

# KATUN<sup>®</sup>

## TCM4 / TCM4-BLE MultiFreq card reader

Technical Manual  
V1.3



### ≧ SAFETY ≦

This CARTADIS product and supplies are manufactured and certified to strict safety regulations, electromagnetic regulations and established environmental standards.

### ≧ WARNING! ≦

Any unauthorised alteration, which may include the addition of new functions or connection of external devices, may impact the product certification.

Please contact your CARTADIS representative for more information.

#### ⇒ Warning markings

All warning instructions marked on or supplied with the product should be followed.

#### ⇒ Electrical supply

This product shall be operated from the type of electrical supply indicated on the product's data plate label. If you are not sure that your electrical supply meets the requirements, please consult your local power company for advice.

To disconnect all electrical power to the product, the disconnect device is the power cord. Remove the plug from the electrical outlet.



#### ⇒ Operator accessible areas

This product has been designed to restrict operator access to safe areas only. Operator access to hazardous areas is restricted with covers or guards which would have to be removed using a tool. Never remove these covers or guards.

#### ⇒ Maintenance

Any operator product maintenance procedure will be described in the user documentation supplied with the product. Do not carry out any maintenance on the product which is not described in the customer documentation.

#### ⇒ Cleaning your product

Before cleaning this product, unplug the product from the electrical outlet. Always use materials specifically designated for this product. The use of other materials may result in poor performance and may create a hazardous situation. Do not use aerosol cleaners; they may be flammable under certain circumstances.

***For more information on Environment, Health and safety in relation to this CARTADIS product and supplies, please contact the following customer help lines:  
Europe: +33 1 48 77 40 60.***



The CE mark applied to this product symbolises CARTADIS declaration of conformity with the following applicable European Union Directives as of the dates indicated:

#### ⇒ January 1, 1995:

Council directive 73/23/EEC, amended by Council Directive 93/68/EEC, approximation of the laws of the member states related to low voltage equipment.

#### ⇒ January 1, 1996:

Council directive 89/336/EEC, approximation of the laws of the member states related to electromagnetic compatibility.

A full declaration of conformity, defining the relevant directives and referenced standards, can be obtained from your CARTADIS representative.

### ≧ WARNING! ≦

In order to allow this equipment to operate in proximity to Industrial, Scientific and Medical (ISM) equipment, the external radiation from the ISM equipment may have to be limited or special mitigation measures taken.

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# 1. Introduction

The small-sized Cartadis TCM4 is a reader of contactless cards.

The TCM4 standard hardware features both low (125 kHz, 134.2 kHz) and high frequency (13.56MHz) antennas, allowing the user to access a wide range of RFID standards. In addition, with the TCM4-BLE hardware, a Bluetooth Low Energy is integrated for supporting the Bluetooth identification by mobile phones.

Application fields of the TCM4 MultiFreq card reader are:

- Secured print: direct connection to the USB port of many multifunctions for identifying the user and release the prints (with Print2me function available) or making copies.
- Option for the Cartadis cPad terminal: integrated into the designed shape of the cPad, the TCM4 enables the user to be identified by using a card with a solution like Gespage, PaperCut, etc ...
- PC applications: entry without error code of a RFID tag, enrolment of a user's card in a database, secured access to some applications ...
- Point of sale: connection to the cash registers for loyalty management.
- OEM: Cartadis assists its customers by providing a customization service of the TCM4 readers on the management of the specific RFID cards or USB protocols.

This technical manual provides the information required to get started the TCM4 card reader. It also describes how to configure your card reader and how to update a new firmware version.

# 2. Overview

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## 2.1 TCM4 models

There are 2 TCM4 hardware models:

- TCM4 standard hardware has both low (125 kHz, 134.2 kHz) and high frequency (13.56MHz) antennas, allowing the user to access a wide range of RFID standards.
- TCM4-BLE fitted with low and high frequency antennas like the standard TCM4 and also integrates Bluetooth Low Energy to allow identification by Bluetooth with mobile phones (required for iOS phones).

## 2.2 Identification

### 2.2.1 Supported tags

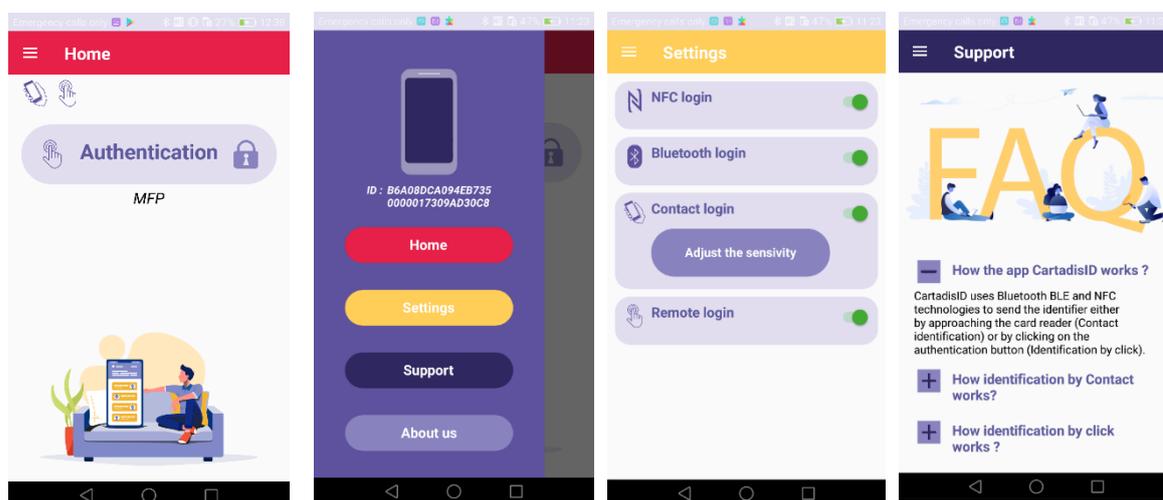
TCM4 reader supports a wide variety of high and low frequency tags, the list is detailed in the “TCM4 card compatibilities” leaflet.

