



User Guide - FIELD TEST DEVICE - Sigfox RC1

≡ Document version	V1.2.0
⌵ Product/Service	FTD
≡ Area	Sigfox RC1

PRODUCT AND REGULATORY INFORMATION



This User Guide applies to the following product:

FIELD TEST DEVICE Sigfox RC1

Reference: From ARF8121AA

Firmware versions:

RTU: from V01.01.01

APP: from V01.01.03

DOCUMENT INFORMATIONS	
Title	FIELD TEST DEVICE
Sub-Title	Sigfox Europe
Type	User Guide
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DOCUMENTATION GUIDE

PREAMBLE

DISCLAIMER

TECHNICAL SUPPORT

RECOMMENDATIONS

INTRODUCTION

[https://s3-us-west-2.amazonaws.com/secure.notion-static.com/f6dfb7f3-43e7-4e4e-be76-f6514604ae65/EU_declaration_of_conformity\(FTD_SIGFOX_868_ARF8121AA\).pdf](https://s3-us-west-2.amazonaws.com/secure.notion-static.com/f6dfb7f3-43e7-4e4e-be76-f6514604ae65/EU_declaration_of_conformity(FTD_SIGFOX_868_ARF8121AA).pdf)

TABLE OF CONTENTS

- ▼ TABLE OF CONTENTS
 - PRODUCT AND REGULATORY INFORMATION
 - TABLE OF CONTENTS**
 - 1. PRODUCT PRESENTATION
 - 1.1. Description
 - 1.2. Mechanical features
 - 1.3. Technical specifications
 - 1.4. Charging the FTD
 - 2. DEVICE DESCRIPTION
 - 2.1 User interface
 - 2.2 Description of the buttons
 - 3. DESCRIPTION OF THE SCREENS
 - 3.1 Start Screen
 - 3.2. Screen Cycle sigfox
 - 3.3. GPS screen
 - 3.4. PER (Packet Error Rate) screen
 - 3.5. Downlink screen
 - 4. DECODING THE PAYLOAD
 - 4.1 Status
 - 4.2 **Temperature**
 - 4.3 Latitude
 - 4.4 Longitude
 - 4.5 UL counter
 - 4.6 DL counter
 - 5. DEVICE CONFIGURATION
 - 5.1 Connecting the device to a computer
 - 5.2 Command mode
 - 5.3 AT command
 - 5.4 Register description
 - 5.4.1 Function register
 - 5.4.2 Network register
 - 6. DEVICE UPDATES
 - 7. DECLARATION ON THE SIGFOX BACK-END
 - DOCUMENT HISTORY

1. PRODUCT PRESENTATION

1.1. Description

The Field Test Device (FTD) from Adeunis is a Sigfox RC1 compatible device. This is not a point to point device and may not be used in this manner. This indicates that it must be used on a private or public operated network.

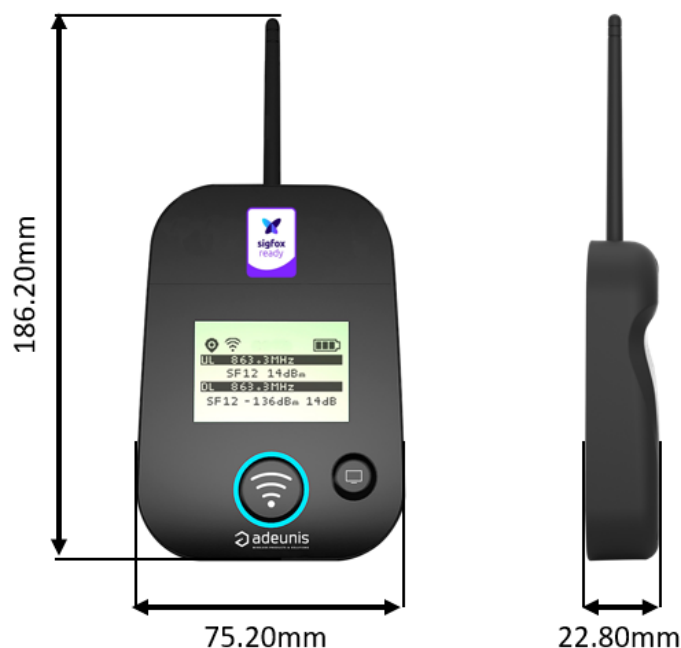
The Sigfox Field Test Device from Adeunis is a ready-to-use device, which makes it possible to communicate with all network operators using the Sigfox protocol. The system makes it possible to transmit and receive radio frames and to instantly view the results.

