

# MIPOT NETWORK LONG RANGE TRX COMMAND REFERENCE

Product Code: **32001345**

32001345 is a **Lora™ technology**-based transceiver operating in the 868 MHz SRD band, optimized for **ultra-long range, low consumption applications**, suitable for **low power networks**.

In addition to its unparalleled range, spread spectrum modulation also allows great immunity to interferers.

With its embedded proprietary stack implementing Physical, MAC and Network layers, its **small LCC form factor** (15.5 x 26 mm only) and **low current consumption**, this module allows the implementation of highly integrated low power (battery operated) solutions for Internet of Things (IoT) applications, security systems, alarms, sensor networks, metering, smart buildings, agriculture, supply chain.

This pre-certified solution allows easy integration into final application **reducing development time, costs and time-to-market**.

Two configurable GPIOs enhance module versatility enabling stand-alone applications without need for an external microcontroller.

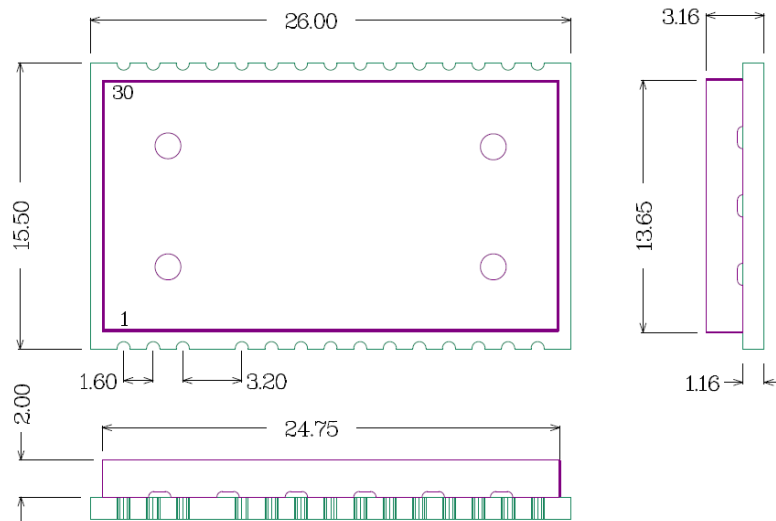
The module meets all the requirements in the **industrial temperature range -40/+85°C**.

The module is certified according to R&TTED 1999/05/EC and designed to be compliant with Radio Equipment **Directive (RED) 2014/53/EU**.

Compliant with ReACH and ROHS directives.



## 1. MECHANICAL CHARACTERISTICS



ALL DIMENSIONS ARE IN MILLIMETERS  
GENERAL TOLERANCE  $\pm 0.1$ MM

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HI-TECH COMPANY

RF  
WIRELESS

## 2. DESCRIPTION

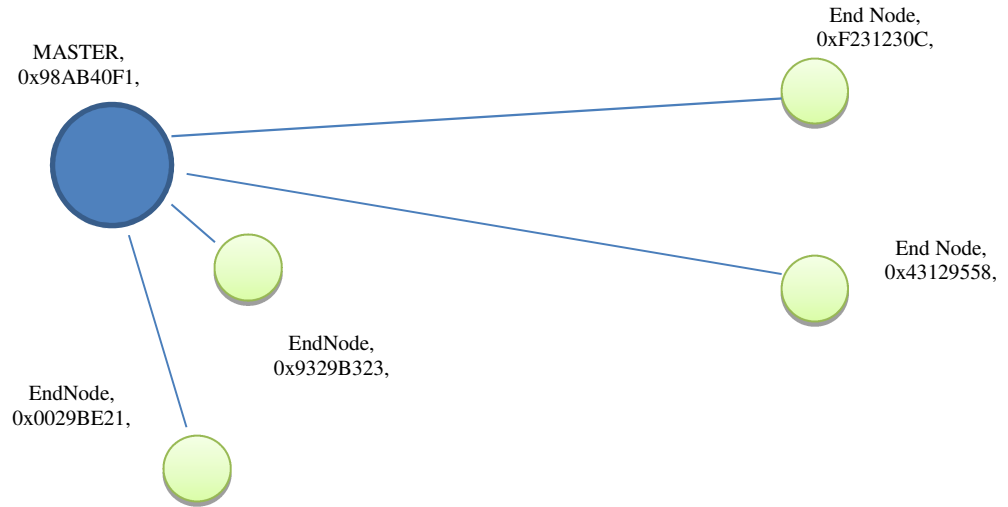
Pin	Name	Pin type	Description	Notes
1	GND	Supply	Ground (0 V)	
2	RF I/O	A IN/OUT	Tx: output RF Rx: input RF	Note 3
3	GND	Supply	Ground (0 V)	
5	NU	NC	Not Used Pin – do not connect	
6	NDATA_INDICATE	D OUT	Data Indicate Pin	
7	NWAKE	D IN	Wake-up Pin	
8	NU	NC	Not Used Pin – do not connect	
9	NU	NC	Not Used Pin – do not connect	
10	NU	NC	Not Used Pin – do not connect	
11	UART TX	D OUT	UART TX Pin	
12	UART RX	D IN	UART RX Pin	
13	NU	NC	Not Used Pin – do not connect	
14	NU	NC	Not Used Pin – do not connect	
15	GND	Supply	Ground (0 V)	
16	GND	Supply	Ground (0 V)	
17	Vcc	Supply	Power supply	
18	SWDAT	NC	Reserved for programming – do not connect	
19	SWCLK	NC	Reserved for programming – do not connect	
20	SWV	NC	Reserved for programming – do not connect	
21	NRST	D IN	Reset. Input Pull-Up	
22	GPIO1	GPIO	Configurable General purpose Input Output	
23	NU	NC	Not Used Pin – do not connect	
24	NU	NC	Not Used Pin – do not connect	
25	NU	NC	Not Used Pin – do not connect	
26	GPIO2	GPIO	Configurable General purpose Input Output	
27	NU	NC	Not Used Pin – do not connect	
28	NU	NC	Not Used Pin – do not connect	
29	NU	NC	Not Used Pin – do not connect	
30	GND	Supply	Ground (0 V)	

