TECHNICAL INFORMATION MANUAL

Revision 0 – 18 July 2018

Tile$_{NF}$ R1251INF

Compact UHF Near Field RFID Desktop Reader

easy2read

CAENRFID

Visit the Tile R1250I web page, you will find the latest revision of data sheets, manuals, certifications, technical drawings, software and firmware. All you need to start using your reader in a few clicks!

Scope of Manual

The goal of this manual is to provide the basic information to work with the **Tile R1251INF Compact UHF RFID Desktop Reader**.

Change Document Record

Date	Revision	Changes	Pages
18 July 2018	00	Preliminary release	-

Reference Document

[RD1] EPCglobal: EPC Radio-Frequency Identity Protocols Class-1 Generation-2 UHF RFID Protocol for Communications at 860 MHz - 960 MHz, Version 2.0.1 (April, 2015).

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Federal Communications Commission (FCC) Notice

This device was tested and found to comply with the limits set forth in Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This device generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instruction manual, the product may cause harmful interference to radio communications. Operation of this product in a residential area is likely to cause harmful interference, in which case, the user is required to correct the interference at their own expense. The authority to operate this product is conditioned by the requirements that no modifications be made to the equipment unless the changes or modifications are expressly approved by CAEN RFID.

Preliminary Product Information

This document contains information for a new product. CAEN RFID reserves the right to modify this product without notice.

“Preliminary” product information describes products that are ready for production, but for which full characterization data is not yet available. CAEN RFID believes that the information contained in this document is accurate and reliable. However, the information is subject to change without notice and is provided “AS IS” without warranty of any kind (Express or implied). You are advised to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability. No responsibility is assumed by CAEN RFID for the use of this information, including use of this information as the basis for manufacture or sale of any items, or for infringement of patents or other rights of third parties.

Disposal of the product

Do not dispose the product in municipal or household waste. Please check your local regulations for disposal/recycle of electronic products.

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1 INTRODUCTION

Product Description

The Tile NF (model R1251INF), desktop reader of the easy2read© family, is a RAIN RFID reader specifically designed to optimize the reading performances with near field miniaturized tags like the Murata Magicstrap and Hitachi USPT.

The near field antenna of the Tile NF reader allows to read those small tags even when embedded in small parts like watches, jewels or mechanical parts. For this reason, the combination of the miniaturized near field tags and the Tile NF reader is a great tool to retrieve the serial numbers in small objects and check the originality of parts.

The reader is powered and controlled directly by an USB cable, thus allowing to read RAIN RFID tags in an easy desktop environment.

The Tile NF reader supports the HID profile (native keyboard emulation) allowing to interact directly with legacy application, office automation SW or any other generic solution requiring manual input.

Being compliant with both European and US regulatory environments, the Tile reader allows installations in various countries worldwide as needed by retailers, forwarders, warehouses and other global organizations.

The core components of the Tile reader are the CAEN RFID QuarkUp module, a top performing ultra-compact UHF RFID module.

Fig. 1.1: Tile R1251INF Compact UHF Near Field RFID Desktop Reader

Accessories

Check for the supplied accessories below:

No. 1 Y USB cable

Fig. 1.2: Tile R1251INF Accessories

Installation Notice

The Tile R1251INF can be easily placed on a table for desktop applications or it is possible to hang it on the wall (only for the model with flanged enclosure).

