



ENTR Dongle Communication protocol document

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1. Introduction

1.1 Scope

This document describes the spec for the BLE USB dongle communication protocols. The module will serve the SW engineers and integrators.

An integrator is a person that owns the knowhow of the home automation API protocol and commands and how to integrate it to our BLE API.

Along with that it will attach the SPI master and UART/USB source codes.

1.2 Purpose

The protocol addresses the following needs: Request of a general system status. Notify the BLE when individual statuses are changed. Allow the BLE to change system settings and etc.

The BLE USB dongle in intend to integrate to a server that supports USB interface.

1.3 Block Diagram

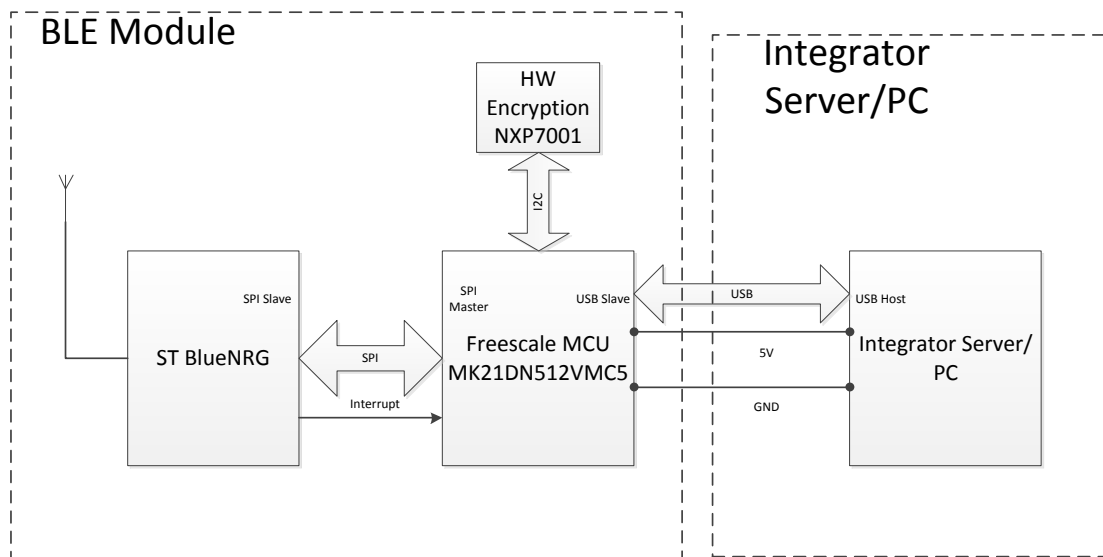


Figure 1-Block Diagram

2 USB Dongle ICD

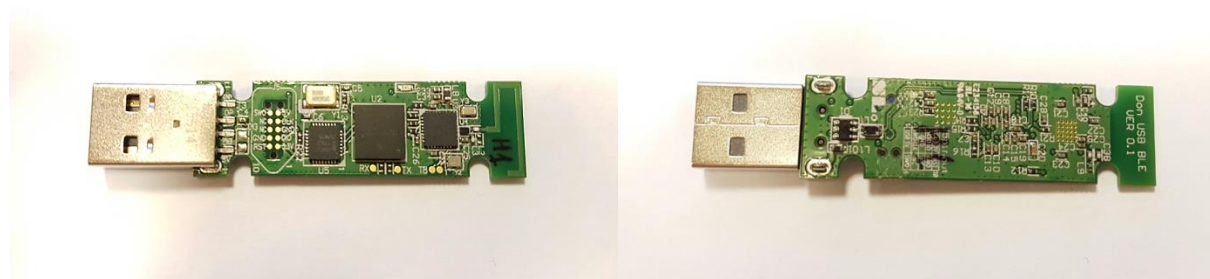
No ICD needed, insert to any standard USB host port.

2.1 Real Estate

		external [mm]			PCB [mm]		
	enclosure	Length	Width	Height	Length	Width	Height
1	P-220705	57.15	19.05	12.7	52.08	14.74	1.57



Figure 2- Real Estate, dimensions: (L)57.15 x (W)19.05mm inc. Plastic Cover



2.1 Temperature

-10~+60C.

