TinyOne Pro 868MHz Terminal User Guide
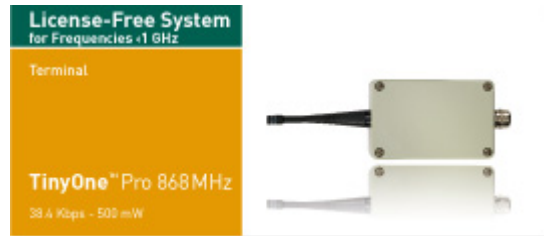
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CONTENTS

CHAPTER I.   INTRODUCTION

I.1. Aim of the Document

The aim of this document is to present the features and the application of M868-TinyPro radio terminal. The characteristics will be described within three distinct chapters:

-   "General characteristics" describes the electrical and mechanical characteristics.
-   "Mechanics and connections" details the casing, connector, cabling and power supply.
-   "Functionalities" lists the operating modes, registers and their use.

I.2. Reference documents

[1] EN 300 220-2 v2.1.2	ETSI Standards for SRD , June 2007
[2] ERC Rec 70-03	ERC Recommendation for SRD, June 2009
[3] 2002/95/EC	Directive of the European Parliament and of the Council, 27 January 2003
[4] TinyTools : User Manual	1vv0300824_Tiny Tools User Guide
[5] Mesh Lite : User Manual	1vv0300819_M_ONE Protocol Stack User Guide

I.3. Document change log

Revision	Date	Changes
ISSUE # 0	29/04/09	First Release
ISSUE # 1	21/06/10	Updated: reference documents table, ERC 70-30 recommendation table Added description of the behavior for internal LEDs
ISSUE # 2	14/09/10	Removed Terminal variant with fixed antenna
ISSUE # 3	14/01/11	Updated paragraph 3.1

I.4. Glossary

ACP	Adjacent Channel Power
BER	Bit Error Rate
Bits/s	Bits per second (1000 bits/s = 1Kbps)
CER	Character Error Rate
dBm	Power level in decibel milliwatt (10 log (P/1mW))
EMC	Electro Magnetic Compatibility
EPROM	Electrical Programmable Read Only Memory
ETR	ETSI Technical Report
ETSI	European Telecommunication Standard Institute
FM	Frequency Modulation
FSK	Audio Frequency Shift Keying
GFSK	Gaussian Frequency Shift Keying
GMSK	Gaussian Minimum Shift Keying
IF	Intermediary Frequency
ISM	Industrial, Scientific and Medical
kbps	kilobits/s
LBT	Listen Before Talk
LNA	Low Noise Amplifier
MHz	Mega Hertz (1 MHz = 1000 kHz)
PLL	Phase Lock Loop
PROM	Programmable Read Only Memory
NRZ	Non return to Zero
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
RSSI	Receive Strength Signal Indicator
Rx	Reception
SRD	Short Range Device
Tx	Transmission
SMD	Surface Mounted Device
VCO	Voltage Controlled Oscillator
VCTCXO	Voltage Controlled and Temperature Compensated Crystal Oscillator

CHAPTER II.   GENERAL CHARACTERISTICS

II.1. General Requirements

The M868- TinyPro terminal is a multi channel radio terminal, delivering up to 500 mW in the 868 MHz ISM band (unlicensed frequency band).

It allows 'point-to-point', `multipoint' or 'mesh' functioning modes.

The "ERC recommendation 70-03" describes the different usable sub-bands in the 868 MHz license free band, in terms of bandwidth, maximum power, duty cycle and channel spacing. It gives the following limitations :

ERC recommendation 70-03				
Band	Frequency band (MHz)	Maximum radiated power (mW)	Channel spacing (kHz)	Duty cycle (%)
Annex1 g3	869.4 - 869.65	500	25 or wideband	10

This band is free to use but the terminal and the user must respect the 10% duty cycle limitation. This means that each terminal is limited to a total transmit time of 6 minutes per hour. It is the responsibility of the user to respect it.

Furthermore, the terminal complies with the ETSI 300-220 (specific for SRD). The main requirements are described in Appendix 1.

Finally, the terminal complies with the new European Directive 2002/95/EC concerning the Restrictive Usage of Hazardous Substances (RoHS).

▪ **_National Restrictions for non specific SR devices Annex 1 band g3:_**

Country	Restriction	Reason/Remark
Russian Federation	No info	

II.2. Temperature Characteristics

	Minimum	Typical	Maximum	Unit
Operating				
Temperature	- 40	25	+ 85	°C
Relative humidity	20		75	%
Storage				
Temperature	- 40	25	+ 85	°C
Relative humidity	0		95	%

II.3. Mechanical Characteristics

Characteristics		Unit
Connectors	Connection using terminal blocks inside the casing. Exit through cable gland	-
Dimensions	117 (without antenna) x 64 x 40	mm^3
Weight	300	g
Antenna length : • Removable antenna version	93	mm
LEDs	No LEDs are available	

II.4. DC Characteristics

Characteristics	6V	12V	40V	Unit
Transmission consumption 500mW / 100mW / 25mW	350 / 180/ 120	250 / 100 / 70	80 / 50 / 35	mA
Reception consumption	30	25	20	mA
Stand-by consumption	-	70	-	µA

II.5. Timing Characteristics

Characteristics	Min.	Typ.	Max.
Power Up Sequence :	-	135 ms	150 ms
Stand by :			
Enter in Hard Stand-by :	-	700 µs	900 µs
Enter in Serial Stand-by :	-	3.2 ms	-
Wake Up from Hard Stand-by :	-	2.85 ms	3.0 ms
Wake Up from Serial Stand-by :	-	5.5 ms	-
Radio :			
Rx to TX switching time (500mW) : (100mW) :	-	- / -	4ms / 3.5ms
Tx to RX switching time (500mW) : (100mW) :	-	- / -	4ms / 3.5ms
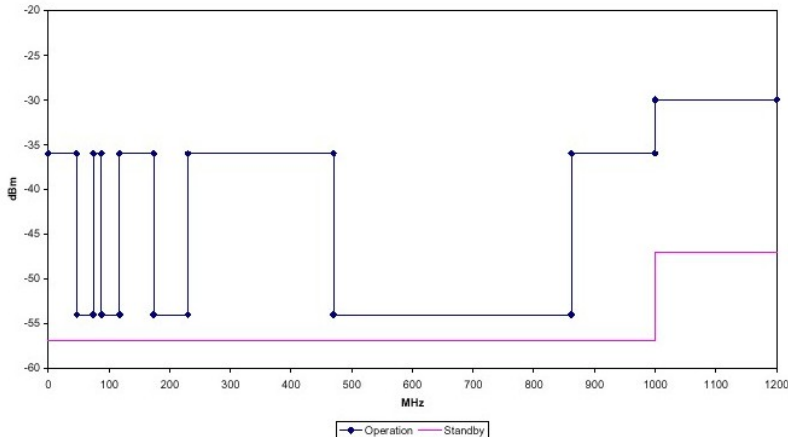
II.6. Functional characteristics

The M868-TinyPro terminal allows 2 types of functioning : single or multi channel.

Global	
Frequency band :	869.400 – 869.650 MHz (ERC-Recommendation 70-03)
Temperature range :	*Functioning* : -40°C to +85 °C *Storage* : -40°C to +85 °C
Relative humidity :	*Functioning* : 20% to 75% RH *Storage* : 0% to 95%

Transmission	Single channel	Multi channel
Channel number :	1 (center frequency 869.525MHz)	10 (first channel at 869.4125MHz)
Channel spacing :	wideband (ERC-Rec 70-03)	25 kHz (ERC-Rec 70-03)
Radio bit rate :	up to 38.4 kbps	4.8 kbps
Output Power :	500mW (27dBm ± 1dB)	100mW (20dBm ± 2dB)
Modulation :	GFSK	
ACP :	-	-37dBm max.
Spurious out of the band :	Under the following limits :	

Reception	Single channel	Multi channel
Sensitivity for CER<10^{-3} :	-100dBm ± 2dB (@ 38.4kbps)	-105dBm ± 2dB (@ 4.8kbps)
Saturation for CER<10^{-3} :	up to -10 dBm under 50 Ohms	
Remaining CER :	< 1.10^{-6} at –50 dBm	
Selectivity :	-	30 dB protection between channels
Immunity :		
against adjacent channels jammer at –20 dBm :	-	20 dB min.
against other channels jammer at –20 dBm :	-	30 dB min.
against out of the band spurious :	40 dB typ.	
Spurious leakage :		
Below 1 GHz :	-57 dBm max.	
Over 1 GHz :	-47 dBm max.	
Other	Single channel	Multi channel
Range :		
in difficult environment :	200 m	300 m
in optimal environment (Line of Sight) :	3 000 m	4 000 m

II.7. Digital Characteristics

Digital characteristics	
Micro-controller	Micro-controller RISC 8 bits with Flash memory
Programming	• Through serial link • Through the air (Download Over The Air)
RAM memory	2 Kbytes
Flash memory	16 Kbytes

Serial link characteristics	
Serial link type	RS232 / 485 / 422
Serial speed	1200 to 115200 bits/s
Data bits	8
Stop bits	1 or 2
Parity	None, Even, Odd
Flow control type	None, Hardware (RTS/CTS), Software (Xon/Xoff)

II.8. Ordering information

Select the desired options from the list below to identify the appropriate Telit part number you need.