### 2.2.2 CartadisID mobile application

TCM4 reader also supports the identification by the CartadisID mobile app using NFC technologies (Android only) and Bluetooth Low Energy (Android & iOS).

The identification by Bluetooth is exclusively available on the TCM4-BLE hardware.

CartadisID is available on Play Store for Android version and Apple Store for iOS version



## 2.3 USB interface

TCM4 connects to the host device by different types of USB protocols depending on the configuration:

- USB HID Keyboard Qwerty or Azerty
- USB CDC Serial Emulator.

## 2.4 Operation

### 2.4.1 Memory view

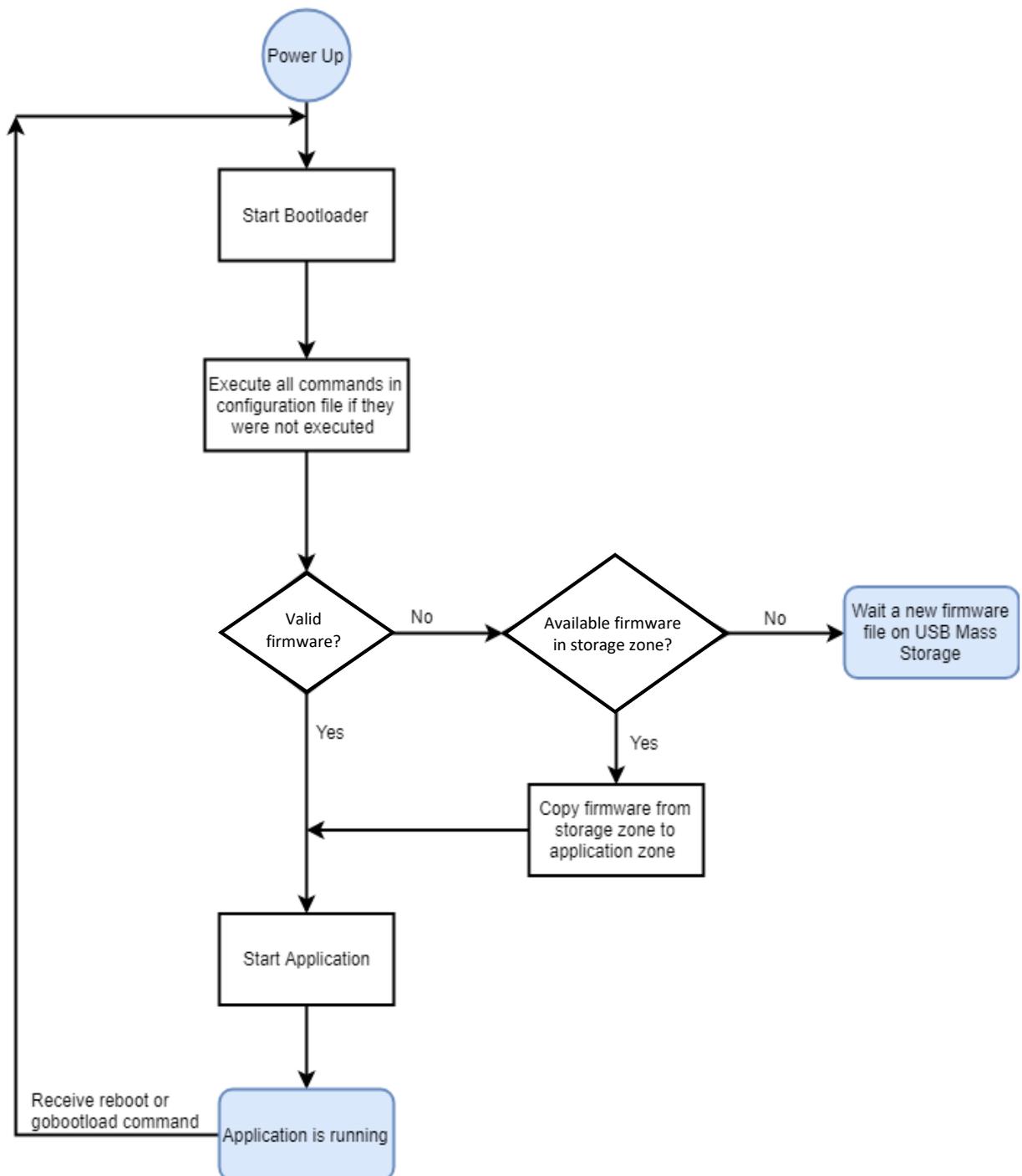
The memory is divided into 3 sections as shown in the following diagram:



- **Bootloader:** The bootloader is the entry point for the firmware after a TCM4 power up or a reset. Only the bootloader provides functions for programming new firmware. This means that the bootloader must be entered to program a new firmware.
- **Application:** TCM4 application.
- **Storage:** Storage area, where a new firmware file and the configuration file are stored. It is accessible from host computer through USB mass storage in bootloader mode.