Equipped with a large LCD screen, you can view various information relating to how the network being used is functioning (Uplink, Downlink, SF, PER, etc.) in addition to information from sensors (GPS coordinates, battery level, etc.). This device is specifically adapted for application validation, such as communicating sensors, tracking, smart building, metering, security and M2M.

Thanks to its rechargeable battery, the FTD allows several hours of functioning and can be recharged using a standard mobile phone micro-usb.

1.2. Mechanical features

Casing Specifications	
Dimensions	H186.20 x L75.20 x P22.80
Weight	140g
Materials	Unit: ABS GP22 + Black Colouring (HB à 1.6mm) Lexan: Autotex Polycarbonate Antenna: Thermolast K TC7AA (d) (a) UL#E214855



1.3. Technical specifications

Communication	Sigfox protocol and DBPSK sigfox
Radio rate	Variable (SF12/125kHz (~183 bps) to FSK (~50kbps)

RF Power	14dBm (25mW)
Sensitivity	Down to -140 dBm in SF12/CR4
Range (open)	Up to 15km
Standards met	EN 300-220, EN 301-489, EN 60950
Network area	RC1
Frequency	ISM band 863-870MHz

Supply	
Battery	Lithium-Ion Polymères 3.7V 2Ah 7.4Wh
Connector	Micro-USB - 5V - 500mA

Opérationnel	
Configuration du produit	IoT Configurator ou commandes AT
Débit série	115.2 kbps
Parité	None
Nombre de données	8
Stop bit	1
Température de fonctionnement	-20°C/+40°C en décharge et 0°C/ +36°C en charge

1.4. Charging the FTD

The device is equipped with a rechargeable battery. Once the device has been connected to a USB charger or the USB socket of a computer, it will start to charge automatically; even if the ON/OFF communicator is set to OFF (this functions in exactly the same way as a mobile phone).

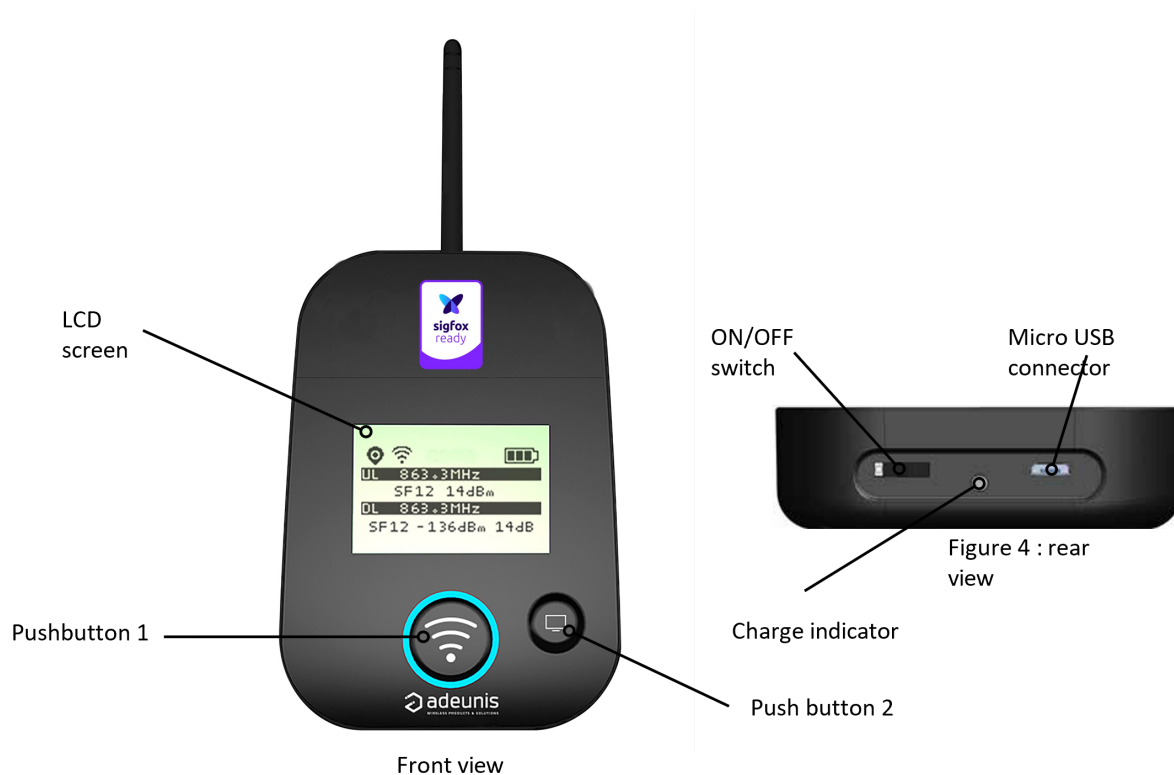
The device can be used while it is charging. During charging, the charge indicator will be red. When the device is fully charged, the indicator will turn green.