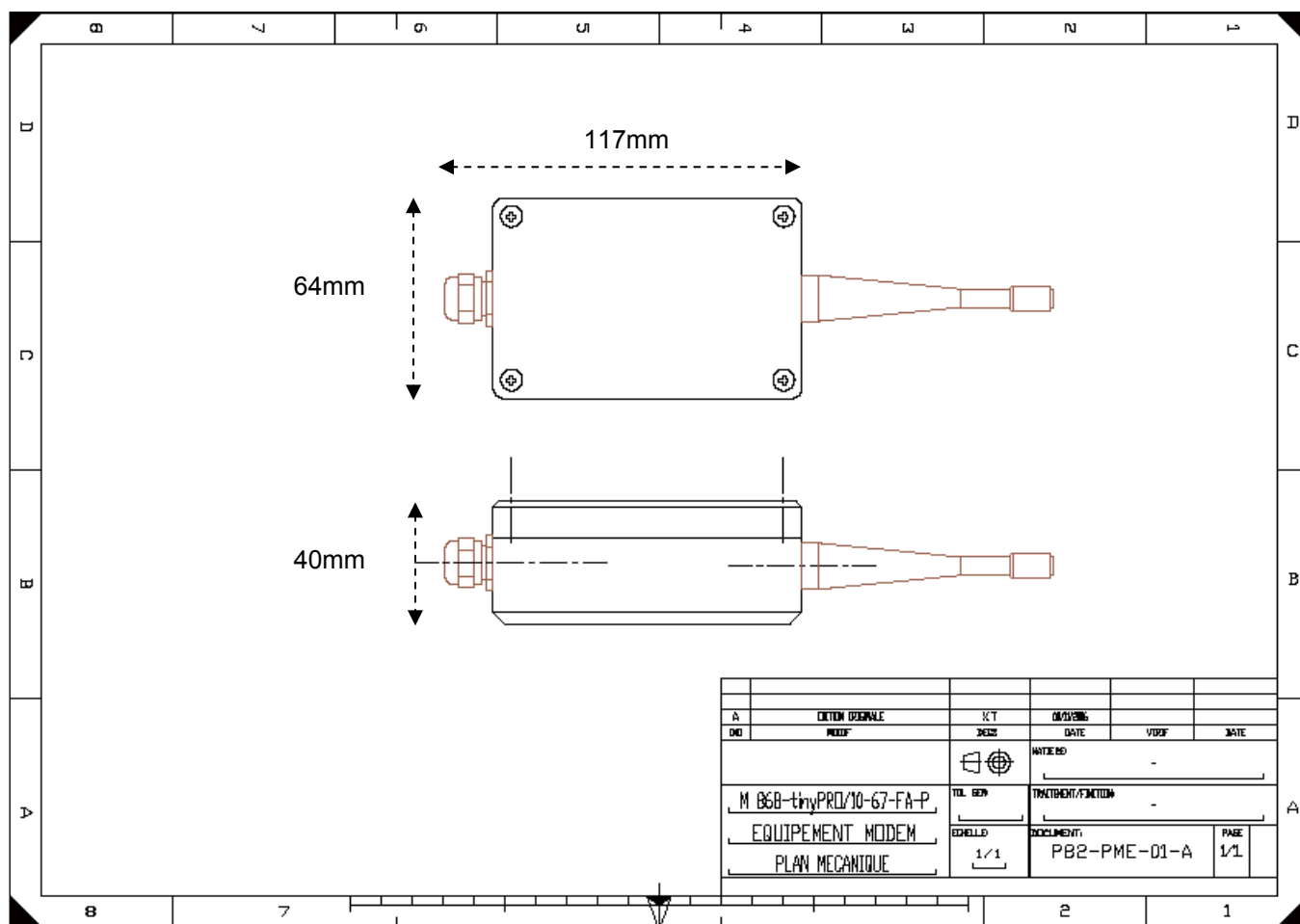**M 868 – TinyPro / 40 – XX – XX – P**

Casing type
67: Metallic IP67

Antenna option
RA: Removable Antenna
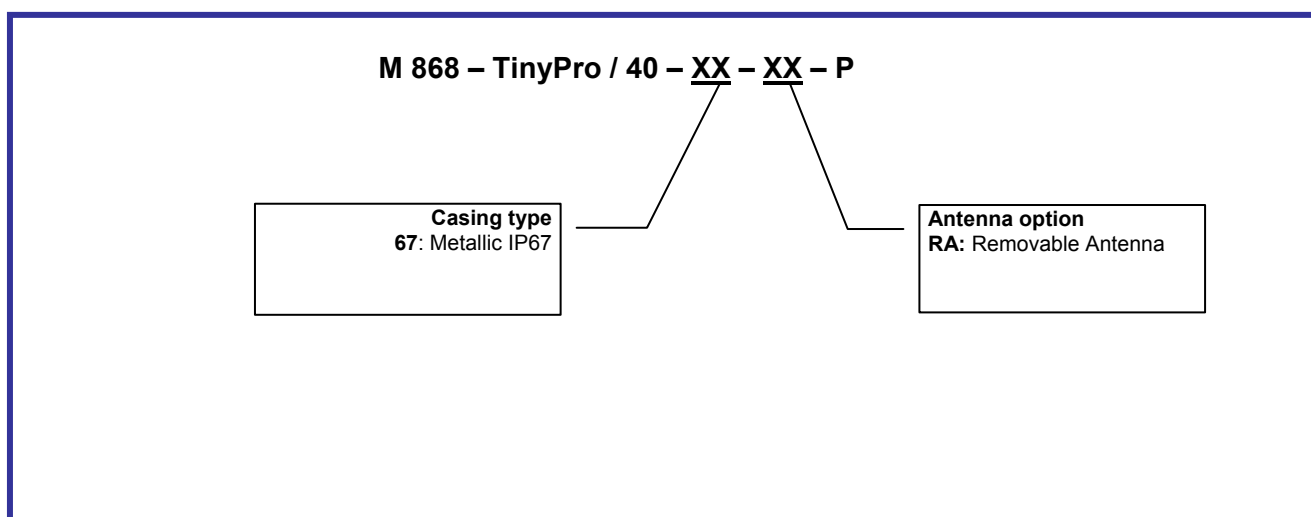
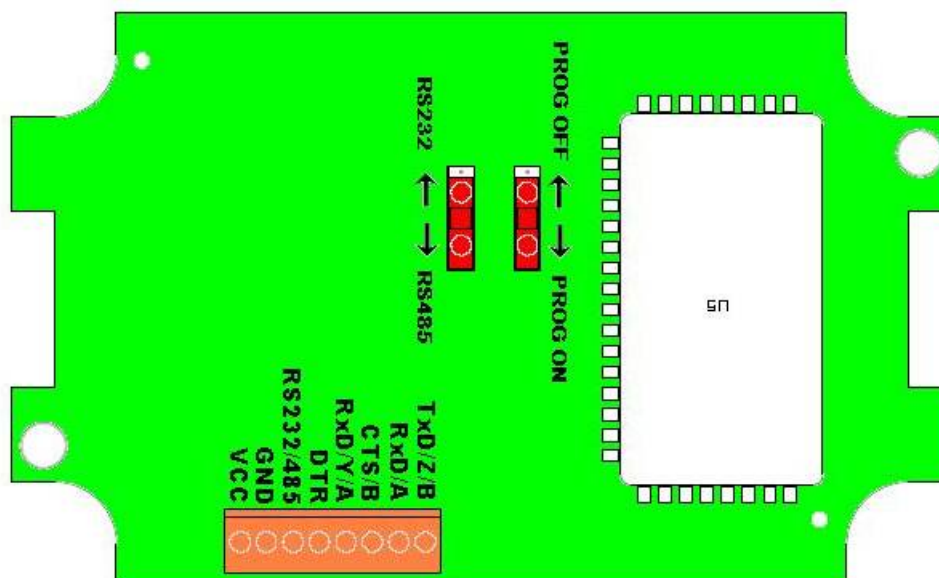# CHAPTER III.   MECHANICS AND CONNECTION

III.1. Mechanical Characteristics

- **_Mechanical Drawings_**

III.2. Connections

The terminal will communicate with the host through a cable connected to terminal blocks on the mother board inside the casing (orange part on the following drawing) :

> ➢ TxD, RxD: Serial link signals in RS232 format. TxD is for the data <u>going out</u> of the Terminal while RxD is for the data <u>coming into</u> the Terminal. The logic '1' is represented by signal between –3 and –15V.

> ➢ DTR: Stand-By signal into the Terminal. Switches the Terminal in Low-Power Mode ('1', -15V to -3V) or in Normal Mode ('0', +3V to +15V).

> ➢ RS232/485:   Used with the S215 Register, selects the type of serial link : open for RS232 (default, internal pull up 100 Kohms), GND for RS422 or RS485. Can be also made by RS232/485 switch.