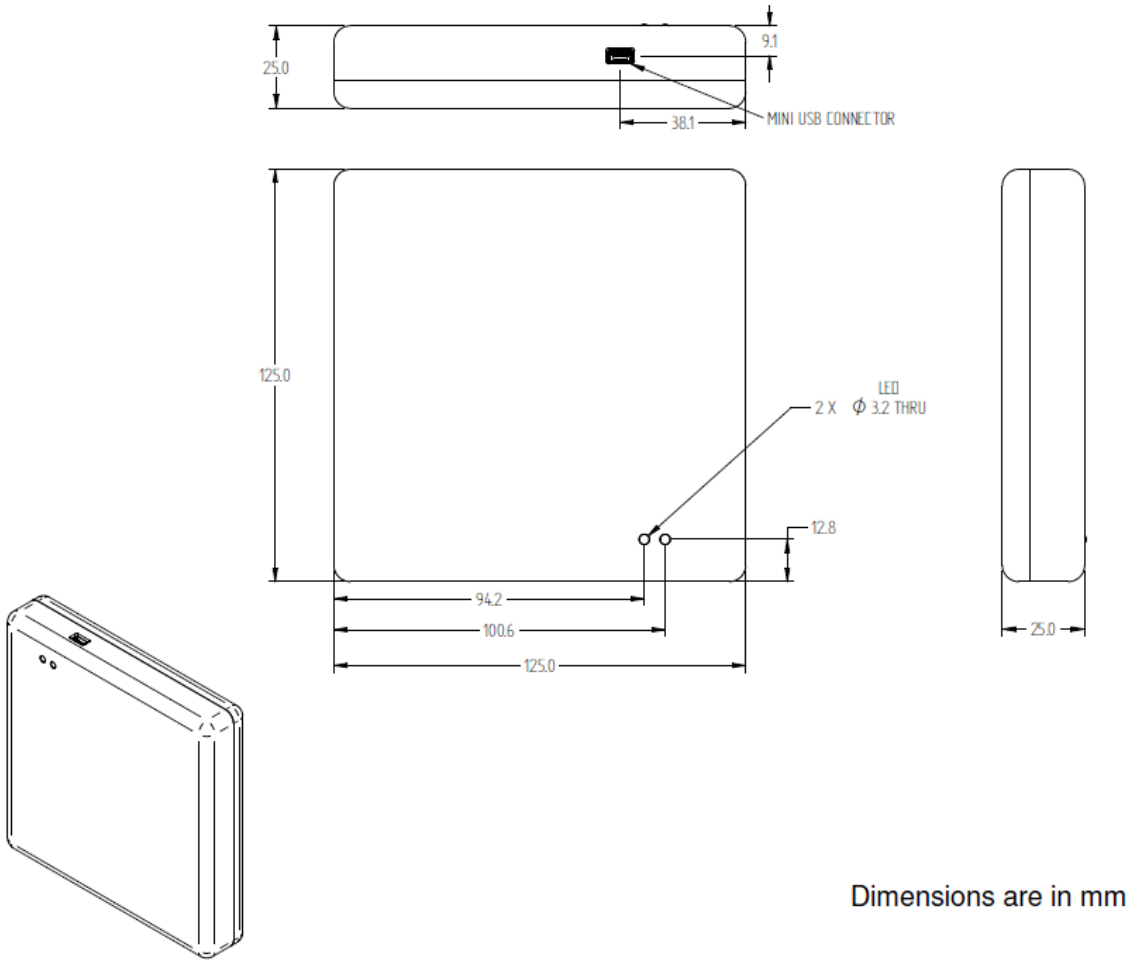


Fig. 1.3: Tile R1251INF (standard enclosure) mechanical drawing

External Interface Description

The Tile R1251INF external connection is via USB port.

The mini USB connector is located in the front edge of the Tile. You **shall** use a dual USB cable and connect the reader to two USB ports (see § *Accessories* page 6).

The Tile R1251INF is powered through the USB host.

Front Panel LEDs

The Tile R1251INF front panel houses the following LEDs (see § *Fig. 1.4: Tile R1251INF Front Panel LEDs* page 7):

LED	FUNCTION	TYPE
PWR	Power ON	Red LED
TAG-ID	Tag detection	Blinking Green LED

Tab. 1.1: Tile R1251INF Front Panel LEDs

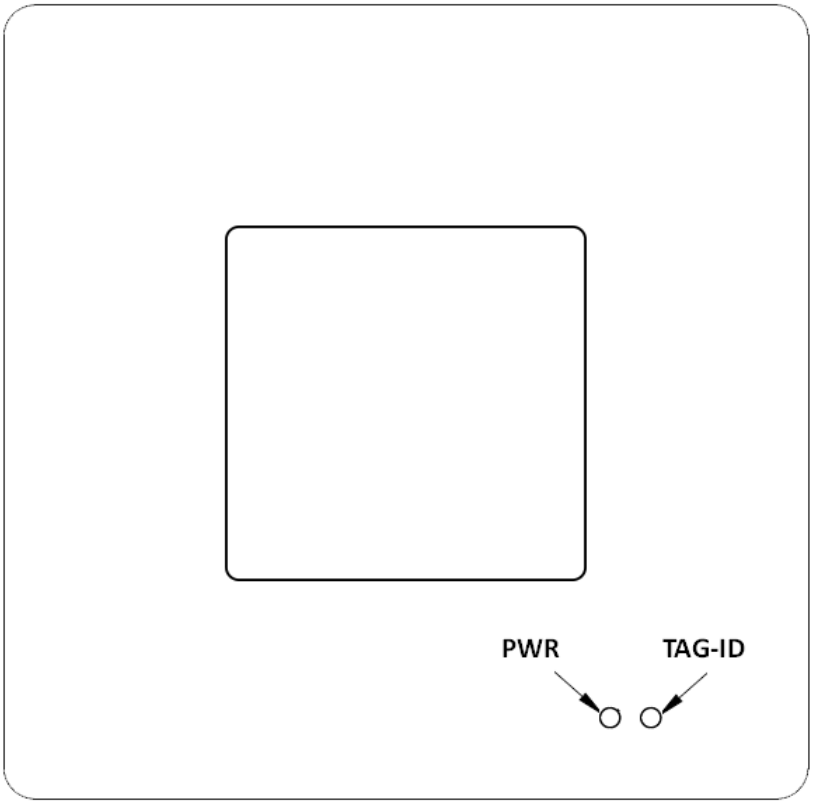


Fig. 1.4: Tile R1251INF Front Panel LEDs

Ordering Options

	Code	Description
Reader	WR1251IENFBA	R1251IENFB - Tile NF - Compact UHF Near Field RFID Desktop Reader (ETSI)
	WR1251IUNFBA	R1251IUNFB - Tile NF - Compact UHF Near Field RFID Desktop Reader (FCC)

2 GETTING STARTED

Introduction

This quickstart guide will help you to get started with your Tile R1251INF reader.

The reader can be configured in two different profiles:

- **EASY2READ** (factory default): choosing this option you select the CAEN RFID easy2read communication protocol. Select this option in order to control the reader using the CAEN RFID Easy Controller Application or the SDK (Software Development Kits) library. For details on the use with the EASY2RD profile please refer to this quickstart guide.
- **HID**: choosing this option you select the keyboard emulation protocol. For details on the use on the HID profile please refer to § *HID PROFILE* chapter page 17.

The reader is sold with the factory profile set to EASY2RD. This guide helps you to getting started with your reader using the EASY2READ profile.

For more detailed information on reader configuration, connections and setup options please refer to the next chapters.

To begin, you need first to download and install the .NET framework 2.0 (only required if .NET is not already installed on your PC).

Serial Port Emulator

The Tile R1251INF reader can be connected to a PC using the provided Y USB cable and it is detected by the PC as an emulated serial port. In order to correctly operate with the reader you need to install the CAEN RFID driver.