2.2 Voltage

+5V±5%, Low power (<100ma) USB 2.0 standard

2.3 Current Consumption

Max. 30ma@5V.

3 USB (UART COM port) Overall Description

3.1 Open a virtual command window

- Install the windows driver (32/64 bit) into the PC.
- Insert the BLE dongle into the Server/PC USB host port.
- Check that the driver recognized the dongle.
- Open a terminal (etc. putty/TeraTerm) and select the appropriate virtual COM port.
- Enable echo on.
- Set the speed to 115200bps and 8, N, 1,
- Now you can write the command as it appears in paragraph 3.3.

3.2 UART Command format

Virtual COM protocol generically implements the same protocol as in SPI between Integrator - MCU and BLE-module MCU.

The same conceptual communication is done as in SPI, starting from the command, and excluding the header.

Each command is finished with line-end, instead of transmitting the length in the header.

All data is sent as hex data printed as two 0-F textual digits. Strings can for example be converted using <https://www.branah.com/ascii-converter>, by putting the textual string in the ASCII field, selecting “Remove 0x” checkbox, and copying the values in “Hex” window.

No delimiters between values.

For example: Send a byte of 0xAB 0xF0, need to send the string "ABF0".

3.3 Examples of step by step command structure

3.3.1 First time USB insertion

When inserting the dongle in the USB port you have to wait at list 6 seconds before sending first command (See BLE USB-Dongle Bootloader user guide for FW update feature).

3.3.2 Search Keys 0x71(see table on paragraph 4.2)

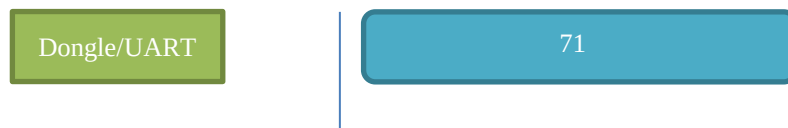


Figure 6-Search Keys Transaction Message structure

- Search Keys
- 71

3.3.3 In response you receive a 0x72 Keysfound status (see paragraph 4.2)

3.3.4 Getkey 0x74(see table on paragraph 4.2)

On the Getkey command you have to insert the ID that you received on message 72 and afterwards the key hex **value** that have been generate for you in your smartphone.



Figure 3-Getkey Transaction Message structure

- Getkey 1 123456
- 7401313233343536(ASCII)

After sending the GetKey command you will receive an FE(acknowledge) or FF(Non acknowledge) response.

3.3.5 Unlock 0x7B(see table on paragraph 6)



Figure 4-Unlock Transaction Message structure

- Unlock
- 7B506176656c6f636b00(ASCII)

The 506176656c6f636b00 is the lock name that you receive from the 0x72 message.

After sending the Unlock command you will receive an FE(acknowledge) or FF(Non acknowledge) response.

The search Keys(0x71) and getKey(0x74) commands are only used for receiving a pending key for the dongle , afterwards you can use the lock/unlock/status commands only.

3.3.6 In response you receive a 0x70 Status (see paragraph 4.2)

The status register contain the door status: **D**oor is closed, **L**ock is locked, **M**uted, Automatic locking, **C**harging and battery condition.

3.3.7 Lock 0x7A(see table on paragraph 4.2)

Dongle/UART

7A506176656c6f636b00

Figure 5-Lock Transaction Message structure

- Lock
- 7A506176656c6f636b00(ASCII)

The 506176656c6f636b00 is the lock name that you receive from the 0x72 message.

After sending the lock command you will receive an FE(acknowledge) or FF(Non acknowledge) response.

3.3.8 In response you receive a 0x70 Status (see paragraph 4.2)

The status register contain the door status: **Door** is closed, **Lock** is locked, **Muted**, **Automatic locking**, **Charging** and battery condition.

3.3.9 Get Status 0x7C(see table on paragraph 4.2)

Dongle/UART

7C506176656c6f636b00

Figure 5-Lock Transaction Message structure

- Lock
- 7C506176656c6f636b00(ASCII)

The status register(0x70) contain the door status: **Door** is closed, **Lock** is locked, **Muted**, **Automatic locking**, **Charging** and battery condition.

After sending the status command you will receive an FE(acknowledge) or FF(Non acknowledge after timeout) response.

