RS485-LB/LS -- Waterproof RS485/UART to LoRaWAN Converter

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1. Introduction

1.1 What is RS485-LB/LS RS485/UART to LoRaWAN Converter

The Dragino RS485-LB/LS is a **RS485** / **UART to LoRaWAN Converter** for Internet of Things solutions. User can connect RS485 or UART sensor to RS485-LB/LS converter, and configure RS485-LB/LS to periodically read sensor data and upload via LoRaWAN network to IoT server.

RS485-LB/LS can interface to RS485 sensor, 3.3v/5v UART sensor or interrupt sensor. RS485-LB/LS provides **a 3.3v output** and **a 5v output** to power external sensors. Both output voltages are controllable to minimize the total system power consumption.

RS485-LB/LS is IP67 waterproof and powered by 8500mAh Li-SOCI2 battery or solar powered + li-on battery, it is designed for long term use for several years.

RS485-LB/LS runs standard LoRaWAN 1.0.3 in Class A. It can reach long transfer range and easy to integrate with LoRaWAN compatible gateway and IoT server.

For data uplink, RS485-LB/LS sends user-defined commands to RS485 devices and gets the return from the RS485 devices. RS485-LB/LS will process these returns data according to user-define rules to get the final payload and upload to LoRaWAN server.

For data downlink, RS485-LB/LS runs in LoRaWAN Class A. When there is downlink commands from LoRaWAN server, RS485-LB/LS will forward the commands from LoRaWAN server to RS485 devices.

RS485-LB/LS Supports BLE configure and wireless OTA update which make user easy to use.

Each RS485-LB/LS pre-load with a set of unique keys for LoRaWAN registration, register these keys to LoRaWAN server and it will auto connect after power on.





1.2 Specifications

Common DC Characteristics:

- Supply Voltage: Built-in Battery , 2.5v ~ 3.6v
- Operating Temperature: -40 ~ 85°C

I/O Interface:

- Battery controllable output (2.6v ~ 3.6v depends on battery)
- +5v controllable output
- 1 x RS485 Interface
- 1 x UART Interface , 3.3v or 5v
- 1 x Interrupt or Digital IN pins
- 1 x I2C Interface
- 1 x one wire interface

LoRa Spec:

- Frequency Range, Band 1 (HF): 862 ~ 1020 Mhz
- Max +22 dBm constant RF output vs.
- RX sensitivity: down to -139 dBm.
- Excellent blocking immunity

Battery:

- Li/SOCI2 un-chargeable battery
- · Capacity: 8500mAh
- Self-Discharge: <1% / Year @ 25°C
- Max continuously current: 130mA

• Max boost current: 2A, 1 second

Power Consumption

- Sleep Mode: 5uA @ 3.3v
- · LoRa Transmit Mode: 125mA @ 20dBm, 82mA @ 14dBm

1.3 Features

- · LoRaWAN 1.0.3 Class A
- Frequency Bands: CN470/EU433/KR920/US915/EU868/AS923/AU915/IN865/RU864/MA869
- Ultra-low power consumption
- Support multiply RS485 devices by flexible rules
- Support Modbus protocol
- Support Interrupt uplink
- Supports connecting a UART sensors with 3.3V or 5V
- Support Bluetooth v5.1 and LoRaWAN remote configure
- Support wireless OTA update firmware
- AT Commands to change parameters
- Uplink on periodically
- Downlink to change configure
- 8500mAh Li/SOCI2 Battery (RS485-LB)
- Solar panel + 3000mAh Li-on battery (RS485-LS)

1.4 Applications

- · Smart Buildings & Home Automation
- Logistics and Supply Chain Management
- Smart Metering
- Smart Agriculture
- Smart Cities
- Smart Factory

1.5 Sleep mode and working mode

Deep Sleep Mode: Sensor doesn't have any LoRaWAN activate. This mode is used for storage and shipping to save battery life.

Working Mode: In this mode, Sensor will work as LoRaWAN Sensor to Join LoRaWAN network and send out sensor data to server. Between each sampling/tx/rx periodically, sensor will be in IDLE mode), in IDLE mode, sensor has the same power consumption as Deep Sleep mode.

1.6 Button & LEDs



1.7 BLE connection

RS485-LB/LS supports BLE remote configure.

BLE can be used to configure the parameter of sensor or see the console output from sensor. BLE will be only activate on below case:

- Press button to send an uplink
- Press button to active device.

• Device Power on or reset.

If there is no activity connection on BLE in 60 seconds, sensor will shut down BLE module to enter low power mode.

1.8 Pin Definitions



1.8.1 SW2 Jumper (Define UART level to external Sensor)

SW2 defines the voltage level of BOARD_RX and BOARD_TX pins. It should match the external sensor voltage level

1.9 Mechanical

1.9.1 for LB version



1.9.2 for LS version





2. Operation Mode

2.1 How it works?

The RS485-LB/LS is configured as LoRaWAN OTAA Class A mode by default. It has OTAA keys to join network. To connect a local LoRaWAN network, user just need to input the OTAA keys in the network server and power on the RS485-LB/LS. It will auto join the network via OTAA.

2.2 Quick guide to connect to LoRaWAN server (OTAA)

Following is an example for how to join the <u>TTN v3 LoRaWAN Network</u>. Below is the network structure; we use the <u>LPS8v2</u> as a LoRaWAN gateway in this example.



The RS485-LB/LS in this example connected to two RS485 devices for demonstration, user can connect to other RS485 devices via the same method.

The LPS8v2 is already set to connected to TTN network, so what we need to now is configure the TTN server.

Step 1: Create a device in TTN V3 with the OTAA keys from RS485-LB/LS.

Each RS485-LB/LS is shipped with a sticker with unique device EUI:

Registration Key, Please keep it safely. DEV EUI: A84041C161 APP EUI: A8404100000 APP KEY: 7EC8A9C917386DFC5DBF73B SN: LST2565 7

User can enter this key in their LoRaWAN Server portal. Below is TTN V3 screen shot:

Add APP EUI in the application.

S K		THE THINGS STACK Community Edition	Overview	Applications	🛋 Gatev	vays 👫 Orga	
		Add applica	ation				
		Owner*					
		davidhuang			~		
		Application ID*					
		my-new-application					
		Application name					
		My new application					
		Description					
		Description for my n	ew application		.4		
		Optional application	description; can also b	e used to save notes a	about the app	olication	
		Create application	on				

CCC ID: 123

🙏 4 End devices 🚢 2 Collaborators 💁 2 API keys Created 95 days ago					
General information Application ID Created at Last updated at	123 Feb 2, 2021 11:12:30 Apr 30, 2021 11:00:33	5	 Live data ↑ 18:89:42 1231234234. F ● 18:89:42 1231234234. S ↑ 18:89:42 1231234234. F ↑ 18:89:42 1231234234. R ↑ 18:89:42 1231234234. K ↑ 18:99:42 1231234234. S ↑ 18:99:42 1231234234. S 	See all activity orward data message to Application Server tore upstream data message orward uplink data message eceive uplink data message uccessfully processed data message rop data message	
End devices (4)	Name 🌣	DevEUI	Q Search by ID JoinEUI	=+ Import end devices + Add end device Created \$	

From The LoRaV	/AN Device Repo	ository Manually		
1. Select the e	nd device			
Brand *		Model*		
Dragino Technol	ogy Co., 🗸	Type to search	~	
Cannot find your e	xact end device?	LBT1		tration.
		LDDS20	=	
		LDDS75	-	
2. Enter regist	ration data	LDS01		
Please choose an e	end device first to	LGT92	1 data	
		LHT65	_	
Register end d	evice	LSE01		
		LSN50-V2	-	

2. Enter registration data	
Frequency plan 🗇 *	
Select	V
The frequency plan used by the end device	
AppEUI ()*	
The AppEUI uniquely identifies the owner of the en	d device. If no AppEUI is provided by the device manufacturer (usually for development), it can be filled with zeros.