Driver installation

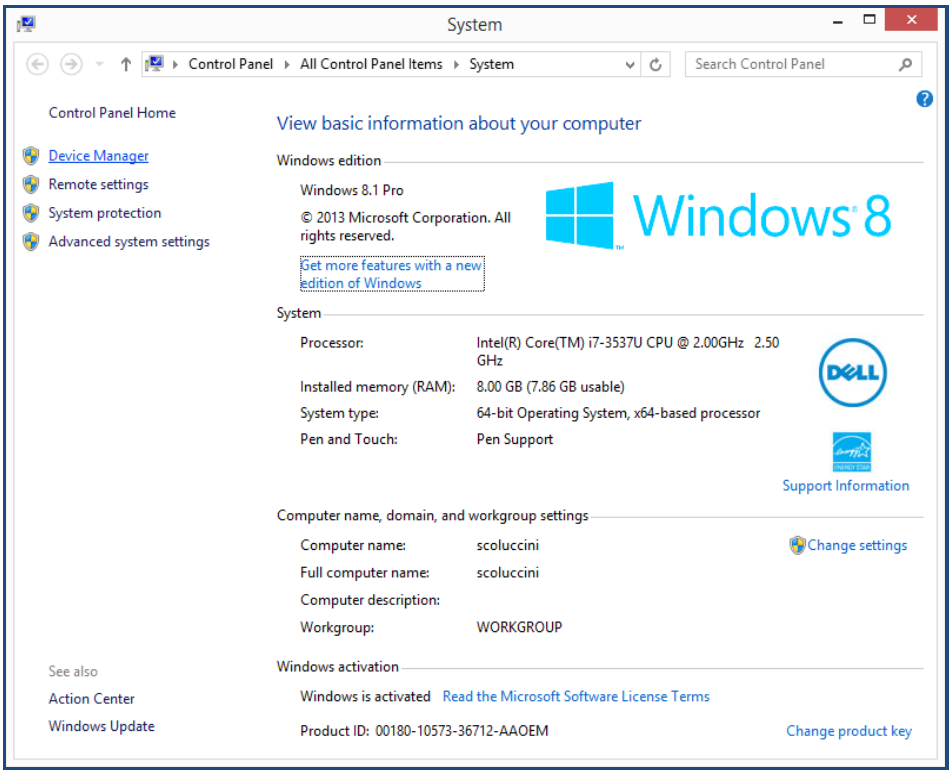
You can download the required driver from the CAEN RFID Web Site at Tile R1250I web page or in the SW/FW area.

The procedure to install the USB driver is presented below:

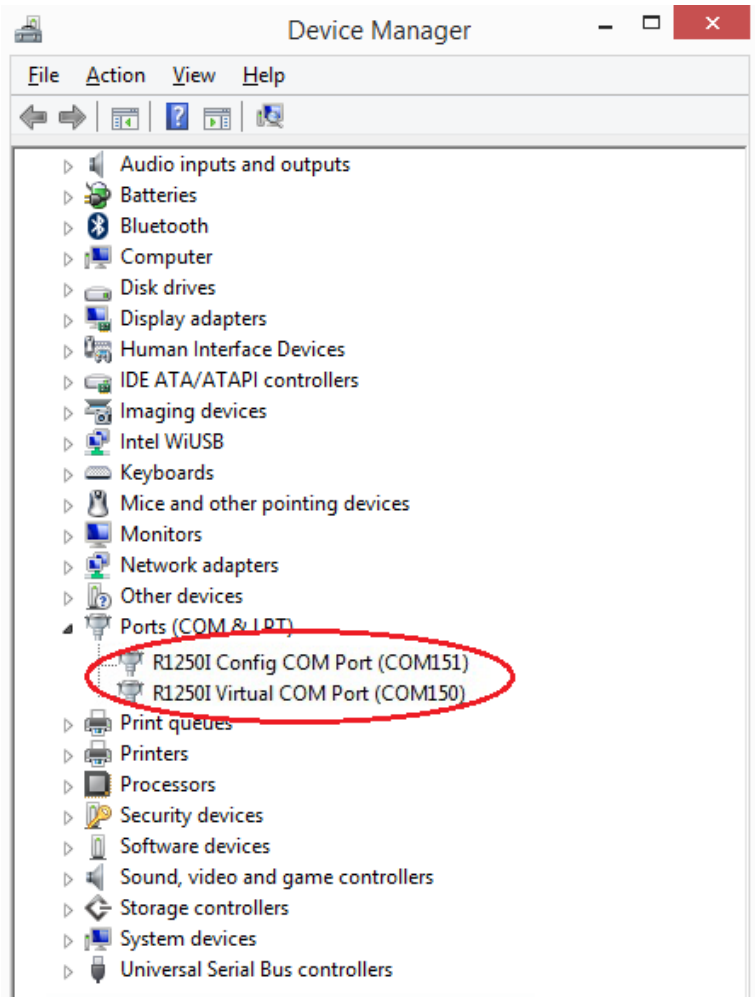
1. Verify that the Y USB cable provided with the reader is correctly plugged into the PC

Warning: You shall use a dual USB cable and connect the pc to both USB ports.

2. Install the CAEN RFID driver (download it at Tile R1250I web page or in the SW/FW area of the CAEN RFID web site).
3. Open the System properties: go to *Control Panel* → *All Control Panel Items* → *System* and click on *Device Manager*.