3.3.10 ShowKeysLock 0x73(see table on paragraph 4.2)

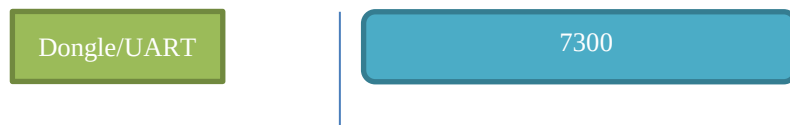


Figure 7-ShowsKeysLock Transaction Message structure

- ShowKeyLock 0
- 7300(ASCII)

4 Remote Unit Commands

The tables below are Commands, statuses and errors and are defines as the message part.

4.1 Error codes

Code	Meaning
0x01	CRC Error
0x02	Unknown command
0x03	Address error
0x04	Command failed
0x05	Data error
0x10	No stored eKey for this lock
0x11	Error communicating with lock
0x12	Permission denied
0x13	Wrong PIN
0x14	Locked out due to many wrong PINs attempts
0x7F	Unspecified error

4.2 External control through BLE master commands(Com port)

Name	Code	Data	Meaning
Remote Unlock	0x7B	LockName+'0'	Actual sent length can be variable, with length in the header. Max allowed total length with trailing 0 is 30 bytes. ACK will be sent in reply when successfully managed sending a unlock command (eKey

			compared). NACK will be sent on errors with following error codes 0x10-0x12.
Remote Lock	0x7A	LockName+'\0'	Usage identical to remote unlock command
Status	0x70	StatusBitmap+ BatteryPercent	The status bits are: {X, Y, Charging ,Door is open, Lock is unlocked, Muted, Manual locking, 1} <u>X,Y</u> 00(>20%) -- High state of charge. 01(<10%) -- Low state of charge. 10(<20%) -- Medium state of charge.
Get Status	0x7C	LockName+'\0'	Usage identical to remote Lock/unlock command
Search Keys	0x71	None	Command to start scanning for locks with pending keys ACK reply when request received and search started
KeysFound	0x72	Count/ID(1 byte) + LockName+'\0'	As a first message, Count/ID will act as Count and say how much Locks is found with pending keys. On all messages, Count/ID acts as ID and will show identification number of the current lock with pending keys. Its values are in range 1 to Count. If Count/ID is 0, then LockName will not exist. Max lock name is 8 character, If the lock name is less than 8 character the FW will add 20(space) to complete to 8 characters and 00 for end of string. If lock name is exactly 8 characters the FW will add 00 only for end of string.
ShowKeyLock	0x73	ID (1 byte)	Request to get KeysFound for specific given ID.
GetKey	0x74	ID (1 byte)+ PIN (6 bytes)	ID of the lock from which to request the pending key PIN is alphanumeric code to get this key ACK is replied when key is received NACK can be sent with codes 0x11 and 0x13
ACK	0xFE	None	
NACK	0xFF	Error code	
Factory reset	0x06	0x80	Resets all persistent memory and erases all stored keys

5 BLE Module Flow → ENTR

This flow describes all flow between the system parts, this document cover the communication between the integrator box and the BLE module/dongle.

BLE Module/Dongle – Communication with Unlock



BLE module is the module with BLE attached to Integrator host unit

Integrator Box is the host unit communicating with the BLE module over SPI/UARTdongle

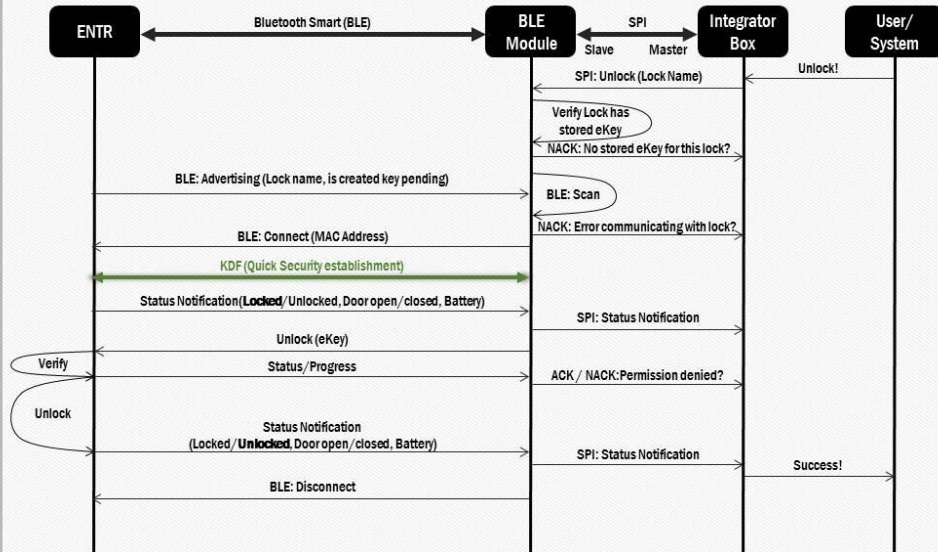
User/System is general abstraction to operations through some UI, some remote control, or some high level decision source