> ➢ A, B, Y, Z :   RS422/RS485 signals.
> For RS422 use A (or Rx+), B (or Rx-), Y (or Tx+) and Z (or Tx-).
> For RS485, use only A (or D+) and B (or D-).

> ➢ CTS: Clear To Send: signal into the Terminal. Indicates if the Terminal can send serial data to the User (Active on '0', +3V to +15V) or not (Inactive on '1', -15V to -3V).

➢ RTS: Request To Send: signal going out of the Terminal. Indicates that the user can transmit serial data (Active on '0', +3V to +15V) or not (Inactive on '1', -15V to -3V). This signal switches when the serial reception buffer's filling rate reaches a programmable threshold (S218) or when the user finished transmitting serial data (out on Time-Out).

➢ 6-40V : 6 to 40 VDC power supply. There is no internal ON/OFF switch for the power supply. The switch off capability should be external.

Internal LED:
- Green: informs about association (blinks when searching for association, stays ON when associated)
- Red: indicates data reception (blinks each 5 seconds when receiving beacon)

Note: In case of the S-One stack green LED indicated transmission.

III.3. Cables Description

The associated cable is connected to the terminal blocks of the mother board and goes out of the terminal through a cable gland. The cable must be shielded and have an external diameter between 3.5 and 7mm. The conductors must have a cross section of 0.22mm² (24AWG).

Possible cable references:

Supplier	Reference	Description
NEXANS	*SMBL07x0.22*	7 conductors
ALPHA WIRE	*5118C*	8 conductors
TELIT	205.000.094	1 meter serial cable with subD-9 connector for RS232 and 2 points connector for power supply

- *Case of RS-232*

Connector (8 points)	Name Terminal Side	Color	Name PC/Automate Side	Connector Sub-D (9 points)
1	TxD (Transmit Data)	Blue	RxD (Receive Data)	2
2	RxD (Receive Data)	White	TxD (Transmit Data)	3
3	CTS (Clear To Send)	Brown	RTS (Request To Send)	7
4	RTS (Request To Send)	Yellow	CTS (Clear To Send)	8
5	DTR	Green	DTR	4
6	RS232/422-485	Orange	**Open**	
7	Gnd (ground)	Black	Gnd (ground)	5
8	Vcc (6 to 40v)	Red	Vcc (6to 40v)	

- *Case of RS-422:*

Connector (8 points)	Name Terminal Side	Color	Name Automate Side
1	Z or Tx- (Transmit Data)	Blue	B or Rx- (Receive Data)
2	A or Rx+ (Receive Data)	White	Z or Tx+ (Transmit Data)
3	B or Rx- (Receive Data)	Brown	Y or Tx- (Transmit Data)
4	Y or Tx+ (Transmit Data)	Yellow	A or Rx+ (Receive Data)
5	DTR	Green	Open
6	RS232/422-485	Orange	**GND (and S215=1)**
7	Gnd (ground)	Black	Gnd (ground)
8	Vcc (6 to 40v)	Red	Vcc (6 to 40v)

- *Case of the RS-485*

Connector (8 points)	Name Terminal Side	Color	Name Automate Side
1	B (Data-)	Blue	B (Data-)
2	open	White	Open
3	open	Brown	Open
4	A (Data+)	Yellow	A (Data+)
5	DTR	Green	Open
6	RS232/422-485	Orange	**GND (and S215=2)**
7	Gnd (ground)	Black	Gnd (ground)
8	Vcc (6 to 40v)	Red	Vcc (6 to 40v)

CHAPTER IV.
STANDARD FIRMWARE : DESCRIPTION OF THE FUNCTIONALITY

Telit terminals and boards are provided with an embedded software which allows to choose between different communication protocols and to play on numerous parameters.

M868-TinyPro terminal is available with the following firmwares :

- *S-ONE protocol stack:*
1. *Standard firmware.;* working in transparent or address secured mode..

- *M-ONE protocol stack:*
2. *Mesh Lite firmware,* allowing mesh networking : refer to dedicated manual (**[5]**) for detailed explanation.

This Chapter is dedicated to the S-ONE protocol stack.

NOTE: The available memory space on the terminal is limited and for this reason Standard and Telemetry firmware are available in the separate installation packages.

There are 2 different modes available for S-ONE protocol stack that are described in following paragraphs :

- The *configuration mode* which allows to parameter the terminal. It is set through the use of Hayes commands sent on the serial link.
- The *operating mode* which is the functional use for data transmission

IV.1. Configuration Mode

Hayes or 'AT' commands complies with Hayes protocol used in PSTN terminal standards. This 'AT' protocol or Hayes mode is used to configure the terminal parameters, based on the following principles:

- A data frame always begins with the two ASCII 'AT' characters, standing for 'ATtention'
- Commands are coded over one or several characters and may include additional data
- A given command always ends up with a <CR> Carriage Return

A	T	Command	Additional data	<CR>

Note: The delay between 2 characters of the same command must be less than 10 seconds

The only exception to this data-framing rule is the switching command from the operating/communication mode to 'AT Mode'. In this case only, the escape code ('+++') must be started and followed by a silent time at least equal to the serial time out. In this case only <AT> and <CR> shall not be used.

Below is the complete list of the 'AT' commands available on the M868-TinyPro terminal.

Command	Description
+++	**Hayes Mode Activation** '+++' command gives an instant access to the terminal's parameters configuration mode (Hayes or AT mode), whatever the current operating mode in process might be. '+++' command should be entered as one string, i.e. it should not be preceded by 'AT' and followed by <CR> but two silent times which duration is configurable via S214 register (Serial time-out). The time between two '+' must not exceed the time-out value. Hayes mode inactivates radio functions.
ATO	**Communication mode activation** 'ATO' command gives an instant access to the terminal's operating mode, configured in S220 register. 'ATO' command is used to get out of Hayes mode. Answer : OK or ERROR if the configuration is not complete
AT/V	**Terminal's firmware version** 'AT/V' command displays the terminal's firmware version number as follows: *Version <Product>: vX.YZn*
AT/S	**Terminal's registers status** 'AT/S' command displays status of all relevant registers of the terminal

ATSn?	**Register interrogation** 'ATSn?' command displays the content of Hayes register number n (Refer to the register description table). Some registers are standard for every Telit terminals while others are specific to some products. Answer : Sn=x<CR>
ATSn=m	**Register modification** 'ATSn=m' command configures Hayes register number n with the value m, e.g. ATS200=4<CR> enters the value '4' in the register S200. The value is automatically stored in the EEPROM memory. Answer : OK or ERROR

ATN	**RSSI interrogation**
	
	'ATN' command runs the received RF level measurement. This RSSI reading is continuously displayed each second until a new character arrives on the serial link.
	4 levels are available :
	  – '0' : received level < -87dBm
	  – '1' : received level between -87 and -82dBm
	  – '2' : received level between -82 and -77dBm
	  – '3' : received level > -77dBm

ATR	**Parameters reset** 'ATR' command resets all terminal's parameters to their default values. Answer : OK
ATP	**Stand By Activation** When serial stand by is set, the 'ATP' command put the terminal in stand by mode. To wake up the terminal, send a NULL (0x00) character.
ATBL	**Switch to Bootloader** 'ATBL' command escape from the main program and run the bootloader. This command is useful to update the firmware by serial or radio link. See the dedicated part for details.

Specific 'AT' commands have been integrated in order to make measurements in continuous mode.
These commands are stopped by the sending of a character.

Command	*Description*
ATT0	*Pure carrier transmission* at center frequency
ATT1	*Pure carrier transmission* representing '0'
ATT2	*Pure carrier transmission* representing '1'
ATT3	*Max modulated carrier transmission*
ATT6	*Min modulated carrier transmission*

Note 1 : *After an AT command (ended by <CR>), the serial link gives back result code, which is "OK" or "ERROR ".*

Note 2 : *"+++" command gives back OK.*

These commands are effective after a maximum delay of 10 mS ; the back code OK indicates the good execution of the command, and another command can be sent right after the back code OK.
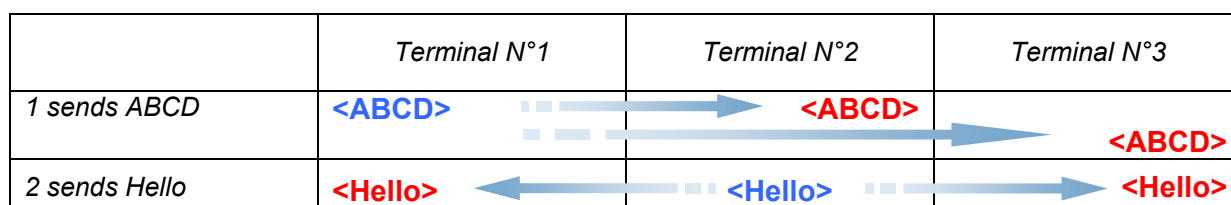
IV.2. Operating Mode

There are 4 communication protocols available on the M868-TinyPro terminal :

- Transparent mode : this is the default communication protocol of the terminal. The terminal transmits the data transparently, without encapsulation or addressing. It acts as a half duplex wired serial link (type RS485).