## 2.4.2 Startup sequences

The following diagram shows the sequences of how bootloader and application are started:



### 2.4.3 LEDs and buzzer status specification

Blue	Red	Buzzer	Signification	
		4 beeps	Power Up	
			TCM4 in bootloader mode	Normal operation
	 Blinks on steps			A copy from host computer to storage zone of TCM4 on USB mass storage is in progress
 Blinks 2, 3 times slowly and stays ON				A firmware's update is done (copy of firmware from storage zone to application zone and firmware verification)
 Blinks every 500ms			TCM4 in application mode	Normal operation
 Blinks every 500ms		1 beep		Card detected

# 3. Configuration

---

TCM4 has a built-in command line interpreter which allows a set of predefined parameters to be displayed or modified.

These parameters can be modified or displayed in three different ways:

- from the TCMxManager mobile application (only available on Android) (recommended method)
- or
- from a serial terminal (like Putty)
- or
- from a configuration file.

The next paragraphs will describe the TCM4 parameters and the way they are configured.

## 3.1 TCM4 parameters

The TCM4 parameters and their possible values are described below:

**TCM4 / TCM4-BLE MultiFreq card reader**

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Parameter name	Description	Default values
	<u><a href="#">General parameters</a></u>	
<b>comusb</b>	USB Communication Type (CDC/HID Keyboard Azerty or Qwerty. 1: HID keyboard QWERTY 2: HID keyboard AZERTY 3: CDC (serial port emulation) 4: HP mode	1: HID Keyboard Qwerty
<b>freq</b>	The TCM4 can scan all types of cards or be restricted to one or several types of card technologies. The values of this parameter can be summed (mask) to scan several types of cards. The following values are configured in hex format. Possible values are (minimum 4 digits entry): 0000: Lock first (card type of the first card detected by TCM4 after power up will be applied as filter) 0001: ISO 14443 13.56Mhz (Mifare) type A 0002: ISO 14443 13.56Mhz (Mifare) type B 0004: ISO 15693 ICODE 13.56Mhz 0100: iCLASS 13.56Mhz 0400: IZLY complete format 13.56Mhz (requires a TCM4-Izly) 0800: FELICA 13.56Mhz 1000: IZLY short format 13.56MHz (requires a TCM4-Izly) 10000: IZLY long format 13.56MHz (requires a TCM4-Izly) 40000: NFC for Smartphone with CartadisID application 0010: EM (Electronic Marin) 125Khz 0020: HID Prox 125Khz 0040: HITAG 125Khz 2000: Indala 125Khz 8000: StartProx FFFF FFFF : All card types	0000: Lock first
<b>nobuzz</b>	Disable/Enable buzzer. 0: Buzzer is enabled (beeps at each card detection) 1: Buzzer disabled	0: Buzzer enabled
	<u><a href="#">UID reading mode parameters</a></u>	
<b>niboffset</b>	Skip niboffset digits in the IUD card. This parameter allows to reduce the size of an UID when all the cards have the same prefix	0
<b>niblen</b>	When the size of IUD is greater than the “niblen”, it is truncated and only the “niblen” digits from the right of the UID are kept	64
<b>swap</b>	Swap MSB/LSB of UID. 0: No swap 1: Swap MSB/LSB	0: Disabled
<b>uidindec</b>	Converts the hex UID card in decimal format. 0: Disabled 1: Converts the UID card in decimal	0: Disabled

