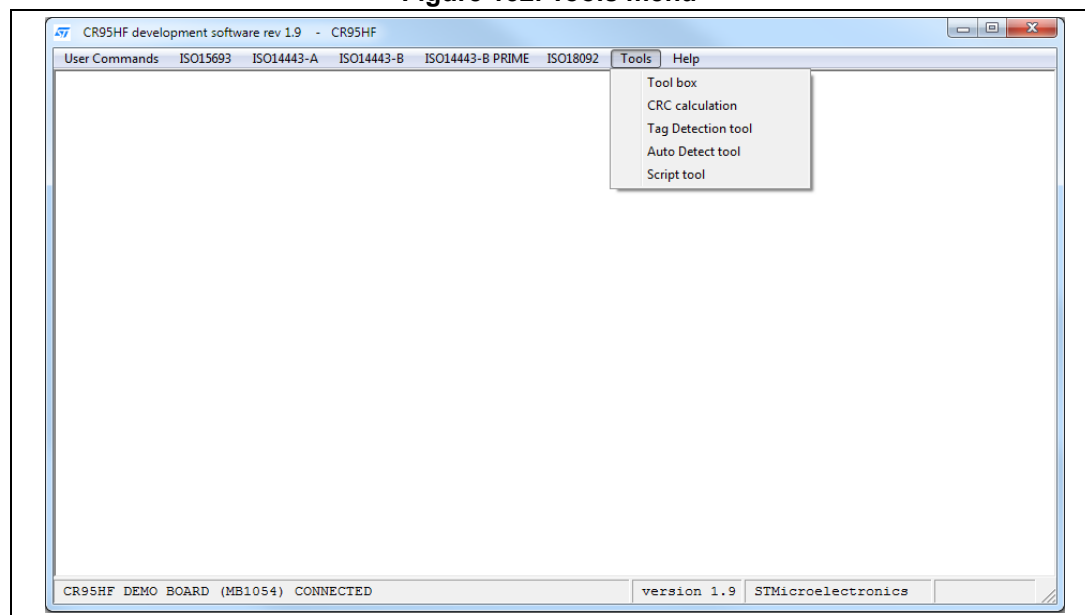
Read command and Write command are also available.

2.8 Tools menu

Select the **Tools** menu to launch one of the following tools (see [Figure 132](#)):

- **CR95HF demonstration board tool box** (see [Section 2.8.1: CR95HF demonstration board toolbox](#))
This menu allows the user to send requests to the CR95HF demonstration board.
- **Tag Detection tool** (see [Section 2.8.2: Tag Detection tool](#))
This menu can be used to launch a CR95HF demonstration board calibration and a CR95HF Tag Detection.
- **Auto Detect tool** (see [Section 2.8.3: Auto detection tool](#))
This menu allows to launch successive anticollision processes on several RFID technologies in order to detect tags
- **Script tool** (see [Section 2.8.4: Script tool](#))
This menu allows to transmit and execute a sequence of CR95HF requests.

Figure 132. Tools menu



2.8.1 CR95HF demonstration board toolbox

The CR95HF demonstration board toolbox allows to send the following requests to the CR95HF demonstration board (see [Figure 133](#)):

- **Get MCU revision:** reads the revision of the STM32 microcontroller firmware.
- **Get DLL revision:** reads the revision of the DLL installed on your PC.
- **IDN:** sends an IDN command to the CR95HF and receives the answer.
- **Field Off:** turns the RF field off.
- **Echo:** sends an Echo command to the CR95HF and receives the answer.
- **Reset SPI:** resets SPI communications between the STM32 MCU and the CR95HF.
- **Negative pulse on IRQ in:** applies a negative pulse on the CR95HF IRQ input.
- **Negative Pulse on SPI NSS:** applies a negative pulse on CR95HF NSS pin.
- **Polling + reading:** puts the CR95HF in polling & reading mode.
- **Get interface pin state:** detects the bus configuration of the CR95HF demonstration board.
- **Change Modulation depth and Receiver Gain:** modifies the setting for ISO14443-A.
- **Change TimerW value:** modifies the setting for ISO14443-A.

Figure 133. CR95HF demonstration board toolbox

The screenshot shows the 'Toolbox' window of the CR95HF demonstration board software. It contains various control buttons and input fields for interacting with the hardware. The interface is organized into several sections:

- Top Section:** Includes buttons for 'Get MCU revision', 'Get DLL revision', 'Get Hardware version', 'Echo', 'Field Off', 'CR95HF demonstration board USB Connect', and 'CR95HF demonstration board USB Handle Check'.
- Command Section:** Features buttons for 'IDN', 'Reset SPI', 'Polling + reading', 'Negative pulse on IRQ in', and 'Negative pulse on SPI NSS', each with associated input fields.
- Interface Section:** Contains a 'Get interface pin state' button and radio buttons for selecting the communication bus: 'UART bus', 'SPI bus', and 'TWI'.
- Modulation and Gain Section:** Includes dropdown menus for 'Change Modulation depth*' (set to 'D : 95%') and 'Receiver Gain*' (set to '3 : 27dB'), along with a 'D3' input field.
- TimerW Section:** Includes a dropdown menu for 'Change TimerW* value for ISO14443-A reader mode' (set to '58').
- Footer Note:** A note states: '* These values will be applied to all ISO14443-A protocol select commands'.
- Bottom Section:** Includes buttons for 'Send any ST_Cmd request', 'Extend Transfer bytes', 'Save Log', and 'Clear Log'.