- Addressed Secured mode : it is a kind of multipoint network protocol. Each terminal can communicate with every terminal in the same network. All the frames are addressed, checked through a CRC and acknowledged.

- Downloader over the air : this is a specific communication protocol allowing re-flashing of remote terminal.

- Auto-repeat mode : this is a specific communication protocol in which the terminal sends back the frames it has received (radio or serial) without echoing. It allows the user to easily test the terminal remotely.

For the classical communication protocols (Transparent and Addressed Secured), an additional functionality is available : LBT (Listen Before Talk). It means that the transmitting terminal will scan the radio link and verify it is free (no radio activity) before sending its data to avoid collision.

- ***Basic Illustration of Transparent mode***

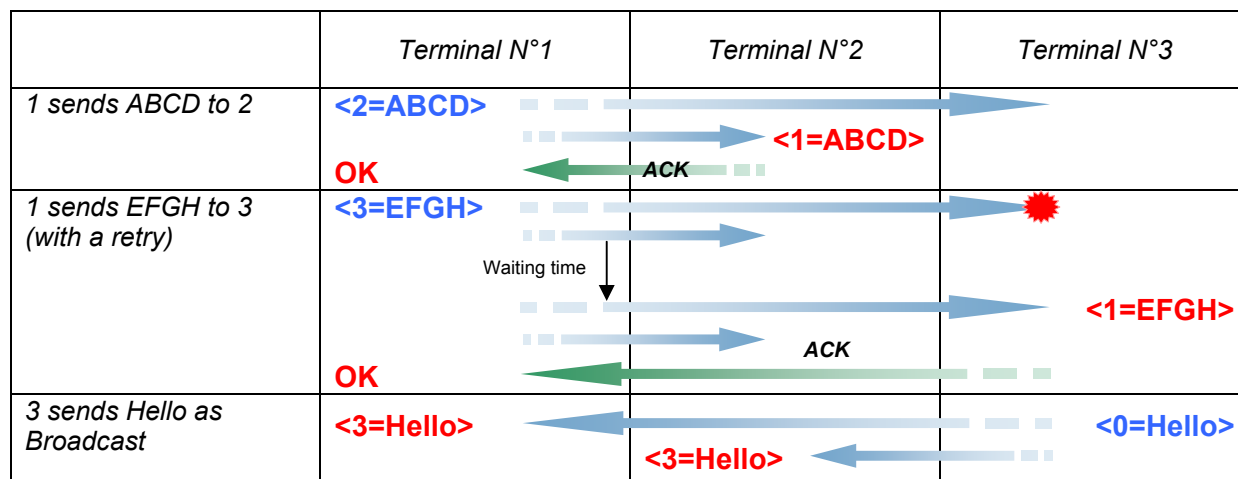|	Terminal N°1	Terminal N°2	Terminal N°3
1 sends ABCD	**<ABCD>**	**<ABCD>**	**<ABCD>**
2 sends Hello	**<Hello>**	**<Hello>**	**<Hello>**

<in blue> : data sent

<in red> : data received

▪ <u>**Basic Illustration of Addressed Secured mode**</u>

	Terminal N°1	Terminal N°2	Terminal N°3
1 sends ABCD to 2	**<2=ABCD>** **OK**	**<1=ABCD>** ACK	
1 sends EFGH to 3 (with a retry)	**<3=EFGH>** Waiting time **OK**	ACK	**<1=EFGH>**
3 sends Hello as Broadcast	**<3=Hello>**	**<3=Hello>**	**<0=Hello>**

✹ **Collision or error**

<in blue> : data sent

<in red> : data received

▪ <u>**Basic Illustration of Addressed Secured mode with LBT**</u>

	Terminal N°1	Terminal N°2	Terminal N°3
1 sends ABCD to 2 (radio link free)	**<2=ABCD>** *LBT = OK* **OK**	**<1=ABCD>** ACK	
1 sends EFGH to 3 (radio link not free)	**<3=EFGH>** *LBT = NOK* Waiting time *LBT = OK* **OK**	ACK	**<1=EFGH>**
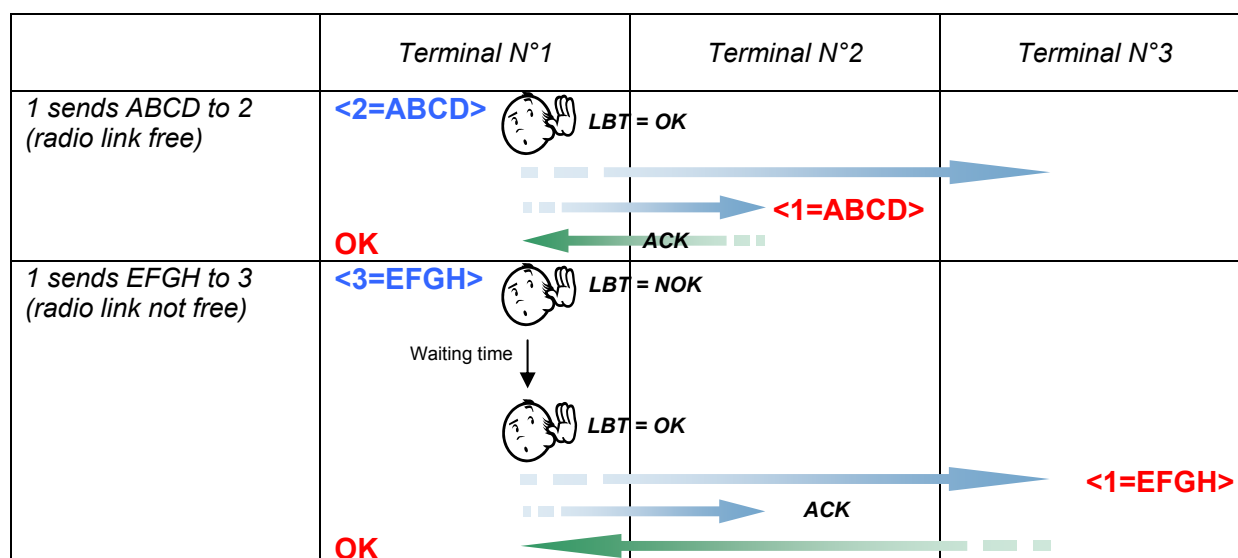
IV.3. Registers Detailed Use

The parameters to be configured via Hayes mode are stored in the terminal permanent memory, called S registers. Those registers are always listed as follow:
- S20x registers correspond to the radio parameters
- S21x registers correspond to the serial parameters
- S22x registers correspond to the operating parameters
- S24x registers correspond to the stand by parameters
- S25x registers correspond to the network parameters

- ### *Radio Configuration*

The Radio configuration is set via the S20x registers. Through them, you can:
- Change radio channel : S200,
- Change the radio baud rate : S201,
- Change the radio Output Power : S202,
- Modify the carrier length : S204,
- Change channelization : S206,

The radio parameters are preferably set in the following order :

1. **Channelization: S206**

This register allows to change the functioning mode : single or multi channel.

S206 value	Functioning mode
0	single channel
1	multi channel

The default value for this register is **S206=0.**

2. **Radio baud rate : S201**

This register allows changing the radio baud rate.

S201 value	Radio baud rate
0	4.8 kbps
1	9.6 kbps
2	19.2 kbps
3	38.4 kbps

When multi channel functioning is chosen (see register S206), this register is automatically set to '0'. When single channel functioning is chosen, the default value for this register is '3'.

3. Radio channel : S200

This register sets the radio channel used for the communication.

S200 value	Frequency
multi channel	
0	869.4125 MHz
1	869.4375 MHz
2	869.4625 MHz
3	869.4875 MHz
4	869.5125 MHz
5	869.5375 MHz
6	869.5625 MHz
7	869.5875 MHz
8	869.6125 MHz
9	869.6375 MHz
single channel	
10	869.525 MHz

When multi channel functioning is chosen (see register S206), S200 value can go from '0' to '9' and the default value is '0'. When single channel functioning is chosen, this register is automatically set to '10'.

4. Radio Output power : S202

This register allows to choose the output power of the terminal, between 25, 100 and 500mW. This parameter allows optimizing power consumption in function of the desired range.

S202 value	Output Power
0	25 mW
1	100 mW
2	500 mW

When multi channel functioning is chosen (see register S206), S202 value can go from '0' to '1' and the default value is '1'. When single channel functioning is chosen, S202 value can go from '0' to '2' and the default value is '2'

5. Radio carrier length : S204

This register sets the duration (in milliseconds) of the radio carrier sent before the data. It serves as synchronization frame for the receiver(s). The default value is 8 milliseconds (S204=8).

Usually, this register isn't modified. However, in some hostile environment (metallic parts, vibrations…) it can be raised to 20ms to have a more reliable synchronization. This will lower the over air throughput as it increase the non-data use of the radio.