You can also choose to create the device manually.

From The LoRaWAN Device Repository	Manually
Preparation	
Activation mode*	
 Over the air activation (OTAA) 	
Activation by personalization (ABP)	
Multicast	
O not configure activation	
LoRaWAN version ⑦*	
Select	
Network Server address	
eu1.cloud.thethings.network	

External Join Server 🗇

Add APP KEY and DEV EUI

2. Enter registration data

Frequency plan 🗇 *
Europe 863-870 MHz (SF12 for RX2)
The frequency plan used by the end device
AppEUI ⑦*
The AppEUI uniquely identifies the owner of the end device. If no AppEUI is provided by the device manufacturer (usually for device)
DevEUI (2) *
The DevEUI is the unique identifier for this end device
АррКеу ③ * Ф
The root key to derive session keys to secure communication between the end device and the application
End device ID*
my-new-device
After registration

Step 2: Power on RS485-LB/LS and it will auto join to the TTN V3 network. After join success, it will start to upload message to TTN V3 and user can see in the panel.

	Overview Live data Messa	ging Location Payload formatters Claiming General settings	
Time	Туре	Data preview	II Pause 📋 Clear
↑ 14:06:05	Forward data message to Applic_	DevAddr: 26 08 28 7E MAC payload: AC 06 29 53 8F E3 18 0C 6C 72 E5 D4 30 48 AC E8 26 88 EC 74 87 21 49 2C 2C C1 95 73 6C FP	ort: 2 SNR: 0.8 RSSI
↑ 14:06:05	Forward uplink data message	3.6, voltageFrequency1: 50, voltageFrequency2: 50 } 188 80 43 5F 99 9A 80 83 13 88 80 80 88 42 48 80 80 FF F9 80 80 11 86	99 99 99 99 99 FPort:
↑ 14:06:05	Receive uplink data message	DevAddr: 26 88 28 7E	
↑ 14:06:05	Successfully processed data me…	DevAddr: 26 08 28 7E FCnt: 2837 FPort: 2 MAC payload: AC 06 29 53 8F E3 18 0C 6C 72 E5 D4 3D 48 AC E8 26 88 EC 74 87 21	49 2C 2C C1 95 73 6C
↑ 14:06:05	Drop data message	Uplink is a duplicate	
↑ 14:06:05	Receive data message	DevAddr: 26 08 28 7E FCnt: 2837 FPort: 2 MAC payload: AC 06 29 53 8F E3 18 0C 6C 72 E5 D4 3D 48 AC E8 26 88 EC 74 87 21	49 2C 2C C1 95 73 6C
↑ 14:06:05	Drop data message	Uplink is a duplicate	
↑ 14:06:05	Receive data message	DevAddr: 26 08 28 7E FCnt: 2837 FPort: 2 MAC payload: AC 06 29 53 8F E3 18 0C 6C 72 E5 D4 3D 48 AC E8 26 88 EC 74 87 21	49 2C 2C C1 95 73 6C
A 14106-05	Dvon data mereode	Unitak te a dunitaata	

2.3 Uplink Payload

2.3.1 Device Status, FPORT=5

Users can use the downlink command(**0x26 01**) to ask LDS12-LB to send device configure detail, include device configure status. RS485-LB/LS will uplink a payload via FPort=5 to server.

The Payload format is as below.

Size(bytes)

2

Size(bytes)	1	2	1	1	2
Value	Sensor Model	Firmware Version	Frequency Band	Sub-band	BAT
Sensor Mo	del: For RS485-LB/LS, thi	is value is 0x30			
Firmware V	ersion: 0x0100, Means: v	/1.0.0 version			
Frequency	Band:				
0x01: EU868	3				
0x02: US915	5				
0x03: IN865					
0x04: AU915	5				
0x05: KZ865	5				
0x06: RU864	4				
0x07: AS923	3				
0x08: AS923	3-1				
0x09: AS923	3-2				
0x0a: AS923	3-3				
0x0b: CN470)				
0x0c: EU433	3				
0x0d: KR920)				
0x0e: MA86	9				
Sub-Band:					
AU915 and U	JS915:value 0x00 ~ 0x08				
CN470: valu	e 0x0B ~ 0x0C				
Other Bands	: Always 0x00				
Battery Info): 				
Check the ba	attery voltage.				
Ex1: 0x0B45	5 = 2885mV				
Ex2: 0x0B49	9 = 2889mV				
2.3.2 Uplink	Payload, FPORT=2				

1

Length depends on the return from the commands

Value	Battery(mV) & Interrupt _Flag	PAYLOAD_VER	If the valid payload is too long and exceed the maximum support payload length in server, server will show payload not provided in the LoRaWAN
			server.

Below is the decoder for the first 3 bytes. The rest bytes are dynamic depends on different RS485 sensors.

Battery(mV)

Check the battery voltage for RS485-LB/LS.

Ex1: 0x0B45 = 2885mV

Ex2: 0x0B49 = 2889mV

Interrupt_Flag

Ex1: 0x0B45>>15&0x01=0x00 : Normal uplink packet.

Ex2: 0x8B49>>15&0x01=0x01 : Interrupt Uplink Packet.

PAYLOAD_VER

RS485-LB/LS can connect to different sensors. User can set the PAYVER_VER field to tell server how to decode the current payload.

2.4 Payload Decoder file

In TTN, use can add a custom payload so it shows friendly reading

In the page Applications --> Payload Formats --> Custom --> decoder to add the decoder from: <u>https://</u> github.com/dragino/dragino-end-node-decoder

2.5 Frequency Plans

The RS485-LB/LS uses OTAA mode and below frequency plans by default. Each frequency band use different firmware, user update the firmware to the corresponding band for their country.

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20Frequency%20Band/

2.6 Configure Device to Read RS485 Sensors

There are plenty of RS485 and TTL level devices in the market and each device has different commands to read the valid data. To support these devices in most flexible, RS485-LB/LS supports flexible command set. User can use <u>Dragino RS485 Tool</u>, <u>AT Commands or LoRaWAN Downlink</u> Command to configure how RS485-LB/LS should read the sensor and how to handle the return from RS485 or TTL sensors.

2.6.1 Method 1 -- via RS485 Configure Tool

Use the RS485 Configure tool is the recommand method. Please see the instruction of how to use the tool:

<u>RS485 Configure Tool Instruction</u>

P.11.0	Consele Output		Confiumo
Poll Counand-1	console output		CONTIURE Sensor Baudrate
<u> </u>		Node Baudrate 9600 V	Sensor Data Bit
(3): RS485 Commands		5VT(Unit:mv)	Sensor Check Bit 🗸 🗸
o Sensor		Connect serial port	Sensor Step Bit
Foll Command-3		Disconnect serial port	Configare Devices
		RS485 Sensor return data	O Bytes Blocks
Poll Connand-4			input format:1-2,4-5
	2: Console Window		Up to 3 groups
Poll Command-5			
			O Discrete Bytes
Poll Command-6			input formst: 3, 6, 9
			Up to 6 bytes
Poll Command-7			
			Choose the needed discrete bytes from return
Poll Command-8	AT Consund		Y
			Return Connand Preview
Poll Command-9	Send		
	Preview Commands		Detume
Poll Command-10		Process Sensor	Returns
Poll Command-11	5: Commands Preview		
Poll Command-12			
Poll Command-13			
Poll Command-14			
Poll Command-15			
			ATHONDON (RS405 Server removes Time Unit:mv)
Test R5485 Commands			A substantio banka response line onic.ns/
Clear All	Import Commands Save Commands Write Erase All		Generate AT instruction
	and the second s	L	Contract of Annual Contract

2.6.2 Method 2 -- via AT Commands

2.6.2.1 Configure UART settings for RS485 or TTL communication

RS485-LB/LS can connect to either RS485 sensors or TTL sensor. User need to specify what type of sensor need to connect.

1. RS485-MODBUS mode:

AT+MOD=1 // Support RS485-MODBUS type sensors. User can connect multiply RS485 , Modbus sensors to the A / B pins.