2.8.2 Tag Detection tool

Two commands are available (see [Figure 134](#)):

- **Calibration**

Clicking the **Calibration** button performs a CR95HF demonstration board calibration to determine the DacDataL/DacDataH parameters that will be used in Tag Detection mode. The calibration sequence is the following:

- Send an Idle command to the CR95HF with DacDataL fixed to 0 and DacDataH set to its maximum value.
- Read the Wakeup register to check whether the CR95HF has entered Wakeup mode on a tag detection event. Otherwise, a new Idle command is sent with a lower DacDataH value. These steps are repeated until a tag is detected.

The DacDataL/DacDataH parameters that will be used for tag detection are:

$$\text{DacDataL}_{\text{Tag detection}} = \text{DacDataL}_{\text{Calibration}} - 2$$

$$\text{DacDataH}_{\text{Tag detection}} = \text{DacDataH}_{\text{Calibration}} + 2, \text{DacDataH}_{\text{Calibration}} \text{ being the value corresponding to the detection limit.}$$

- **Tag Detection**

The tag detection sequence is performed using the DacDataL_{Tag detection}/DacDataH_{Tag detection}:

- Send an Idle command to put the CR95HF in tag detection state.
- Wait till the CR95HF wakes up: read the Wakeup register to check if the CR95HF has been woken up by a tag detected in the RF field or by timeout.

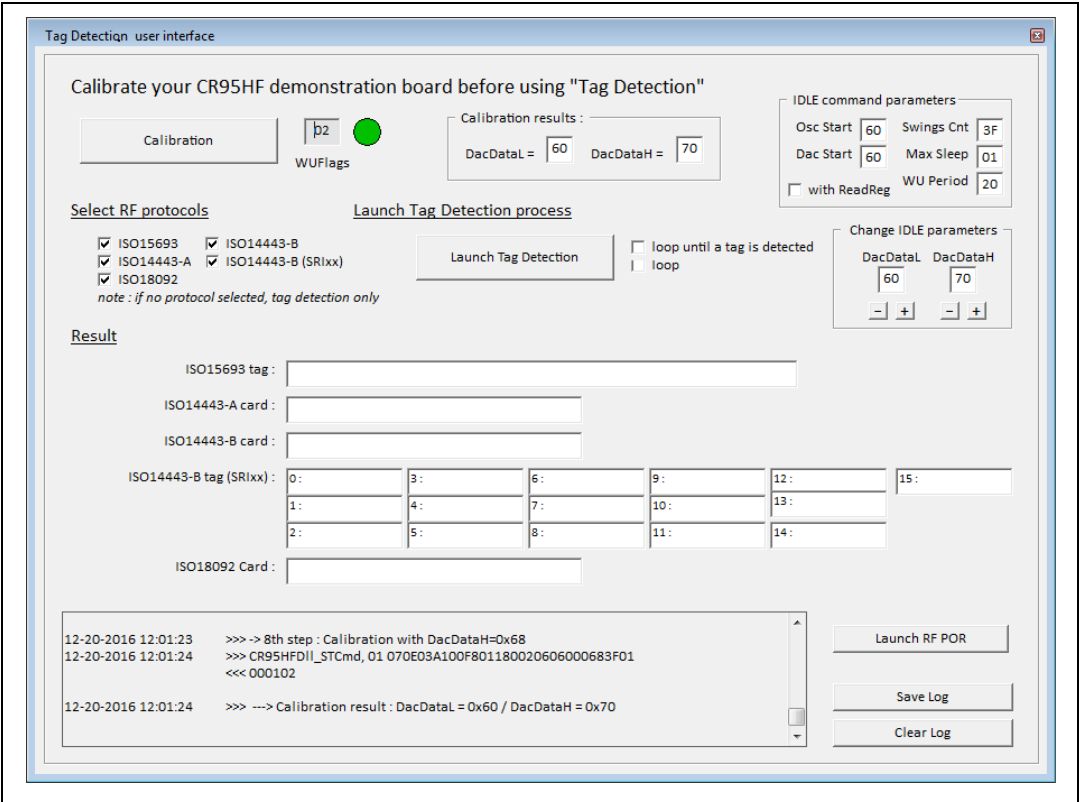
If a tag is detected in the CR95HF demonstration board field, the CR95HF enters Wakeup mode, and an ISO15693/ISO14443-B anti-collision procedure starts to identify the tags present in the field.

To perform one-shot tag detection, uncheck both **Loop** and **Loop until a tag is detected**, before pressing the **Tag Detection** button.

If only **Loop** is checked, the tag detection runs continuously and stops when **Loop** is unchecked.

If only **Loop until a tag is detected** is checked, the tag detection runs continuously and stops when a tag is detected and identified.

Figure 134. Tag detection interface



2.8.3 Auto detection tool

The Auto detection tool allows to play a tag hunt on several RFID technologies (see [Figure 135](#)).