6. Radio Whitening Character : S209

This register sets the value XOR with each character of the radio frame in order to avoid long sequences of 0s or 1s. If the user application sends frames containing series of 0x00 or 0xFF, the receiver can unsynchronized itself, thus the need for this whitening. To mix a frame of these types, use a value of 170 (Hex : 0xAA , Bin : 10101010)

▪ <u>*Serial link configuration*</u>

The serial link configuration is set via the S21x registers. Through them, you can:
  ↳ Set the serial baud rate : S210,
  ↳ Set the parity : S212,
  ↳ Set the number of stop bits: S213,
  ↳ Set the serial time-out : S214,
  ↳ Set the serial link type : S215,
  ↳ Set the flow control type : S216,

After each modification in the serial settings, the M868-TinyPro will answer 'OK' with the current configuration, and the changes will be effective immediately after.

The Serial parameters are preferably set in the following order :

1. <u>Serial Baud rate : S210</u>

This register selects the serial baud rate value. It is linked to the time-out register S214. They can be set with the following values :

S210 value	Serial baud rate	S214 minimum value
1	1 200 bps	17
2	2 400 bps	9
3	4 800 bps	5
4	9 600 bps	3
5 (default)	**19 200 bps**	**2**
6	38 400 bps	2
7	57 600 bps	2
8	115 200 bps	2

2. Serial timeout : S214

The M868-TinyPro is not able to know when a frame reception is finished on the serial link, but it needs this information to stop radio transmission in transparent mode, or to start sending data in the other modes.

This timeout is the indicator used to decide when the data frame is finished : if no character is received for a time equal to this timeout, the data frame is seen as finished and the terminal acts accordingly.

The default value is 5 milliseconds.

The Timeout value is of course in accordance with the serial baud rate : it must be at least equal to the length of 2 characters. See the table in the baud rate (S210) part of this chapter. For example, for a 19200 bps baud rate, the time to send 1 character (1 start bit + 8 data bits + 1 stop bit) is 521 µs, giving a squared up timeout value of 2 ms.

You can set a higher value to this timeout if you have some gaps in the sending of a frame.

3. Serial data format : S212 and S213

These registers set the format of the characters sent on the serial link :
- ✤ S212 : Parity. It can take three values : '1' for No Parity, '2' for Even Parity, or '3' for Odd Parity. The default value is '1'.
- ✤ S213 : Number of Stop bits: 1 bit or 2 bits. Default value is '1'.

The settings for the available configurations are :

Format type		Parity S212	Stop Bits S213
8/N/1	8 data bits, no parity, 1 stop bit	1	1
8/E/1	8 data bits, even parity, 1 stop bit	2	1
8/O/1	8 data bits, odd parity, 1 stop bit	3	1
8/N/2	8 data bits, no parity, 2 stop bits	1	2
8/E/2	8 data bits, even parity, 2 stop bits	2	2
8/O/2	8 data bits, odd parity, 2 stop bits	3	2
7/N/2	These configurations are only possible in transparent using the same settings as 8/N/1		
7/E/1			
7/O/1			

4. Serial type management : S215

The M868-TinyPro serial link can be configured to work in any of the 4 following modes:

- RS232 (S215=0, default value) : This is the standard full duplex serial link.
  It works on up to 5 signals (3 without flow control): RxD, TxD, RTS, CTS and GND, and uses +/-12V levels.
  It is the only serial link type allowing flow control.

- RS422 (S215=1) : Full duplex link on 4 wires(A,B,Y,Z) using voltage difference.

- RS485 (S215=2) : Half duplex link on 2 wires(A,B) using voltage difference.

- RS485-Full (S215=3) : Full duplex link on 4 wires(A,B,Y,Z) using voltage difference. Unlike the point-to-point RS422 protocol, it can be used for multipoint operations.

5. Flow control management : S216

In all the modes, the data coming from the serial link are stored in a buffer and then sent. Thus, it is necessary to have a flow control on the serial link to avoid a buffer overflow and the loss of data.

The M868-TinyPro manages three types of flow control :

- Hardware or CTS/RTS (S216=0) : the RTS signal from the M868-TinyPro will authorize the host to transmit data. The other way will be controlled by the CTS signal entering the terminal.

- Software or Xon/Xoff (S216=1) : the M868-TinyPro sends a Xoff character on the serial link to interrupt the transmission from the host, and a Xon character to resume. This control will only work from the M868-TinyPro to the host.

- None (**S216=2, default**) :the host must manage its outgoing data frames in order not to overflow the buffer.

This flow control is available for our virtual RS232 serial link .

Note 1 : in Hayes mode, the flow control is not active so as to be able to modify these registers without locking the serial link.

Note 2 : in Addressed Secured mode, the flow control works only by activating the default transmission address (S256 ≠ 0).

▪ *Operating Mode configuration*

The Operating mode configuration is set via the S22x registers. Through them, you can:
- ↳ Set the operating mode : S220,
- ↳ Set the number of retries: S223,
- ↳ Set the LBT: S226
- ↳ Set the random waiting time : S227

The Operating Mode parameters are preferably set in the following order :

1. Operating Mode : S220

This is the most significant register : it tells how the M868-TinyPro must run. The available operating modes are :

Value	Mode
1	Transparent Mode (default)
9	Addressed Secured Mode
12	Downloader over the air
14	Auto-repeat Mode

2. LBT : S226

This register allows activating and setting up the LBT functionality. The LBT sensitivity refers to the detected RF level over which the RF link is considered as occupied.

Value	LBT	Comment
0	OFF (default)	no LBT
1	ON with high sensitivity	LBT with detection for RF >-87dBm
2	ON with medium sensitivity	LBT with detection for RF >-82dBm
3	ON with low sensitivity	LBT with detection for RF >-77dBm

3. Number of repetitions : S223

This register is used in Addressed Secured mode. It is the number of times the message will be repeated in case of non acknowledgement, or the number of times the terminal will try to send the message in case of the radio link is not free (when LBT functionality is activated).

This register is set to 2 as default. It is enough in most of the configurations.

4. Random waiting time : S227

This register activates a random waiting time before every radio transmission (except for acknowledge). When LBT functionality is ON, it is automatically activated. The random waiting time is comprised between 0 and 64mS.

S227 value	Random Waiting Time
0 (default)	OFF
1	ON

▪ **Network Configuration**

The configuration to use the M868-TinyPro in Addressed Secured mode is done with the S25x registers. Through them, you can:
- Set the Network ID : S250,
- Set the Client Address : S252,
- Set the Network options : S255,
- Set a default address for transmission : S256.

The parameters are preferably set in the following order:

1. **Network ID : S250**

When in Addressed Secured operation, M868-TinyPro terminals can communicate only if they are parts of the same 'network'.

There can be up to 65535 networks defined, but only one can work in a given area in each radio channel. If you want to place more than one network in the same area, use different radio channels and not different network numbers.

The default value is 0.

2. **Network Options : S255**

When running in Addressed and Secured mode, this register contains the option flags used to configure the operation.

This register is a group of 4 flag bits :

Bits	7	6	5	4	3	2	1	0
Name	-	ACK	2B	Ret	-	NH	CR	N°

- *Header* (Bit 0, **default 1**) : if set to 1, the frames sent on the serial link will be preceded with a header showing the sender address. This frame will be as follows, for each settings of the bit 2:
  "1=data" if the header is ASCII
  "<0x01>data" if the header is numeric
  If set to 0, the receiver will not know where the frame comes from

- *Carriage Return* (Bit 1, **default 0**) : if set to 1, the frame sent on the serial link will be followed by a CR character (<0x0D>).

- *Numeric Header* (Bit 2, **default 0**) : Used when bit 0 is set to 1, it selects the type of header for transmission or reception to ASCII (0) or numeric (1).

✤   *Status answer* (Bit 4, **default 0**) : defines if the M868-TinyPro returns a transmission status after sending a frame. If set to 1 (no answer), the terminal will give no information if the frame has been received on the remote side or not. If set to 1 (answer), it returns OK if the acknowledge has been received, ERROR otherwise.

✤   *2 bytes Numeric Header* (Bit 5, **default 0**) : Used when bit 2 is set to 1, it defines if the numeric header is on 1 byte (0) for less than 255 terminals, or 2 bytes (1) for up to 65535 terminals. This bit has no effect if the header is ASCII (Bit 2 = 0). The frames sent and received will be as follows :
"<0x01>Data" if this bit is set to 0
"<0x00><0x01>Data" if this bit 5 is set to 1

✤ $\overline{ACK}$ (Bit 6, **default 0**) : Radio Acknowledge disable: if '1', the radio Ack is disable and any secured radio frames are not acknowledged. This is useful when several clients have the same ID in a network.

3.   Client Address: S252

The user can set a Client number between 1 and 65535. The client numbers must all be different in a network.

The default value is 0.

4.   Default transmission Address: S256

If this register is different from 0, the frames received on the serial link will be sent to this address, without any header detection done.

This register is useful to set a Network-like system with up to 65534 clients and one server, and/or when the clients are not able to manage the frame header.