2. TTL mode:

AT+MOD=2 // Support TTL Level sensors, User can connect one TTL Sensor to the TXD/RXD/GND pins.

RS485-LB/LS default UART settings is **9600**, **no parity**, **stop bit 1,data bit 8**. If the sensor has a different settings, user can change the RS485-LB/LS setting to match.

AT Commands	Description	Example
AT+BAUDR	Set the baud rate.	AT+BAUDR=9600
	Default Value is: 9600.	Options: (1200,2400,4800,14400,19200,115200)
AT+PARITY	Set UART parity.	AT+PARITY=0
	Default Value is: no parity.	Option: 0: no parity, 1: odd parity, 2: even parity
AT+STOPBIT	Set serial stopbit	AT+STOPBIT=1 for 1 bit
	Default Value is: 1bit.	AT+STOPBIT=2 for 2 bits
AT+DATABIT	Set serial databit.	AT+DATABIT=7 for 7 bits

 Default Value is: 8bits.
 AT+DATABIT=8 for 8 bits

 Example (Soil three-parameter detector) :

Wiring the UART sensor

GND <----> GND TX <----> RX RX <----> TX VCC <----> 3.3/5V



Set the correct configuration:

AT+BAUDR=9600

AT+PARITY=0

AT+STOPBIT=1

AT+DATABIT=8

If the sensor needs 5v. Need to move the switch position to 5v and then use the command AT+5VT=30000

Configuration read command:

AT+CFGDEV=FE 03 00 00 00 03 11 C4,0

FE: Station address

03: Function code

- 00 00: Register start address
- 00 03: Number of registers
- 11 04: Check code

AT+CFGDEV=FE 03 00 00 00 03 11 C4,0 AT+CFGDEV=fe 03 00 00 00 03 11 c4,0 RETURN DATA: fe 03 06 00 00 09 49 00 00 b6 cb OK

Use AT+COMMAND1 to set it as a command, and use AT+DATACUT1 to intercept the bytes I need

AT+SETMAXNBTRANS=1	L, O		
AT+DISFCNTCHECK=0			
AT+DISMACANS=0			
AT+COMMAND1=fe 03	00 00 00 03 11 c4,0	AT+SEARCH1=0,0	
AT+DATACUT1=11, 2, 4	4 [~] 9 AT+CMDDL1=0		
AT+COMMAND2=0,0	AT+SEARCH2=0,0	AT+DATACUT2=0, 0, 0	AT+CMDDL2=0
AT+COMMAND3=0,0	AT+SEARCH3=0,0	AT+DATACUT3=0,0,0	AT+CMDDL3=0
AT+COMMAND4=0,0	AT+SEARCH4=0,0	AT+DATACUT4=0,0,0	AT+CMDDL4=0
AT+COMMAND5=0,0	AT+SEARCH5=0,0	AT+DATACUT5=0,0,0	AT+CMDDL5=0
AT+COMMAND6=0,0	AT+SEARCH6=0,0	AT+DATACUT6=0,0,0	AT+CMDDL6=0
AT+COMMAND7=0,0	AT+SEARCH7=0,0	AT+DATACUT7=0,0,0	AT+CMDDL7=0
AT+COMMAND8=0,0	AT+SEARCH8=0,0	AT+DATACUT8=0,0,0	AT+CMDDL8=0
AT+COMMAND9=0,0	AT+SEARCH9=0,0	AT+DATACUT9=0,0,0	AT+CMDDL9=0
AT+COMMANDA=0, 0	AT+SEARCHA=0,0	AT+DATACUTA=0, 0, 0	AT+CMDDLA=0
AT+COMMANDB=0, 0	AT+SEARCHB=0,0	AT+DATACUTB=0, 0, 0	AT+CMDDLB=0
AT+COMMANDC=0,0	AT+SEARCHC=0,0	AT+DATACUTC=0, 0, 0	AT+CMDDLC=0

upload payload:

[1870882]***** UpLinkCounter= 31 *****
[1870884]TX on freq 904900000 Hz at DR 3
[1870945]txDone
[1875932]RX on freq 926300000 Hz at DR 13
[1875957]rxTimeOut
[1876948]RX on freq 923300000 Hz at DR 8
[1877008]rxTimeOut
CMD1 = fe 03 00 00 00 03 11 c4
RETURN1 = fe 03 06 00 00 09 49 00 00 b6 cb
Payload = 0d 32 01 00 00 09 49 00 00

2.6.2.2 Configure sensors

Some sensors might need to configure before normal operation. User can configure such sensor via PC or through RS485-LB/LS AT Commands AT+CFGDEV.

When user issue an AT+CFGDEV command, Each AT+CFGDEV equals to send a command to the RS485 or TTL sensors. This command will only run when user input it and won't run during each sampling.

AT Commands	Description	Example
AT+CFGDEV	This command is used to configure the RS485/TTL devices; they won't be used during sampling.	AT+CFGDEV=xx xx
	AT+CFGDEV=xx xx	
	mm: 0: no CRC, 1: add CRC-16/MODBUS in the end of this command	

Detail of AT+CFGDEV command see <u>AT+CFGDEV detail</u>.

2.6.2.3 Configure read commands for each sampling

RS485-LB/LS is a battery powered device; it will sleep most of time. And wake up on each period and read RS485 / TTL sensor data and uplink.

During each sampling, we need to confirm what commands we need to send to the sensors to read data. After the RS485/TTL sensors send back the value, it normally includes some bytes and we only need a few from them for a shorten payload.

To save the LoRaWAN network bandwidth, we might need to read data from different sensors and combine their valid value into a short payload.

This section describes how to achieve above goals.

During each sampling, the RS485-LB/LS can support 15 commands to read sensors. And combine the return to one or several uplink payloads.

Command from RS485-LB/LS to Sensor:

RS485-LB/LS can send out pre-set max 15 strings via AT+COMMAD1, ATCOMMAND2,..., to AT+COMMANDF . All commands are of same grammar.

Handle return from sensors to RS485-LB/LS:

After RS485-LB/LS send out a string to sensor, RS485-LB/LS will wait for the return from RS485 or TTL sensor. And user can specify how to handle the return, by **AT+DATACUT** or **AT+SEARCH** commands

AT+DATACUT

When the return value from sensor have fix length and we know which position the valid value we should get, we can use AT+DATACUT command.

• AT+SEARCH

When the return value from sensor is dynamic length and we are not sure which bytes the valid data is, instead, we know what value the valid value following. We can use AT+SEARCH to search the valid value in the return string.

Define wait timeout:

Some RS485 device might has longer delay on reply, so user can use AT+CMDDL to set the timeout for getting reply after the RS485 command is sent. For example, AT+CMDDL1=1000 to send the open time to 1000ms

After we got the valid value from each RS485 commands, we need to combine them together with the command **AT** +DATAUP.

Examples:

Below are examples for the how above AT Commands works.

AT+COMMANDx : This command will be sent to RS485/TTL devices during each sampling, Max command length is 14 bytes. The grammar is:

xx xx: The RS485 command to be sent

m: 0: no CRC, 1: add CRC-16/MODBUS in the end of this command

For example, if we have a RS485 sensor. The command to get sensor value is: 01 03 0B B8 00 02 46 0A. Where 01 03 0B B8 00 02 is the Modbus command to read the register 0B B8 where stored the sensor value. The 46 0A is the CRC-16/MODBUS which calculate manually.

In the RS485-LB/LS, we should use this command AT+COMMAND1=01 03 0B B8 00 02,1 for the same.

If a single command exceeds 14 bytes, you can use the command splicing function.

When AT+CMDDLx=1, the commands of AT+COMMANDx and AT+COMMAND(x+1) will be merged.

Examples: To send 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F data it should be configured:

AT+COMMAND1=00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D,0

AT+COMMAND1=1

AT+COMMAND2=0E 0F,0

AT+SEARCHx: This command defines how to handle the return from AT+COMMANDx.