Figure 135. Auto Detect tool interface

Auto Detect Tool user interface

Select RF protocols

☒ ISO15693 ☒ ISO14443-A ☒ ISO14443-B ☒ ISO14443-B (SRIxx) ☒ ISO18092

Select at least one RF protocol to be able to launch Auto Detection process

Launch Auto Detection process

Launch Auto Detection

☒ no loop
☐ infinite loop on all selected protocols
☐ loop on all selected protocols until a tag is found
☐ loop on all selected protocols until a tag is found, then loop on this tag only

Result

ISO15693 tag :

ISO14443-A card :

ISO14443-B card :

ISO14443-B tag (SRIxx) :

0:	3:	6:	12:	9:	15:
1:	4:	7:	10:	13:	
2:	5:	8:	11:	14:	

ISO18092 Card :

Launch RF POR

Save Log

Clear Log

- **Select RF protocols**
By selecting one or more RF protocol, you can define which kind of tag will be detected and on which protocol the tag hunt will be launched.
- **Launch Auto Detection process**
The Launch Auto Detection button allows to launch a tag hunt on a selected process. This can be done once. The Loop option can be selected.
- **Result**
In case of a Tag detection, the result field will be the field with the Tag identification.

2.8.4 Script tool

The **Script** tool allows playing a script containing a sequence of CR95HF commands (see [Figure 139](#)). The following functions are available:

- **Save Script** saves the script in a text file.
- **Load Script** loads a script file
- **Launch Script** runs the script. The script is executed until an error occurs. Read the log to identify the cause of the error and correct your script. This can be due to a syntax error. Refer to the Script Help to correct it.
- **Help**: display the list of commands that can be used to program the script.

