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UM0853
User manual

M24LRxx application software user guide

1 Introduction

The purpose of this user manual is to teach how to use the M24LRxx tool kit with the *M24LRxx_Application_Software*. It describes the *M24LRxx_Application_Software* interface and its menus, and shows how to send commands to M24LRxx tags.

Contents

List of figures

2 Tool kit descriptions

2.1 M24LRxx development kit

Ordering information: **DEVKIT-M24LR-A**

The development kit contains:

- A middle-range RF reader (ISO 15693, RF 13.56 MHz) interfaced via the USB bus and an external power supply to have a greater read range. *Figure 1* shows the RF reader.
- An external antenna, shown in *Figure 2*.
- A serial EEPROM USB reader, shown in *Figure 3*: it is an I²C bus reader (interfaced via the USB bus).
- An I^2C bus cable to connect the serial EEPROM USB reader to the I^2C bus of the reference antenna. *Figure 4* shows the cable to use.
- M24LR64-R reference antennas:
  - ANT1-M24LR-A shown in *Figure 5*:
    RF antenna size: 75 mm × 45 mm (2.9 in × 1.77 in)
  - ANT2-M24LR-A shown in *Figure 6*:
    RF antenna size: 20 mm × 40 mm (0.79 in × 1.57 in)
- M24LRxx samples in SO8 package (see *Figure 7*)

Figure 1. RF reader (ISO 15693, RF 13.56 MHz)

Figure 2. External antenna

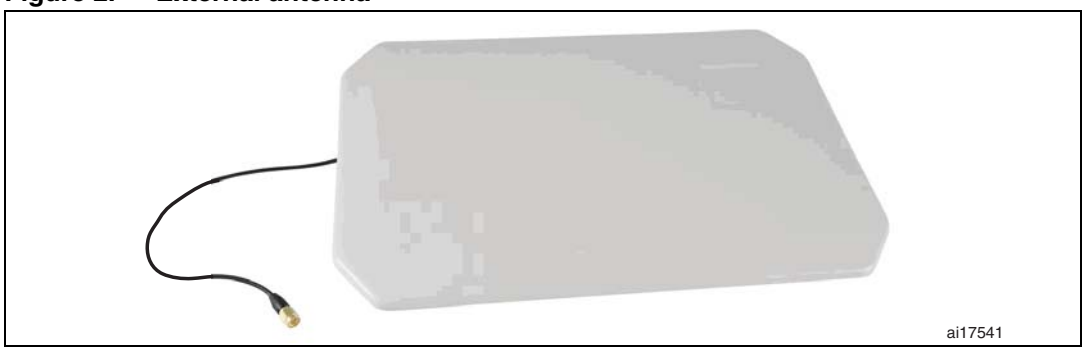


Figure 3. Serial EEPROM USB reader

Figure 4. I²C bus cable

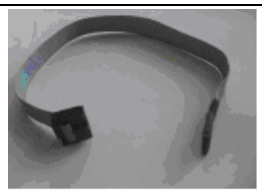


Figure 5. ANT1-M24LR-A reference antenna

Figure 6. ANT2-M24LR-A reference antenna

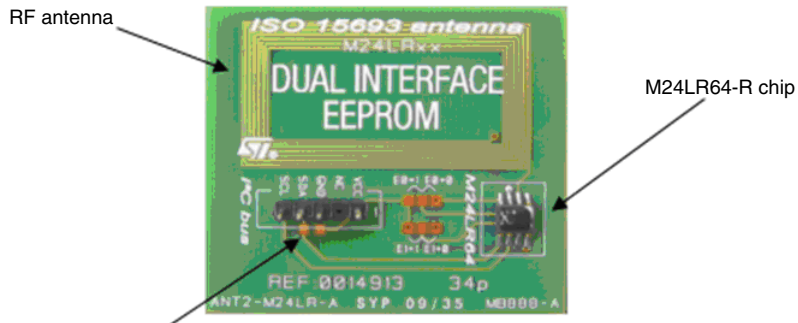
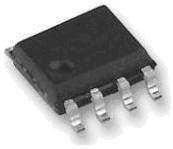


Figure 7. M24LR64-R in SO8 package



2.2 M24LR64-R demonstration kit

Ordering information: **DEMOKIT-M24LR-A**

The demonstration kit contains:

- A middle-range RF reader (ISO 15693, RF 13.56 MHz) interfaced via the USB bus, shown in *Figure 8*
- An M24LR64-R reference antenna: PRIM2-M24LR-A shown in *Figure 9*
  RF antenna size: 20 mm × 40 mm (0.79 in x 1.57 in)
- Optional: STM32-PRIMER2 (to be ordered separately) shown in *Figure 10*

Figure 8. RF reader

Figure 9. PRIM2-M24LR-A reference antenna

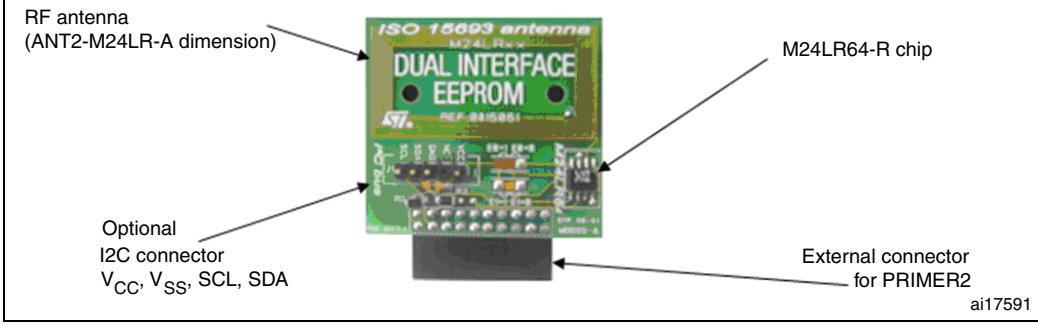


Figure 10. STM32-PRIMER2

1. Not included in the kit, to be ordered separately.

2.3 M24LRxx starter kit

Ordering information: STARTKIT-M24LR-A

The starter kit contains:

- A short-range RF reader (ISO 15693, RF 13.56 MHz), interfaced via the USB bus (including the external I²C bus cable + connector) illustrated in *Figure 11*
- M24LR64-R reference antennas:
  - ANT1-M24LR-A shown in *Figure 12*: RF antenna size: 75 mm × 45 mm (2.9 in × 1.77 in)
  - ANT2-M24LR-A shown in *Figure 13*: RF antenna size: 20 mm × 40 mm (0.79 in × 1.57 in)
- M24LR64-R samples in SO8 package (see *Figure 7*)