If the battery is completely empty, it will be necessary to recharge the device for 6 hours in order for it to be fully charged.

2. DEVICE DESCRIPTION

2.1 User interface



2.2 Description of the buttons

Operation interface:

Push button 1



This button allows you to carry out radio transmissions in manual mode.
On the PER menu, a long press reset the counters to zero.

Push button 2



This button allows you to manage the LCD screen:

- When the LCD back-light is switched off, pressing this button will switch on the back-light.
- When the LCD back-light is switched on, each press will allow you to scroll through the different screens available on this device.

A long press on this push button enables to see the Configuration screen.

ON/OFF switch



The ON/OFF switch allows you to switch the device on or off. Moving the switch to the right will turn the device on.

Micro-USB connector



The micro-USB connector allows you to charge the device or configure it.

Charge indicator



The charge LED shows you the device's charge status.

3. DESCRIPTION OF THE SCREENS

The LCD screen of the product is split on few part :

- The START screen (Showing the firmware version) - Only on the powering up
- The SIGFOX CYCLE screen
- The GPS screen
- The PER screen (Packet Error Rate)
- The DOWNLINK FRAME screen

The following icon are present on each screen of the product

GPS status (First on the left)

No icon

GPS has been deactivated



GPS has not been synchronized



GPS has been synchronized

Battery (Last on the left)



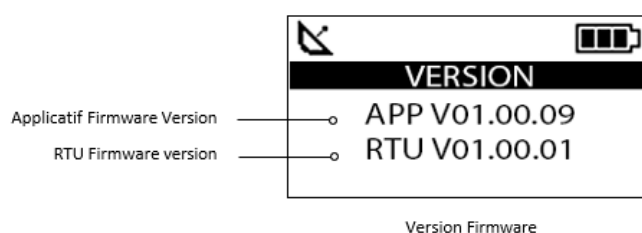
Battery level



Product in charge

3.1 Start Screen

The device is switched on using the ON/OFF switch located on the underside of the device. Once it has been switched on, the device's LCD screen will light up and the start menu will be displayed. This screen show the 2 firmware versions during few seconds.



NOTE: If the device does not switch on, this could mean that there is insufficient battery charge. You would then need to connect the device to a USB charger. When the battery is completely empty, it is possible that the device will not switch on, even when connected. Please wait a few minutes before the device can be used.

3.2. Screen Cycle sigfox

This screen is displayed after the start screen.

All the frame transmit or receive on the network can be see on the screen. If the product is correctly set, frames are directly sending on the sigfox network as soon as the product is power on. The periodic transmission icon and 3 sending frames sigfox cycle information (UL1 to UL3) must appear, join the emission frequency.

Uplink and Downlink transmission information will be displayed on the LCD screen.

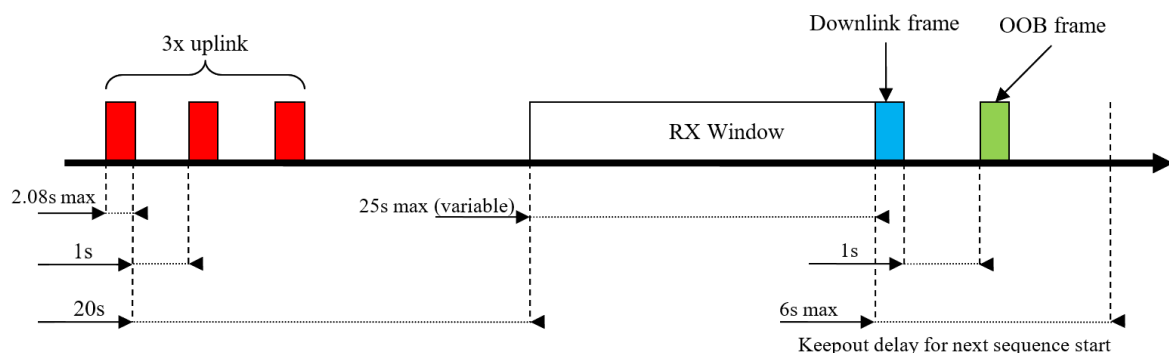
The first line show the Uplink information «ULx» with x for the number and frequency of repetition. She also show the Out Of Band «OOB» information. The second line show the power used