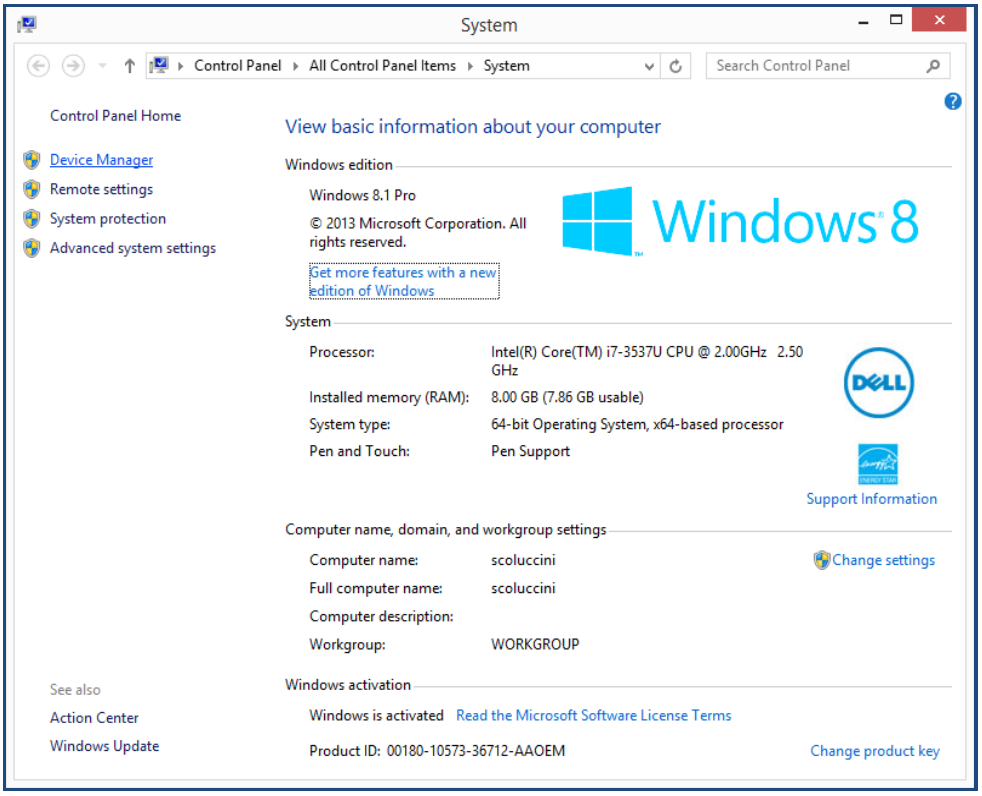
4. After having installed the driver, the reader is detected by the PC as two emulated serial ports (a Virtual COM Port and a Config COM Port):



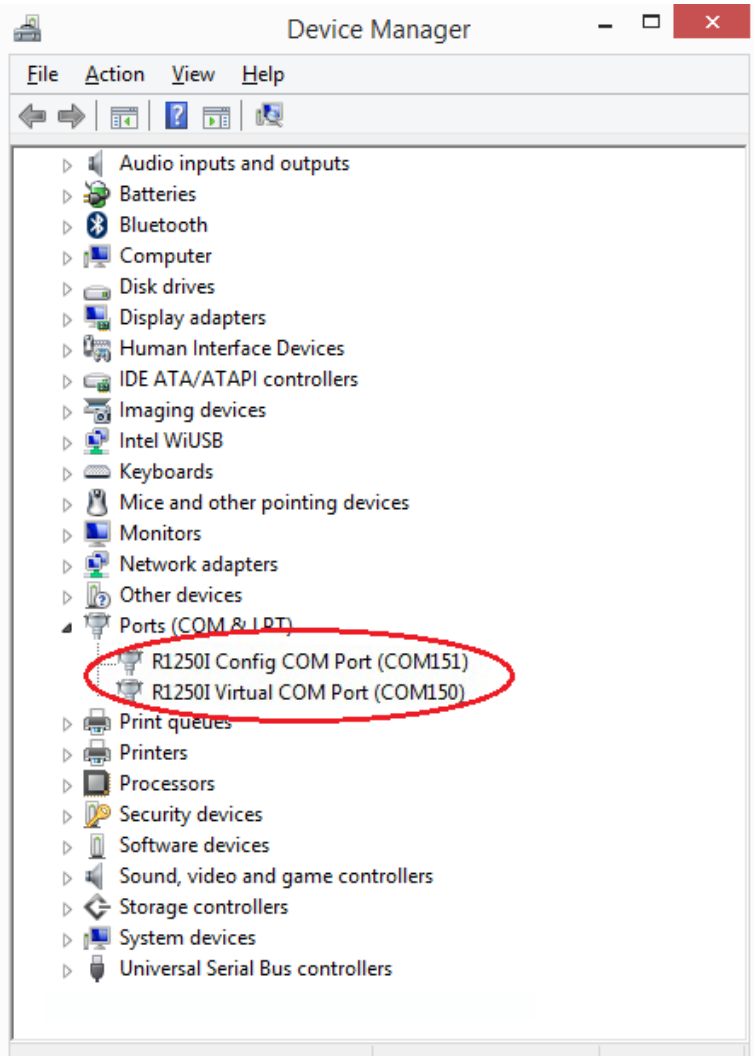
Connecting the Tile R1251INF Reader using the EasyController

Using the EASY2READ profile, you can connect to the Tile R1251INF Reader using the *EasyController* software via USB connection.

1. Download the latest version of the *EasyController software* for Windows from the Tile R1250I web page, *Downloads* section and install it.
2. Connect the Tile reader to your pc using the Y USB connection.
3. Open the System properties (right click on *My computer* icon) → *All Control Panel Items* → *System* and click on *Device Manager*.



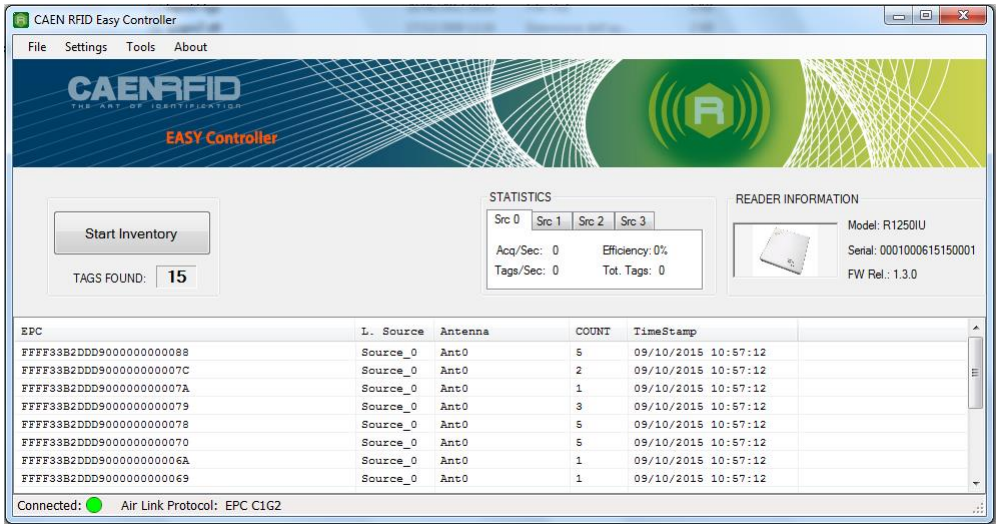
4. After having installed the driver (see § *Driver installation* page 8), the reader is detected by the PC as two emulated serial port. See the Virtual COM Port, in the case below COM150:



5. Once the serial port connection is established, CAEN RFID *EasyController* software can be used to interface the reader. Launch the *EasyController* by double clicking on the icon on your desktop.