Figure 11. I²C & RF reader

Figure 12. ANT1-M24LR-A reference antenna

Figure 13. ANT2-M24LR-A reference antenna

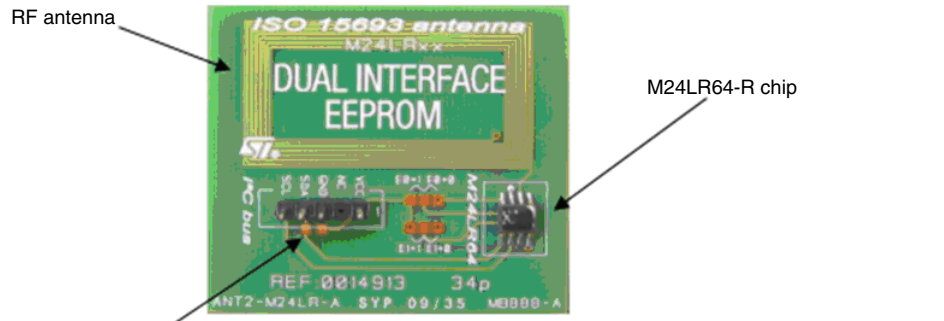
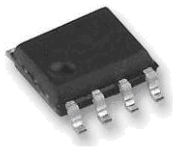


Figure 14. M24LR64-R in SO8 package



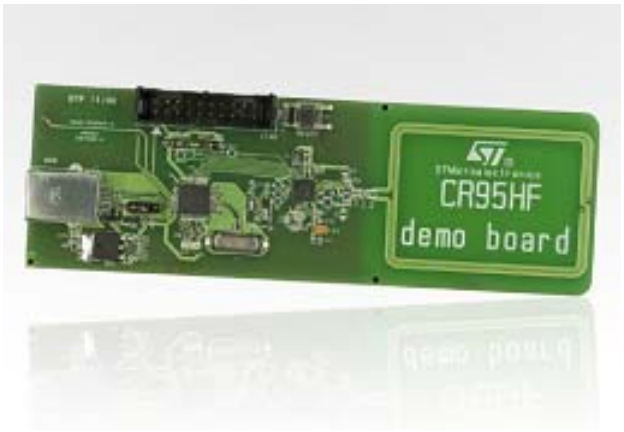
2.4 M24LRxx demonstration kit

Ordering information: DEMO-CR95HF-A.

The DEMO-CR95HF-A is a demonstration kit used to evaluate the performances of ST CR95HF 13.56 MHz multiprotocol contactless transceiver.

It is powered through the USB bus and no external power supply is required. It includes a CR95HF contactless transceiver, a 47 x 34 mm 13.56 MHz inductive etched antenna and its associated tuning components.

Figure 15. DEMO-CR95HF-A demonstration kit



3 How to control the RF and I²C channels from your screen

3.1 Starting *M24LRxx_Application_Software*

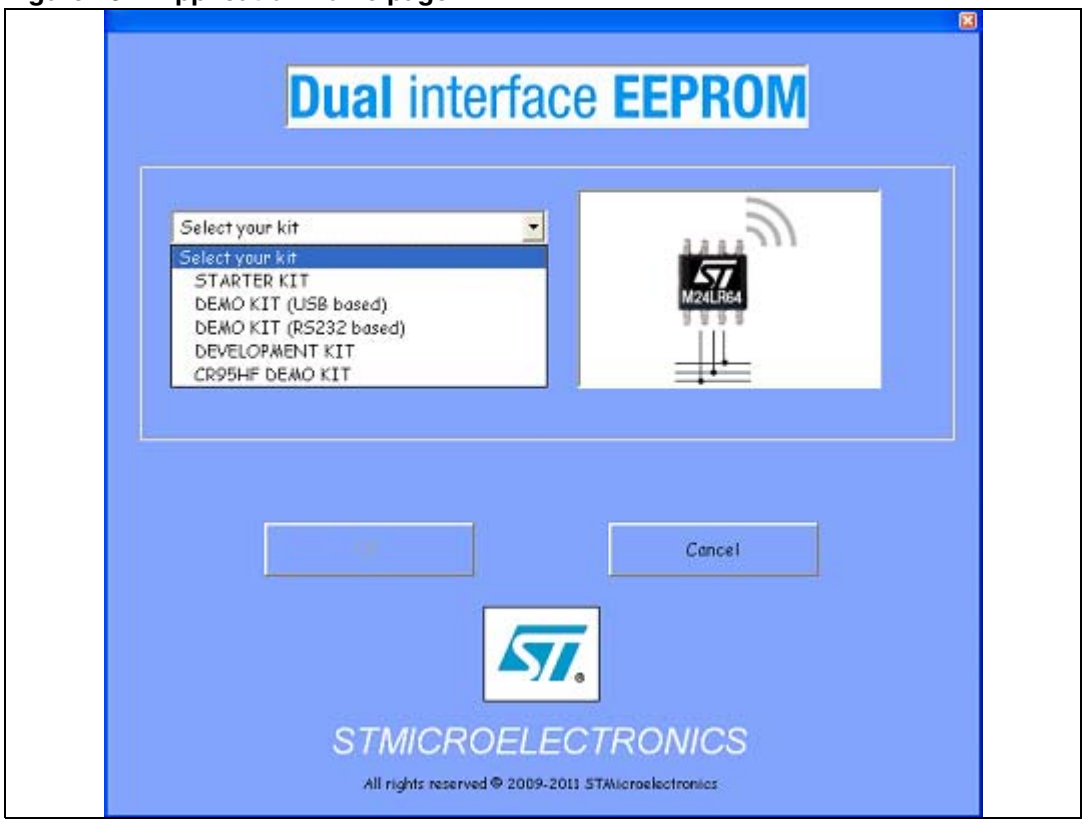
Before starting, you must have:

- previously installed all the drivers. For how to install the required drivers, please refer to UM0863: “M24LRxx tool driver install guide”
- connected the reader’s USB cable

3.1.1 Choosing your tool kit

On the PC desktop, double click on the *M24LRxx_Application_Software* icon. On launching the software, you will be prompted to select the kit you wish to use as shown in *Figure 16*.