AT+SEARCHx=aa,xx xx xx xx xx xx

- aa: 1: prefix match mode; 2: prefix and suffix match mode
- xx xx xx xx xx: match string. Max 5 bytes for prefix and 5 bytes for suffix

Examples:

1) For a return string from AT+COMMAND1: 16 0c 1e 56 34 2e 30 58 5f 36 41 30 31 00 49

If we set AT+SEARCH1=1,1E 56 34. (max 5 bytes for prefix)

The valid data will be all bytes after 1E 56 34 , so it is 2e 30 58 5f 36 41 30 31 00 49

CMD1 = 11 01 1e d0 SEARCH1 = 1e 56 34 RETURN1 = 2e 30 58 5f 36 41 30 31 00 49 Payload = 8d 2d 01 2e 30 58 5f 36 41 30 31 00 49

2) For a return string from AT+COMMAND1: 16 0c 1e 56 34 2e 30 58 5f 36 41 30 31 00 49

If we set AT+SEARCH1=2, 1E 56 34+31 00 49

Device will search the bytes between 1E 56 34 and 31 00 49. So it is 2e 30 58 5f 36 41 30

CMD1 = 11 01 1e d0 SEARCH1 = 1e 56 34 + 31 00 49 RETURN1 = 2e 30 58 5f 36 41 30 Payload = 8d 2f 01 2e 30 58 5f 36 41 30

AT+DATACUTx : This command defines how to handle the return from AT+COMMANDx, max return length is 100 bytes.

AT+DATACUTx=a,b,c

- · a: length for the return of AT+COMMAND
- b:1: grab valid value by byte, max 6 bytes. 2: grab valid value by bytes section, max 3 sections.
- c: define the position for valid value.

Examples:

```
    Grab bytes:
```

```
AT+PAYVER=1
AT+COMMAND1=01 03 0b b8 00 02 ,1
                                     AT+DATACUT1=10,1,9+4+6+8+1+3
AT+COMMAND2=0,0 AT+DATACUT2=0,0,0
AT+COMMAND3=0,0
                    AT+DATACUT3=0,0,0
AT+COMMAND4=0,0
                 AT+DATACUT4=0,0,0
AT+COMMAND5=0.0
                    AT+DATACUT5=0.0.0
AT+DATACUT1=10,1,9+4+6+8+1+3
a=10, return total 10 bytes (20 20 20 20 2d 30 2e 32 20 75)
/ b=1 grab byte.
 c=9+4+6+8+1+3 (grap the 9th, 4th, 6th, 8th, 1th, 3rd byte and link them together by grab sequence
so command1 valid value is 20 20 30 32 20 20
AT+COMMANDE=0,0
                    AT+DATACUTE=0,0,0
AT+COMMANDF=0,0
                    AT+DATACUTF=0,0,0
AT+CHS=0
OK
```

CMD1	=	01	03	0b	b8	00	02	46	0a		
RETURN1	=	20	20	20	20	2d	<u>30</u>	2e	<u>32</u>	20	75
Payload	=	0c	fc	01	20	20	30	32	20	20	

· Grab a section.

AT+PAYVER=1
AT+COMMAND1=01 03 0b b8 00 02 ,1 AT+DATACUT1=8,2,4~8
AT+COMMAND2=0,0 AT+DATACUT2=0,0,0
AT+COMMAND3=0,0 AT+DATACUT3=0,0,0
AT+COMMAND4=0,0 AT+DATACUT4=0,0,0
AT+COMMAND5=0,0 AT+DATACUT5=0,0,0
AT+COMMAND6=0,0 AT+DATACUT6=0,0,0
AT+COMMAND7=0,0 AT+DATACUT7=0,0,0
AT+C(AT+DATACHT1-8.2.4~8
AT+C(AT+DATAGOT1-0,2,4 0
AT+c(a=8, return total 8 bytes (20 20 20 20 2d 30 2e 00)
AT+C(h=2)
AT+C(-1) (see the 4th -2 the base from return on common distribution in 20.24 20.25 00
AT+C(C=4~8 (grap the 4th ~ 8th bytes from return, so command 1 valid value is 20 2d 30 2e 00
AT+COmmandr-0,0 AITDATACOTF-0,0,0
AT+CHS=0
OK

CMD1	=	01	03	0b	b8	00	02	46	0a
RETURN1	=	20	20	20	20	2d	30	2e	00
Payload	=	0c	fc	01	20	2d	30	2e	00

Grab different sections.

AT+COMMAND1=01 03 0b b8 00 02 ,1 AT+COMMAND2=0,0 AT+DATACUT2=0,0,0 AT+DATACUT1=13,2,1~2+4~7+10~11 AT+COMMAND3=0,0 AT+DATACUT3=0,0,0 AT+COMMAND4=0,0 AT+DATACUT4=0,0,0 AT+COMMAND5=0,0 AT+DATACUT5=0,0,0 $\Delta T + COMM \Delta ND6=0 0$ $\Delta T + D \Delta T \Delta C \parallel T h = 0 0 0$ AT+DATACUT1=13,2,1~2+4~7+10~11 a=13, return total 13 bytes (90 02 6a 82 1a 04 20 2d 30 2e dd 9b 00) b=2 c=1~2+4~7+10~11 (grap the 1 ~ 2 bytes + 4~7 bytes + 10~11 bytes so command1 valid value is 90 02 82 1a 04 20 2e dd ATTOMMANDE-V.V AITUATACUTE-V. AT+COMMANDF=0,0 AT+DATACUTF=0,0,0 AT+CHS=0 οк

CMD1	=	01	03	0b	b8	00	02	46	0a					
RETURN1	=	90	02	6a	82	1a	04	20	2d	30	<u>2e</u>	dd	9b	00
Payload	=	0c	fc	01	90	02	82	1a	04	20	2e	dd		

Note:

AT+SEARCHx and AT+DATACUTx can be used together, if both commands are set, RS485-LB/LS will first process AT+SEARCHx on the return string and get a temporary string, and then process AT+DATACUTx on this temporary string to get the final payload. In this case, AT+DATACUTx need to set to format AT +DATACUTx=0,xx,xx where the return bytes set to 0.

Example:

AT+COMMAND1=11 01 1E D0,0

AT+SEARCH1=1,1E 56 34

AT+DATACUT1=0,2,1~5

Return string from AT+COMMAND1: 16 0c 1e 56 34 2e 30 58 5f 36 41 30 31 00 49

String after SEARCH command: 2e 30 58 5f 36 41 30 31 00 49

Valid payload after DataCUT command: 2e 30 58 5f 36

CMD1 = 11 01 1e d0 SEARCH1 = 1e 56 34 RETURN1 = 2e 30 58 5f 36 41 30 31 00 49 Payload = 8d 2d 01 2e 30 58 5f 36

2.6.2.4 Compose the uplink payload

Through AT+COMMANDx and AT+DATACUTx we got valid value from each RS485 commands, Assume these valid value are RETURN1, RETURN2, ..., to RETURNx. The next step is how to compose the LoRa Uplink Payload by these RETURNs. The command is **AT+DATAUP**.

Examples: AT+DATAUP=0

Compose the uplink payload with value returns in sequence and send with A SIGNLE UPLINK.

Final Payload is

Battery Info+PAYVER + VALID Value from RETURN1 + Valid Value from RETURN2 + ... + RETURNX

Where PAYVER is defined by AT+PAYVER, below is an example screen shot.



Examples: AT+DATAUP=1

Compose the uplink payload with value returns in sequence and send with Multiply UPLINKs.