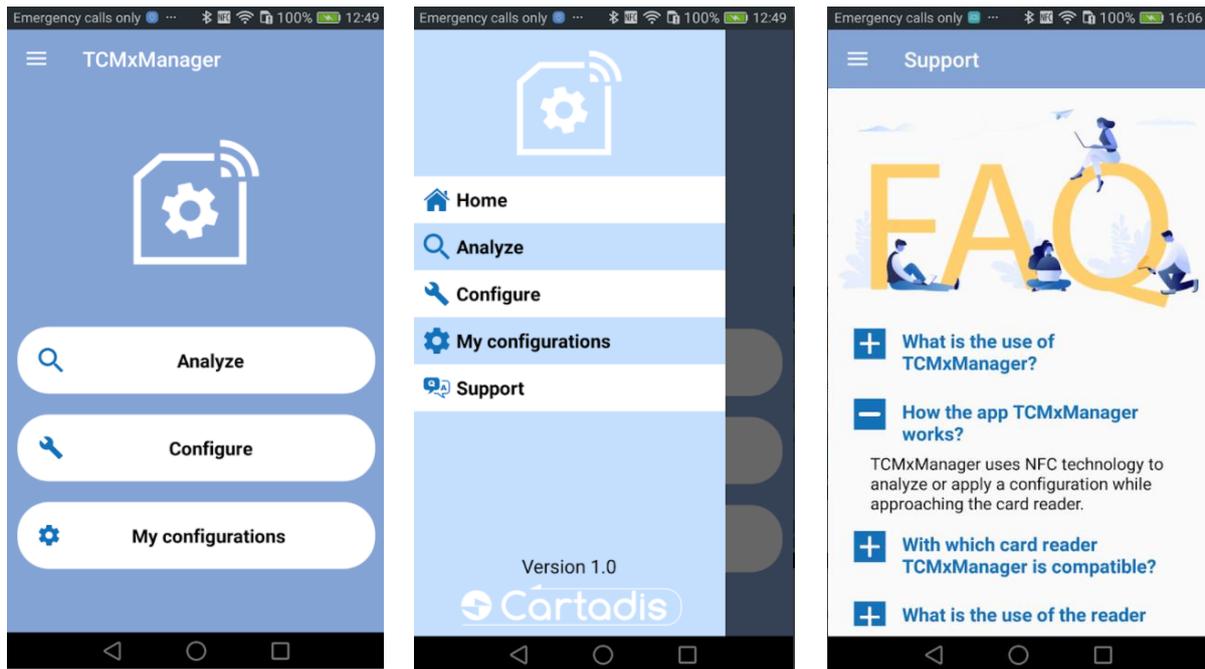
<b>uidcase</b>	Forces UID card upper case or lower case. 0: Disabled 1: Upper case 2: Lower case	0: Disabled
<b>rm0head</b>	Removes 0 at the head of the UID	0: Disabled
<b>padding</b>	Adds 0 at the head of UID if UID length < padding, number of 0 to add = padding - uid length	0: Disabled
<b>evensize</b>	Adds 00 at the head of UID card if UID length (in bytes) is odd. If enabled, all commands niboffset, niblen, uidindec, rm0head, padding will be ignored	0: Disabled
<b><u>Mifare sector reading parameters</u></b>		
<b>ulen</b>	Number of bytes to read data in a sector of a Mifare tag	0: Disabled
<b>usector</b>	Sector number in which reading data	0
<b>uoffset</b>	Skips uoffset bytes from the beginning of sector	0
<b>ukeya</b>	Key A for reading data from a sector of Mifare card	0x00 0x00 0x00 0x00 0x00 0x00
<b><u>HID parameters</u></b>		
<b>hidmode</b>	Decoding mode of HID tag 0: normal 26: 26 bits mode 254: Mixed mode (26 bits + Normal)	0: Normal mode
<b>hidsite</b>	Site code (8 bits in hexadecimal) using when hidmode is set to 26 bits mode	0
<b><u>Miscellaneous</u></b>		
<b>debug</b>	Enable/Disable debug mode. With this mode the message sent to the host computer via USB gives extra information about the card technology in form: <i>Detected frequency (13.56Mhz/125kHz)-Tag type[filter value to configure]-UID length in bytes-UID</i> Ex: 1356Mhz-TAG_FELICA[0x00000800]-8 bytes-0127006853DD8FC7 125kHz-TAG_HITAG_2[0x00000040]-4 bytes-1C94345B	
<b>password</b>	Password is used to secure TCMxManager communication. It can be reinitialized to default value with the "password clear" command	Production password
<b>name</b>	Custom name to be displayed in CartadisID App if Bluetooth identification is enabled. <i>For the TCM4-BLE hardware only.</i>	TCM4
<b>isinside</b>	This flag informs if the TCM4 reader is integrated inside the MFP. This setting optimizes the CartadisID BLE swipe detection algorithm <i>For the TCM4-BLE hardware only.</i>	1

## 3.2 Modification

### 3.2.1 By TCMxManager App (recommended)

TCMxManager is an application which allows you to configure and analyse a compatible Cartadis card reader, such as TCM4. This tool is intended for maintenance technicians.

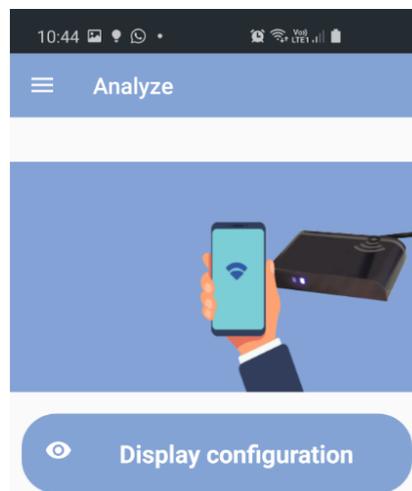
TCMxManager is available on Android Play Store. It is only compatible with Android devices and requires activating NFC on the device.