Figure 16. Application home page



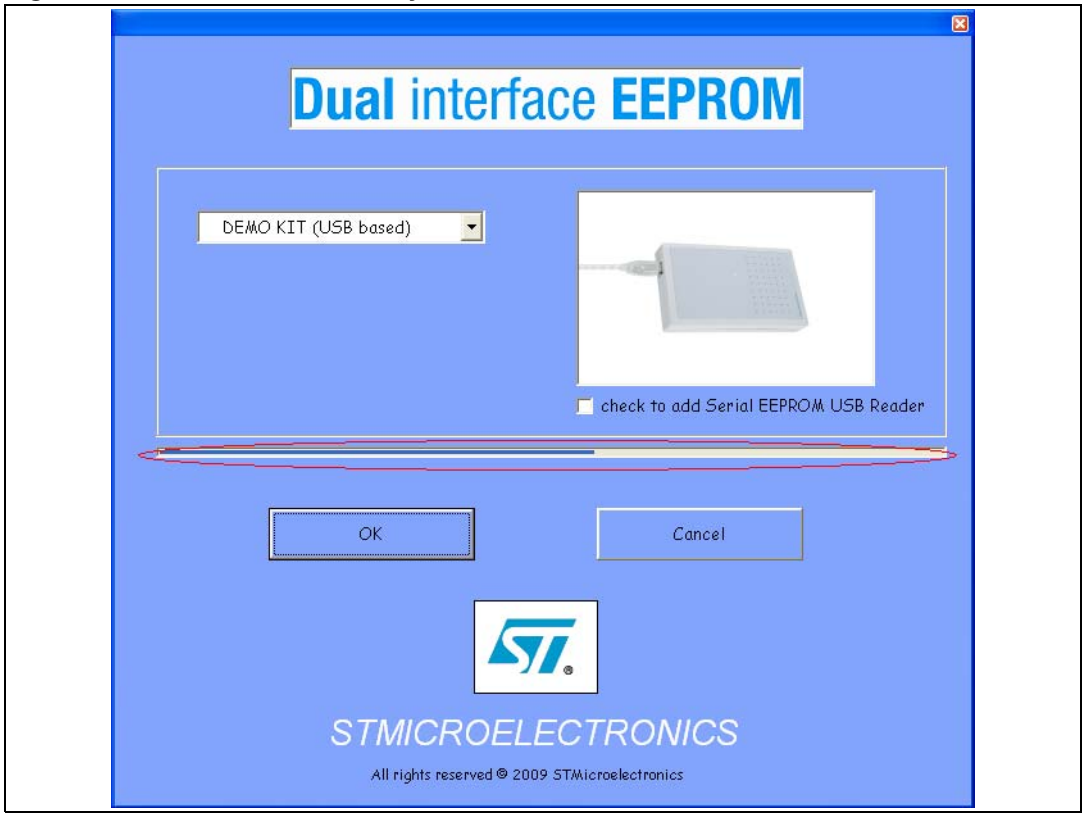
Select your kit from the list below and press the OK button:

- STARTER KIT
- DEMO KIT (USB based)
- DEMO KIT (based on the RS232 port - old version)
- DEVELOPMENT KIT
- DEMO-CR95HF-A

If you select DEMO KIT (USB based), you can also play with the SERIAL EEPROM USB reader by checking the box to add the Serial EEPROM USB reader.

Once the kit has been selected, the software checks that the selected readers are well connected. A progress bar appears during the check as shown in *Figure 17*.

Figure 17. Connection check by the software



If a problem occurs, a window appears to indicate what the problem is:

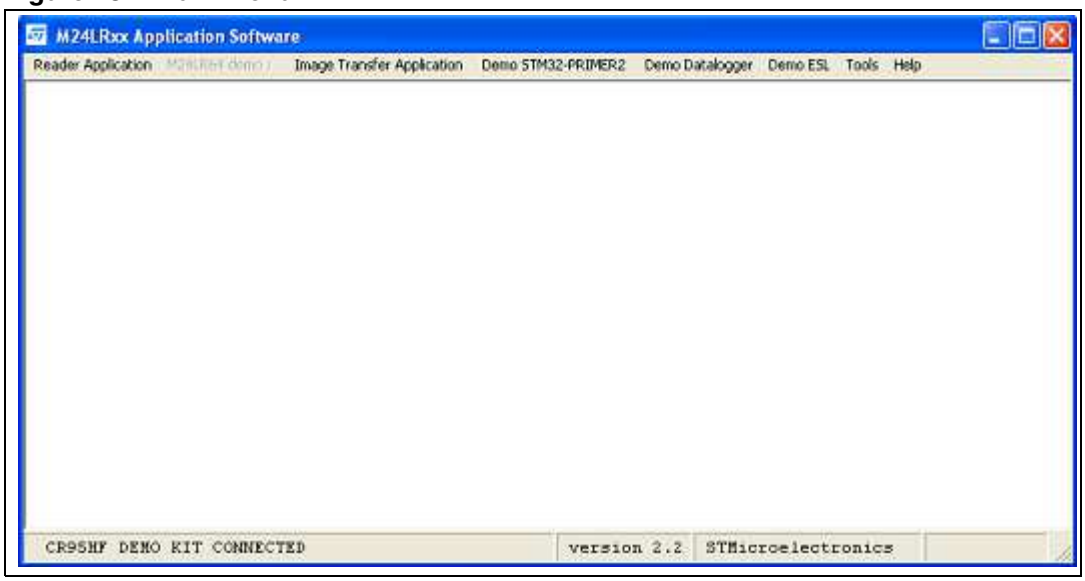
- If the development kit is used, the problem could be:
  - medium-range RF reader not plugged in the USB port
  - medium-range RF reader driver not installed
  - I²C bus reader not plugged in the USB port
  - I²C bus reader driver not installed
- If the demo kit is used, the problem could be:
  - medium-range RF reader not plugged in the USB port
  - medium-range RF reader driver not installed
- If the starter kit is used, the problem could be:
  - Short-range RF reader not plugged in the USB port
  - Short-range RF reader driver not installed

3.1.2 Main menu

If all the drivers have been installed correctly, and the selected readers have been plugged, the window shown in *Figure 18* appears.

The connection status of the readers as well as the version of the software are displayed at the bottom of the window.

Figure 18. Main menu

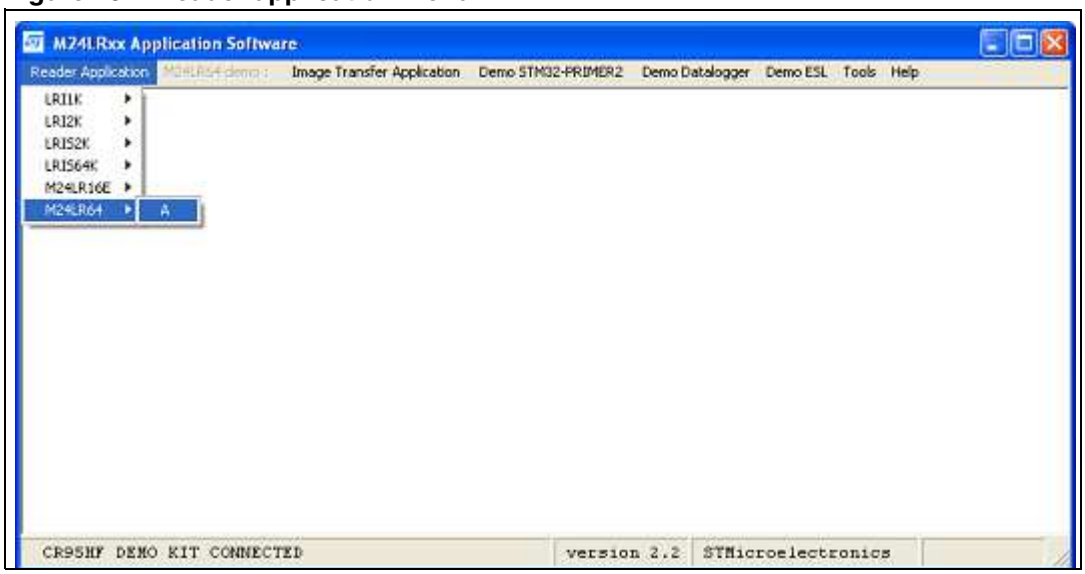


You can use the menu at the top of the window to select several applications:

Reader Application menu

Click **Reader Application** and select a product from the list (see *Figure 19*) to manage all the I²C and RF commands of LRxxx (RFID) and M24LRXX (Dual Interface EEPROM) products.