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### 3. NETWORK DESCRIPTION

MIPOT LONG RANGE NETWORK is an **asynchronous network** based on physical layer of LoRa Technology. Network topology is a **star** where, in order to minimize power consumption, **end nodes** work in **duty cycle mode**:



All messages are cyphered with **AES128 encryption** algorithm ensuring confidential authentication and integrity during the exchanging of data payload.

### 4. UART INTERFACE DATA FRAME FORMAT

UART interface allows Host both to configure the module and to exchange LoRa radio frame data messages.

#### 4.1. Physical Parameters

Default UART configuration is 115200 8n1. Baud rate can be changed configuring an EEPROM parameter.

Communication interface:

Pin	Description	Notes
UART TX	Uart Tx pin. Output push-pull	
UART RX	Uart Rx pin. Input pull-up	Equivalent Internal Pull-up 40KOhm (Typical Value)
NDATA_INDICATE	Module digital output. Indicates radio frame reception.	
NWAKE	Module digital input. This pin has the function to wake up the module	Equivalent Internal Pull-up 40KOhm (Typical Value)

#### 4.2. Byte Order

Multiple byte values are transmitted in Little Endian order, with least significant byte first (LSB).

#### 4.3. Message Structure

Structure of the messages is the following:

HEADER	CMD	LENGTH	Payload (n Bytes)	CheckSum
--------	-----	--------	-------------------	----------

Where:

- HEADER = 0xAA
- CMD = Command code to module, see following table.
- LENGTH = Payload length
- CheckSum = 2's complement of the sum of all preceding bytes

Each command by host invokes an answer by module in the same format. The answer to the host has the CMD field equal to host request OR 0x80.

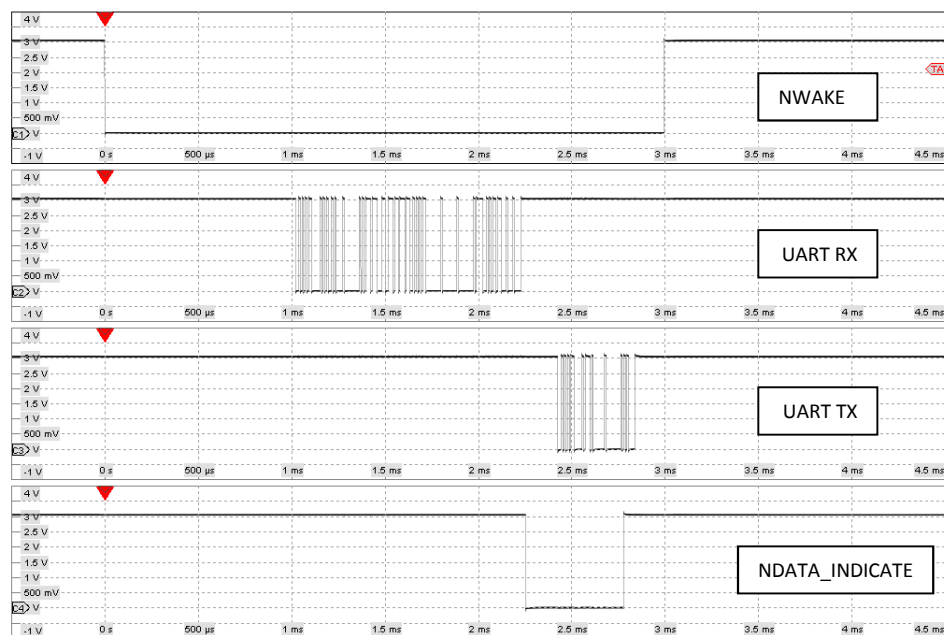
#### 4.4. Detailed Signal Flow

When the module receives a valid command and the checksum is correct, the module sets NDATA\_INDICATE LOW, transmits the answer through UART TX pin and then sets NDATA\_INDICATE HIGH.

In order to transfer a received radio frame to the host microcontroller, the module has to set NDATA\_INDICATE LOW, wait for DATA\_INDICATE\_TIMEOUT expiration, then send the message on UART TX pin. DATA\_INDICATE\_TIMEOUT represents the time (in ms) between the instant when NDATA\_INDICATE pin goes LOW and the start of transmission on UART TX pin.

The module enters sleep mode as soon as possible therefore, before initiating a UART session, the host shall wake it up by setting the NWAKE pin LOW (pin 7) and then setting it back HIGH at the end of the session.