Figure 136. Script help page 1/3

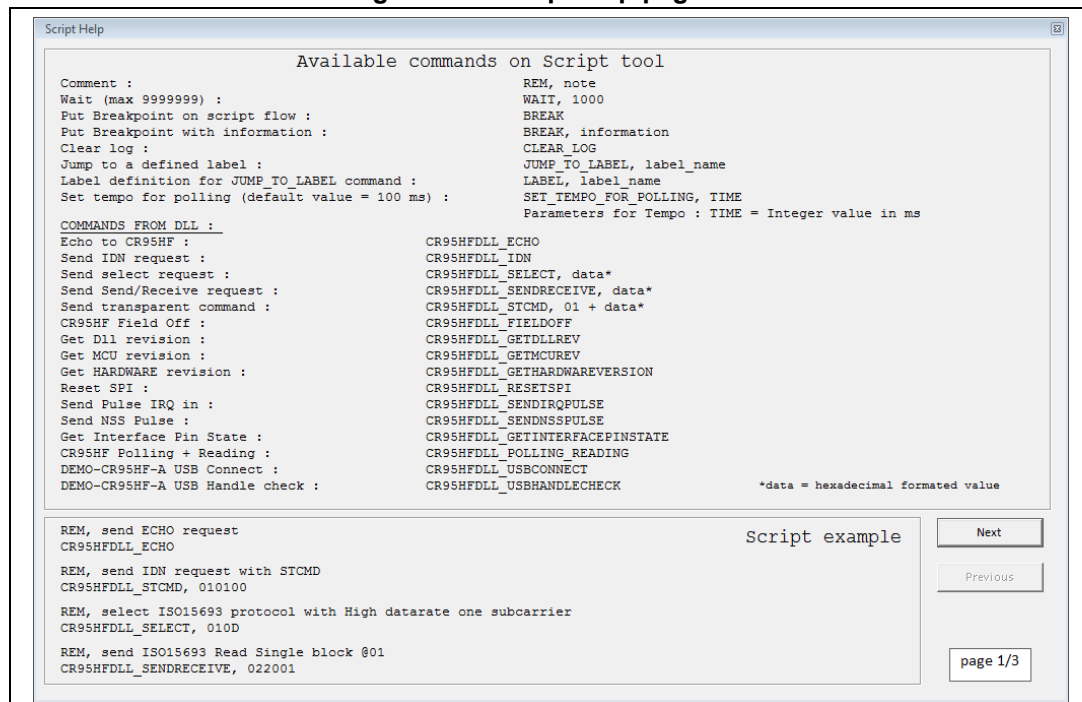


Figure 137. Script help page 2/3

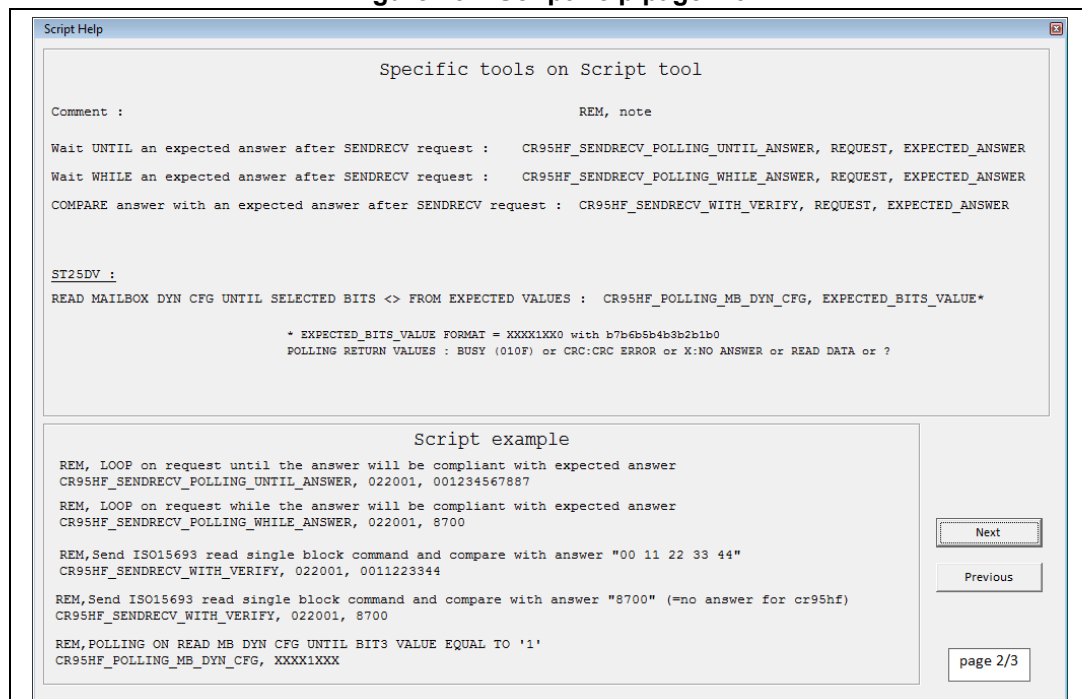
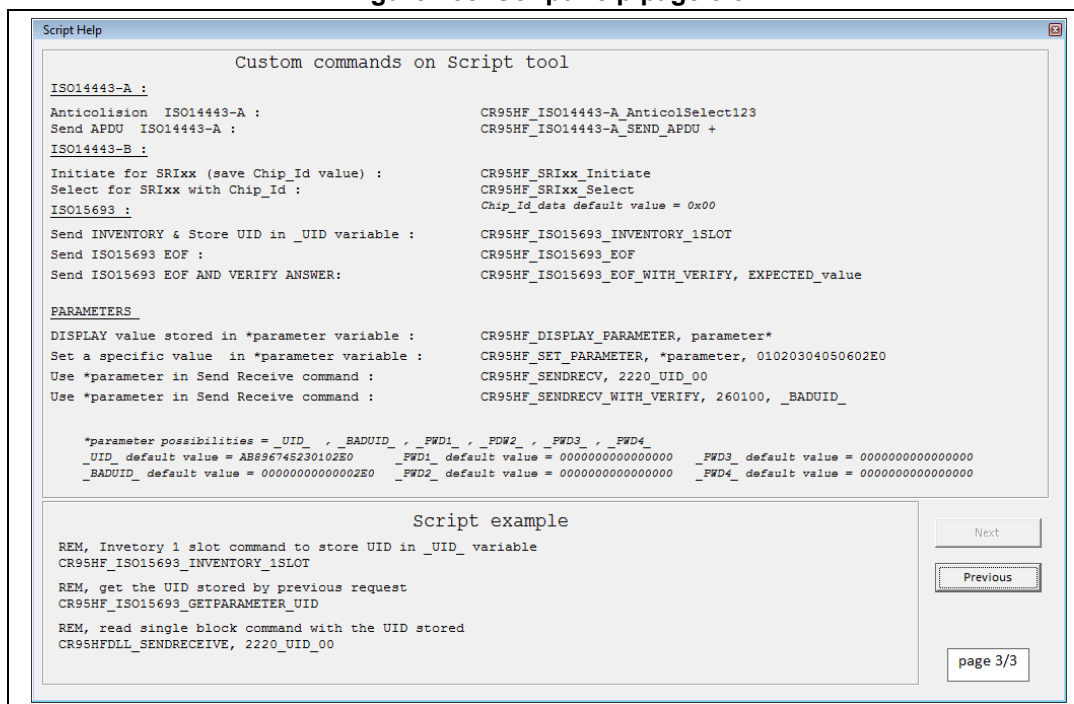
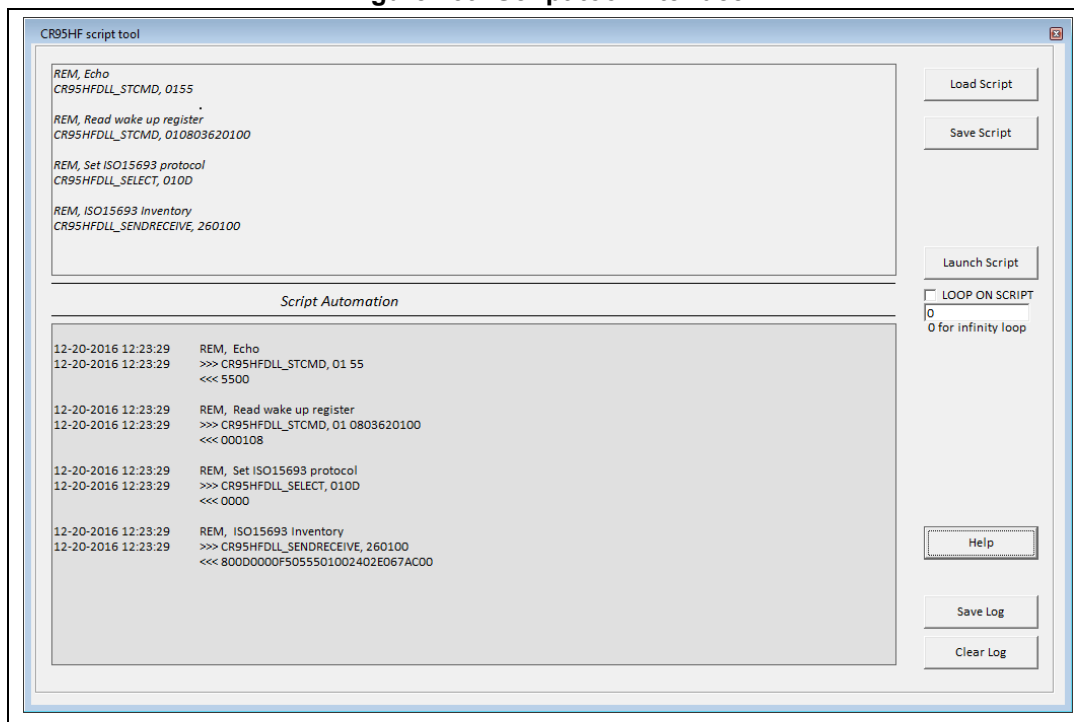


Figure 138. Script help page 3/3



The Script Help (see [Section 2.9: Help menu](#)) describes the syntax of all the commands that can be sent to the CR95HF demonstration board.