On the SPI/UART interface the unlock requests are by lock name

Scanning and connecting take place only after Unlock request has been received on SPI/UART

If there is Auto-Locking done afterwards, The integrator is not informed (it's already disconnected)

Lock is done similarly

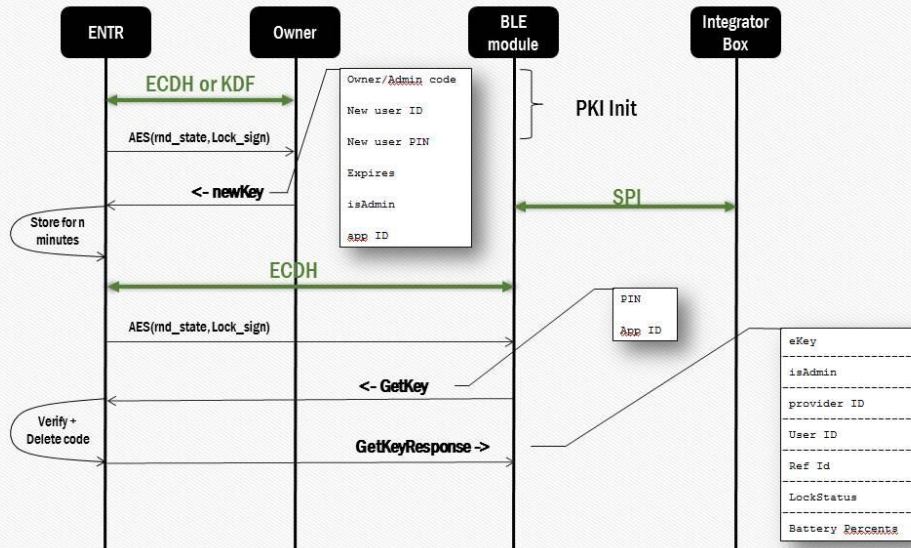


Issue and Get a new e-Key – BLE module– General with Owner