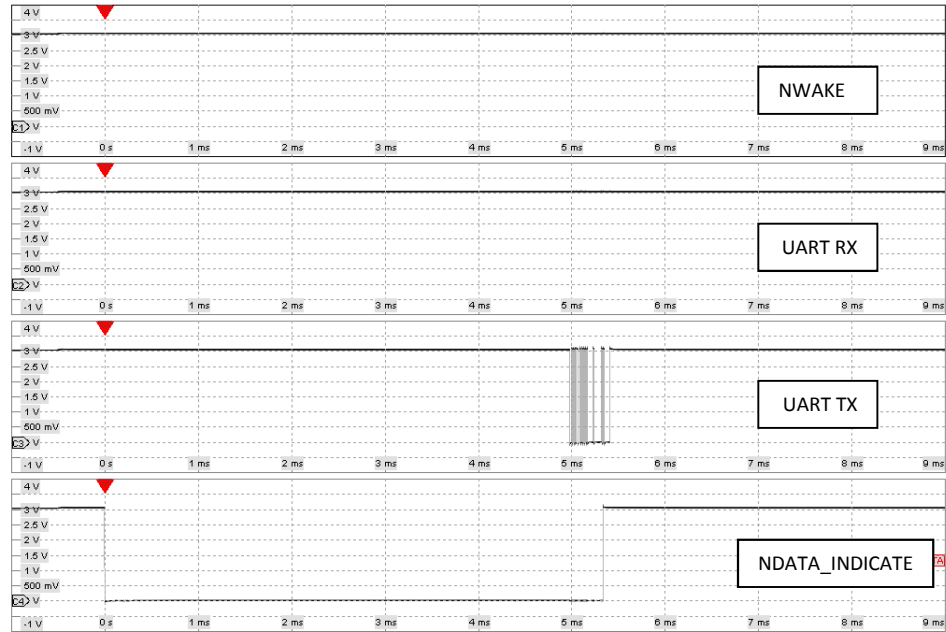
##### 4.4.1. Example of UART TX command session (Host → Module):



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4.4.2. Example of UART RX Command session (DATA\_INDICATE\_TIMEOUT = 5ms)  
(Module → Host):



5. COMMAND DESCRIPTION

Command (CMD)	Value	Description
RESET_CMD	0x30	Module Software Reset
FACTORY_RESET_CMD	0x31	Restore EEPROM to factory default values
EEPROM_WRITE_CMD	0x32	Write EEPROM parameter
EEPROM_READ_CMD	0x33	Read EEPROM parameter
GET_FW_VERSION_CMD	0x34	Get Firmware Version
GET_SERIALNO_CMD	0x35	Get Serial Number stored in Module
ENABLE_PAIRING_CMD	0x40	Enable/Disable pairing command (Only for MASTER)
DEVICE_PAIRING_IND	0x41	MASTER pairing indicate (Only for MASTER)
GET_NETWORK_TABLE_SIZE_CMD	0x42	Get MASTER Network Table Size (Only for MASTER)
GET_NETWORK_TABLE_ROW_CMD	0x43	Get MASTER Network Table Row (Only for MASTER)
DEL_EN_DEVICE_CMD	0x44	Delete END NODE from MASTER Network Table (Only for MASTER)
DEL_ALL_EN_DEVICE_CMD	0x45	Delete whole Network Table (Only for MASTER)
PAIRING_REQ_CMD	0x48	Pairing request (Only for END NODE)
PAIRING_CONFIRM_IND	0x49	Indication of Activation (Only for END NODE)
GET_ACTIVATION_STATUS_CMD	0x4A	Get Activation Status Command (Only for END NODE)
TX_MSG_CMD	0x50	Transmission of Radio Message
TX_MSG_CONFIRMED_IND	0x51	Indication of Confirmed Radio Message Transmission
TX_MSG_UNCONFIRMED_IND	0x52	Indication of Unconfirmed Radio Message Transmission
RX_MSG_IND	0x53	Indicate reception of Radio Message
LINK_CHECK_REQ_CMD	0x56	Request for a link Check
LINK_CHECK_ANS_IND	0x57	Link Check Indication
SET_APP_KEY_CMD	0x58	Write EEPROM parameter Application encryption key

TX_SESSION_ABORT_IND	0x59	Indicate the abort of current communication session (Only for END NODE)
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### 5.1. RESET\_CMD (0x30)

This command performs a Module Reset. The reset will be performed after about 1s. When a valid reset request is received, the module starts a timer and replies immediately to the host microcontroller. When the timeout expires the module resets. UART interface will be disabled during the reset procedure.

Host: 0xAA, 0x30, 0x00, 0x26

Reply: 0xAA, 0xB0, 0x00, 0xA6

### 5.2. FACTORY\_RESET\_CMD (0x31)

This command restores EEPROM factory default values.

Host: 0xAA, 0x31, 0x00, 0x25

Reply: 0xAA, 0xB1, 0x01, Status, cks

Status: 0x00: Success

A value different from 0: error

### 5.3. EEPROM\_WRITE\_CMD(0x32)

This command performs an EEPROM data write. For Address and Data table see "Module Configuration" section.

Host: 0xAA, 0x32, Length, Start Address, <Data>, cks

Reply: 0xAA, 0xB2, 0x01, EEWriteStatus, cks

Note: Data outside allowed range will not be stored in EEPROM and the current value will not be modified.

If the variable to be updated has the same value of the new one then the EEPROM will not be updated in order to minimize memory write cycle operation.

EEWriteStatus: 0x00: Success

0x01: Invalid address

### 5.4. EEPROM\_READ\_CMD(0x33)

This command performs an EEPROM data read. For Address and Data table see "Module Configuration" section.

Host: 0xAA, 0x33, 0x02, Start Address, Number of bytes, cks

Reply: 0xAA, 0xB3, Length, Status, Data, cks

Status: 0x00: Success, Data contains EEPROM values

0xFF: failure, Data is empty and Length is equal to 1

### 5.5. GET\_FW\_VERSION\_CMD(0x34)

Get 32-bit firmware version.

Host: 0xAA, 0x34, 0x00, 0x22

Reply: 0xAA, 0xB4, 0x04, FWV0, FWV1, FWV2, FWV3, cks

FWV0, FWV1, FWV2, FWV3: Fw version

### 5.6. GET\_SERIALNO\_CMD(0x35)

Get unique 32-bit Serial Number.