Final Payload is

Battery Info+PAYVER + PAYLOAD COUNT + PAYLOAD# + DATA

- 1. Battery Info (2 bytes): Battery voltage
- 2. PAYVER (1 byte): Defined by AT+PAYVER
- 3. PAYLOAD COUNT (1 byte): Total how many uplinks of this sampling.
- 4. PAYLOAD# (1 byte): Number of this uplink. (from 0,1,2,3...,to PAYLOAD COUNT)
- 5. DATA: Valid value: max 6 bytes(US915 version here, Notice*!) for each uplink so each uplink <= 11 bytes. For the last uplink, DATA will might less than 6 bytes



So totally there will be 3 uplinks for this sampling, each uplink includes 6 bytes DATA

DATA1=RETURN1 Valid Value = 20 20 0a 33 90 41

DATA2=1st ~ 6th byte of Valid value of RETURN10= 02 aa 05 81 0a 20

DATA3=7th ~ 11th bytes of Valid value of RETURN10 = 20 20 20 2d 30

Below are the uplink payloads:



Notice: the Max bytes is according to the max support bytes in different Frequency Bands for lowest SF. As below:

- * For AU915/AS923 bands, if UplinkDwell time=0, max 51 bytes for each uplink (so 51 -5 = 46 max valid date)
- * For AU915/AS923 bands, if UplinkDwell time=1, max 11 bytes for each uplink (so 11 -5 = 6 max valid date).
- * For US915 band, max 11 bytes for each uplink (so 11 -5 = 6 max valid date).
- * For all other bands: max 51 bytes for each uplink (so 51 5 = 46 max valid date).

* When AT+DATAUP=1, the maximum number of segments is 15, and the maximum total number of bytes is 1500;

When AT+DATAUP=1 and AT+ADR=0, the maximum number of bytes of each payload is determined by the DR value. (Since v1.4.0)

• If the data is empty, return to the display (Since v1.4.0)

1) When AT+MOD=1, if the data intercepted by AT+DATACUT or AT+MBFUN is empty, it will display NULL, and the payload will be filled with n FFs.

Payload = 01 02 00 FF
[68528]***** UpLinkCounter= 4 *****
[68530]TX on freq 867900000 Hz at DR 5
[68652]RX on freq 869525000 Hz at DR 0
r 68654]txDone
[23643]RX on freq 867988888 Hz at DR 5
NNA - A 80 88 89 10 81 44
RETURN1 = NULL
Payload = 01 02 01 FF
[77352]***** UpLinkCounter= 5 *****
[77354]TX on freq 867500000 Hz at DR 5
[77476]RX on freq 869525000 Hz at DR 0
[77478]txDone
IR24671RX on Freq 867588888 Hz at DR 5
Location in red outsetone in a contraction of the second s

2) When AT+MOD=2, if the data intercepted by AT+DATACUT or AT+MBFUN is empty, it will display NULL, and the payload will be filled with n 00s.

```
= 01 03 00 00 00 06 c5 c8
CMD1
RETURN1 = NULL
CMD2
       = 01 03 00 00 00 08 44 0c
RETURN2 = NULL
CMD15 = 01 03 00 00 00 04 44 09
RETURN15 = NULL
[9561]***** UpLinkCounter= 0 *****
[9562]TX on freq 868500000 Hz at DR 0
[12032]txDone
[17062]RX on freq 868500000 Hz at DR 0
ADR Message:
TX Datarate change to 4
TxPower change to 0
NbRep change to 1
[18217]rxDone
Rssi= -50
```

2.6.3 Uplink on demand

Except uplink periodically, RS485-LB/LS is able to uplink on demand. The server sends downlink command to RS485-LB/LS and RS485 will uplink data base on the command.

Downlink control command:

0xA8 command: Send a command to RS485-LB/LS and uplink the output from sensors.

2.6.4 Uplink on Interrupt

Put the interrupt sensor between 3.3v_out and GPIO ext.



AT+INTMOD=0 Disable Interrupt

- AT+INTMOD=1 Interrupt trigger by rising or falling edge.
- AT+INTMOD=2 Interrupt trigger by falling edge. (Default Value)
- **AT+INTMOD=3** Interrupt trigger by rising edge.

3. Configure RS485-LB/LS

3.1 Configure Methods

RS485-LB/LS supports below configure method:

- AT Command via Bluetooth Connection (Recommended): BLE Configure Instruction.
- AT Command via UART Connection : See <u>UART Connection</u>.
- LoRaWAN Downlink. Instruction for different platforms: See <u>IoT LoRaWAN Server</u> section.

3.2 General Commands

These commands are to configure:

- General system settings like: uplink interval.
- LoRaWAN protocol & radio related command.

They are same for all Dragino Devices which support DLWS-005 LoRaWAN Stack. These commands can be found on the wiki:

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20AT%20Commands%20and%20Downlink %20Command/

3.3 Commands special design for RS485-LB/LS

These commands only valid for RS485-LB/LS, as below:

3.3.1 Choose Device Type (RS485 or TTL)

RS485-LB/LS can connect to either RS485 sensors or TTL sensor. User need to specify what type of sensor need to connect.

AT Command

AT+MOD=1 // Set to support RS485-MODBUS type sensors. User can connect multiply RS485 , Modbus sensors to the A / B pins.

AT+MOD=2 // Set to support TTL Level sensors, User can connect one TTL Sensor to the TXD/RXD/GND pins.

- Downlink Payload
- **OA aa** --> same as AT+MOD=aa

3.3.2 RS485 Debug Command (AT+CFGDEV)

This command is used to configure the RS485 or TTL sensors; they won't be used during sampling. Max Length of AT+CFGDEV is **40 bytes**.

AT Command

m: 0: no CRC; 1: add CRC-16/MODBUS in the end

Downlink Payload

Format: A8 MM NN XX XX XX XX YY

Where:

- · MM: 1: add CRC-16/MODBUS ; 0: no CRC
- NN: The length of RS485 command
- XX XX XX XX: RS485 command total NN bytes
- YY: How many bytes will be uplink from the return of this RS485 command, if YY=0, RS485-LB/LS will
 execute the downlink command without uplink; if YY>0, RS485-LB/LS will uplink total YY bytes from the
 output of this RS485 command

Example 1:

To connect a Modbus Alarm with below commands.

- The command to active alarm is: 0A 05 00 04 00 01 **4C B0**. Where 0A 05 00 04 00 01 is the Modbus command to read the register 00 40 where stored the DI status. The 4C B0 is the CRC-16/MODBUS which calculate manually.
- The command to deactivate alarm is: 0A 05 00 04 00 00 8D 70. Where 0A 05 00 04 00 00 is the Modbus command to read the register 00 40 where stored the DI status. The 8D 70 is the CRC-16/MODBUS which calculate manually.

So if user want to use downlink command to control to RS485 Alarm, he can use:

A8 01 06 0A 05 00 04 00 01 00: to activate the RS485 Alarm

A8 01 06 0A 05 00 04 00 00 00: to deactivate the RS485 Alarm

A8 is type code and 01 means add CRC-16/MODBUS at the end, the 3rd byte is 06, means the next 6 bytes are the command to be sent to the RS485 network, the final byte 00 means this command don't need to acquire output.

Example 2:

Check TTL Sensor return:

AT+CFGDEV=11 01 1e d0,0 RETURN DATA:16 0c 1e 56 34 2e 30 58 5f 36 41 30 31 00 49

OK

3.3.3 Set Payload version

This is the first byte of the uplink payload. RS485-LB/LS can connect to different sensors. User can set the PAYVER field to tell server how to decode the current payload.

• AT Command:

```
AT+PAYVER: Set PAYVER field = 1
```

• Downlink Payload:

0xAE 01 --> Set PAYVER field = 0x01

0xAE 0F --> Set PAYVER field = 0x0F

3.3.4 Set RS485 Sampling Commands

AT+COMMANDx, AT+DATACUTx and AT+SEARCHx

These three commands are used to configure how the RS485-LB polling data from Modbus device. Detail of usage please see : <u>polling RS485 device</u>.

- AT Command:
 AT+COMMANDx: Configure RS485 read command to sensor.
 AT+DATACUTx: Configure how to handle return from RS485 devices.
 AT+SEARCHx: Configure search command
- Downlink Payload:

0xAF downlink command can be used to set AT+COMMANDx or AT+DATACUTx.