The third line show the Downlink information «DL» and frequency of the reception window

The last line show the RSSI received

The sigfox cycle can be split in several stages :

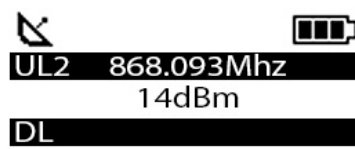
- 3 emissions on a variable frequency (Figure 6, 7 et 8)
- 1 reception windows after a 20 seconds times break (Figure 9)
- 1 OOB emission, if the product received a downlink (Figure 10)



Uplink 1



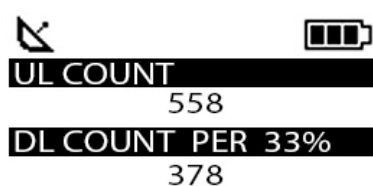
Uplink 2



Uplink 3



Downlink



OOB



Transmission Status (Second on the left)

No icon There is currently no radio transmission



Manual transmission has been triggered (transmission cycle in progress)



Periodic transmission has been triggered (transmission cycle in progress)

Uplink information (Black Line)

Display showing the number of Uplink (UL1 to UL3) frame repetitions as well as the transmission frequency of the frame or the OOB frame, accurate to three decimal place.

Uplink Information (White Line)

Display showing the SF used as well as the transmission power of the frame.

Downlink Information (Black Line)

Display showing the listening window of the device (DL) as well as the reception frequency of the frame, accurate to three decimal place.

Downlink Information (White Line)

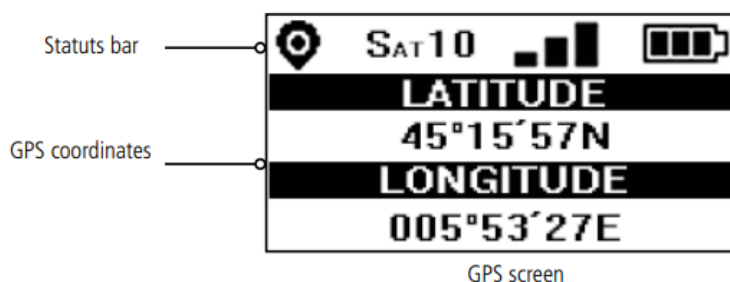
Display showing the RSSI of the most recent frame received.

The Downlink information displayed on the device relates to a Downlink frame sent from a sigfox network. If no information can be found in this section, this does not indicate that the device will not function on the network but only that it has not received any information from the network.

To validate the upload link (sending a frame from the device to the network) it is necessary to use an interface that will allow you to read frames from the network (example: back-end or application).

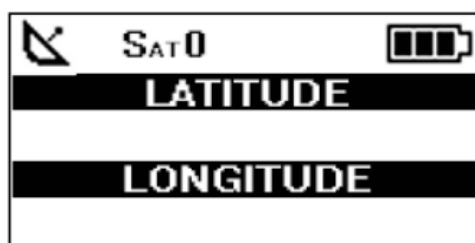
3.3. GPS screen

This screen can be accessed by briefly pressing 2 times on pushbutton 2 after the home screen (if GPS is activated). It allows you to view the functioning information of the GPS module, as well as the device's GPS positioning.



Number of Satellites (Second on the left)	SAT xx	Indicates the number of satellites received by the device
GPS signal (Third on the left)		Indicator showing the quality of the GPS signal 1 bar: weak reception 2 bars: average reception 3 bars: good reception
LATITUDE	Display showing latitude coordinates in degrees, minutes and seconds	
LONGITUDE	Display showing longitude coordinates in degrees, minutes and seconds	

When GPS has not yet been “fixed”, no information on latitude or longitude will be displayed on the screen and the information icon will indicate that GPS has not been synchronized.



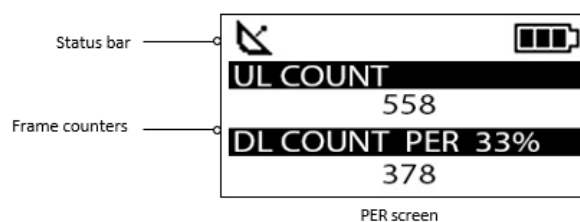
GPS screen (No synchronisation)

If the product loses synchronisation with the GPS, the information in this screen will no longer be available. There is no storage of the last received position.

3.4. PER (Packet Error Rate) screen

This menu can be accessed by briefly pressing on pushbutton 2 after the GPS menu. It allows you to evaluate the quality of the radio connection between the device and the network.