Host: 0xAA, 0x35, 0x00, 0x21

Reply: 0xAA, 0xB5, 0x04, SN0, SN1, SN2, SN3, cks

SN0, SN1, SN2, SN3: 32-bit Mipot Serial Number.

### 5.7. ENABLE\_PAIRING\_CMD (0x40)

This command is accepted only when the module is configured as MASTER.

Enable or disable network the pairing procedure, where END NODEs are discovered by MASTER.

Host: 0xAA, 0x40, 0x01, EN, cks

Reply: 0xAA, 0xC0, 0x00, 0x96

Where EN = 0 to disable pairing procedure

EN != 0 to enable pairing procedure

### 5.8. DEVICE\_PAIRING\_IND (0x41)

This command is accepted only when the module is configured as MASTER.

Indicates successful pairing with an END NODE. When MASTER module receives a Radio Join Request then adds the device to its Network Table and then sends this command to host.

Module: 0xAA, 0x41, Len, EN\_ID, CUSTOM\_PAIRING\_PAYLOAD\_BYTE, cks

Where:

- EN\_ID is a 4-bytes array containing Serial Number of the paired device
- CUSTOM\_PAIRING\_PAYLOAD\_BYTE is a byte defined in EEPROM through EndNodePairingReqPayload parameter. This parameter could be useful, for instance, in host application to declare the type of an END NODE without using extra radio messages

### 5.9. GET\_NETWORK\_TABLE\_SIZE\_CMD (0x42)

This command is accepted only when the module is configured as MASTER.

Get from MASTER module the size of Network Table. The last row containing a valid data has an index equal to (TABLE\_SIZE – 1).

Host: 0xAA, 0x42, 0x00, 0x14

Reply: 0xAA, 0xC2, 1, ROUTING\_SIZE, cks

**NOTE: The maximum number of END NODES is 255.**

### 5.10. GET\_NETWORK\_TABLE\_ROW\_CMD (0x43)

This command is accepted only when the module is configured as MASTER.

Returns a Network Table row from index.

Host: 0xAA, 0x43, 0x01, IDX, cks

Reply: 0xAA, 0xC3, 0x05, <Routing Row>, cks

Where:

IDX is the index of Network Table row and must be between 0 to (TABLE\_SIZE – 1).

<Routing Row> has the following information:

- EN\_ID (4 Bytes);
- CUSTOM\_PAIRING\_PAYLOAD\_BYTE is the byte received at pairing phase.

All multiple byte fields are LSB first.

### 5.11. DEL\_EN\_DEVICE\_CMD (0x44)

This command is accepted only when the module is configured as MASTER.

Deletes a Network Table row from module Serial Number.

Host: 0xAA, 0x44, 0x04, <EN\_ID>, cks

Reply: 0xAA, 0xC4, 0x01, status, cks

Status: 0x00: Success

0xFF: Failure. Device not found in MASTER Network Table

### 5.12. DEL\_ALL\_EN\_DEVICE\_CMD (0x45)

This command is accepted only when the module is configured as MASTER.

Deletes whole Network Table.

Host: 0xAA, 0x45, 0x00, 0x11

Reply: 0xAA, 0xC5, 0x01, status, cks

Status: 0x00: Success

0xFF: Failure

### 5.13. PAIRING\_REQ\_CMD(0x48)

This command is accepted only when the module is configured as END NODE.

Requests a pairing to a network.

Host: 0xAA, 0x48, 0x00, 0x0E

Reply: 0xAA, 0xC8, 0x01, status, cks

Status: 0x00 = OK

0x01 = BUSY, pairing request not accepted.

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**5.14. PAIRING\_CONFIRM\_IND(0x49)**

This command is accepted only when the module is configured as END NODE.

Indicates the reception of a Pairing Confirm message from MASTER.

- Module: 0xAA, 0x49, 0x06, status, MST\_ID, IDX, cks
- Status: 0x00 = success  
A value different from zero means an error occurred and MST\_ID and IDX are equal to 0.
- MST\_ID: MASTER Serial Number (4 bytes). If Status is different from success (0x00) this field is equal to 0x00000000.
- IDX: MASTER table index assigned after pairing phase.

**5.15. GET\_ACTIVATION\_STATUS\_CMD(0x4A)**

This command is accepted only when the module is configured as END NODE.

Gets the module activation status.

- Host: 0xAA, 0x4A, 0x00, cks
- Reply: 0xAA, 0xCA, 0x05, status, MST\_ID, cks
- Status: 0x00 = Not activated  
0x01 = Paired to a network
- MST\_ID: MASTER Serial Number (4 bytes)

**5.16. TX\_MSG\_CMD(0x50)**

This command performs the transmission of radio frames.

- Host: 0xAA, 0x50, Length, Options, <DST\_ID>, <MsgPayload>, cks
- Reply: 0xAA, 0xD0, 0x01, Status, cks

- Options: 0bxxxxxx0 = Unconfirmed Data Transmission. The message will be transmitted UnconfirmedTxNumber times (see Stack parameter table configuration).  
0bxxxxxx1 = Confirmed Data Transmission. As long as an Ack is not received, the message will be transmitted up to ConfirmedTxNumber times (see Stack parameter table configuration).
- DST\_ID: Destination device Serial Number (4 bytes). This field is used only when the module is configure as MASTER. When the module is configured as END NODE this field will be ignored.  
0xFFFFFFFF = Broadcast Message. In this case message will be an Unconfirmed Data message type, independently from Options field.  
Other values are used for unicast addressing.
- MsgPayload: Data to be transmitted. **Maximum allowed payload size is 26 bytes.**
- Status: 0x00: Success  
0x01: Device busy  
0x02: Device not Activated  
0x03: Payload Size Error

**NOTE:**

**The module does not manage automatically duty cycle restrictions. Host application must handle the duty cycle requirements in order to assure compliance with the harmonized standard limits.**

The following table shows time-on-air for a single frame as a function of the number of transmitted bytes for an END NODE device:

Number of bytes	Time on Air (ms)
0-10	67
11-26	88

The following table shows time-on-air for a single frame as a function of the number of transmitted bytes for MASTER device:

Number of bytes	Time on Air (ms)
0-10	1155
11-26	1175

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### 5.17. TX\_MSG\_CONFIRMED\_IND(0x51)

This command indicates the end of a confirmed transmission session. An Ack is received or all transmission retries have been carried out.