Figure 19. Reader application menu

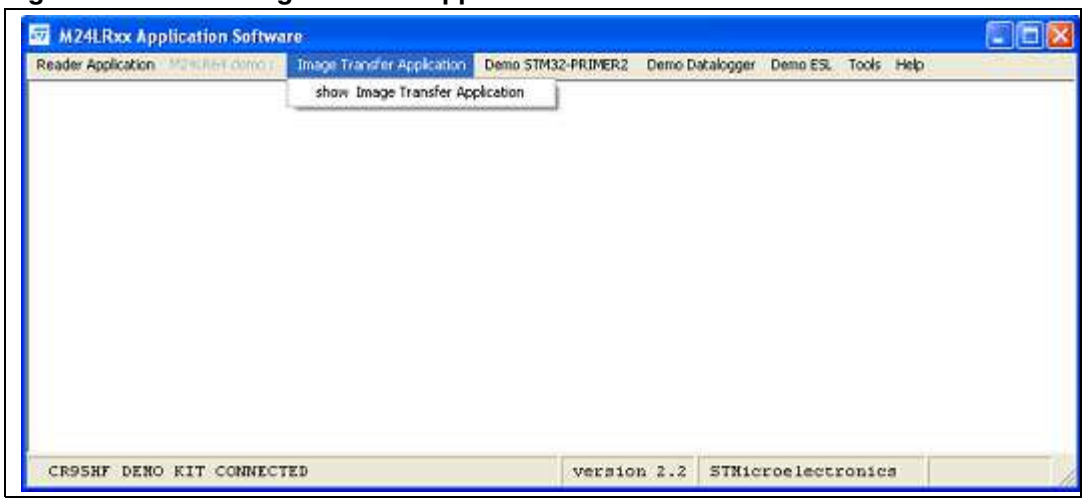


3.1.3 Image Transfer Application menu

Figure 20 shows the Image Transfer Application menu.

Select **show Image Transfer application** to upload or download a picture to or from the M24LR64-R by RF or I²C.

Figure 20. show Image Transfer application



3.1.4 Demo STM32-PRIMER2 menu

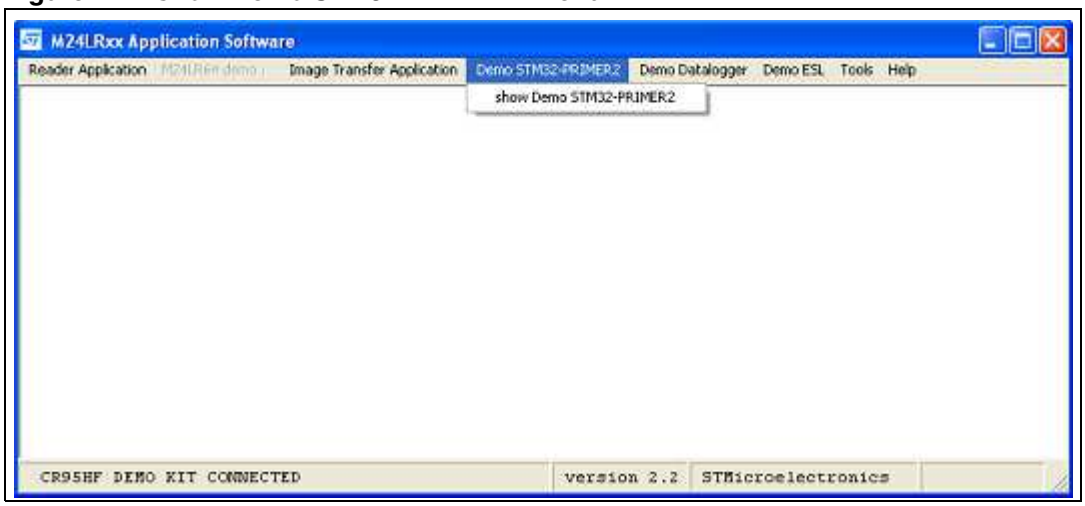
Figure 21 shows the **Demo STM32-PRIMER2 menu**.

Select **show Demo STM32-PRIMER2** to upload or download a picture to or from the M24LR64-R by RF.

Pictures are formatted to be usable by the “Dual EE” firmware of your STM32-PRIMER2 demo.

Refer to UM0850 for details on how to use Dual EE.

Figure 21. show Demo STM32-PRIMER2 menu

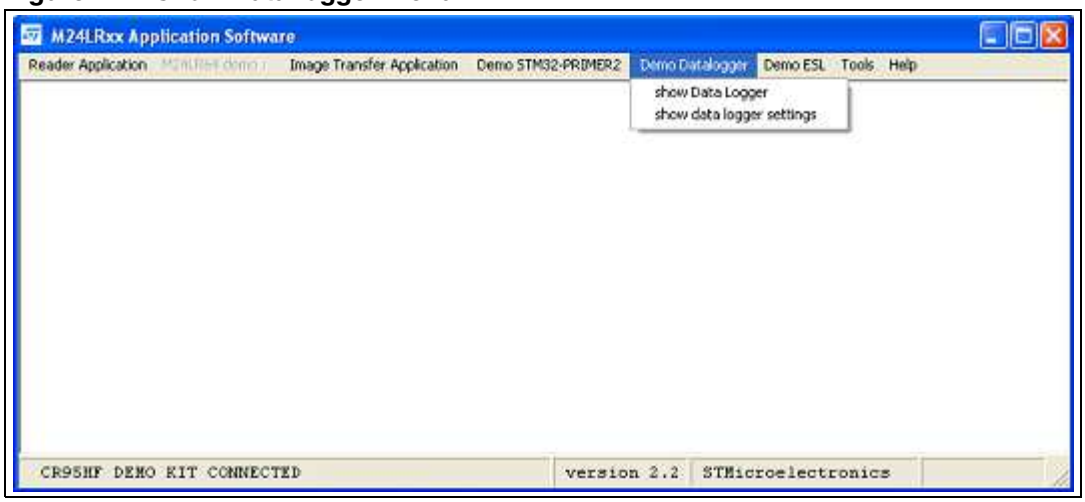


3.1.5 Demo datalogger menu

Figure 22 shows the **Data Logger menu**.