Figure 139. Script tool interface



2.9 Help menu

Select the **Help** menu to access the following functions (see [Figure 140](#)):

- **Change background color**

This function changes the color of the main window. Once set, the background color is saved and recalled each time the software is used (see [Figure 141](#)).

- **Script Help**

This function allows to get information on CR95HF function syntax (see [Figure 136](#), [Figure 137](#) and [Figure 138](#)). It is particularly useful when developing a script (see [Section 2.8.4: Script tool](#)).

- **About ...**

Click **About ...** to get information on the CR95HF development software (see [Figure 145](#)).

Figure 140. Help menu

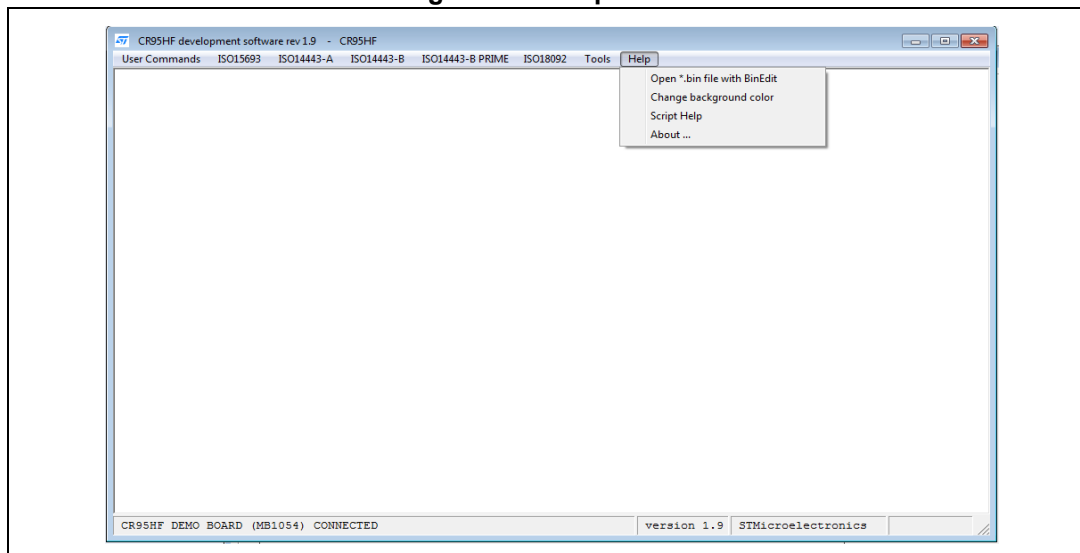


Figure 141. Change background color menu

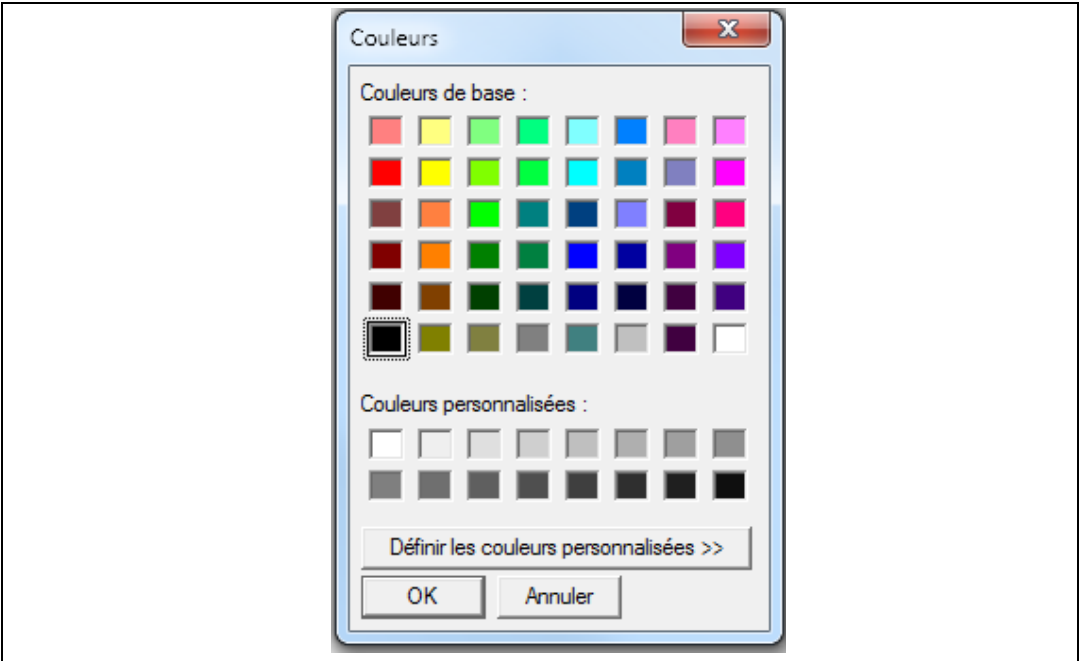


Figure 142. Script help 1

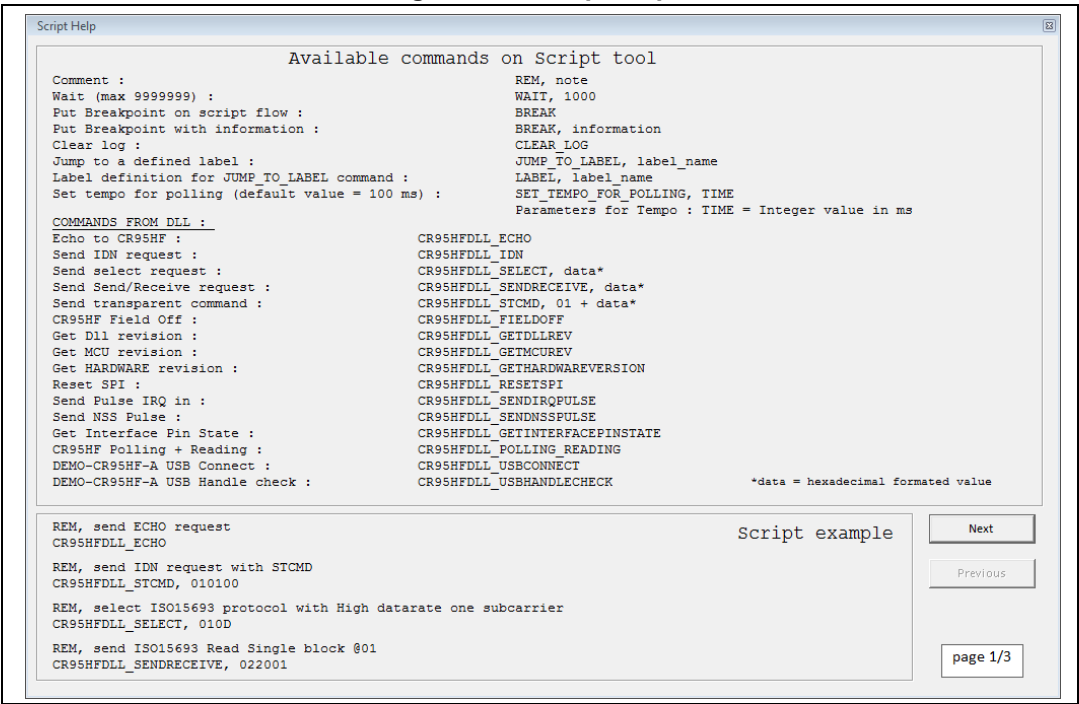


Figure 143. Script help 2

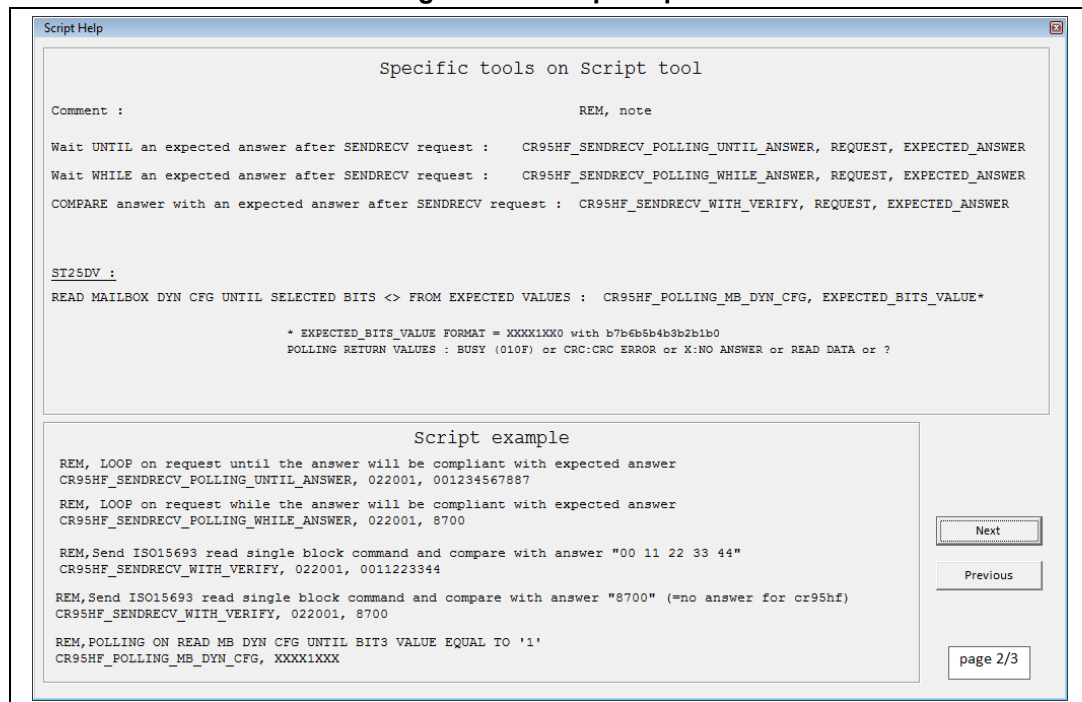


Figure 144. Script help 3

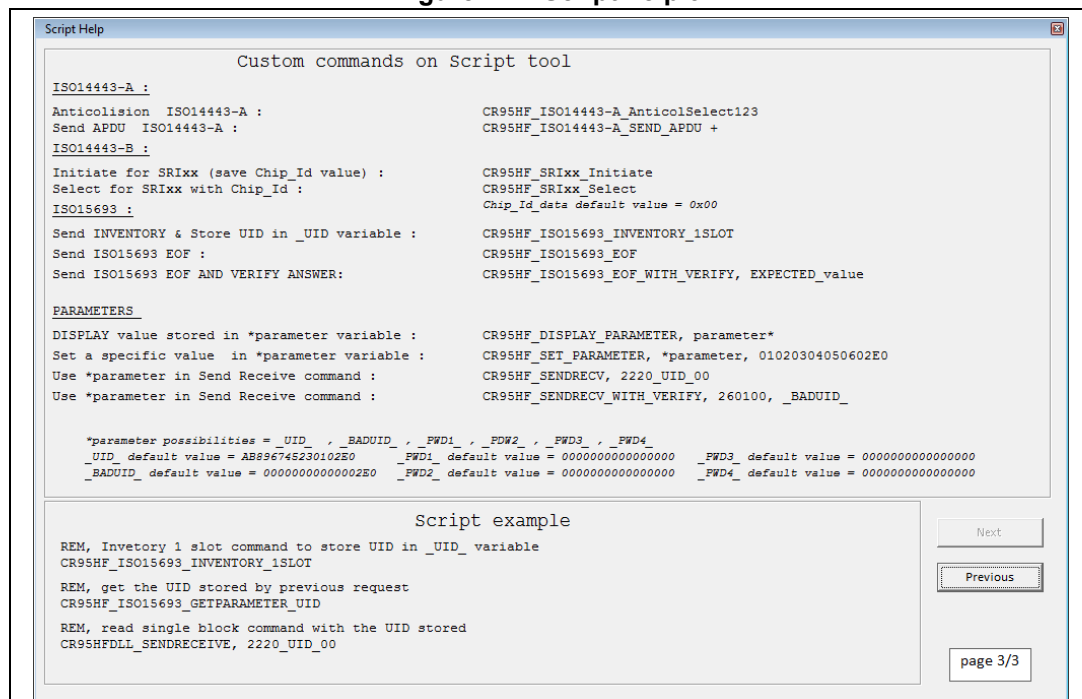
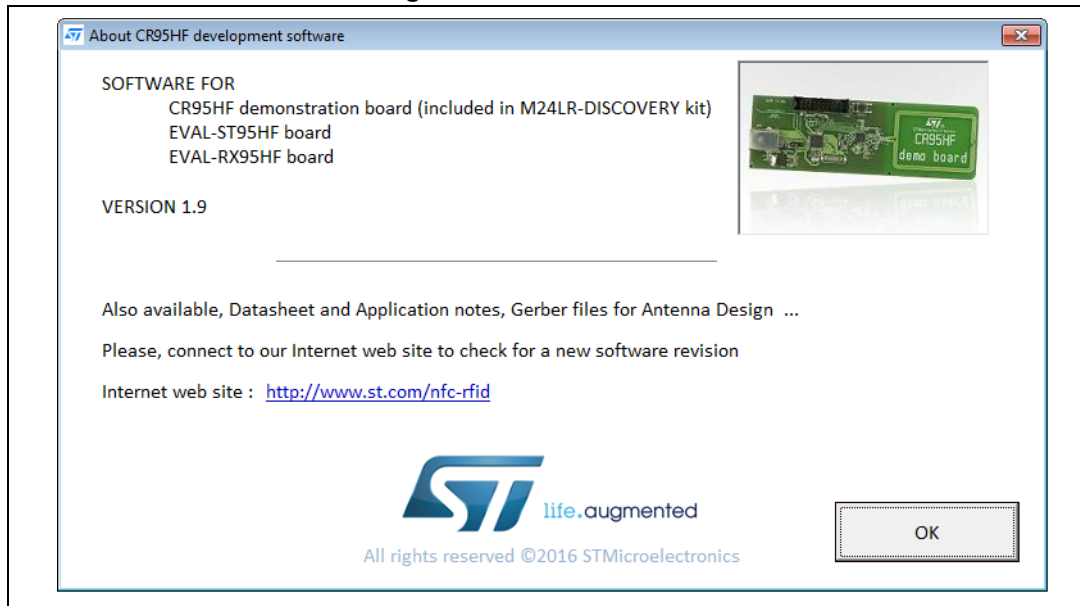


Figure 145. About window



2.10 Log window