IV.4. Registers List

Numbers in **bold** indicate the default value

Access	Register	Name	Description
Access	**Register**	**Name**	**Description**
General			
R	S192	Serial Number	Serial number of the terminal, the one present on the sticker. Read-only register.
Radio			
R/W	S200	Channel	Indicates the channel number, depending on the channelization (S206) Single channel : value **10** Multi-channel : between **0** to 9
R/W	S201	Radio Baud-Rate	Indicates the radio bit rate, depending on the channelization (S206). Single channel : between 0 to **3** Multi-channel : value **0** • '0': 4800 bits/s • '1': 9600 bits/s • '2': 19200 bits/s • '3': 38400 bits/s
R/W	S202	Output Power	Radio power output in milliwatts, depend of the channelization (S206). Single channel : between 0 to **2** Multi-channel : between 0 to **1** • '0' : 25 mW • '1' : 100mW • '2' : 500mW
R/W	S204	Radio Carrier Length	Indicates the radio carrier length in milliseconds. This carrier is sent before each data frame and is used to synchronize the receiver. Between 5 and 60mS. **Default : 8 ms.**
R/W	S206	Channelization	Indicates channelization. • **'0' : single channel (default)** • '1' : multi channel
R/W	S209	Radio Whitening Character	Indicates the XOR value for radio data. Between **0** and 255.

Access	Register	Name	Description

		Serial Link	
R/W	S210	Serial Speed.	Indicates the speed on the Serial Connection '1': 1200 bits/s **'5': 19200 bits/s** '2': 2400 bits/s '6' : 38400 bits/s '3': 4800 bits/s '7' : 57600 bits/s '4': 9600 bits/s '8' : 115200 bits/s The time out value must be compatible with the serial speed: _Min. time-out (S214)_ / _Serial Speed (S210)_ 17 ms / 1200 bits/s 9 ms / 2400 bits/s 5 ms / 4800 bits/s 3 ms / 9600 bits/s 2 ms / ⩾19200 bits/s
R/W	S212	Parity	Serial Link Parity Type: • **'1': None (default) ,** • '2': Even, • '3': Odd.
R/W	S213	Number of Stop bits	Serial Link Stop Bits : • **1 bit (default),** • 2 bits.
R/W	S214	Serial Link Time Out	Indicates the value of the time-out on the serial link. The time out value must be compatible with the serial speed: (see S210 register description). Between 2 and 100 milliseconds **Default : 5.**
R/W	S215	Serial type	Selects the type of serial link used: **'0' : RS232** '1' : RS422 '2' : RS485 '3' : RS485 full duplex The selection between RS232 and the other modes is done with the RS232/RS485 hardware signal (pin 6 on the terminal blocks) or through the switch
R/W	S216	Flow Control	Indicates flow control type: • '0': Hardware: CTS/RTS • '1': Software: Xon/Xoff • **'2': None (default)**

Access	Register	Name	Description

		Operation	
R/W	S220	Function Mode	Operating mode of the Terminal : • **'1' : Transparent** • '9' : Addressed Secured • '12' : Downloader over the air • '14' : Auto-repeat
R/W	S223	Number of Retries	Number of retries in case of non-Ack response to a message (addressed secured mode) mode, or in case of non free radio link (LBT). Included between 0 and 255 (255 means retry until success). **Default value: 2**
R/W	S226	LBT	LBT ON / OFF, and sensitivity • **'0' : OFF** • '1' : ON with high sensitivity • '2' : ON with medium sensitivity • '3' : ON with low sensitivity
R/W	S227	Random Waiting Time	Random waiting Time ON / OFF • **'0' : OFF** • '1' : ON

		Low Power	
R/W	S240	Type of Low-power	Indicates whether the low power control pin is used or not • **'0': No Low Power (default)** • '1': Stand-By activated by Hardware pin • '2': Stand-By activated by Serial

Access	Register	Name	Description

		Network Control		
R/W	S250	Network ID	Network Number on 2 Bytes. **Default : 0**
R/W	S252	Client Number	Client Number on 2 Bytes. Between 0 and 65535. **Default : 0**
R/W	S255	Network Options	Indicates the Network options. 4 bits are used :

Bits	7	6	5	4	3	2	1	0
	-	$\overline{ACK}$	2B	Ret	-	NH	CR	N°

Default value : 01.

➢ Bit **'N°'**: indicates whether the received frame begins with the Client ID (**1**) or not (0).
➢ Bit **'CR'**: indicates whether the received frame ends with the 'Carriage Return' character (0x0D) (1) or not (**0**).
➢ Bit **'NH'**: indicates whether the format in Transmission (and in reception, if the Bit 'N°' is activated) is ASCII (1=Data) (**0**) or Numeric (<0x01>Data) (1).
➢ Bit **'Ret'**: Indicates if the 'OK' should be returned after each radio transmission (**0**) or not (1).
➢ Bit **'2B'**: In case of a Numeric Header (bit 'NH'=1) indicates if the header is on 1 bytes (**0**) or 2 bytes (1). Used if you have more than 255 terminals in your system.
➢ Bit **'/ACK'** : Disable the radio acknowledgement (1) or enable (**0**).

R/W	S256	Default Address	Indicates the default address to which every radio frame will be sent. **Default : 0** (inactive)

IV.5. Configuration Example

We will describe in this paragraph how to parameter the terminals in order to set up 2 different Addressed Secured configurations :
- One classical configuration where all the terminals in the network can communicate to each others.
- One specific configuration equivalent to a Client/Server configuration, also called "Star" network, where communications are able only between the Server and the Clients.

| CLASSICAL	CLIENT/SERVER	
All	Server	Clients
ATS220=9	ATS220=9	ATS220=9
ATS223=X (up to customer choice)	ATS223=X (up to customer choice)	ATS223=X (up to customer choice)
ATS226=X (up to customer choice)	ATS226=1, 2 or 3 (up to customer choice)	ATS226=1, 2 or 3 (up to customer choice)
ATS227=X (up to customer choice)	ATS227=1	ATS227=1
ATS250≠0	ATS250≠0	ATS250≠0
ATS252=1 to N	ATS252=255 or 65535	ATS252=1 to N except 255 or 65535
ATS255='0X0X00X1' (in binary)	ATS255='000X00X1' (in binary)	ATS255='000X00X1' (in binary)
ATS256=X (up to customer choice)	ATS256=0	ATS256=255 or 65535

IV.6. Terminals reflashing

M868-TinyPro terminals are re-flashable through the serial link.

To reflash the terminal, switch off the power supply, open the casing, put the "PROG" switch on "ON" position, and switch on the power supply. Then, a specific software tool "TinyTools" is necessary. Refer to its user manual (**[4]**) for detailed explanation.
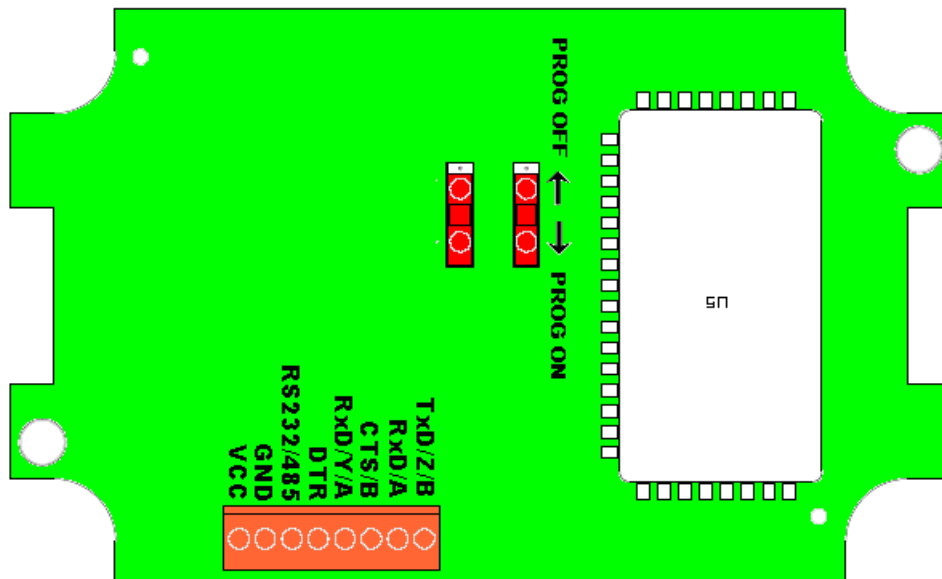
IV.7. Configuration and Download Over The Air (DOTA)

TinyPro terminal includes the new DOTA functionality. This function is able to change or update the firmware of a remote terminal, using a local terminal. In this application, the new firmware is sent through the radio link to another device without the need of any hardware intervention on the remote device. All steps of the process can be done from a local radio terminal connected to a computer.