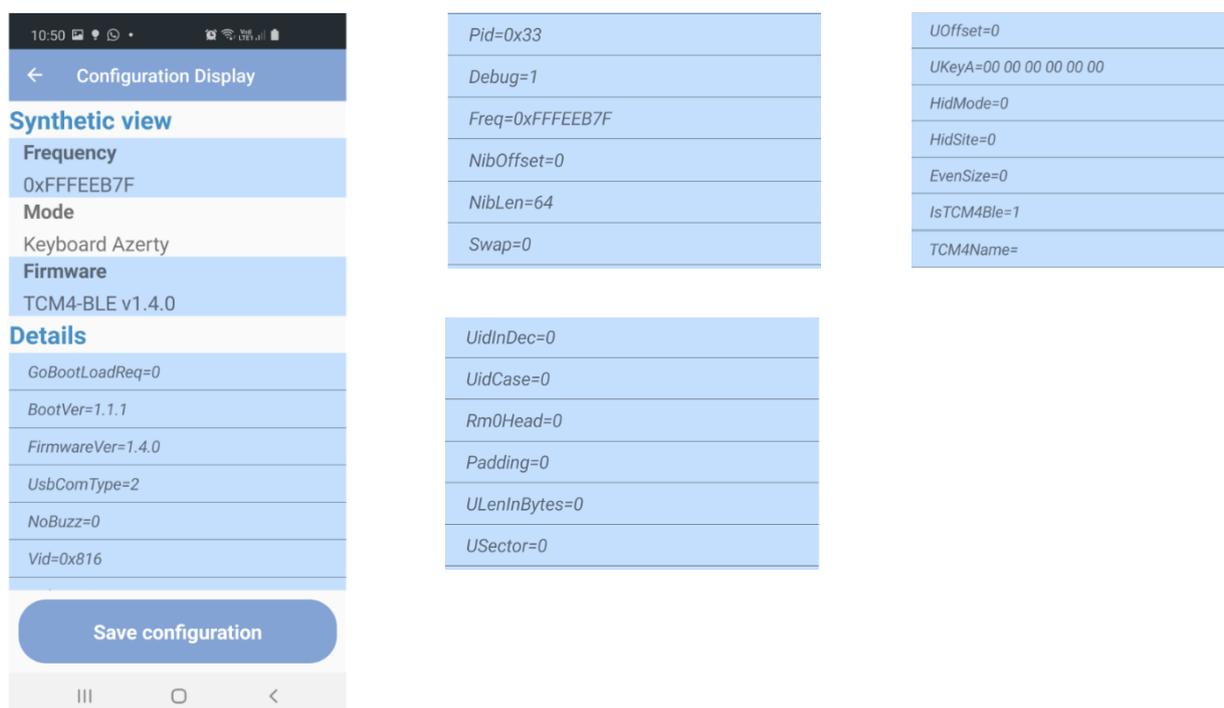
It is required to know the TCM4 reader password to be able to analyse or configure it (see § 3.2.1.2 ).

#### 3.2.1.1 Analyse a reader

To analyse the TCM4 parameters, select “Analyze” button and bring your mobile phone close to TCM4 to retrieve the parameters. After a beep, all the parameters of the TCM4 can be viewed by clicking on the button "Display configuration":



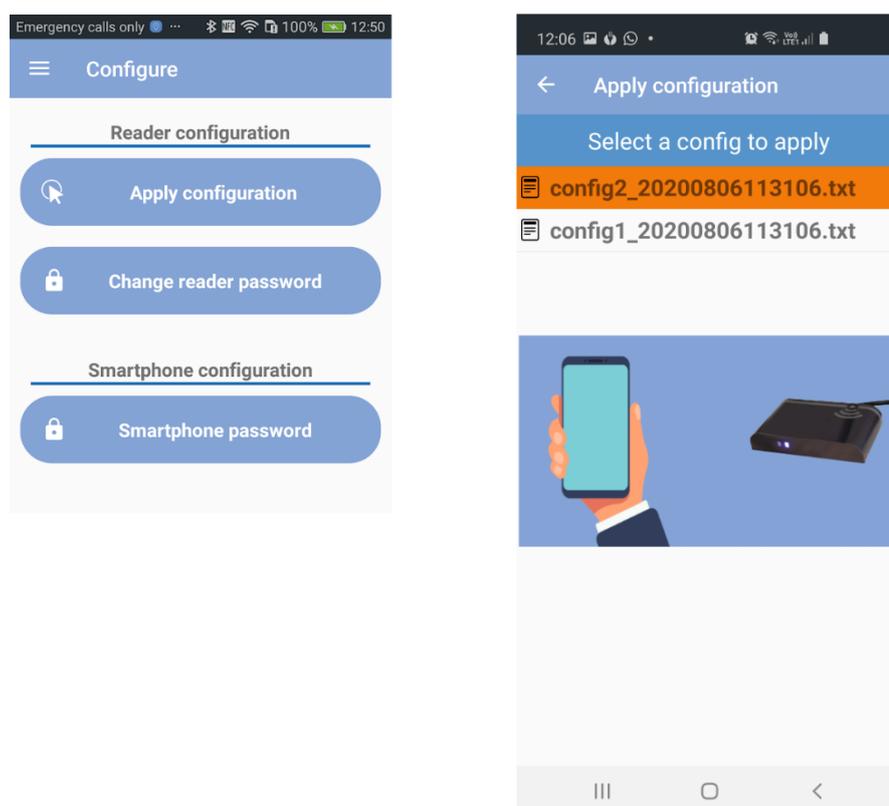
Under "Details" by moving your finger on the screen you scroll through the parameters:



“Save configuration” button allows you to save the retrieved configuration on the phone’s file system.

### 3.2.1.2 Configure a reader

Apply a configuration to TCM4 is done through the “Apply configuration” button, select a configuration and bring your mobile phone closer to TCM4. In case of success, a message is displayed after 2 beeps. If not, an error message is shown.



You can also import an existing config by copying this config in *Internal storage/TCMxManager/TCM4Configs* in your phone's file system. Then you will find this imported config in "Apply configuration" screen.