The log is displayed at the bottom of each window. It contains all the requests sent to the CR95HF demonstration board through the USB interface. The log contains the following information:

- Date and hour when the command has been sent.
- Request and parameters sent to the CR95HF demonstration board: name of the command sent to the board through the DLL, followed by all parameters in hexadecimal format.
- Answer from the CR95HF.

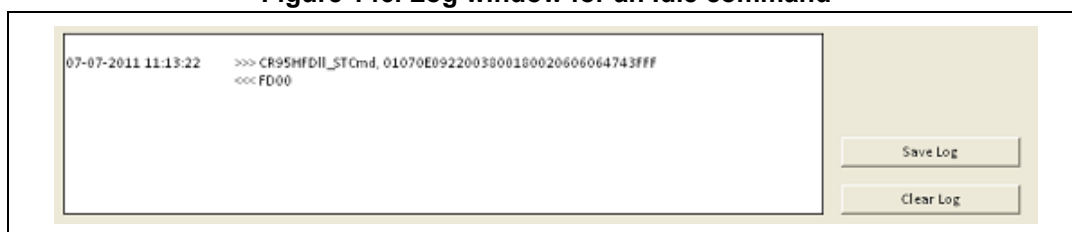
The command and parameter formats are compatible with the Script tool (see [Section 2.7: ISO18092 menu](#)) and can be directly copied in a script file.