Module: 0xAA, 0x51, 0x07, Status, <SessionTxTime>, AckReceived, NbRetries, cks

Status: 0x00 = success

A value different from zero means that an error has occurred.

AckReceived: 0 = No Ack received

1 = Ack received

NbRetries: Number of carried out transmissions.

SessionTxTime: 4 bytes. Session transmission time expressed in ms; includes cumulative transmission time for all retries.

### 5.18. TX\_MSG\_UNCONFIRMED\_IND(0x52)

This command indicates the end of an unconfirmed transmission session (All UnconfirmedTxNumber retries have been carried out).

Module: 0xAA, 0x52, 0x05, Status, <SessionTxTime>, cks

Status: 0x00 = success

A value different from zero means that an error has occurred.

SessionTxTime: 4 bytes. Session transmission time expressed in ms; includes cumulative transmission time for all retries.

### 5.19. RX\_MSG\_IND(0x53)

This command indicates the reception of radio frames.

Module: 0xAA, 0x53, Length, Status, RssiLSB, RssiMSB, SNR, <SRC\_ID>, <Payload>, cks

Status: 0x00 = success

Values different from zero are reserved.

RssiLSB/MSB: 16-bit Rssi Value expressed in dBm

SNR: 8-bit Signal-to-Noise Ratio

SRC\_ID: Source device Serial Number (4 bytes)

Payload: Data Message

### 5.20. LINK\_CHECK\_REQ\_CMD(0x56)

This command initiates from END NODE a link check procedure between END NODE and MASTER.

Host: 0xAA, 0x56, 0x03, Power, MessageNumber, MessageTh, cks

Reply: 0xAA, 0xD6, 0x01, status, cks

Power: Defines the power used for the link check procedure expressed in dBm. Allowed range is from 2 to 14dBm. Suggested value is 11dBm.

MessageNumber: Defines the number of messages to be transmitted. Allowed Range is from 4 to 20. Suggested Value is 5.

MessageTh: Defines pass/fail criteria threshold as the number of received messages. If the number of received messages is  $\geq$  to MessageTh test succeeded. The suggested value is 4. Minimum value is 1 and maximum Value is Message Number.

Status: 0x00 = Success

0x01 = Device Busy

0x02 = Parameters Out of range

### 5.21. LINK\_CHECK\_ANS\_IND(0x57)

This command indicates the end of a link check procedure.

Module: 0xAA, 0x57, 0x02, Result, RxMessages, cks

Result: 0x00 = Link test KO

0xFF = Link test OK

RxMessages: Number of received messages.

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### 5.22. SET\_APP\_KEY\_CMD(0x58)

This command performs an EEPROM data write.

Host: 0xAA, 0x58, 0x10, <AppKey>, cks

Reply: 0xAA, 0xD8, 0x00, cks

AppKey: 16 byte in Little Endian Order. Needed for Application encryption customization. This key is used only when AppEnAes parameter is set to 1.

### 5.23. TX\_SESSION\_ABORT\_IND(0x59)

This command is used only when the module is configured as END NODE.

This command indicates the end of current communication session due to a master confirmed type session.

Module: 0xAA, 0x59, 0x04, <SessionTxTime>, cks

SessionTxTime: 4 bytes. Session transmission time expressed in ms; includes cumulative transmission time for all retries.

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## 6. MODULE CONFIGURATION

Multiple byte values are expressed in Little Endian order with Least Significant Byte first (LSB).

### 6.1. Stack Parameters

Parameter	Description	Address	Values Range	Default	Notes
DeviceType	MASTER – END NODE Selection	0x00	0-1	1 = END NODE	0x00 = MASTER 0x01 = END NODE
UnconfirmedTxNumber	Define the Number of broadcast consecutive message transmissions	0x01	1-15	3	
ConfirmedTxNumber	Define the Number of transmission retries if ACK is not received	0x02	1-15	3	
EndNodePairingReqPayload	Define the Pairing Request Payload	0x03	0 – 255	0	END NODE Pairing Request Custom Payload (1 byte)
EndNodePairingMstAddress	Define the paired MASTER address	0x04 - 0x07	0x0000 0000 – 0xFFFF FFFF	0x00000 000	This field is meaningful only for END NODE
EndNodeMstTblIdx	Define the END NODE index assigned by MASTER after the pairing phase.	0x08	0x00-0xFF	0x00	This field is meaningful only for END NODE

### 6.2. Radio Physical Parameters

Parameter	Description	Address	Range	Default	Notes
Power	Power expressed in dBm	0x10	2-14	14	Power expressed in dBm
Frequency	Channel Frequency selection	0x11	0 – 2	2	0 = 868.1MHz 1 = 868.3MHz 2 = 868.5MHz
RSSI_Th	Define the RSSI threshold for channel free assessment. It is an absolute value	0x12	80-110	90	90 => RSSI_Th = -90dBm