The screen will display:



- The number of frames sent (UL COUNT), including repetitions
- The number of frames received (DL COUNT)

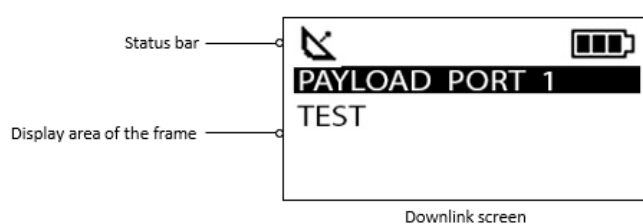
- The Packet Error Rate (PER) as a percentage

The PER measurement is calculated by comparing the number of frames transmitted to the number of frames received:

$$\text{PER (\%)} = 100 - ((\text{DL_COUNT} / \text{UL_COUNT}) * 100)$$

3.5. Downlink screen

This menu can be accessed by briefly pressing on pushbutton 2 after the PER menu. It will allow you to view a downlink frame sending by the network. This frame is displayed in ASCII characters. The non printable characters are replace by a point.



The screen allow a viewing of 51 characters (17 characters per lines). If the size of the payload is upper than 51 bytes, the product will not display the extra bytes.

4. DECODING THE PAYLOAD

The size of the Field Test Device's payload can vary depending on the information transmitted. The first byte will enable you to identify the presence of information contained in the payload. Information will always be shown in the order indicated in the following table.

Example of a payload received: 9C004515969000553450272020

This example will be used in order to explain how the payload is decoded.

	1	2	3	4	5	6
Number of byte	1	1	4	4	1	1
Description	Status	Temperature	GPS latitude	GPS longitude	UL counter	DL counter
Example	9C	00	45 ; 15 ; 96 ; 90	00 ; 55 ; 34 ; 50	20	20

4.1 Status

Hex	Decimal	N°order	Bit	Commentaires	Valeur
9E	1	1	7	Reserved	0 or 1
	0		6	Reserved	0 or 1
	0		5	Transmission triggered by pressing pushbutton 1	0 or 1
	1		4	Presence of GPS information	0 or 1
	1		3	Presence of Uplink frame counter	0 or 1
	1		2	Presence of Downlink frame counter	0 or 1
	0		1	Presence of battery level information	0 or 1
	0		0	No used	0

0: Data missing from the payload

1: Data present in the payload

4.2 Temperature

Temperature measurement is no longer supported for Field Test Device with App firmware from V01.01.03

Temperature value is setted to 0°C (invalid measurement) to ensure compatibility with existing decoders.

4.3 Latitude

Hex		N°	Bit N°	Comments	Value
45		3	7..4	BCD coding of the entire degree section (tenth of a degree)	45°15,9820
			3..0	BCD coding of the entire degree section (whole degrees)	45°15,9820
15			7..4	BCD coding of the entire minute section (tenth of a minute)	45°15,9820
			3..0	BCD coding of the entire minute section (whole minutes)	45°15,9820
96			7..4	BCD coding of the decimal section (tenth)	45°15,9820
			3..0	BCD coding of the decimal section (one hundredth)	45°15,9620
			7..4	BCD coding of the decimal section (one thousandth)	45°15,9890
90			3...1	Not used	
			0	Hemispheric coding	0 : North 1 : South

Note: the value expressed in the payload will be in degrees , minutes and fractions of a second. A conversion to degrees, minutes and seconds must be carried out in order to make a comparison with the coordinates displayed on the device's LCD screen.

4.4 Longitude

Hex		N°	Bit N°	Comments	Value
00		4	7..4	BCD coding of the entire degree section (one hundredth of a degree)	005°34,500
			3..0	BCD coding of the entire degree section (one tenth of a degree)	005°34,500
53			7..4	BCD coding of the entire degree section (whole degrees)	005°34,500
			3..0	BCD coding of the entire minute section (one tenth of a minute)	005°34,500
45			7..4	BCD coding of the entire minute section (whole minutes)	005°34,500
			3..0	BCD coding of the decimal section (tenth)	005°34,500
			7..4	BCD coding of the decimal section (one hundredth)	005°34,500
00			3...1	Not used	
			0	Hemispheric coding	0 : East 1 : West

Note: the value expressed in the payload will be in degrees , minutes and fractions of a second. A conversion to degrees, minutes and seconds must be carried out in order to make a comparison with the coordinates displayed on the device's LCD screen.

4.5 UL counter

Octet	Decimal	N°	Bit N°	Comments	Value
20	32	5	1	Uplink frame counter	0 ... 255

Please note: This counter is not the Sigfox stack frame counter, but an internal frame counter. Therefore, there is no correlation between this counter and the one that you can view on the network.