6. Click on *File* → *Connect*, select the RS232 Connection Type and select from the pull-down menu the COM port number where the driver has mapped the virtual port for the Tile (in the example COM150) and then click on **connect**.

7. Place a tag on the reader, click on *start inventory* and see the tag information displayed on the main window.



For more info on the use of the *EasyController*, please refer to its technical information manual (download it at the Tile R1250I web page, *Downloads* section or in the Manuals & Documents web area).

3 CONFIGURATION

Introduction

The Tile R1251INF reader is detected by the PC as two emulated serial ports:

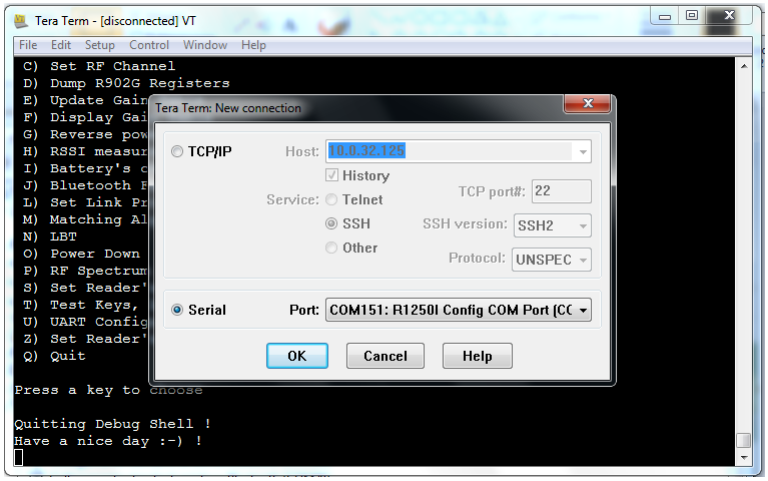
- Virtual COM Port
- Config COM Port

The Config COM Port is used to configure the reader profile.

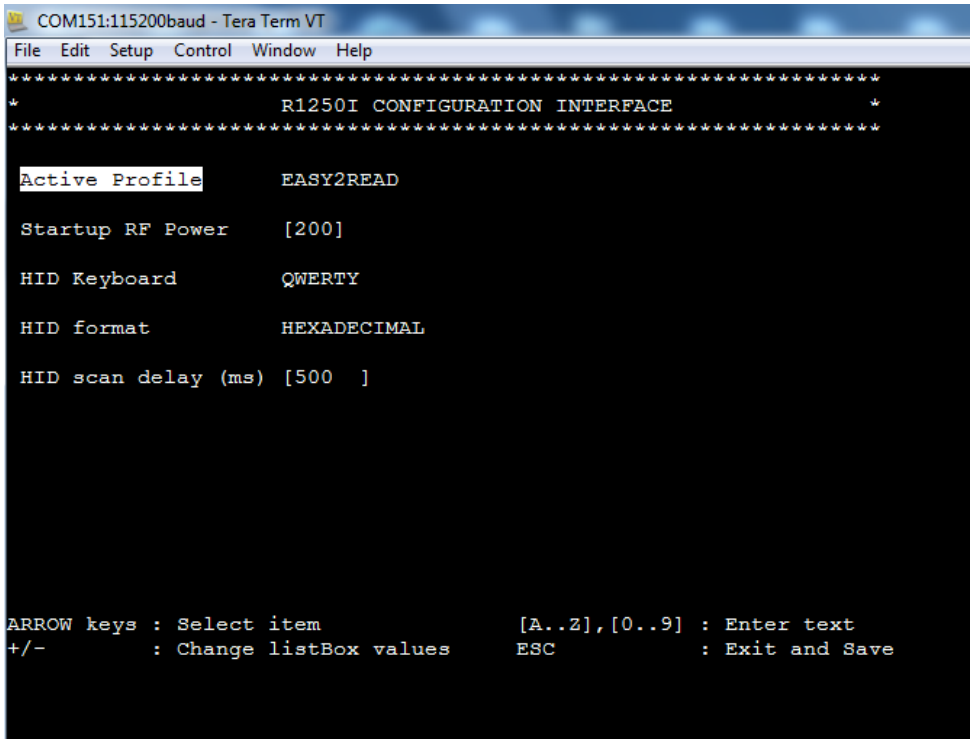
The Virtual COM Port is the main communication interface.

Reader Configuration Menu

1. Verify that the Y USB cable provided with the reader is correctly plugged into the PC
2. Install the required CAEN RFID USB driver as explained in § *Driver installation* page 8.
3. Open a serial terminal compatible with VT100 (e.g. Hyperterminal or Teraterm).
4. Click on *File-> New Connection* and look for the *R1251INF Config Port* (in the example COM151) and select it ->OK.



5. Press the “ESC” key to access the reader configuration menu:



The Tile R1251INF menu options are the following:

- **Active profile**
- **Startup RF Power**
- **HID Keyboard**
- **HID format**
- **HID scan delay**

To scroll through the main menu press the arrow keys, to change the listbox values press the "-" or "+" keys and to exit and save press "ESC".

Active Profile

Access the configuration menu as explained in the *Reader Configuration Menu* paragraph page 13.

Use the arrow keys to scroll through the main menu.

The *Active Profile* is the first option of the main menu.