### 3.2.1.3 Reader password mechanism

A reader password is used to secure exchanges between TCMxManager and the TCM4. Only a technician who knows the password of a reader can analyse and configure it with TCMxManager.

To use TCMxManager for analysing and configuring a TCM4, you must therefore enter the TCM4 password in your application first. This password must be entered in the "smartphone password" parameter and it must match the TCM4 reader password.

When configuring a TCM4 for the first time with TCMxManager, a "reader password" is set in the TCM4. This default reader password is automatically set to the "smartphone password" of the technician doing the configuration for the first time.

When using TCMxManager on different fleets of card readers (with different passwords), remember to enter the smartphone password corresponding to the current fleet before using the app.

It is possible to change this reader password through the TCMxManager application (requires knowing the old password).

If the TCM4 password is lost, it can be reset using a PC and the serial terminal configuration mode (see § 3.2.2). The TCM4 password is reset by the command « password clear ».

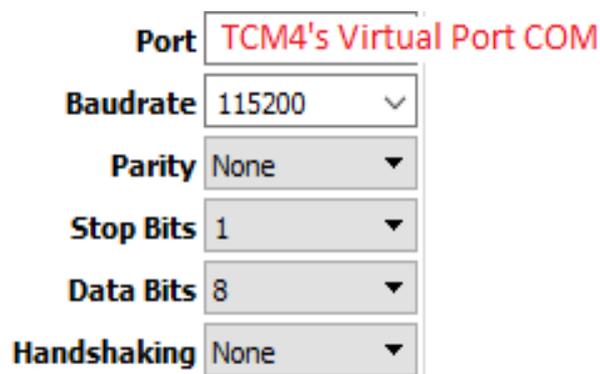
## 3.2.2 By command lines in application mode

Application mode means the TCM4 reader is running the application (as opposite to the bootloader mode).

It is only possible to communicate with the TCM4 over a virtual PC serial port when the TCM4 is in application mode, that is to say when the blue LED is blinking.

All TCM4 parameters can be modified or displayed by using a serial terminal (like Putty on Windows). No matter how your TCM4 is configured, as soon as it is connected to a PC, it declares itself as a USB composite device CDC and HID.

- The serial port of the PC must be configured as below:



The image shows a serial port configuration window with the following settings:

Port	TCM4's Virtual Port COM
Baudrate	115200
Parity	None
Stop Bits	1
Data Bits	8
Handshaking	None

- All TCM4 commands are shown in entering "help" or "?".  
In the following screenshot, the first column indicates whether the parameter can be modified when TCM4 is in application mode ("For\_App"), bootloader mode ("For\_Boot") or whatever the mode ("For\_All").

```

S?
For_App | help (alias:?) : Help
For_All | beep (alias:?) : Test Buzzer
For_App | gobootload (alias:gbl) : Go to Bootloader
For_App | fwupdate req (alias:fur) : Set/Get fwupdate request
For_App | fwversion (alias:fv) : Get Firmware version
For_All | bootversion (alias:bv) : Get Bootloader version
For_Boot | gotoapp (alias:gta) : Go to application
For_App | comusb (alias:cu) : Set/Get USB Type
For_All | nobuzz (alias:nb) : Disable Buzzer
For_App | vid (alias:?) : Set/Get VID, set vid 0xff to reset VID to default value
For_App | pid (alias:?) : Set/Get PID, set vid 0xff to reset PID to default value
For_All | reboot (alias:rb) : Reboot TCM4
For_App | debug (alias:db) : Enable/Disable debug mode
For_App | listfreq (alias:lf) : List all supported frequencies
For_All | freq (alias:fq) : Set/Get card types filter, set freq 0xffffffff to read all card types
For_All | niboffset (alias:nos) : Nibble offset
For_All | niblen (alias:nl) : Maximum number of characters of uid
For_All | swap (alias:?) : Swap MSB/LSB of uid
For_All | uidindec (alias:udec) : Convert uid in decimal format
For_All | uidcase (alias:ucase) : Force uid to upper case or lower case
For_All | rm0head (alias:rm0h) : Remove 0 at the head of uid
For_All | padding (alias:pd) : Add 0 at the head if uid length (number of characters) < padding, number of 0 to add = padding-uid length
For_All | rdrprofile (alias:rp) : List all parameters of reader profile, set rdrprofile 0 to reset all parameters to default value
For_All | ulen (alias:ul) : Number of bytes to read data in a sector of a Mifare tag
For_All | usector (alias:us) : Sector number in which reading data
For_All | uoffset (alias:uo) : Skip uoffset bytes from the beginning of sector
For_All | ukeya (alias:uka) : Key A to read data from a sector of Mifare card
For_All | uidsectorparam (alias:usp) : All parameters for reading data from a sector
For_All | hidmode (alias:?) : Decoding mode of HID tag, 0:normal, 26: 26 bits mode or 254: Mixed mode (26 bits + Normal)
For_All | hidsite (alias:?) : Site code (8 bits in hexadecimal) using when hidmode is set to 26 bits mode
For_App | sam (alias:?) : Get the serial number of SAM card
For_All | evensize (alias:es) : if actif, add 00 at the head if uid length (in bytes) is odd
For_App | password (alias:pwd) : Get/Set password for exchanging with TCM4Manager
For_App | name (alias:?) : Get/Set TCM4 name
For_App | serial (alias:?) : Get the serial number of TCM4
For_App | bleterm (alias:ble) : Direct communication with BLE Module Mode
For_App | setbleautorunpin (alias:?) : Set Autorun Pin of Bluetooth BL652 module
For_All | isinside (alias:ins) : Set/Get TCM4 location(inside or outside MFP)
For_App | format (alias:?) : Format EEPROM memory