4.6 DL counter

Hex	Decimal	N°	Bite N°	Comments	Value
20	32	6	1	Downlink frame counter	0 ... 255

Please note: This counter is not the sigfox stack frame counter, but an internal frame counter. Therefore, there is no correlation between this counter and the one that you can view on the network.

5. DEVICE CONFIGURATION

The device can be configured using the USB connector. This connection allows you to communicate with the device via a virtual com port and to transmit AT commands in order to modify the parameters of the device.

5.1 Connecting the device to a computer

Connect the Field Test Device (FTD) to the USB input of a computer. The FTD device has a Type B micro USB connector.

During connection, the device must be recognized by the computer as a Virtual Com Port (VCP) device.

Using Windows: Verification that the device has been recognized to be functioning properly can be obtained by consulting the device manager.

You should see the USB series device with a corresponding COM port number appear during connection.

If you are not able to see a device of this type, you must install the USB driver for this device, available to download from our website:

<https://www.adeunis.com/en/produit/ftd-network-tester/>

Select:

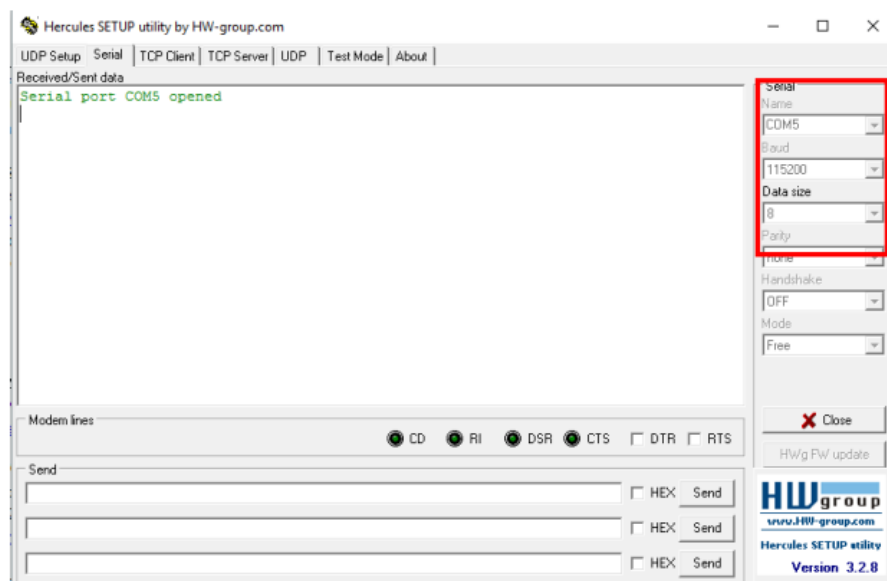
- DRIVER - stsw-stm32102_vcpdriver

5.2 Command mode

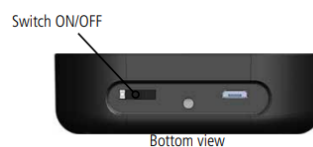
Use a COM port terminal in order to communicate with the device. We use the HERCULES COM port soft terminal available to download for free by clicking on the following link: https://www.hw-group.com/products/hercules/index_en.html

- With Hercules, select the "Serial" tab, then configure the serial port with the following serial parameters:
- Select the serial port on which the device has been created with Windows (Name).
- Click on the "Open" button to open the serial port.

PLEASE NOTE: If the com port has been opened correctly, Hercules will display the message "Serial COM3 port opened". Alternatively, "Serial port com opening error" will be displayed, meaning either that the com port is already open for another application, or it does not exist.



To supply power to the device, move the switch to the right.



You must send a specific frame in order to move the device to configuration mode.
Frame expressed in hexadecimals: 0xFF 0xFF 0xFF 0xFF 0xFF 0x2B 0x2B 0x2B

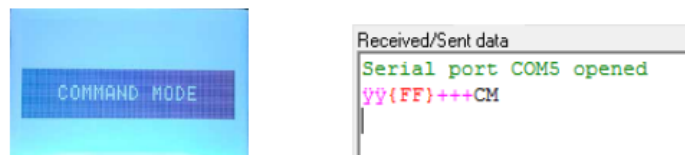


For Hercules, this frame must be entered in one of the 3 lines available at the bottom. The hexadecimal format must be expressed using a "\$" in this program, which gives us the following frame:
\$FF\$FF\$FF\$FF\$FF\$2B\$2B\$2B



Send the transition frame in command mode in order to switch the device to configuration mode by clicking on the SEND button.