The *Active Profile* options are the following:

- **EASY2READ** (factory default): choosing this option you select the CAEN RFID easy2read communication protocol. Select this option in order to control the reader using the CAEN RFID Easy Controller Application or the SDK (Software Development Kits) library. For details on the use with the EASY2RD profile please refer to § *GETTING STARTED* chapter page 8.
- **HID**: choosing this option you select the keyboard emulation protocol. For details on the use on the HID profile please refer to § *HID PROFILE* chapter page 17.

The reader is sold with the factory profile set to EASY2READ.

To activate a different profile, press the right arrow to select the *EASY2READ profile* (factory profile), then use the "-" or "+" keys until the desired profile is displayed (*EASY2READ* or *HID)*. Press the *ESC* key to exit from the configuration interface and to save the new setting.

The display shows the message *"Configuration Saved"* to inform you that the new settings is active.

Disconnect the USB cable and connect the reader once again.

If you have set the HID profile, after 6 seconds the device starts making inventories and transferring the EPC codes to the host PC through the HID interface.

You can activate only one profile at a time.

Startup RF Power

Access the configuration menu as explained in the *Reader Configuration Menu* paragraph page 13.

Use the arrow keys to scroll through the main menu.

The *Startup RF Power* is the second option of the main menu.

The reader is sold with the factory *Startup RF Power* set to 200mW.

To set a different RF value, press the down arrow and then the right arrow to select the *Startup RF Power* value. Using the “backspace” key, delete the current value and insert the desired power value in the range 0-500. All values are expressed in mW.

Press the *ESC* key to exit from the configuration interface and to save the new setting.

The display shows the message *"Configuration Saved"* to inform you that the new settings is active.

Disconnect the USB cable and connect the reader once again.

You can activate only one power level at a time.

HID Keyboard

Access the configuration menu as explained in the *Reader Configuration Menu* paragraph page 13.

Use the arrow keys to scroll through the main menu.

The *HID Keyboard* is the third option of the main menu.

The *HID Keyboard* options are the following:

- **QWERTY**: standard keyboard.
- **AZERTY**: French keyboard

The reader is sold with the factory *HID keyboard* set to QWERTY.

To set a different keyboard, press the down arrow until “*HID Keyboard*” is displayed and then the right arrow to select the QWERTY option; use the “-“ or “+“ keys to shift between *QWERTY* and *AZERTY*. Press the *ESC* key to exit from the configuration interface and to save the new setting.

The display shows the message *"Configuration Saved"* to inform you that the new settings is active.

Disconnect the USB cable and connect the reader once again.

You can activate only one *HID Keyboard* at a time.

HID format

In the HID profile you can set different EPC format, while using the EASY2READ profile it is not possible to change the HEXADECIMAL EPC format.

Access the configuration menu as explained in the *Reader Configuration Menu* paragraph page 13.

Use the arrow keys to scroll through the main menu.

The *HID format* is the fourth option of the main menu.

The *HID format* options are the following:

- **HEXADECIMAL:** The RFID EPC is represented by hexadecimal digits
- **ASCII:** The RFID EPC is represented by ASCII characters
- **SGTIN14**: This is a special option, please contact our support team for more info

The reader is sold with the factory *HID format* set to HEXADECIMAL.

To set a different format, press the down arrow until "*HID format*" is displayed and then the right arrow to select the HEXADECIMAL option (factory format); use the "-" or "+" keys to select the desired format. Press the *ESC* key to exit from the configuration interface and save the new setting.

The display shows the message *"Configuration Saved"* to inform you that the new settings is active.

Disconnect the USB cable and connect the reader once again.

You can activate only one HID format at a time.

HID scan delay

The *HID scan delay* represents the delay between a scan and the subsequent.

Access the configuration menu as explained in the *Reader Configuration Menu* paragraph page 13.

Use the arrow keys to scroll through the main menu.

The reader is sold with the factory scan delay set to 500ms.

To set a different *HID scan delay*, press the down arrow until "*HID scan delay*" is displayed and then the right arrow to select the current value. Using the "Canc" key, delete the current value and insert the desired scan delay in the range 0-99999. All values are expressed in ms.

Press the ESC key to exit from the configuration interface and to save the new setting.

The display shows the message "Configuration Saved" to inform you that the new settings is active.

Disconnect the USB cable and connect the reader once again.

You can activate only one *scan delay* level at a time.

4 HID PROFILE

Introduction

Choosing the **HID** profile option you select the keyboard emulation protocol.

For details on the available profiles and on the activation method, please refer to § *Active Profile* paragraph page 14.

Making Inventory

If the reader is in the EASY2READ profile (factory profile), you need to install the CAEN RFID driver (refer to § *Driver installation* page 8) and then access the reader configuration menu to set the HID reader profile (refer to § *Active Profile* paragraph page 14).

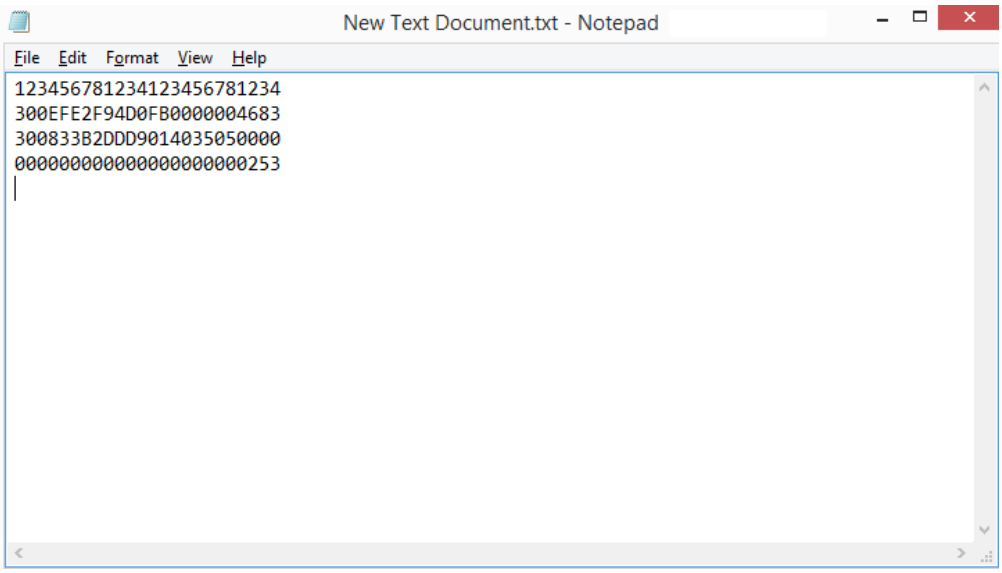
Otherwise, if the reader is already in the HID profile, you don't need any driver installation and you can start logging activity.