Hardly accessible remote terminal to be updated or configured

Local terminal

Firmware or settings are sent through the air without any access to the remote device
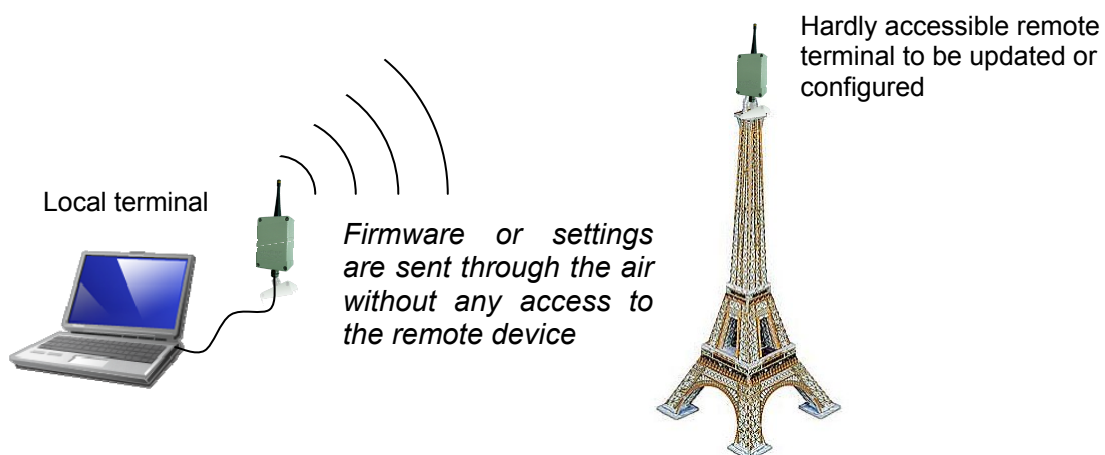
Completing DOTA, the configuration over the air functionality gives access to the Hayes mode of a remote terminal. Thanks to it, you can adjust all the settings of a terminal without physical access to it.

Both functionalities are available through a specific software tool "TinyTools". Refer to its user manual (**[4]**) for detailed explanation.

CHAPTER V.   ANNEXES

V.1. Terminals' Installation: Principles and cautions

➢ You must use the power supply and serial cable provided by Telit with the terminal. Take care of the polarity for the power supply connection (red wire +Vcc, black wire GND).

➢ The ON/OFF switching capability of the power supply is external to the terminal.

➢ The radio environment should be closely studied prior to any installation with a spectrum analyzer in order to determine whether and where the installation will be optimal.

➢ In case of outdoor installations, IP casings are recommended.

➢ In case of a ceiling installation, the terminal should be mounted upside down for a better radiation

➢ A 1 m distance between two terminals should be respected under 25 mW power output, at least 2 m at 100 mW and 3 m at 500 mW.

➢ The terminals should be located as high and as free as possible so that a line of sight propagation is established between terminals.

➢ The terminal should not be surrounded by metallic masses because of the disturbances caused by a reflection phenomena.

➢ The electrical disturbances can come from various sources and should be avoided

     o   Engines
     o   High current devices
     o   Power relays, transformers
     o   Etc...

➢ The radio disturbances should also be avoided:

     o   System in the same frequency band such as cars remote control systems.
     o   Systems in a nearby frequency band such as high power (2 W) talkie-walkie systems.

➢ Vibrations and/or shocks can also be source of disturbances. It is therefore advised to mount the terminals in silent-blocks in order to stabilize it whenever necessary.

➢ Distances, obstacles and weather conditions can strongly affect radio communications and cause disturbances as well as communication breakdowns.

V.2. Connection to a RS422 or RS485 interface

M868-TinyPro terminal is configured in RS232 mode by default : it allows to directly connect it on a PC serial port.

To configure the terminal in RS422 or RS485 mode :

- ✥ Go to Hayes Mode and configure S215 Register : set to '2' for RS485 and to '1' for RS422.

- ✥ Power Off the terminal.

- ✥ Connect RS485 or RS422 serial link to the terminal.

- ✥ Connect RS232/422 pin to GND or set RS232/485 switch to RS485 side.
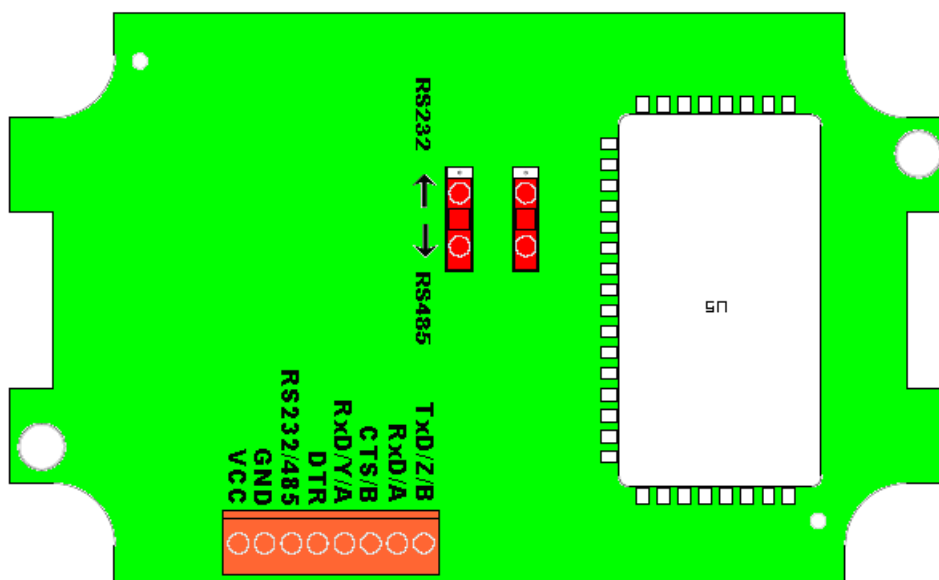
- ✥ Power On the terminal.

N.B.1: if you Power off Board and set RS232/422 pin open, RS485/RS422 is inactivate and RS232 is activate.

V.3. ETSI 300 220-3 Version 1.3.1 standards (summary)

ETSI EN 300 220

The ETSI EN 300 220 specifies in detail the requirements and test methods to be used for type approvals of licence free operated radio equipment. The following is a summary of the most important requirements. The complete document can be downloaded from www.etsi.fr.

Frequency error (section 8.1)
The maximum frequency error depends on type of use; base/mobile or portable, and of the channel separation. The requirement applies only when a channel spacing is specified.

Frequency band	10/12.5kHz channel spacing	20/25 kHz channel spacing	Comment
300-500 MHz	1 / 1.5 / 2.5	2 / 2 / 2.5	Figures is in kHz for base/mobile/portable
500-1000MHz	N.A.	2.5 / 2.5 / 3	

Carrier power, conducted (section 8.2)
This requirement applies for equipment with external antenna connector. The maximum power depends on equipment class. The class is found in the table on page 4

Class	Maximum power mW / dBm
7a	5 / 7
8	10 / 10
9	25 / 14
11	100 / 20
12	500 / 27

Effective radiated power (section 8.3)
This requirement applies for equipment with dedicated or integral antenna. The test method is different from equipment with external antenna connector, but the test limits are the same as above.

TX modulation (section 8.4)
This test apply to analogue speech systems only (FM and AM).

Adjacent channel power (section 8.5)
This test is applicable for equipment operating in bands with specified channel separation and bandwidths.

For 25kHz channel spacing, which is the narrowest channel spacing used in the 868MHz band, the test receiver bandwidth and filter shape for the adjacent channel is specified as follows:

Offset kHz	Attenuation dB
6	-2
8	-6
9.25	-26
13.25	-90

(There is special test instruments made for this kind of measurements, for example the Rhode & Swartz test receiver CMTA 84)

The test should be used using test modulation patterns D-M3 (package) or D-M2 (data steam).

The requirement for 25kHz channel spacing is 200nW = -37dBm for normal test conditions, and 640nW = -32dBm for extreme test conditions.

Modulation bandwidth for wideband equipment (>25kHz) (section 8.6)
This test is applicable when no channel spacing is specified, or channel spacing is larger than 25kHz.

The power envelope shall be measured with a spectrum analyser, RBW=100 Hz, VBW=10kHz, using the maximum hold display function. The bandwidth is defined as the bandwidth of the power envelope where the power is above the required spurious level. The spurious level limit is 250nW = -36dBm.

Spurious emission (section 8.7)
The spurious emission is a measurement of unwanted emitted signals. The device shall be measured without modulation applied.

If the carrier frequency is < 470 MHz the equipment shall be measured for unwanted emissions from 9kHz to 4 GHz. If the carrier frequency is >470 MHz, the upper limit is 12.75 GHz.

All spurs except emission at the intended channel and the adjacent channels shall be measured. The requirement is given in the table, and illustrated in the figure below.

State	47-74 MHz 87.5-118 MHz 174-230 MHz 470-862MHz	Other frequencies below 1000 MHz	Above 1000 MHz
Operating	4nW = -54 dBm	250nW = -36dBm	1µW = -30dBm
Standby	2nW = -57dBm	2nW = -57dBm	20nW = -47dBm

Spurious emission requirement
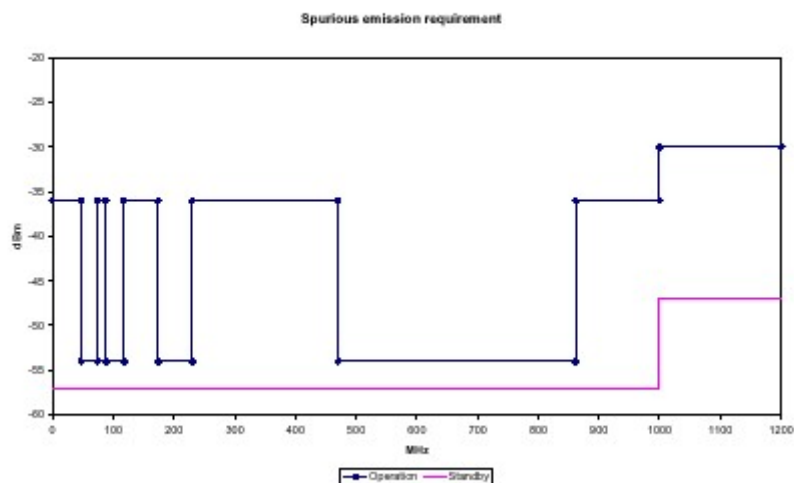
Frequency stability for low voltage, battery operation (section 8.8)

This requirement applies for battery operated equipment only.