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### 6.3. Module Parameters

Parameter	Description	Address	Range	Default	Notes
DATA_INDICATE_TIMEOUT	Timeout in ms	0x80	1-255	5	Expressed in ms
UartBaudrate	Uart baudrate selection	0x81	0 – 4	4	0 = 9600 1 = 19200 2 = 38400 3 = 57600 4 = 115200
AppEnAes	Application AES Key Enable/Disable	0x82	0 – 1	0	0 = Disabled 1 = Enabled

### 6.4. Internal DATA (Read Only)

Parameter	Description	Notes
SerialNumber0	Byte 0 SN	Serialization at 32 bit
SerialNumber1	Byte 1 SN	
SerialNumber2	Byte 2 SN	
SerialNumber3	Byte 3 SN	
FwVersion0	Byte 0 FW Version	Fw Version
FwVersion1	Byte 1 FW Version	
FwVersion2	Byte 2 FW Version	
FwVersion3	Byte 3 FW Version	

### 6.5. Application AES KEY (Write Only)

The module implements on-board network AES encryption with an internal key (not accessible to the host microcontroller). If the Host microcontroller needs to customize the encryption at application level, it has to enable this feature by setting AppEnAes parameter to 1 then write AppKey through SET\_APP\_KEY\_CMD.

Parameter	Description	Values Range	Default	Notes
AppKey	16 byte Application Key	0-255 for all 16 bytes	0 for all 16 bytes	Used at application level (Write Only Variable)

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## 7. EXAMPLES

This section describes some examples for network configuration and message exchange. The examples will consider five 32001345 modules with the following serial number:

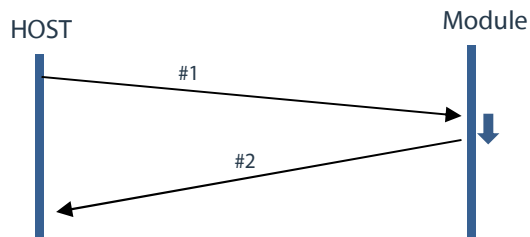
- 0x11111111
- 0x22222222
- 0x33333333
- 0x44444444
- 0x55555555

### 7.1. MASTER NODE CONFIGURATION

All modules are factory configured as End Node (EN); one module must be elected as MASTER (MST) node (the example will use Module 0x55555555 as MST). To do this the host microcontroller has to write the "DeviceType" parameter to 0.

Module 0x55555555:

Host command:	0xAA, 0x32, 0x02, 0x00, 0x00, 0x22	(#1)
Module Answer:	0xAA, 0xB2, 0x01, 0x00, 0xA3	(#2)



### 7.2. END NODES PAIRING PHASE

Now all ENs have to be paired to MST node. First of all, MST node has to be put in pairing mode:

Module 0x55555555:

Host command:	0xAA, 0x40, 0x01, 0x01, 0x14	(#3)
Module Answer:	0xAA, 0xC0, 0x00, 0x96	(#4)

Then each EN, being in the range of MST, should send a pairing request command. For Modules 0x11111111, 0x22222222, 0x33333333, 0x44444444:

Host command:	0xAA, 0x48, 0x00, 0x0E	(#5)
Module Answer:	0xAA, 0xC8, 0x01, 0x00, 0x8D	(#6)

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When the pairing procedure succeeds, an indicate message will be transmitted by both modules on MST side and EN side:

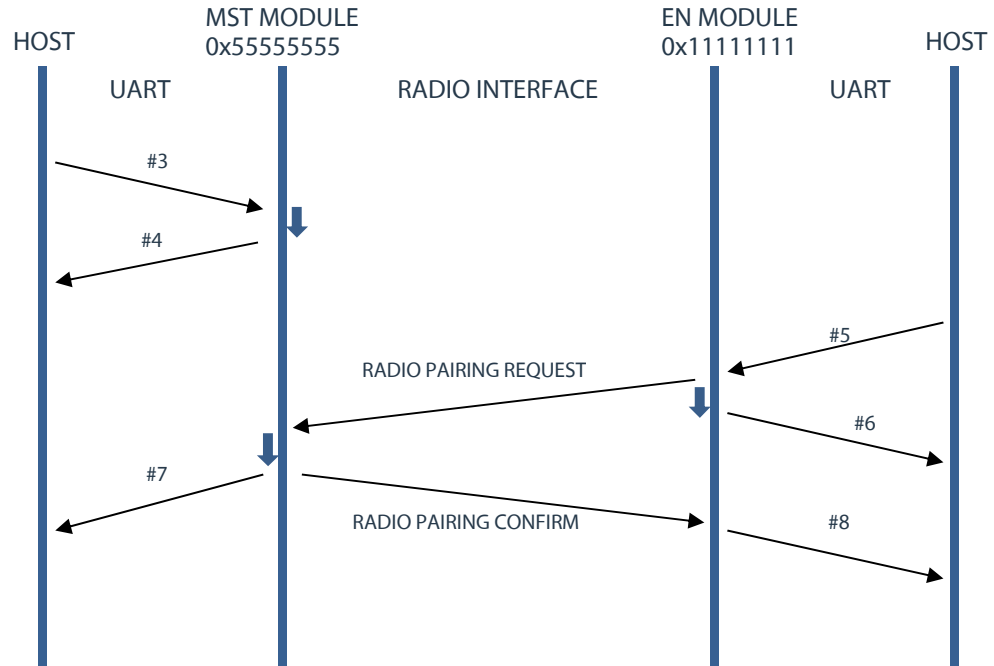
Hereafter the message exchange for EN 0x11111111 successfully paired with MST.