Select **show Data Logger** to launch the data logger demonstration. This application performs temperature acquisition and displays a graphical representation of the data. Refer to *Section 6: Datalogger demonstration* for a description of this demonstration application.

Figure 22. show Data logger menu



3.1.6 Demo ESL menu

Figure 23 shows the ESL Demo menu.

Select **Show ESL demo** to configure your M24LRxx as an ESL (electronic shelf label) and display the ESL data of your device.

Refer to *Section 7: ESL demonstration* for a detailed description of this demonstration application.

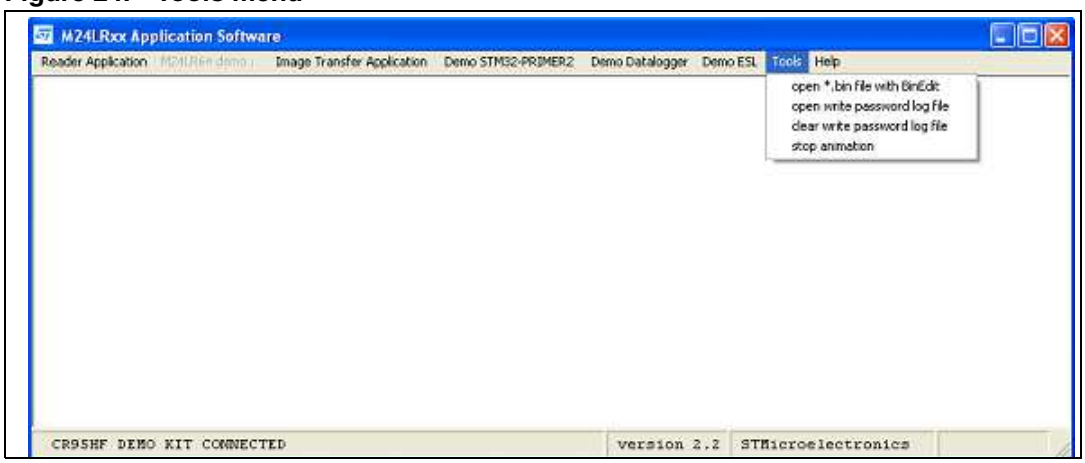
Figure 23. show demo ESL menu

3.1.7 Tools menu

Figure 24 shows the Tools menu.

Select **stop animation** to stop the animation in the reader application interface.

Figure 24. Tools menu

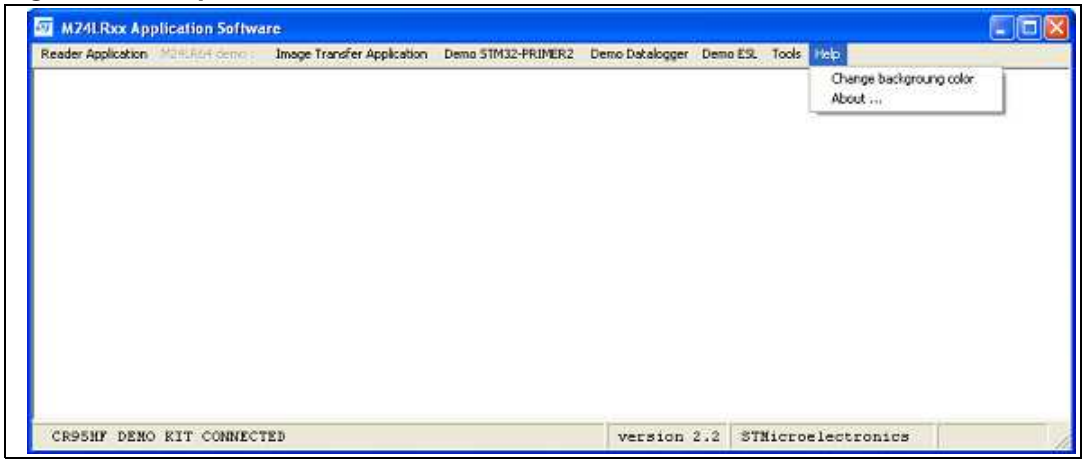


3.1.8 Help menu

Figure 25 shows the Help menu:

- **Open *.bin file with BinEdit** gives you access to a freeware for reading binary files (*.bin format).
- **Change background color** allows you to change the color of the main window.
- **About** provides information about the software.

Figure 25. Help menu



3.2 Reader application

Select **Reader Application** in the main menu and choose a product from the list:

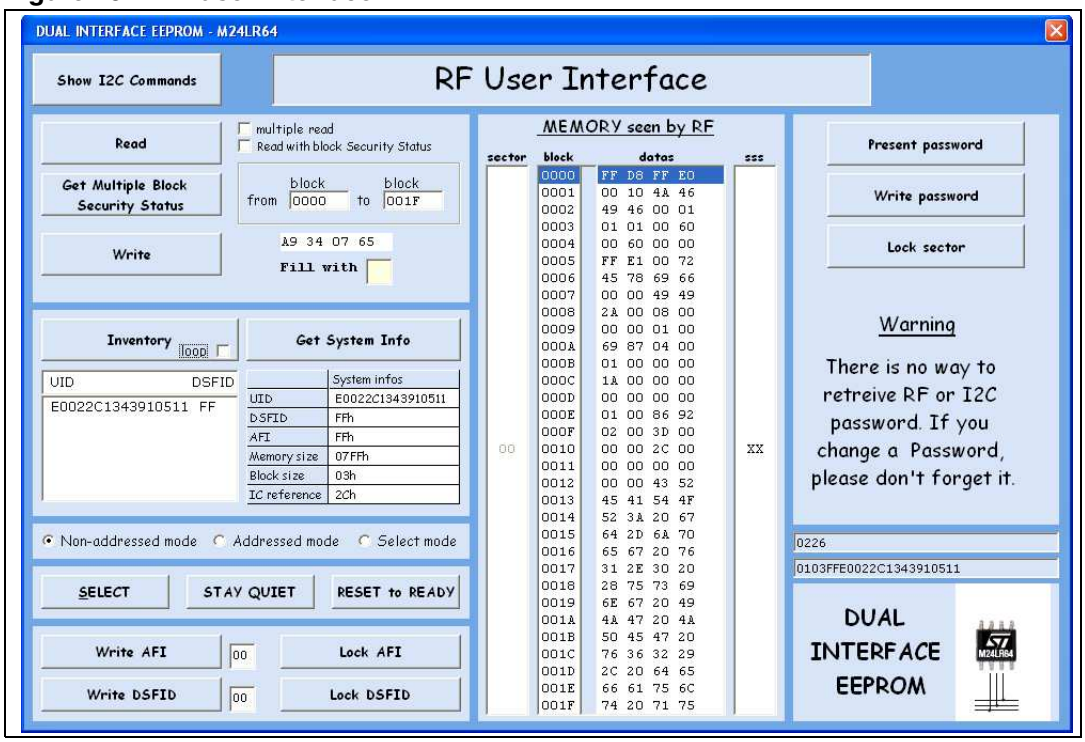
- LRIxx for ISO15693 RFID products
- M24LRxx for Dual Interface EEPROM products.