Note : if user use AT+COMMANDx to add a new command, he also need to send AT+DATACUTx downlink.

Format: AF MM NN LL XX XX XX XX YY

Where:

- MM: the ATCOMMAND or AT+DATACUT to be set. Value from 01 ~ 0F,
- NN: 0: no CRC; 1: add CRC-16/MODBUS ; 2: set the AT+DATACUT value.
- LL: The length of AT+COMMAND or AT+DATACUT command
- XX XX XX XX: AT+COMMAND or AT+DATACUT command
- YY: If YY=0, RS485-LB/LS will execute the downlink command without uplink; if YY=1, RS485-LB/LS will execute an uplink after got this command.

Example:

AF 03 01 06 0A 05 00 04 00 01 00: Same as AT+COMMAND3=0A 05 00 04 00 01,1

AF 03 02 06 10 01 05 06 09 0A 00: Same as AT+DATACUT3=16,1,5+6+9+10

AF 03 02 06 0B 02 05 07 08 0A 00: Same as AT+DATACUT3=11,2,5~7+8~10

0xAB downlink command can be used for set AT+SEARCHx

Example: AB aa 01 03 xx xx (03 here means there are total 3 bytes after 03) So

- AB aa 01 03 xx xx xx same as AT+SEARCHaa=1,xx xx xx
- AB aa 02 03 xx xx xx 02 yy yy(03 means there are 3 bytes after 03, they are xx xx xx;02 means there are 2 bytes after 02, they are yy yy) so the commands

AB aa 02 03 xx xx xx 02 yy yy same as AT+SEARCHaa=2,xx xx xx+yy yy

3.3.5 Fast command to handle MODBUS device

AT+MBFUN is valid since v1.3 firmware version. The command is for fast configure to read Modbus devices. It is only valid for the devices which follow the <u>MODBUS-RTU protocol</u>.

This command is valid since v1.3 firmware version

AT+MBFUN has only two value:

• AT+MBFUN=1: Enable Modbus reading. And get response base on the MODBUS return

AT+MBFUN=1, device can auto read the Modbus function code: 01, 02, 03 or 04. AT+MBFUN has lower priority vs AT+DATACUT command. If AT+DATACUT command is configured, AT+MBFUN will be ignore.

• AT+MBFUN=0: Disable Modbus fast reading.

Example:

- AT+MBFUN=1 and AT+DATACUT1/AT+DATACUT2 are not configure (0,0,0).
- AT+COMMAND1= 01 03 00 10 00 08,1 --> read slave address 01, function code 03, start address 00 01, quantity of registers 00 08.
- AT+COMMAND2= 01 02 00 40 00 10,1 --> read slave address 01, function code 02, start address 00 40, quantity of inputs 00 10.

AT+COMMAND1=01 03 AT+COMMAND2=01 02 AT+COMMAND3=0,0 AT+COMMAND4=0,0 AT+COMMAND5=0,0 AT+COMMAND5=0,0 AT+COMMAND7=0,0 AT+COMMAND8=0,0 AT+COMMAND9=0,0 AT+COMMAND9=0,0	00 10 00 08,1 AT+DATACUT3=0,0,0 AT+DATACUT3=0,0,0 AT+DATACUT4=0,0,0 AT+DATACUT5=0,0,0 AT+DATACUT5=0,0,0 AT+DATACUT7=0,0,0 AT+DATACUT7=0,0,0 AT+DATACUT8=0,0,0 AT+DATACUT8=0,0,0 AT+DATACUT8=0,0,0 AT+DATACUT9=0,0,0	AT+CMDL4=0 AT+CMDDL3=0 AT+CMDDL4=0 AT+CMDDL5=0 AT+CMDDL5=0 AT+CMDDL5=0 AT+CMDDL6=0 AT+CMDDL8=0 AT+CMDDL8=0 AT+CMDDL8=0 AT+CMDDL8=0 AT+CMDDL8=0 AT+CMDDL8=0	AT+CMDDL1=0 AT+CMDDL2=0	
AT+COMMANDE=0,0 AT+COMMANDE=0,0 AT+COMMANDE=0,0 AT+COMMANDE=0,0	AT+DATACUTE=0,0,0 AT+DATACUTE=0,0,0 AT+DATACUTE=0,0,0 AT+DATACUTE=0,0,0 AT+DATACUTE=0,0,0	AT+CMDDLD=0 AT+CMDDLD=0 AT+CMDDLD=0 AT+CMDDLE=0 AT+CMDDLF=0	1	
Start Tx events				
ОК				
CMD1 = 01 03 00 1 RETURN1 = 01 03 10 CMD2 = 01 02 00 4	0 00 08 45 c9 01 00 05 ff 00 00 00 00 0 00 10 78 12	0 01 03 00 00 00	00 00 00 86 fe	DATA1:8 register values
RETURN2 = 01 02 02 Payload = 0C FC 01	20 00 a0 78	0 01 03 00 00 00		
[177893]***** UpLink([177895]TX on freq 86 [178145]RX on freq 86 [178148]txDone [179143]RX on freq 86 [179183]RX on freq 86 [179185]rxTimeOut	Counter= 4 ***** 7700000 Hz at DR 3 9525000 Hz at DR 3 7700000 Hz at DR 3 9525000 Hz at DR 3	010500000		

Downlink Commands:

A9 aa --> Same as AT+MBFUN=aa

3.3.6 RS485 command timeout

Some Modbus device has slow action to send replies. This command is used to configure the RS485-LB to use longer time to wait for their action.

Default value: 0, range: 0 ~ 10 seconds

- AT Command:
- AT+CMDDLaa=hex(bb cc)

Example:

AT+CMDDL1=1000 to send the open time to 1000ms

• Downlink Payload:

0x AA aa bb cc Same as: AT+CMDDLaa=hex(bb cc)

Example:

```
0xAA 01 03 E8 --> Same as AT+CMDDL1=1000 ms
```

3.3.7 Uplink payload mode

Define to use one uplink or multiple uplinks for the sampling.

The use of this command please see: Compose Uplink payload

• AT Command:

AT+DATAUP=0

AT+DATAUP=1

• Downlink Payload:

0xAD 00 --> Same as AT+DATAUP=0

0xAD 01 --> Same as AT+DATAUP=1 //Each uplink is sent to the server one after the other as it is segmented.

• AT Command:

AT+DATAUP=1,Timeout

• Downlink Payload:

0xAD 01 00 00 14 --> Same as AT+DATAUP=1, 20000 //(00 00 14 is 20 seconds)

Each uplink is sent to the server at 20-second intervals when segmented.

3.3.8 Clear RS485 Command

The AT+COMMANDx and AT+DATACUTx AT+SEARCHx and AT+CMDDLx settings are stored in special location, user can use below command to clear them.

• AT Command:

AT+CMDEAR=mm,nn mm: start position of erase ,nn: stop position of erase Etc. AT+CMDEAR=1,10 means erase AT+COMMAND1/AT+DATACUT1/AT+SEARCH1/AT+CMDDL1 to AT+COMMANDA/AT+DATACUTA/AT +SEARCHA/AT+CMDDLA.

Example screen shot after clear all RS485 commands.