MST Module 0x55555555:

Module Indicate: 0xAA, 0x41, 0x05, 0x11, 0x11, 0x11, 0x11, 0x11, 0x00, 0xCC (#7)

EN Module 0x11111111:

Module Indicate: 0xAA, 0x49, 0x06, 0x00, 0x55, 0x55, 0x55, 0x55, 0x00, 0xB3 (#8)

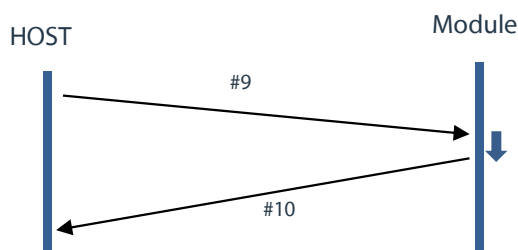


When the pairing procedure ends, the pairing mode has to be disabled on MST.

Module 0x55555555:

Host command: 0xAA, 0x40, 0x01, 0x00, 0x15 (#9)

Module Answer: 0xAA, 0xC0, 0x00, 0x96 (#10)



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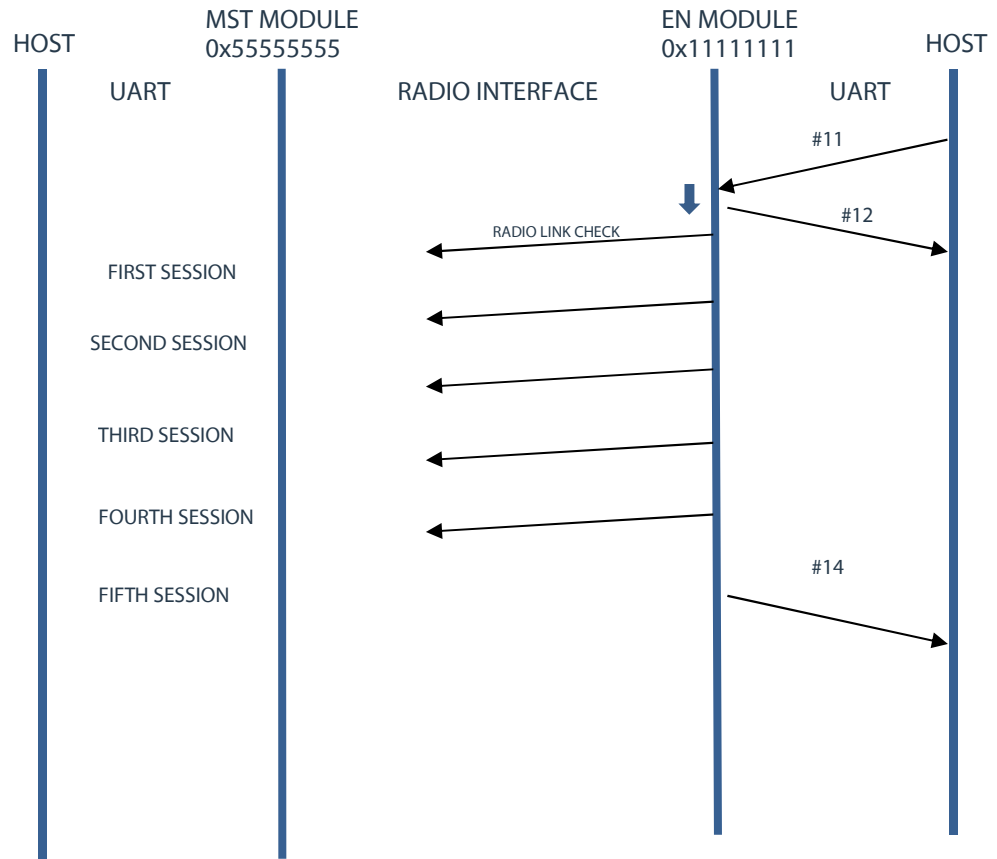
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If the link check test does not succeed:

Module Indicate: 0xAA, 0x57, 0x02, 0x00, 0x00, 0xFD

(#14)



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**7.4. MESSAGE UNCONFIRMED TRANSMISSION SESSION**

This example shows how to send an unconfirmed message from EN (same procedure applies to MASTER node). UnconfirmedTxNumber has been set to 3 (Default value).

To send a PAYLOAD equal to {0x11, 0x22, 0x33, 0x44} from EN 0x11111111 to MST:

Host command: 0xAA, 0x50, 0x09, 0x00, 0xFF, 0xFF, 0xFF, 0xFF, **0x11, 0x22, 0x33, 0x44**, 0x57 (#15)

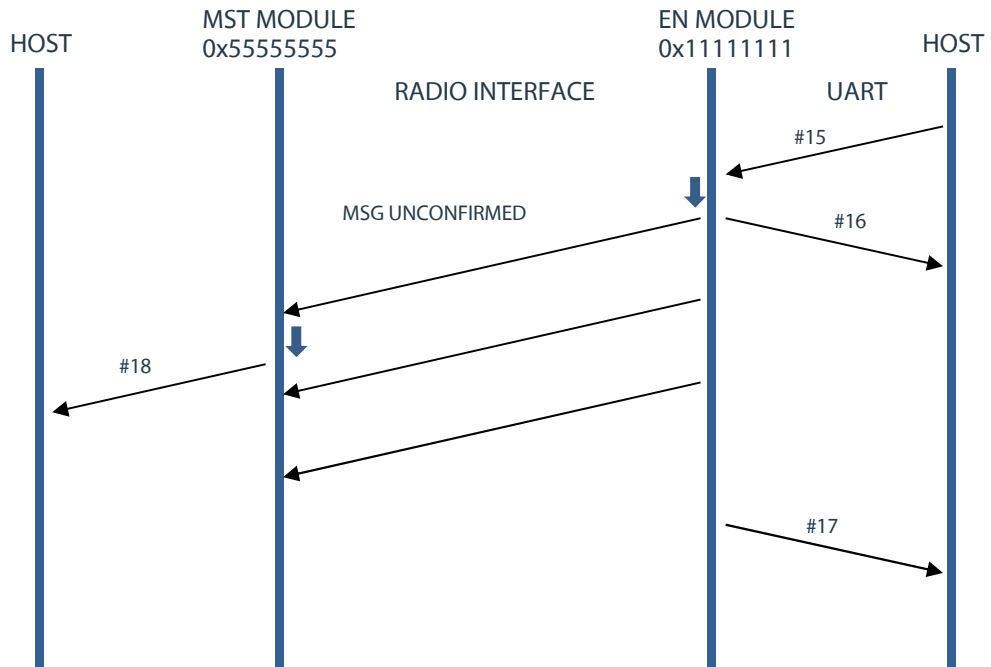
Module Answer: 0xAA, 0xD0, 0x01, 0x00, 0x85 (#16)