After a few seconds, you should see the COMMAND MODE screen appear on the device's LCD. This may take some time due to the fact that transition to command mode can only happen during a transmission cycle.



On the com port terminal, you should also have "CM" feedback for Command Mode.

Sending a character on Hercules is displayed in magenta and receiving a character is displayed in black. If you do not see sending characters, this is probably because ECHO is not active on this program. To activate the option in the accessible menu, right click in the viewing window.

5.3 AT command

A command starts with 2 ASCII characters: "AT", followed by one or more characters and data (see the list below for the syntax of AT commands available on the modem).

Each command must finish with a "CR" or "CR" "LF" – both are acceptable.
(CR indicates: Carriage Return, LF indicates: Line Feed)

Once the command has been received, the modem will feedback:

<cr><lf> "Data" for ATS type playback control <n> ?, AT/S or AT/V

"O" <cr><lf>, for any other command when this has been accepted.

"E" <cr><lf>, if it refuses the command due to a syntax error, unknown command, unknown range, invalid

parameter, etc.

"CM" <cr><lf>, if it accepts the input in command mode

Table of AT commands:

Command	Description	Response
ATS<n> ?	Feeds back the content of the n range	Sn=y where y represents the content of the n range
ATS<n>=<m>	Transfers the m value to the n range	"O" if the operation has been accepted "E" if the operation has been refused "W" if the operation has encountered a problem during configuration
AT/S	Edits the content of all of the user ranges in the form of a list.	Sxxx=y for each range
AT/V	Feeds back the version of the software	Example: 8123AAA_PRG_1601_V01.00.00:8134AAA_PRG_1601_V01.00.00 (chapter 6)
ATR	Restores the value of all non-volatile memory ranges to volatile memory.	"O" if the operation has been accepted. "E" if the operation has been refused.
AT&W	Saves the current configuration to non-volatile memory.	"O" if the operation has been accepted. "E" if the operation has been refused.
AT&RST	Restart the device	"O" if the operation has been accepted. "E" if the operation has been refused.
ATO	Exit command mode	"O" if the operation has been accepted. "E" if the operation has been refused.
ATT63 PROVIDER	Unblock the operating range	"O" if the operation has been accepted. "E" if the operation has been refused.

Example of a set of commands and corresponding responses that can be seen on the terminal:

Command syntax	Description	Response syntax
\FF\FF\FF\FF+++	Input request in command mode	CM
ATS202=3	The number of repetition change	E → This command is not validated (register no unlocked)
ATT63 PROVIDER	Unblock the operating range	O
ATS202=3	The number of repetition change	O
ATS230?	Feeds back the value of the S230 range	S230=868130000
AT&W	Memory request for the state range	O
ATO	Output request in command mode	O

Interpreting the previous example: the user wanted to modify the number of repetition after having made an unauthorized command (answer **E**), and the ranges were unblocked in order to modify the range. The range 230 was verified and the parameters were saved before exiting. When exiting command mode, the device will start a new transmission cycle.

5.4 Register description

Once supplied with power, the Field Test Device will function according to the last saved configuration (factory settings if this is the first time the device has been switched on, or if this configuration has not been changed).

ATS<n>=<m> or ATR type modification commands allow you to modify the content of these ranges. It is essential to save the parameters using the AT&W command before exiting the command mode, otherwise all of your changes will be lost.

5.4.1 Function register

Below is a list of the ranges accessible on the device (by default). These ranges make it possible to modify the device's behavior.

Details on how each range functions can be found elsewhere in the table.

Range	Content	Default value	Comments
S370	RESERVED	0	
S371	GPS configuration	11	0: GPS deactivated 1: GPS activated/Continuous Mode 0x00000101: GPS activated/Continuous Mode + GPS Reset (Cold Start)
S380	Frame transmission period	600	0: No periodic transmission 1 to 86400 (expressed in seconds) : Periodic transmission
S382	Communication mode	1	0: monodirectionel 1: bidirectionnel
S383	RESERVED	1	
S385	Personalized Payload Size	0	0 : Deactivated 1 to 16 : Size of the payload
S386	Personalized Payload Text - Bloc 1	0	Each bloc allow to define 4 bytes of the payload The data enter in the last bloc will be not take in charge
S387	Personalized Payload Text - Bloc 2	0	Each bloc allow to define 4 bytes of the payload The data enter in the last bloc will be not take in charge
S388	Personalized Payload Text - Bloc 3	0	Each bloc allow to define 4 bytes of the payload The data enter in the last bloc will be not take in charge
S389	Personalized Payload Text - Unused	0	Each bloc allow to define 4 bytes of the payload The data enter in the last bloc will be not take in charge

S371 : GPS configuration

The way in which the GPS module is configured is completely independent from the main firmware. Two functioning modes are available:

- Permanent Mode
- Periodic Mode

In

permanent mode, the GPS is always active and will operate at maximum power (like the GPS in a car). This is the most efficient mode and we would recommend using it when it is necessary to move the Field Test Device (example: if the device will be in a car), or if satellite visibility is poor.