As an example, the log contains the information shown in [Figure 146](#) when an Idle command is sent to the board. In this example:

‘CR95HFDII_STCmd 01 070E0922003800180020606064743FFF’ means that:

- The CR95HFDII_STCmd request has been sent to the CR95HF demonstration board.
- ‘01’ is the header of CR95HFDII_STCmd command.
- ‘070E0922003800180020606064743FFF’ corresponds to an Idle command followed by its parameters.

‘FD00’ is the answer from the CR95HF demonstration board.

Figure 146. Log window for an Idle command

3 Revision history

Table 1. Document revision history

Date	Revision	Changes
12-Jul-2011	1	Initial release.
28-Oct-2011	2	Changed document title. Updated disclaimer on last page.
12-Sep-2013	3	Updated the title and the Introduction for RPN consistency. Added Section 2.7: ISO18092 menu and Section 2.6: ISO14443-B menu . Extended the list of Section 2.8.1: CR95HF demonstration board toolbox . Added Section 2.8.3: Auto detection tool . Updated several software figures (Figure 15 , Figure 19 to Figure 24 , Figure 26 to Figure 62 ...) Added Figure 124: Example of ISO14443-B user interface .
25-Feb-2014	4	Updated Section 2.3: User commands on page 15 , added Figure 2.3.1: CR95HF commands menu Added new Section : 09: WrReg on page 21 with new Figure 28 . Added new Section 2.3.2: RX95HF commands menu on page 22 with new figure from Figure 34 to Figure 43 . Added new Section 2.5 and Section 2.6 with new figures from Figure 79 to Figure 129 Updated Figure 15 , Figure 62 , Figure 130 , Figure 132 and Figure 140

Table 1. Document revision history (continued)

Date	Revision	Changes
15-Dec-2016	5	<p>Updated:</p> <ul style="list-style-type: none"> – Section 2.2: Main menu, Section 2.3.1: CR95HF commands menu, Section 2.3.2: RX95HF commands menu, Section 2.4: ISO15693 menu, Section 2.5: ISO14443-A menu, Section 2.5.3: M24SR, SRTAG and ST25TA user interface, Section 2.5.5: NFC Type 4A - NDEF Message user interface, Section 2.8.4: Script tool – Figure 14: Select RF READER IC, Figure 16: CR95HF user commands menu, Figure 17: CR95HF commands menu, Figure 62: ISO15693 menu, Figure 63: Example of ISO15693 user interface for M24LR64, Figure 64: Selecting User Mode from ISO15693 user interface (M24LR64), Figure 105: NFC Type 4A - NDEF message user interface, Figure 130: ISO18092 menu, Figure 132: Tools menu, Figure 133: CR95HF demonstration board toolbox, Figure 140: Help menu, Figure 141: Change background color menu, Figure 145: About window <p>Added:</p> <ul style="list-style-type: none"> – Figure 15: Main menu, Figure 31: User commands menu for RX95HF, Figure 65: ST25DV user interface: Inventory, Figure 66: ST25DV user interface: AFI DSFID INFO, Figure 67: ST25DV user interface: EEPROM, Figure 68: ST25DV user interface: display Extended commands, Figure 69: ST25DV user interface: ISO15693 Data Rate management, Figure 70: ST25DV user interface: static configuration, Figure 71: ST25DV user interface: Fast Transfer Mode interface, Figure 72: ST25DV user interface: Password management, Figure 73: ST25DV user interface: Energy Harvesting and GPO management, Figure 74: ST25DV user interface: Fast Transfer Mode demo, Figure 75: Read and write NFC Type 5 CC file, Figure 76: Read NFC Type 5 NDEF message, Figure 77: Prepare NFC Type 5 NDEF message, Figure 78: Write NFC Type 5 NDEF message, Figure 79: ISO14443-A menu, Figure 109: Prepare TEXT NDEF record, Figure 110: Prepare URI NDEF record, Figure 111: Prepare SMARTPOSTER NDEF record, Figure 112: Prepare MIME VCARD NDEF record, Figure 113: Prepare MIME BLUETOOTH PAIRING NDEF record, Figure 114: Prepare MIME MEDIA NDEF record, Figure 115: Prepare MIME VARIOUS NDEF record, Figure 136: Script help page 1/3, Figure 137: Script help page 2/3, Figure 138: Script help page 3/3, Figure 142: Script help 1, Figure 143: Script help 2, Figure 144: Script help 3 – Section 2.3.3: ST95HF commands menu, Section 2.5.4: Password management for M24SR and SRTAG products, PREPARE NDEF MESSAGE
09-Aug-2018	6	<p>Updated:</p> <ul style="list-style-type: none"> – Section 2.4: ISO15693 menu, Section 2.5: ISO14443-A menu, Section 2.6: ISO14443-B menu, title of Section 2.6.3: SRIxx/SRTxx/ST25TBxxx products. – Figure 62: ISO15693 menu, Figure 79: ISO14443-A menu, Figure 123: ISO14443-B menu, Figure 130: ISO18092 menu

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