When the session ends, EN module sends back to the host an indication message containing the session time-on-air:

EN Module Indicate: 0xAA, 0x52, 0x05, 0x00, 0xC9, 0x00, 0x00, 0x00, 0x36 (#17)

When MST module receives a radio message, it indicates this to Host through UART interface:

MST Module Indicate: 0xAA, 0x53, 0x0C, 0x00, 0xC7, 0xFF, 0x06, 0x11, 0x11, 0x11, 0x11, **0x11, 0x22, 0x33, 0x44**, 0x3D (#18)



**7.5. MESSAGE CONFIRMED TRANSMISSION SESSION**

This example shows how to send a confirmed message from MST to EN. Here assume ConfirmedTxNumber equal to 3 (Default value).

To send a PAYLOAD equal to {0xAA, 0xBB, 0xCC, 0xDD, 0xEE, 0xFF} from MST to EN 0x11111111:

Host Command: 0xAA, 0x50, 0x0B, 0x01, 0x11, 0x11, 0x11, 0x11, **0xAA, 0xBB, 0xCC, 0xDD, 0xEE, 0xFF**, 0xBB (#19)

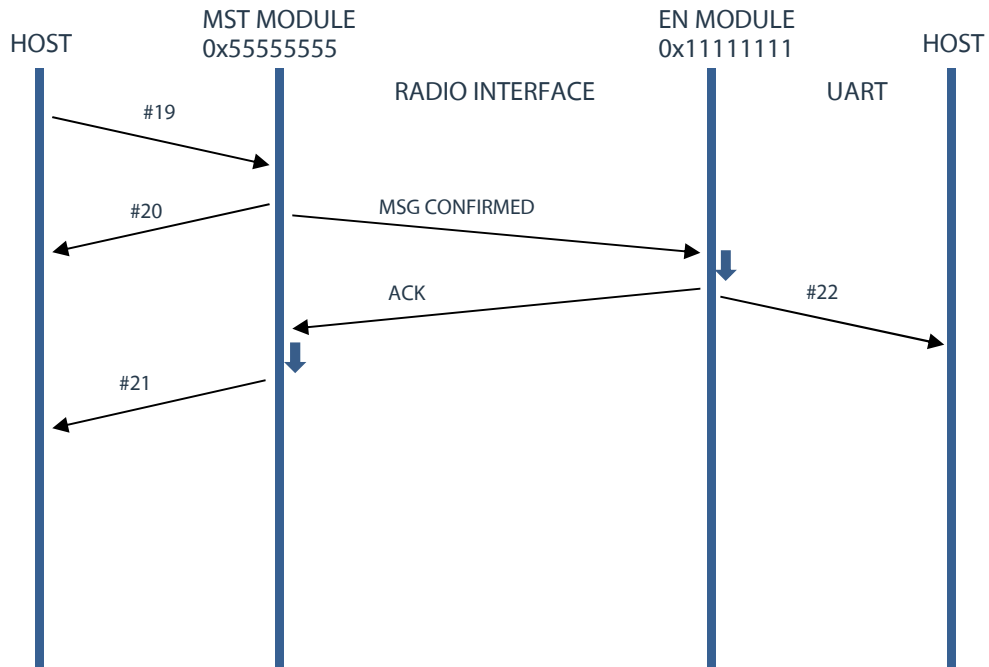
Module Answer: 0xAA, 0xD0, 0x01, 0x00, 0x85 (#20)

When the session ends, MST module sends back to the host an indication message containing the session time-on-air, a confirm of Ack reception, and the number of transmitted messages:

MST Module Indicate: 0xAA, 0x51, 0x07, 0x00, 0x31, 0x04, 0x00, 0x00, 0x01, 0x01, 0xC7 (#21)

When a EN module receives a radio message, it indicates this to the Host through UART interface:

EN Module Indicate: 0xAA, 0x53, 0x0E, 0x00, 0xCB, 0xFF, 0x06, 0x55, 0x55, 0x55, **0xAA, 0xBB, 0xCC, 0xDD, 0xEE, 0xFF**, 0xD6 (#22)



## 8. GLOSSARY

SN = Serial Number  
 Fw = Firmware  
 LSB = Least significant byte  
 MSB = Most significant byte  
 Cks = Checksum  
 EN = END NODE  
 MST = MASTER

## 9. REFERENCES

[1] Sx1272 Datasheet

## 10. REVISION HISTORY

Revision	Date	Description
0.1	08-02-2017	Preliminary
0.2	29-05-2017	Changed Master transmission duration time. Added command 0x54 (TX_SESSION_ABORT_IND)
1.0	27-08-2019	Final release

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