In

periodic mode, the GPS will start for a period of 5 min at maximum power before switching to periodic power. In this mode, the GPS will become active for 30-40 seconds every 10 minutes. The rest of the time, it will be in rest mode, which will aid the device's independence. This mode should be used for static use (fixed position, or very slow movement), or where satellite visibility is very good.

The user can also choose to reset the GPS once it is switched on. This operation will allow you to delete the GPS memory as well as all previously acquired information. This can be useful when the GPS is not able to synchronize itself while it is starting up. Essentially, the GPS will use its internal memory to set a position and to locate satellites, but when the GPS has not been used for a long period of time or has traveled a great distance (for example, if it has traveled on-board an aircraft to another country), the information will be inaccurate and must be deleted. If the GPS coordinates are available during transmission of a Sigfox frame, these coordinates will be included in the payload. Otherwise the corresponding bytes will be deleted, rendering the payload shorter.

S380 : Frame transmission period

The device is capable of automatically making periodic transmissions. The transmission period is defined in seconds and can be anywhere between 0 and 86400 (24 hours).

If the value for the period is equal to 0, the function will then be deactivated.

If the button is locked, the periodical mode is used with the period indicated in this register.

S382 : Communication mode

The communication mode allows to modify the device comportment in front of the network.

- Monodirectional mode: the device transmit a frame to the network and can't receive a downlink frame.
- Bidirectional mode: the device transmit a frame to the network and open a reception window which allows the network to transmit a frame to the device, but also to transmit acknowledgment frames.

5.4.2 Network register

Range	Content	Default value	Comments
S200	Transmission frequency	868130000	From 862000000 to 870000000 (Test mode)
S201	Reception frequency	869525000	From 862000000 to 870000000 (Test mode)
S202	Number of repetitions	2	From 0 to 2 (only available in BIDIR mode)
S230	RESERVE	0	
S260	RESERVE	0	

Range	Content	Default value	Comments
S261	RESERVE	0	

S200: Transmission frequency

The central transmission frame of the device can be change for the test. This parameter have to be change only for operator test.

S201: Reception frequency

The central reception frame of the device can be change for the test. This parameter have to be change only for operator test.

S202: Number of repetitions

Usually a sigfox message is repeated twice time. The number of repetition stay unchanged in monodirectional communication mode, but it can be change in bidirectional mode.

6. DEVICE UPDATES

The firmware versions of the device can be updated. The device has 2 firmwares that can be updated individually:

RTU firmware

APPLICATIVE firmware

It is possible to find out the references for versions loaded onto the device using the command AT/S

Example :

8121AAB_PRG_1701_V01.00.09:8120AAB_PRG_1701_V01.00.01

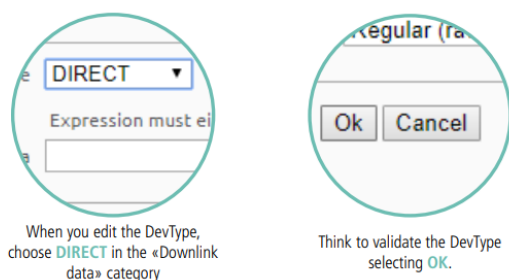
The RTU firmware version is: V01.00.09 The APPLICATIVE firmware version is: V01.02.01

The full procedure is available on the device page of our website:

www.adeunis.com

7. DECLARATION ON THE SIGFOX BACK-END

When you declare your FTD on the Sigfox Back-end, isolate the product in a dedicated Dev-Type and activate the "direct" callbacks for this DevType.



DOCUMENT HISTORY

Version	Contenu
V1.2.0	Removal of accelerometer, temperature measurement and temperature display. Removal of frame transmission when triggering of the accelerometer
V1.1.5	Minor corrections
V1.1.4	Minor corrections
V1.1.3	Minor corrections
V1.1.2	Design updated
V1.1.1	DoC deleted
V1.1.0	New: • Downlink frame screen • Personalize payload • Firmware version screen on start
V1.0.0	Creation