Launch a text editing application (or any other application accepting keyboard input).

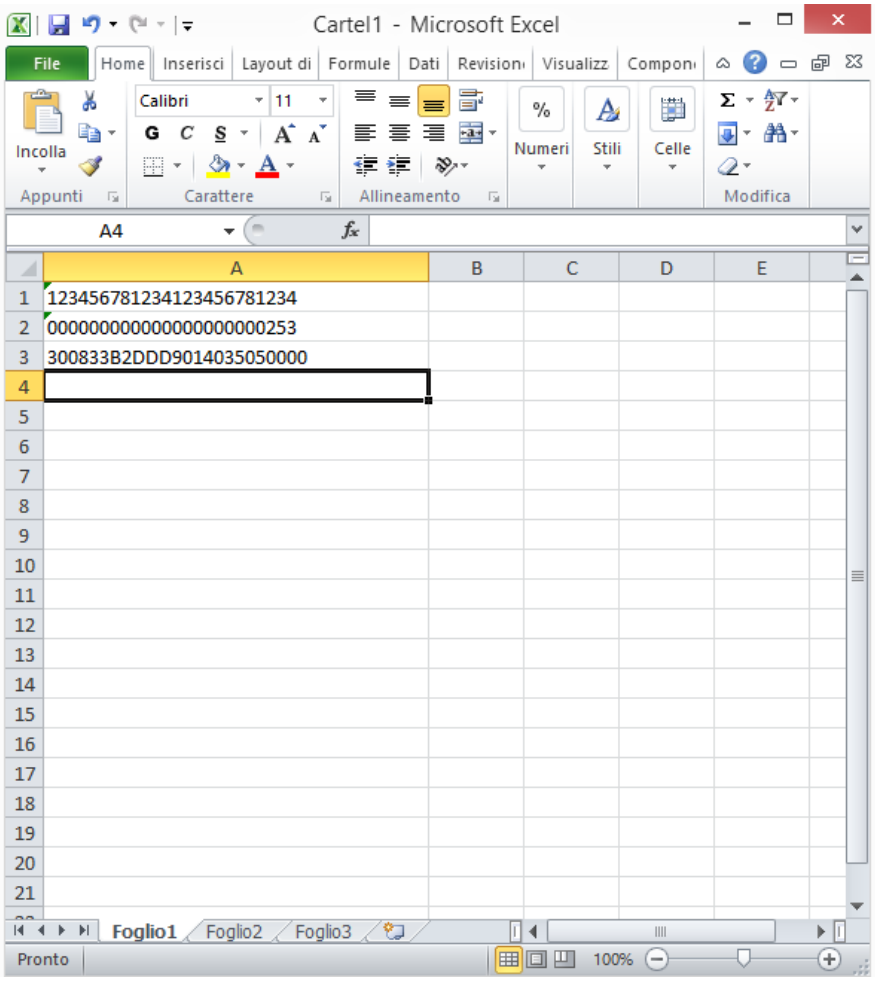
Put tags in the reader read range.

On the text editing window you will see the EPCs of the tags.

Example with a .txt file:



Example with Microsoft Excel:



The EPCs of the tags are shown in the format defined in the *HID format* of the *Configuration Menu.* The reader is sold with the factory HID format set to HEXADECIMAL. See § *HID format* page 16 to set a different HID format (HEXADECIMAL, ASCII or SGTIN14).

The reader makes an inventory tags every “scan delay” defined in the *HID scan delay* of the *Configuration Menu.* The reader is sold with the factory scan delay set to 500ms. See § *HID scan delay* page 16 to set a different value in the range 0÷99999 ms.

Note that if you want to change the active profile or access the reader configuration menu, you must remove the tags in the read range of the reader to stop the reader editing activity!

5 READER UPGRADE

Firmware Upgrade

The Tile R1251INF firmware upgrade can be managed via USB. You need the Tile Upgrade Tool and the R1251INF firmware image available for free at the Tile R1250I web page, *Downloads* section or in Software & Firmware area.

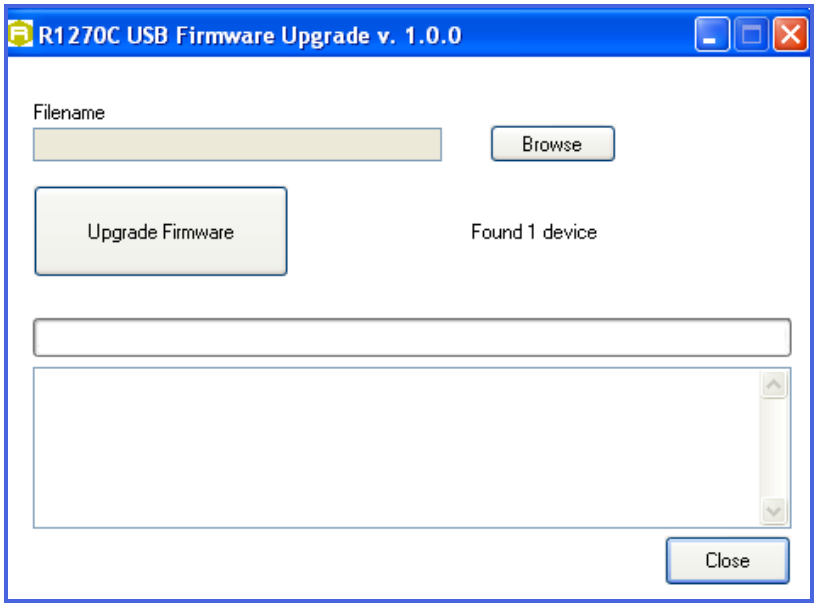
In order to upgrade the firmware, follow the steps described below:

1. Remove the 4 screws on the back of the reader's case (see the picture below).

2. Connect to the USB port the evaluation board with the Quark Up reader installed (the R1270CEVB evaluation board is the one circled in red in following picture).