The requirement is that when reducing the operating voltage to zero, the equipment should stay on the desired frequency, or cease to function altogether.

Duty cycle (section 8.9)
This requirement states the transmitter on/off ratio measured during 1 hr period. The duty cycle ratio is found in the table on page 4.

Receiver spurious radiation (section 9.1)
For equipment with integral antenna the radiated emission from the receiver shall be measured. Equipment with external antenna connector shall be measured for both conducted spurious emission and cabinet radiation.

If the carrier frequency is < 470 MHz the equipment shall be measured for unwanted emissions from 9kHz to 4 GHz. If the carrier frequency is >470 MHz, the upper limit is 12.75 GHz.

The radiation limit is given in the table below.

State	Below 1000 MHz	Above 1000 MHz
Receive	2nW = -57dBm	20nW = -47dBm

Receiver spurious response or blocking (section 9.2)
The ETSI standard does not give any mandatory requirements to receiver spurious response or blocking.

V.4. Examples of propagation attenuation

Factor	433 MHz		868 MHz		2.4 GHz	
	Loss	Attenuation	Loss	Attenuation	Loss	Attenuation
Open office	0 %	0 dB	0 %	0 dB	0 %	0 dB
Window	< 5 %	< 1 dB	15 %	1 – 2 dB	30 %	3 dB
Thin wall (plaster)	25 %	3 dB	35 %	3 – 4 dB	50 %	5 – 8 dB
Medium wall (wood)	40 %	4 – 6 dB	50 %	5 – 8 dB	70 %	10 – 12 dB
Thick wall (concrete)	50 %	5 – 8 dB	60 %	9 – 11 dB	85 %	15 – 20 dB
Armoured wall (reinforced concrete)	70 %	10 – 12 dB	80 %	12 – 15 dB	90 %	20 – 25 dB
Floor or ceiling	50 %	5 – 8 dB	60 %	9 – 11 dB	85 %	15 – 20 dB
Armoured floor or ceiling	70 %	10 – 12 dB	80 %	12 – 15 dB	90 %	20 – 25 dB
Rain and/or Fog	90 %	20 – 25 dB	95 %	25 – 30 dB	?? *	?? *

* = *Attenuations increase along with the frequency. In some cases, it is therefore difficult to determine loss and attenuation value.*

Note = *The table above is only indicative. The real values will depend on the installation environment itself.*

V.5. Declarations of Compliance

DECLARATION OF CONFORMITY

We,
  Telit RF Technologies

Of:
  Rue Evarist Galois
  06410 BIOT
  FRANCE

declare under our sole responsibility that the product:

TinyOne Pro 868MHz Terminal

Radio terminal for wireless data transmission in 868MHz ISM band

to which this declaration relates is in conformity with all the essential requirements of the European Directive 1999/05/EC (R&TTE).

The conformity with the essential requirements of the European Directive 1999/05/EC has been verified against the following harmonized standards:

RF spectrum efficiency (R&TTE art. 3.2)	EN 300220 -2 Version 2.1.1
EMC (R&TTE art. 3.1b)	EN 301489 -3 Version 1.4.1
Electrical Safety and Health protection (R&TTE art. 3.1a)	EN 60950 -1/A11 and EN 50371

All the tests related to this conformity have been done by the notified organism:

  EMITECH

  3 rue des Coudriers
  ZA de l'Observatoire - CAP 78
  78180 MONTIGNY LE BRETONNEUX
  FRANCE

  Identification number: 0536

Biot, **14th April 2009**   _____

<Xavier TATOPOULOS – R&D Manager>

EMITECH ATLANTIQUE

1/2

ORGANISME NOTIFIE n° 0536 / NOTIFIED BODY n° 0536

AVIS D'EVALUATION DE CONFORMITE

OPINION OF CONFORMITY ASSESSMENT

AEC N° 288
AF–35–07101227-1

Evaluation de la conformité d'un équipement radioélectrique selon l'article 10 de la Directive R&TTE 1999/5/CE / *Conformity assessment of a Radio equipment, according to article 10 of Directive 1999/5/EC.*

Société / Company
Nom / *Name* : ONE RF Technology
Adresse / *Address* : Emerald Square – Bâtiment D
Rue Evariste Galois
06410 SOPHIA – ANTIPOLIS
FRANCE

Tél. : 04.97.21.33.10   Fax : 04.97.21.33.11   Mail : info@one-rf.com
Demande en date du / *Date of request* : 25 septembre 2007 / *25 September 2007*

concernant la conformité aux exigences essentielles de l'équipement radioélectrique suivant / *concerning the conformity to essential requirements of the following Radio equipment :*

Identification de l'équipement / *Equipment identification*
Marque et désignation commerciale / *Brand and Trade name:*   TinyOne Pro 868MHz RF Modem
M868-tiny-pro

Type /*Type* :   40-67-FA-P

Genre :   Emetteur-récepteur / *Transceiver*   Utilisation/ *Use* :   Mobile / *Mobile*

Application prévue / *Intended use*: Modem de transmission de données / *Data transmission modem*

Après examen du dossier technique présenté par la Société mentionnée ci-dessus, et compte tenu des observations notées ci-après, EMITECH émet :
Following the examination on technical file presented by the Company mentioned above, and considering observations opiniond hereafter, EMITECH issues:

un avis FAVORABLE / *a POSITIVE opinion*

sur la conformité de l'équipement susmentionné aux exigences essentielles de la directive 1999/5/CE / *on conformity to essential requirements of 1999/5/EC directive of the above mentioned equipment.*

Montigny, le : 03 octobre 2007

Pour / *On behalf of* EMITECH :   Yvon JUDEAUX

Ce document ne doit être photocopié que dans son intégralité / This document must only be photocopied in its entirety

Emitech C128 Rév.1

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S.A. au capital de 480 000 € - R.C.S. VERSAILLES 344 545 645 - APE 742C

EMITECH   AEC N° 288 (AF-35-07101227-1)   2/2

ORGANISME NOTIFIE n° 0536 / NOTIFIED BODY n° 0536

- Conformité aux exigences essentielles / *Conformity to essential requirements* :

Article de la directive / *Directive article*	Référence et origine du document justificatif / *Supporting document reference and origin*	Normes / Standards
3.1 (a) Sécurité Electrique / *Safety* Protection de la santé / *protection of the health*	☒ Rapport / *Report:* N° RA-26-07101227-1 du laboratoire Emitech Atlantique / *from Emitech Atlantique laboratory* ☒ Déclaration de conformité R&TTE / *R&TTE Declaration of conformity*	EN 60950-1 (01) /A11 (04) EN 50371
3.1 (b) CEM / *EMC*	☒ Rapport / *Report:* N° RA-22-07101227-1 du laboratoire Emitech Atlantique / *from Emitech Atlantique laboratory*	EN 301 489-3 V1.4.1
3.2 Utilisation efficace du spectre radioélectrique / *Effective use of radioelectrical spectrum*	☒ Rapport / *Report:* N° RA-24-07101227-1 du laboratoire Emitech Atlantique / *from Emitech Atlantique laboratory* Série d'essais réalisés pour un équipement fonctionnant dans une bande large (> à 200 kHz) et pour un récepteur de classe 2, déclaré par le présentateur / *Tests carried out for equipment operating on a wideband frequency (> to 200 kHz) and for a receiver of class 2, declared by the applicant.*	EN 300 220-2 V2.1.1
3.3 autres exigences/ *other requirements*	-	-

Référence du rapport de synthèse EMITECH / *Reference of EMITECH synthesis report* : RT-35-07101227. (document interne / *internal document*)

- Observations / *Observations* :

❏ Néant / *Pointless*

❏ Le présent avis ne concerne que les exigences essentielles mentionnées ci-dessus et ne constitue en aucune façon une garantie sur les caractéristiques d'interfonctionnement de l'équipement avec un réseau ouvert au public / *The present opinion is limited to the essential requirements mentioned above and does not give any guaranties on interworking capabilities of the equipment towards open public networks.*

Cet avis ne prend pas en compte les éventuelles dispositions particulières de chaque Etat Membre concernant la bande de fréquence utilisée, selon l'article 6.4 de la directive / *This opinion does not take into account the possible requirements of each Member States concerning the frequency band used, according to article 6.4 of the directive.*

Cet avis résulte de l'examen d'un dossier et d'essais effectués sur un exemplaire des produits, il n'implique pas une appréciation de l'ensemble de la fabrication des produits en série.
This opinion result of technical construction file examination and/or tests results performed on one sample, it does not implicate a valuation of all manufactured equipments.

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