```

### 3.2.3 By a configuration file in bootloader mode

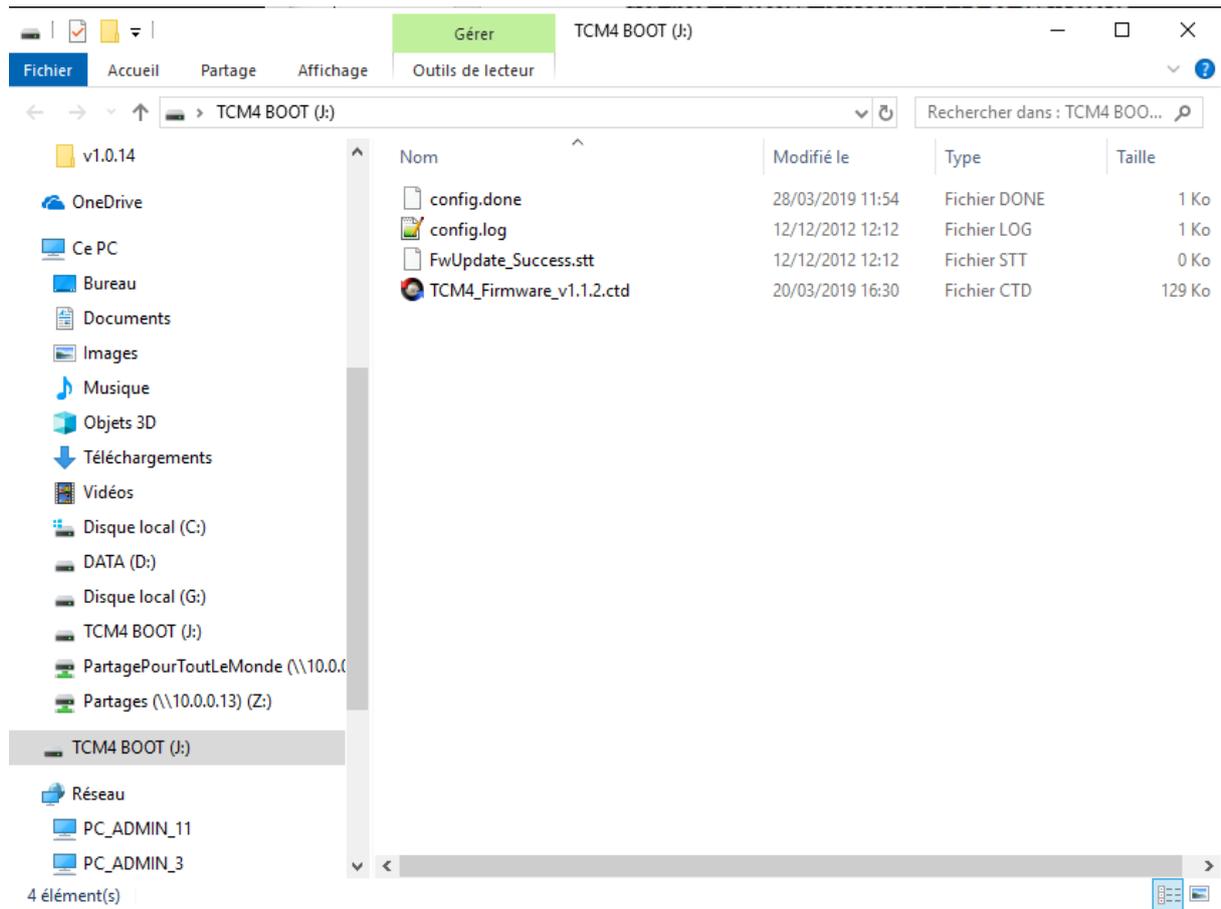
You can identify your TCM4 is in bootloader mode when the blue LED is on and not blinking.

If you wish to switch from “application mode” to “bootloader mode”, you need to enter the command “**gobootload**” in a serial terminal like Putty, see above.

Once your TCM4 is in bootloader mode, you can read/write the parameters of TCM4 by using a configuration file.

- As soon as TCM4 is in bootloader mode, it is mounted to the host computer and it behaves like a USB key with the name “**TCM4 BOOT**”.