The following section describes the **Reader Application** menu for an M24LR64-R device.

3.2.1 RF commands

The *RF user interface* opens (see *Figure 26*). Using this interface you can send any command to the LRIxxx or M24LRxx tag present in the RF reader field. Refer to the datasheet for a detailed description of the RF commands.

Figure 26. RF user interface



The **Show I2C Commands** button is used to switch from the RF user interface to the I²C user interface.

3.2.2 Inventory command

The **Inventory** button launches an Inventory command and thus detects the tags present in the RF field. The command is associated with an anticollision algorithm to detect each tag individually (see *Figure 27* and *Figure 28*).

The **Loop** option is used to loop on inventory commands. It is selected (or deselected) by checking (or unchecking) the box next to **Loop**.

Figure 27. Inventory button

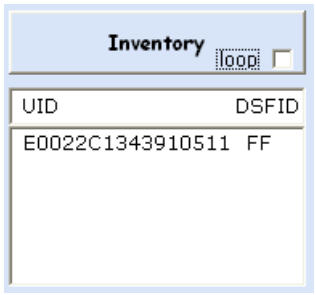
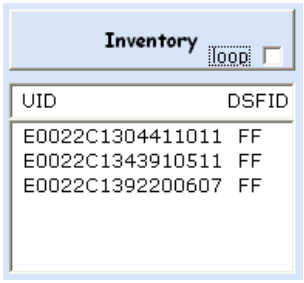
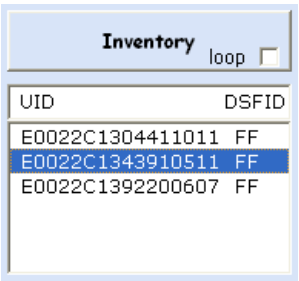


Figure 28. Three tags detected



You can select a tag in the list of detected UIDs by clicking on the desired UID in the list as shown in *Figure 29*. The selected UID will then be used in all RF requests sent in Addressed mode.

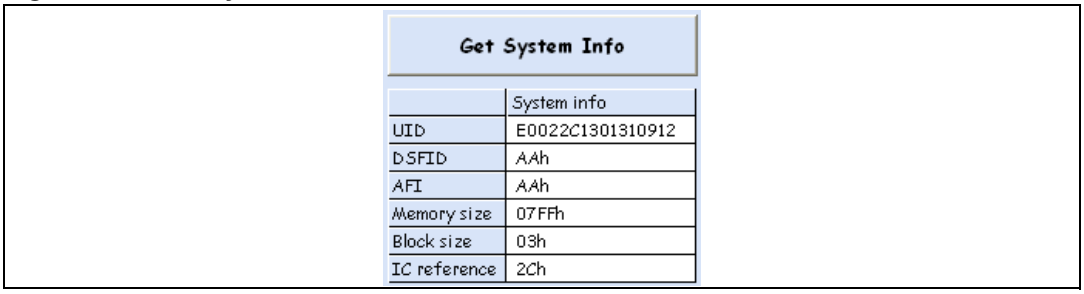
Figure 29. Specific UID selected



3.2.3 Get System Info command

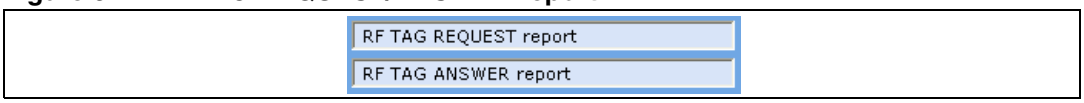
The **Get System Info** button launches a Get System Info command, thus filling the **System info** fields.

Figure 30. Get System Info button



3.2.4 Viewing RF requests and answers

Figure 31. RF TAG REQUEST/ANSWER report

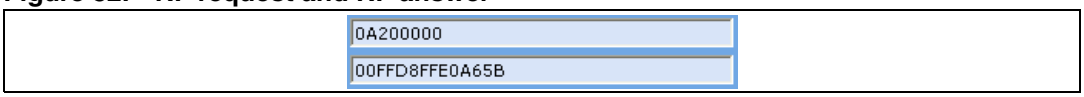


The **RF TAG REQUEST report** button shows the RF request sent by the RF reader to the tag.

The **RF TAG ANSWER report** button shows the RF answer from the tag, detected by the RF reader.

Figure 32 shows an example of a reader's RF request and the corresponding answer from the tag.

Figure 32. RF request and RF answer



The RF read request is at address 0000. The RF answer is the read data: FF D8 FF E0.

3.2.5 Selecting the RF mode

The RF ISO 15693 protocol allows the user to communicate in RF in three different modes: the Non-addressed mode, the Addressed mode and the Select mode. For further details, please refer to the M24LRxx datasheet.

The Non-addressed, Addressed or Select mode can be selected by clicking on the desired mode as shown in *Figure 33*, *Figure 34* or *Figure 35*.

Non-addressed mode

Selecting the Non-addressed mode clears the bits 5 and 6 in the Request_flags of the RF request (bit 5 = 0, bit 6 = 0).

The request is executed by any M24LRxx device (please refer to the M24LRxx datasheet for details).

Figure 33. Selecting the Non-addressed mode

Addressed mode

Selecting the Addressed mode clears bit 5 and sets bit 6 in the Request_flags of the RF request (bit 5 = 0, bit 6 = 1).

The request is addressed. The UID field is present (please refer to the M24LRxx datasheet for details).

After an Inventory command (see *Section 3.2.2: Inventory command*), you will be able to click on an UID to select a specific tag. The desired UID will be sent with the request if the Addressed mode is chosen.

If no specific UID tag is selected, the device sends “00 00 00 00 00 00 00 00” instead of the UID value.

Figure 34. Selecting the Addressed mode

Select mode

Selecting the Select mode sets bit 5 and clears bit 6 in the Request_flags of the RF request (bit 5 = 1 and bit 6 = 0).

The request is executed only by the M24LRxx device in the Select State (please refer to the M24LRxx datasheet for details).

To select a tag, refer to the *SELECT* paragraph below, and to the M24LRxx datasheet (Select paragraph).

Figure 35. Selecting the Select mode

3.2.6 Managing M24LRxx states

The M24LRxx can be in different states: Power-off, Ready, Quiet and Selected (refer to the M24LRxx datasheet for details).

The interface shown in *Figure 36* is used to send three types of RF request to place the M24LRxx in one out of three specific states: Selected, Quiet and Ready.