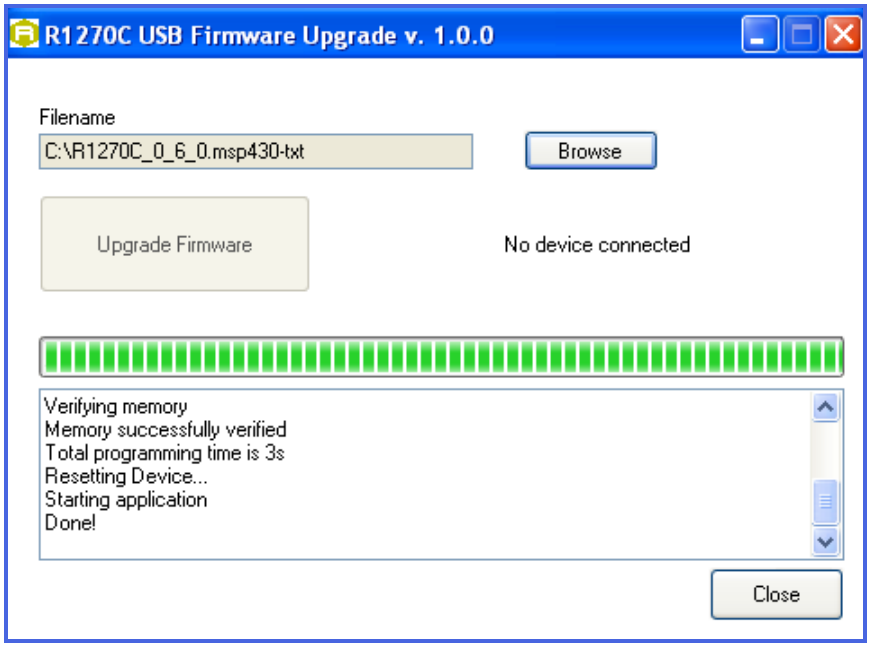
3. Press the reset switch on the evaluation board (SW3).
4. With SW3 pressed, press the BSL_SEL switch on the evaluation board (SW2).
5. Release SW3.
6. Release SW2 within 1s respect to SW3.
7. Open the FW upgrade program.
8. Click on Next button.

9. In the window you will see the message “Found 1 device” (if the message is “No device connected” repeat the points 3, 4, 5 and 6).



10. Select the FW image file by clicking on “Browse” button.
11. Click on “Upgrade Firmware” button and wait for the upgrade to be completed.

12. At the end of procedure, if the upgrade has been successfully performed, you will see the messages reported in the image below and the module is ready for normal operation:



6 TECHNICAL SPECIFICATIONS

Technical Specifications Table

Frequency Band	865.600÷867.600 MHz (ETSI EN 302 208) (Mod. R1251IENF) 902÷928 MHz (FCC part 15) (Mod. R1251IUNF)
RF Power	Programmable in 18 levels (1dB step) from 0 dBm ERP to 17 dBm ERP
Output power accuracy	+/- 1dB
Antenna	Integrated UHF Near Field Antenna
Frequency Tolerance	±10 ppm over the entire temperature range
Number of Channels	4 channels (compliant to ETSI EN 302 208) (Mod. R1251IENF) 50 hopping channels (compliant to FCC part 15) (Mod. R1251IUNF)
Standard Compliance	EPC C1G2/ISO 18000-6C
User Interface	Red LED: Power Blinking Green LED: Tag detection
Connectivity	Mini USB type B plug connector USB 2.0 Full Speed (12Mbit/s) device port Must be connected to two High-power USB Type A ports (500 mA @ VBUS) Virtual COM port parameters: - Baudrate: up to 115.200kbps - Databits: 8 - Stopbits: 1 - Parity: none - Flow control: none HID profile available
Dimensions	(W)125 x (L)125 x (H)25 mm^3 (4.92 x 4.92 x 0.98 $inch^3$)
Electrical Power	5 V ± 5% - DC bus powered (USB) Max 650 mA
Operating Temperature	-10 °C to +55 °C
Weight	200g max.
Length of USB cable	1.8 m

Tab. 6.1: Tile R1251INF Technical Specifications

***Warning**: The RF settings must match the country/region of operating to comply with local laws and regulations.*

The usage of the reader in different countries/regions from the one in which the device has been sold is not allowed.

Reader – Tag Link Profiles

The Tile R1251INF reader supports different modulations and return link profiles according to EPC Class1 Gen2 protocol.

In the following table are reported all profiles that have been tested for the compliance with ETSI and FCC regulations.

Link profile #	Regulation	Modulation	Return Link
0	ETSI - FCC	PR–ASK; f=40kHz	FM0; f = 40kHz
1	ETSI - FCC	PR–ASK; f=40kHz	Miller (M=4); f = 256kHz
2	ETSI	PR–ASK; f=40kHz	Miller (M=4); f = 320kHz

Tab. 6.2: Tile R1251INF Reader to tag link profiles

7 REGULATORY COMPLIANCE

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

a. Reorient or relocate the receiving antenna.

b. Increase the separation between the equipment and receiver.

c. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

d. Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modification not approved by CAEN RFID could void the user's authority to operate the equipment.

The device shall be used such that a minimum separation distance of 20cm is maintained between the reader and user's/nearby people's body.

RoHS EU Directive

Tile R1251INF Reader is compliant with the EU Directive 2011/65/EU on the Restriction of the Use of certain Hazardous Substances in Electrical and Electronic Equipment (RoHS2).