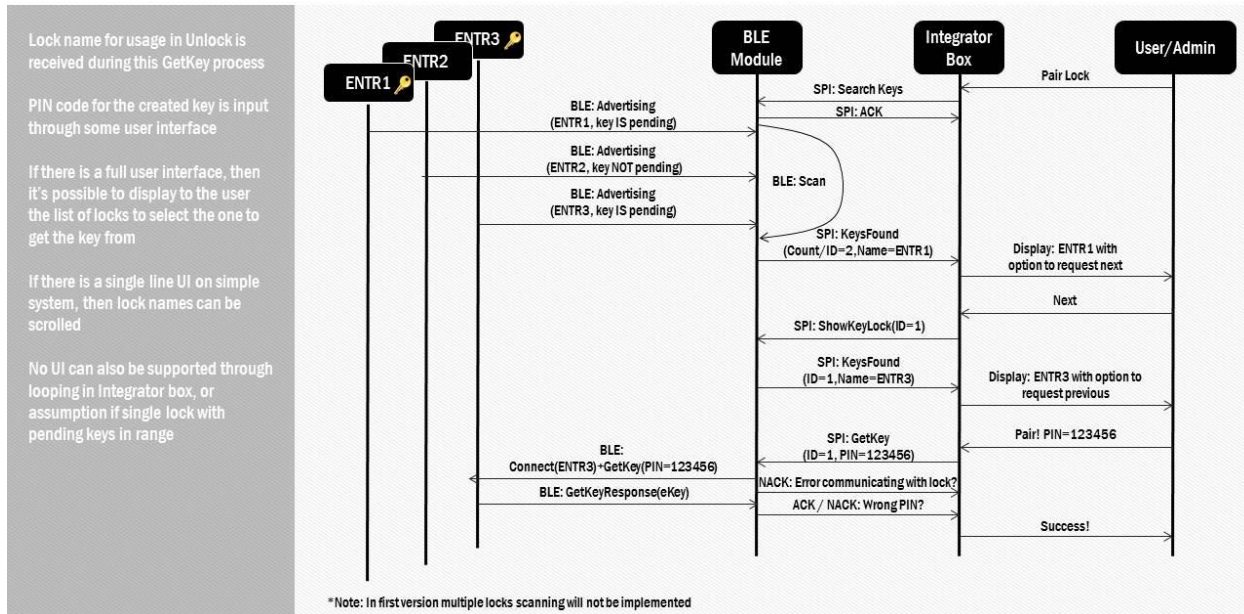


Same flow key generation and passing flow as with phones only

Same security preliminary infrastructure as with phones



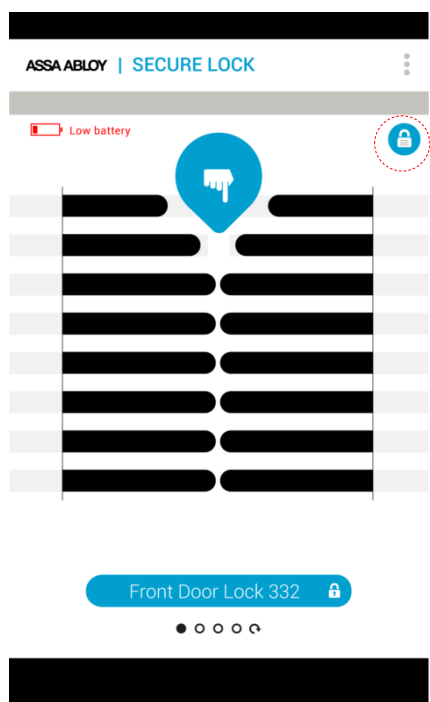
Integrator- Get a new e-Key – Detailed with example*



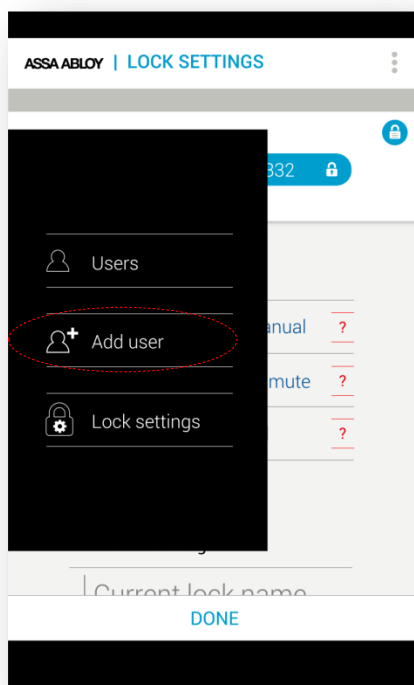
6 Pending key generation process through the smartphone App

Assuming the ENTR DU is already paired to the smartphone.