## TCM4 / TCM4-BLE MultiFreq card reader

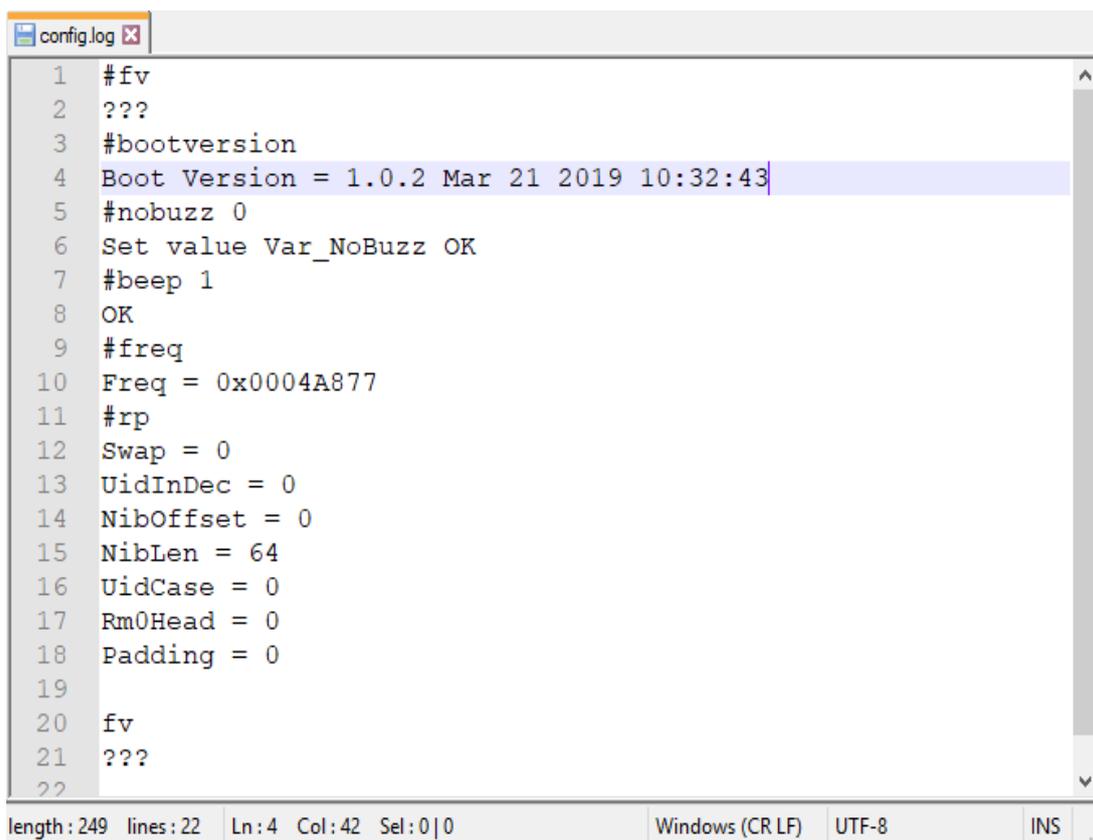


- Configuration file's name is **config.cmd**, it contains different commands to run. After the execution of config.cmd file, you will find 2 files in the TCM4 BOOT directory: **config.done** and **config.log** which are the results of all runned commands.

Hereafter is an example of a configuration file and result file:

```
1 #fwversion
2 #bootversion
3 #nobuzz 0
4 #beep 1
5 #freq
6 #rp
7
```

Ln : 7 Col : 1 Sel : 0 | 0 Windows (CR LF) UTF-8 INS



```
1 #fv
2 ???
3 #bootversion
4 Boot Version = 1.0.2 Mar 21 2019 10:32:43
5 #nobuzz 0
6 Set value Var_NoBuzz OK
7 #beep 1
8 OK
9 #freq
10 Freq = 0x0004A877
11 #rp
12 Swap = 0
13 UidInDec = 0
14 NibOffset = 0
15 NibLen = 64
16 UidCase = 0
17 Rm0Head = 0
18 Padding = 0
19
20 fv
21 ???
22
```

length: 249 lines: 22 Ln: 4 Col: 42 Sel: 0|0 Windows (CR LF) UTF-8 INS

- To execute commands in a configuration file from TCM4, the following instructions have to be followed:
  - Navigate to the newly mounted TCM4 drive (TCM4 BOOT).
  - Delete config.done file and config.log file.
  - Copy a new config.cmd file to the TCM4 BOOT.
  - TCM4 should automatically un-mount and re-mount itself.
  - If the execution of configuration file was successful, you will get a new config.done file and config.log file. Consult config.log file to know the result.

# 4. Firmware

## 4.1 Upgrading TCM4 firmware

TCM4 firmware can be updated via USB interface by switching to **bootloader mode**. As you know, in this mode, TCM4 is mounted as a USB stick.

To remind you, the bootloader mode is entered by doing the command “gobootload” in a serial terminal in application mode. When TCM4 is in bootloader mode, a firmware file (**TCM4\_Firmware\_vx.x.x.ctd**) and a status of previous update operation are visible in the device root.

To upgrade a new TCM4’s firmware, the following instructions have to be achieved:

- Navigate to the newly mounted TCM4 (TCM4 BOOT)
- Delete **TCM4\_Firmware\_vx.x.x.ctd** file
- Copy a new firmware file to TCM4 BOOT
- TCM4 should automatically un-mount and re-mount itself.

The update was successful if the **FwUpdate\_Success.stt** status file is present.

All the firmware update status are detailed below:

Status	Description
<b>FwUpdate_NoFwFile.stt</b>	No firmware file in storage zone
<b>FwUpdate_SameFw.stt</b>	Firmware file is the same as the firmware in application zone
<b>FwUpdate_Success.stt</b>	Update operation is successful
<b>FwUpdate_Failed.stt</b>	Update operation has failed
<b>FwUpdate_FwCorrupted.stt</b>	Firmware file is corrupted