Figure 36. Device state management interface

SELECT

The **SELECT** button is used to send a Select RF request with the UID of a specific tag (*Section 3.2.2: Inventory command*) (refer to the M24LRxx datasheet for details).

If no tag was selected after the Inventory request, the device sends “00 00 00 00 00 00 00 00” instead of the UID value.

STAY QUIET

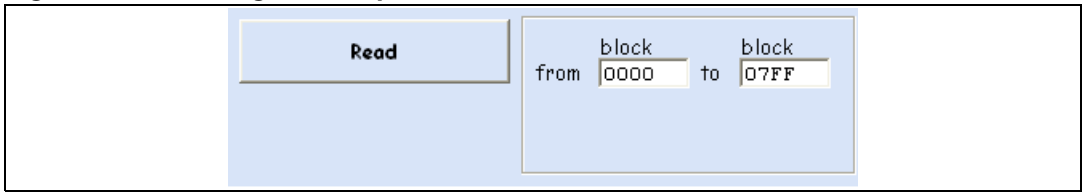
The **STAY QUIET** button is used to send a Stay Quiet RF request (refer to the M24LRxx datasheet for details).

RESET TO READY

The **RESET TO READY** button is used to send a Reset to Ready RF request (refer to the M24LRxx datasheet for details).

3.2.7 Read command

Figure 37. Initiating a read operation

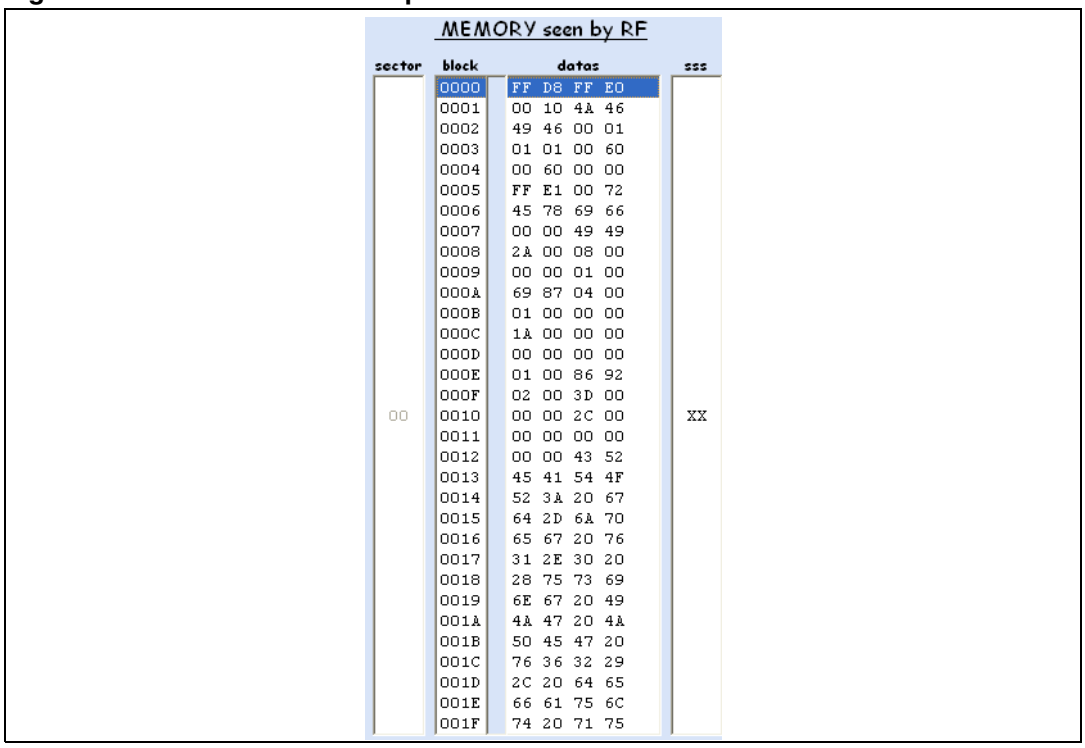


By pressing the Read button, you launch RF requests to read the contents of the M24LRxx EEPROM from the block address specified in the **from** field to the block address specified in the **to** field.

The result of the read operation is displayed in the **MEMORY seen by RF** area (see *Figure 38* to *Figure 41*).

From **0000** to **07FF** reads all M24LRxx EEPROM contents. *Figure 38* and *Figure 39* only show the results for sector 0 and sector 3F, respectively.

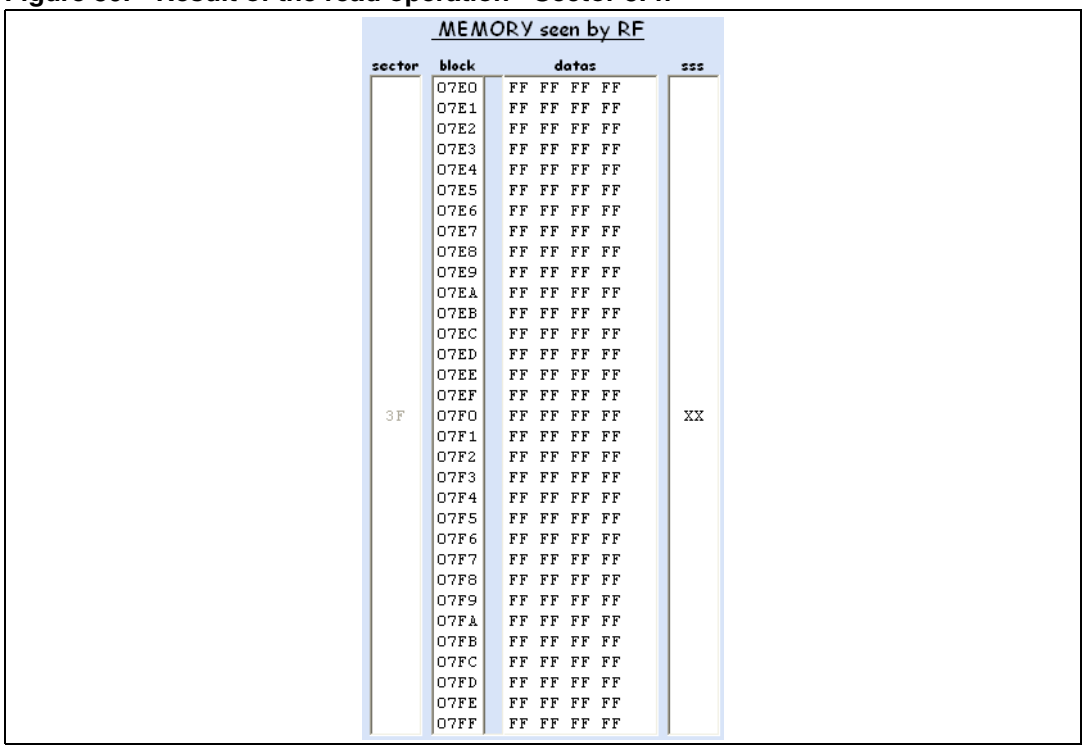
Figure 38. Result of the read operation - Sector 00h