The uplink screen shot is:

↓ 14:41:47	Schedule data downlink for tra_	DevAddr:	26 0B 82 34	Rx1 Delay: 5						
1 4:41:47	Store upstream data message	DevAddr:	26 0B 82 34							
↑ 14:41:47	Forward data message to Applic_	DevAddr:	26 8B 82 34	MAC payload: A0 77	1E 21 32 BF CA 82 80 84 A3	FPort: 2 S	SNR: 3.2 RSSI: -1	18 Bandwidth: 1	25000	
↑ 14:41:47	Forward uplink data message	DevAddr:	26 0B 82 34	Payload: { BatV: 3.3	99, EXTI_Trigger: "FALS	E", Pay_ver:	1 } 00 47 01 00 0	0 00 00 00 00 00 00	FPort: 2 SNF	R: 3.2 RSS1
↑ 14:41:47	Receive uplink data message	DevAddr:	26 0B 82 34							
↑ 14:41:47	Successfully processed data me_	DevAddr:	26 0B 82 34	FPort: 2 MAC payloa	d: A0 77 1E 21 32 BF CA 82	2 8D 84 A3	Bandwidth: 125000	SNR: 3.2 RSSI:	-118 Raw payloa	id: 40 34 8
↑ 14:41:47	Drop data message	Uplink is	a duplicate		_					,
↑ 14:41:47	Drop data message	Uplink is	a duplicate							
↑ 14:41:47	Receive data message	DevAddr:	26 8B 82 34	FPort: 2 MAC payloa	d: A0 77 1E 21 32 BF CA 82	2 8D 84 A3	Bandwidth: 125000	SNR: 7.2 RSSI:	-109 Raw payloa	id: 48 34 8

• Downlink Payload:

0x09 aa bb same as AT+CMDEAR=aa,bb

3.3.9 Set Serial Communication Parameters

Set the Rs485 serial communication parameters:

- AT Command:
- · Set Baud Rate:

AT+BAUDR=9600 // Options: (200~115200), When using low baud rate or receiving multiple bytes, you need to use AT+CMDDL to increase the receive timeout (the default receive timeout is 300ms), otherwise data will be lost.

Set UART Parity

AT+PARITY=0 // Option: 0: no parity, 1: odd parity, 2: even parity

Set STOPBIT

AT+STOPBIT=1 // Option:1 for 1 bit ; 2 for 2 bits

Set DATABIT

AT+DATABIT=8 // Option:7 for 7 bits ; 8 for 8 bits

• Downlink Payload:

Example:

A7 01 00 60 same as AT+BAUDR=9600

A7 01 04 80 same as AT+BAUDR=115200

A7 02 aa: Same as AT+PARITY=aa (aa value: 00, 01 or 02)

A7 03 aa: Same as AT+STOPBIT=aa (aa value: 01 or 02)

A7 04 07: Same as AT+DATABIT=7

A7 04 08: Same as AT+DATABIT=8

3.3.10 Cut data separation processing

AT+NEWLINE command, which only takes effect when AT+DATAUP=1 or AT+DATAUP=1, timeout.

When not set, each part of AT+DATAUP is sent according to the maximum number of bytes of DR.

When setting, each part of AT+DATAUP is sent according to the value set by AT+NEWLINE.

• AT Command:

AT+NEWLINE=ALL The data cut out by each AT+COMMANDx command is sent separately as an uplink.

AT+NEWLINE=ALL equal# AT+NEWLINE=1+2+3+4+5+6+7+8+9+10+11+12+13+14+15

AT+NEWLINE=a+b+c The data returned by all commands is divided into three parts, COMMAND(1~a) is the first part, COMMAND(a+1~b) is the second part,COMMAND(b+1~c) is the third part.

AT+NEWLINE=NULL Turn off the functionality of this AT command.

Downlink Payload:	
AT+NEWLINE=ALL>	0xA5 01
AT+NEWLINE= NULL>	0xA5 00
AT+NEWLINE= a+b+c>	0xA5 number of bytes a b c
AT+NEWLINE= 1+5+15>	0xA5 03 01 05 0F

3.3.11 Control output power duration

User can set the output power duration before each sampling.

• AT Command:

Example:

AT+3V3T=1000 // 3V3 output power will open 1s before each sampling.

AT+3V3T=0 // Normally open 3V3 power supply.

AT+3V3T=65535 // Normally closed 3V3 power supply.

AT+5VT=1000 // +5V output power will open 1s before each sampling.

AT+5VT=0 // Normally closed +5V power supply.

AT+5VT=65535 // Normally open +5V power supply.

LoRaWAN Downlink Command:

07 01 aa bb : Same as AT+5VT=(aa bb)

07 02 aa bb : Same as AT+3V3T=(aa bb)

07 03 01 : Same as AT+3V3T=0

07 03 00 : Same as AT+3V3T=65535

07 04 01 : Same as AT+5VT=65535

07 04 00 : Same as AT+5VT=0

3.3.12 Encrypted payload

• AT Command:

AT+DECRYPT=1 // The payload is uploaded without encryption

AT+DECRYPT=0 // Encrypt when uploading payload (default)

3.3.13 Get sensor value

• AT Command:

AT+GETSENSORVALUE=0 // The serial port gets the reading of the current sensor

AT+GETSENSORVALUE=1 // The serial port gets the current sensor reading and uploads it.

3.3.14 Resets the downlink packet count

• AT Command:

AT+DISFCNTCHECK=0 // When the downlink packet count sent by the server is less than the node downlink packet count or exceeds 16384, the node will no longer receive downlink packets (default)

AT+DISFCNTCHECK=1 // When the downlink packet count sent by the server is less than the node downlink packet count or exceeds 16384, the node resets the downlink packet count and keeps it consistent with the server downlink packet count.

3.3.15 When the limit bytes are exceeded, upload in batches

• AT Command:

AT+DISMACANS=0 // When the MACANS of the reply server plus the payload exceeds the maximum number of bytes of 11 bytes (DR0 of US915, DR2 of AS923, DR2 of AU195), the node will send a packet with a payload of 00 and a port of 4. (default)

AT+DISMACANS=1 // When the MACANS of the reply server plus the payload exceeds the maximum number of bytes of the DR, the node will ignore the MACANS and not reply, and only upload the payload part.

Downlink Payload

0x21 00 01 // Set the DISMACANS=1

3.3.16 Copy downlink to uplink

• AT Command:

AT+RPL=5 // After receiving the package from the server, it will immediately upload the content of the package to the server, the port number is 100.

Example: **aa xx xx xx xx** // aa indicates whether the configuration has changed, 00 is yes, 01 is no; xx xx xx xx are the bytes sent.

	Overview	Live data	Messaging	Location	Payload formatters	Claiming	General settings					
Time	Туре			Data previe	w			Verbose	stream 🔿 🗙	Export as JSON	Pause	📋 Clear
↑ 14:22:1	2 Forward	uplink data	message	DevAddr:	26 0B 7C A7 🗘 🖺	Payload: { }	00 11 22 33 44 55 66 77	↔ 🖷	FPort: 100	Data rate: SF8BW125	5 SNR: 11.8	RSSI: -81
↑ 14:22:1	2 Successi	ully proces	sed data …	DevAddr:	26 0B 7C A7 🗘 盾							

For example, sending 11 22 33 44 55 66 77 will return invalid configuration 00 11 22 33 44 55 66 77.

	Overview	Live data	Messaging	Location	Payload formatters	Claiming	General settings				
Time	Туре			Data previe	w			Verbose stream 🔿 🗙	🛓 Export as JSON	II Pause	📋 Clear
↑ 14:26:1	3 Forward	uplink data	a message	DevAddı:	26 0B 7C A7 🔇	Payload: { }	01 01 00 02 58 🔇	FPort: 100 Data rate	: SF7BW125 SNR: 10	.5 RSSI: -8	4
↑ 14:26:1	3 Success	fully proces	sed data …	DevAddr:	26 0B 7C A7 🗘 🖺						

For example, if 01 00 02 58 is issued, a valid configuration of 01 01 00 02 58 will be returned.

3.3.17 Query version number and frequency band

Downlink Payload: 26 01 // Downlink 26 01 can query device upload frequency, frequency band, software version number, battery.

Example:

Time	Туре	Data previ	iew		Verbose st	tream 🔿 🗙	🛓 Export as JSC	N II Pause	🗑 Clea	ar
↑ 17:36:46	Forward uplink data message	DevAddr:	26 0B 33 F8	\diamond	Payload: { BAT: 3.6, FIRMWARE_VERSION: "1.0.0", FREQUENCY_BAND: "US915", SENSOR_MODEL: "RS	485-LB", SUB_E	BAND: 0 } 30 G	1 00 02 00 0E 10	o ∫	6

3.4 +3V3 Output

RS485-LB/LS has a Controllable +3V3 output, user can use this output to power external sensor.