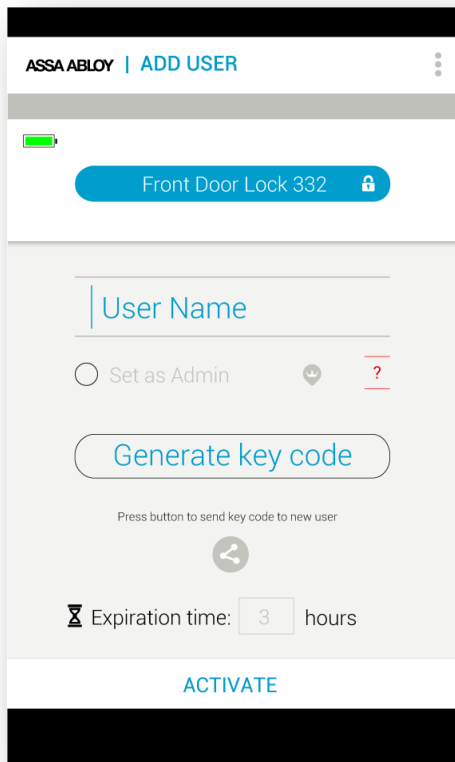
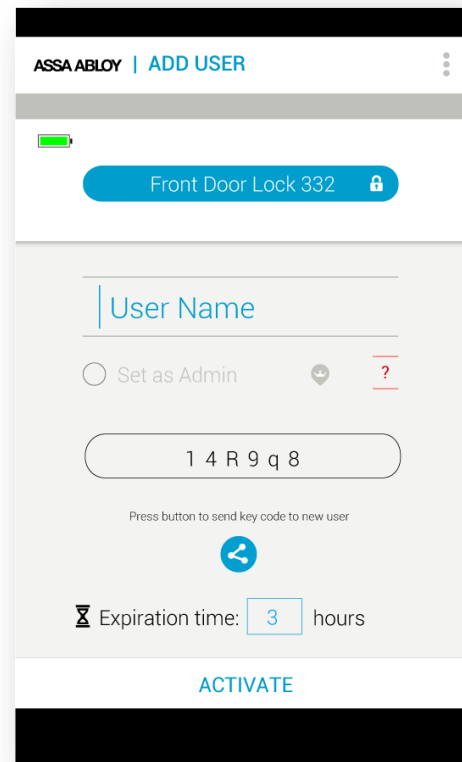
Get into “Lock Settings” by tapping the lock icon:



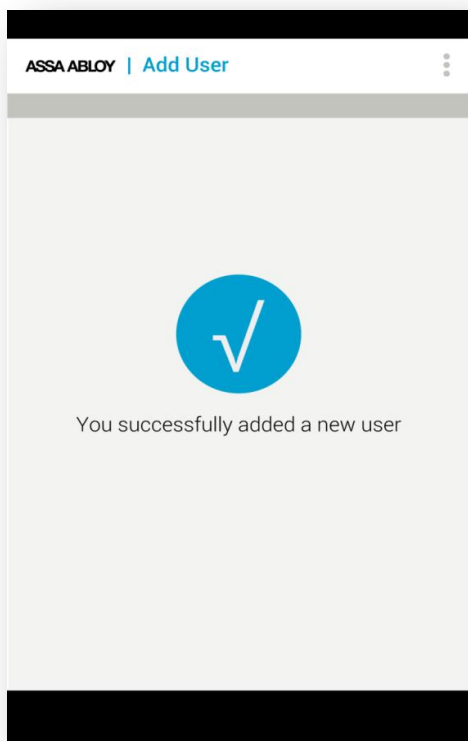
Tap on “Add User”



Enter the user name, generate the key code, and share or remember the code for the process of getting the key through the integration unit. Press “ACTIVATE”:

This is a screenshot of a mobile application interface for adding a user. At the top, it says "ASSA ABLOY | ADD USER". Below that is a status bar with a battery icon and the text "Front Door Lock 332" with a lock icon. The main section has a "User Name" input field, a "Set as Admin" radio button, and a "Generate key code" button. Below the button is a share icon and the text "Press button to send key code to new user". At the bottom, there is an "Expiration time" set to 3 hours and an "ACTIVATE" button.This is a second screenshot of the same mobile application interface. The "Generate key code" button has been replaced by a display showing the generated key code "1 4 R 9 q 8". The rest of the interface, including the "User Name" field, "Set as Admin" option, share icon, expiration time, and "ACTIVATE" button, remains the same.

On Success you will see the following screen:



From this moment, for the predefined expiration time, the key will be waiting in the lock until it will be pulled from the lock using the code. The key pulling can be done by the integration unit or any other phone user possessing the code.

7 For radio enclosure Federal

Communications Commission requirement for (FCC) Statement Labelling small device statement (FCC15.19(3))

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.

7.1 Radio Frequency Interference (RFI) (FCC 15.105)

This equipment has been tested and found to comply with the limits for Class B digital devices pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, 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 and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.



Product FCC ID: 2AHH881132

7.3 Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by Mul-T-Lock® may void the user's authority to operate this equipment.

7.4 RF warning for Portable device

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.