MEMORY seen by RF

sector	block	datas	sss
	0000	FF D8 FF E0	
	0001	00 10 4A 46	
	0002	49 46 00 01	
	0003	01 01 00 60	
	0004	00 60 00 00	
	0005	FF E1 00 72	
	0006	45 78 69 66	
	0007	00 00 49 49	
	0008	2A 00 08 00	
	0009	00 00 01 00	
	000A	69 87 04 00	
	000B	01 00 00 00	
	000C	1A 00 00 00	
	000D	00 00 00 00	
	000E	01 00 86 92	
	000F	02 00 3D 00	
00	0010	00 00 2C 00	XX
	0011	00 00 00 00	
	0012	00 00 43 52	
	0013	45 41 54 4F	
	0014	52 3A 20 67	
	0015	64 2D 6A 70	
	0016	65 67 20 76	
	0017	31 2E 30 20	
	0018	28 75 73 69	
	0019	6E 67 20 49	
	001A	4A 47 20 4A	
	001B	50 45 47 20	
	001C	76 36 32 29	
	001D	2C 20 64 65	
	001E	66 61 75 6C	
	001F	74 20 71 75	

Figure 39. Result of the read operation - Sector 3Fh



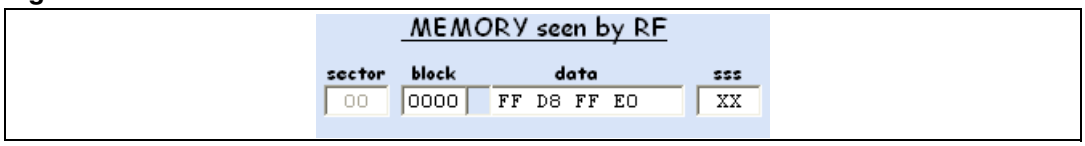
MEMORY seen by RF

sector	block	datas	sss
	07E0	FF FF FF FF	
	07E1	FF FF FF FF	
	07E2	FF FF FF FF	
	07E3	FF FF FF FF	
	07E4	FF FF FF FF	
	07E5	FF FF FF FF	
	07E6	FF FF FF FF	
	07E7	FF FF FF FF	
	07E8	FF FF FF FF	
	07E9	FF FF FF FF	
	07EA	FF FF FF FF	
	07EB	FF FF FF FF	
	07EC	FF FF FF FF	
	07ED	FF FF FF FF	
	07EE	FF FF FF FF	
	07EF	FF FF FF FF	
3F	07F0	FF FF FF FF	XX
	07F1	FF FF FF FF	
	07F2	FF FF FF FF	
	07F3	FF FF FF FF	
	07F4	FF FF FF FF	
	07F5	FF FF FF FF	
	07F6	FF FF FF FF	
	07F7	FF FF FF FF	
	07F8	FF FF FF FF	
	07F9	FF FF FF FF	
	07FA	FF FF FF FF	
	07FB	FF FF FF FF	
	07FC	FF FF FF FF	
	07FD	FF FF FF FF	
	07FE	FF FF FF FF	
	07FF	FF FF FF FF	

Use the arrows on the keyboard to change the sector or block to be read.

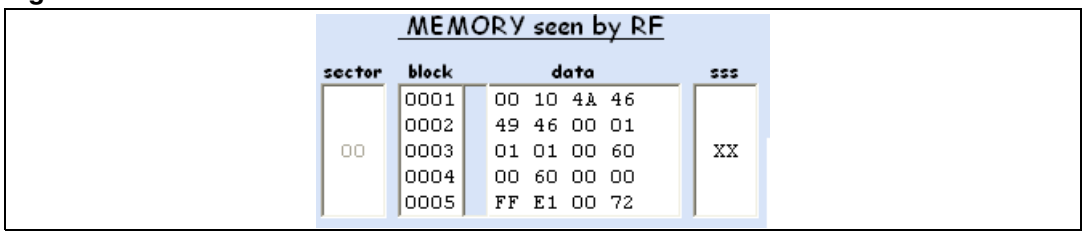
From **0000** to **0000** reads block 0 in sector 0 as shown in *Figure 40*.

Figure 40. Sector 0 block 0



From **0001** to **0005** reads the blocks 1, 2, 3, 4, 5 in sector 0 as shown in *Figure 41*.

Figure 41. Sector 0 blocks 1 to 5



How to read the memory area with the RF Interface:

- The first column (**sector**) indicates the sector read.
- The second column (**block**) indicates the address of the block read.
- The third column (**data**) shows the contents of the M24LRxx at the specified addresses.
- The fourth column (**sss**) gives the sector security status.

Example: in *Figure 41* above, the data **49 46 00 01** means:

49 (49h Hex) is the first piece of data read in block number 0002 (sector 0)

46 (46h Hex) is the second piece of data read in block number 0002 (sector 0)

00 (00h Hex) is the third piece of data read in block number 0002 (sector 0)

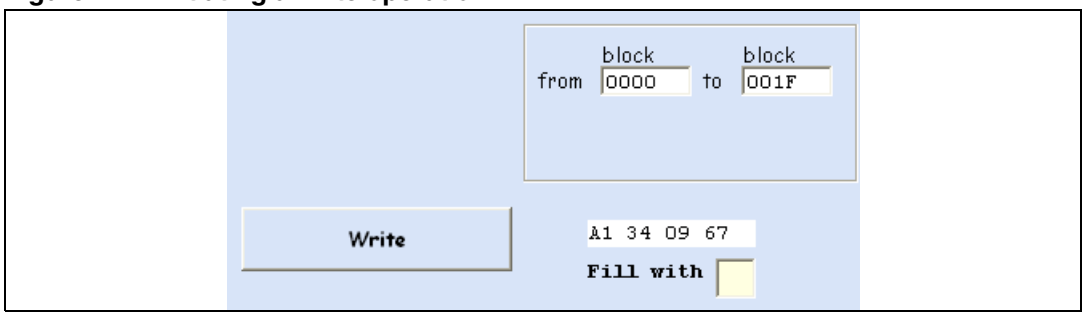
01 (01h Hex) is the fourth piece of data read in block number 0002 (sector 0)

3.2.8 Write command

The **Write** button launches RF requests to write data to the M24LRxx EEPROM from the block address specified in the **from** field to the block address entered in the **to** field.

In *Figure 42*, the Write command fills the blocks 0000h to 001Fh with “A1 34 09 67”.

Figure 42. Initiating a write operation



You can choose to write the same byte four times by changing the value in the **Fill with** field. In the example below, the byte 55 is to be written four times.