The +3V3 output will be valid for every sampling. RS485-LB/LS will enable +3V3 output before all sampling and disable the +3V3 after all sampling.

The +3V3 output time can be controlled by AT Command.

AT+3V3T=1000

Means set +3v3 valid time to have 1000ms. So, the real +3v3 output will actually have 1000ms + sampling time for other sensors.

By default, the AT+3V3T=0. This is a special case, means the +3V3 output is always on at any time

3.5 +5V Output

RS485-LB/LS has a Controllable +5V output, user can use this output to power external sensor.

The +5V output will be valid for every sampling. RS485-LB/LS will enable +5V output before all sampling and disable the +5v after all sampling.

The 5V output time can be controlled by AT Command.

AT+5VT=1000

Means set 5V valid time to have 1000ms. So, the real 5V output will actually have 1000ms + sampling time for other sensors.

By default, the AT+5VT=0. If the external sensor which require 5v and require more time to get stable state, user can use this command to increase the power ON duration for this sensor.

3.6 Switch Jumper

Switch Jumper	Feature
SW1	ISP position: Upgrade firmware via UART Flash position: Configure device, check running status.
SW2	5V position: set to compatible with 5v I/O. 3.3v position: set to compatible with 3.3v I/O.,

+3.3V: is always ON

+5V: Only open before every sampling. The time is by default, it is AT+5VT=0.

Note: If SW2 is at +5V and AT+5VT=0, work mode 2 will not be able to send data.

3.7 Battery & Power Consumption

RS485-LB use ER26500 + SPC1520 battery pack and RS485-LS use 3000mAh Recharable Battery with Solar Panel. See below link for detail information about the battery info and how to replace.

Battery Info & Power Consumption Analyze .

4. Case Study

User can check this URL for some case studies: <u>APP RS485 COMMUNICATE WITH SENSORS</u>

5. OTA Firmware update

User can change firmware RS485-LB/LS to:

- Change Frequency band/ region.
- Update with new features.
- · Fix bugs.

Firmware and changelog can be downloaded from : Firmware download link

Methods to Update Firmware:

- (Recommanded way) OTA firmware update via wireless: <u>http://wiki.dragino.com/xwiki/bin/view/Main/</u> <u>Firmware%200TA%20Update%20for%20Sensors/</u>
- Update through UART TTL interface: Instruction.

6. FAQ

6.1 How to upgrade the image?

The RS485-LB/LS LoRaWAN Controller is shipped with a 3.5mm cable, the cable is used to upload image to RS485-LB/LS to:

- Support new features
- For bug fix
- Change LoRaWAN bands.

Below shows the hardware connection for how to upload an image to RS485-LB/LS:



Update through UART TTL interface: Instruction.

6.2 How to change the LoRa Frequency Bands/Region?

User can follow the introduction for how to upgrade image. When download the images, choose the required image file for download.

6.3 How many RS485-Slave can RS485-LB/LS connects?

The RS485-LB/LS can support max 32 RS485 devices. Each uplink command of RS485-LB/LS can support max 16 different RS485 command. So RS485-LB/LS can support max 16 RS485 devices pre-program in the device for uplink. For other devices no pre-program, user can use the downlink message (type code 0xA8) to poll their info.

6.4 How to Use RS485-LB/LS to connect to RS232 devices?

Use RS485-LB/LS or RS485-LN to connect to RS232 devices. - DRAGINO

6.5 How to judge whether there is a problem with the set COMMAND

6.5.1 Introduce:

Users can use below the structure to fast debug the communication between RS485-LB/LS and RS485-LN. The principle is to put the PC in the RS485 network and sniff the packet between Modbus MTU and RS485-LB/LS/LN. We can use this way to:

- 1. Test if Modbus-MTU works with PC commands.
- 2. Check if RS485-LN sent the expected command to Mobus-MTU
- 3. Check if Modbus-MTU return back the expected result to RS485-LN.
- 4. If both b) and c) has issue, we can compare PC's output and RS485-LN output.



Example Connection:



6.5.2 Set up PC to monitor RS485 network With Serial tool

Note: Receive and send set to hex mode

■ 友善丰口调试助手 - 试用版	_		×
文件(F) 編辑(E) 视图(V) 工具(T) 控制(C) 帮助(H)			
- 串口设置			_
端 □ COM5(USB-SERIAL CH340) ▼			
波特率 9600 🔹			
数据位 8 🔹			
校验位 None 🔽			
停止位 1 🔹			
流 控 None 💌			
- 接收设置			
ASCII			
□ 自动换行			
▼ 显示发送			
▽ 显示时间			
- 发送设置			
C ASCII			
□ 自动重发 1000 ÷ ms			
		发动	з
	r	A Pale -	-
CONTO OPENED, 9000, 6, NOTRE, 1, OFF XX: 0 Bytes XX: 0 Bytes		Althon	6

6.5.3 With ModRSsim2:

(1) Select serial port MODBUS RS-232

😹 MODBUS RTU	J RS-232	PLC - Simulator (port:	9600,8,N,1,R-on)				-		_	\Box ×
Connected (0) : (n	ceived	sent) (0/0) Serv. read da	ata. R	x: 🔴 Tx: 🔴					🛔 🔒 🔗	🗢 ¥ M 🐱	
Address: C H 🖲	D VO	Holding Regs (40000	00) 💌 🔍 Fm	t decimal +/- 💌	Prot. MODBUS	8 RS-232					Clone
Address	+0	+1	+2	+3	MODEUS	RS-232 TCP/IP					
400001-400010	0	0	0	0	Allen Brai	dley DF1					
400011-400020	0	0	0	0	JOY SCC	DÉ1					
400021-400030	0	0	0	0	0	D	0	0	0	0	
400031-400040	0	0	0	0	0	0	0	0	0	0	
400041-400050	0	0	0	0	0	0	0	0	0	0	
400051-400060	0	0	0	0	0	0	0	0	0	0	
400061-400070	0	0	0	0	0	0	0	0	0	0	
400071-400080	0	0	0	0	0	0	0	0	0	0	
400081-400090	0	0	0	0	0	0	0	0	0	0	
400091-400100	0	0	0	0	0	0	0	0	0	0	
400101-400110	0	0	0	0	0	0	0	0	0	0	
400111-400120	0	0	0	0	0	D	0	0	0	0	
400121-400130	0	0	0	0	0	D	0	0	0	0	
400131-400140	0	0	0	0	0	D	0	0	0	0	
400141-400150	0	0	0	0	0	0	0	0	0	0	
400151-400160	0	0	0	0	0	0	0	0	0	0	
400161-400170	0	0	0	0	0	0	0	0	0	0	
400171-400180	0	0	0	0	0	0	0	0	0	0	
400181-400190	0	0	0	0	0	0	0	0	0	0	
400191-400200	0	0	0	0	0	0	0	0	0	0	
400201-400210	U	0	U	0	0	0	0	U	U	0	
00 01 02	03	04 05 08 07	08 09 1			10 17 18	19 20 21	22 23 24 2	25 A	т	Comms
									14		Commo
		30 31 32 33				10 M		40 00	V	Ver. 8	.21.2.7
							116.00	00 1011 AuD-m-			

(2) Click the serial port icon

MODBUS RTU	J RS-232 P	LC - Simulator (port:	9600,8,N,1,R-on)							- 0	×
Connected (0) : (re	acaived/se	ent) (0/0) Serv. read o	lata. Po	с 🔴 Тж 🔴					🛔 🔒 🔗	◎ 🛃 🗤 📓 🗖	
Address: C H @	D 1/0	Holding Regs (4000	100) 💌 🌒 Fmt	decimal +/- 💌	Prot: MODBUS	RS-232				-	🗆 Clone 🗆 Log
Address	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	
400001-400010	0	0	0	0	0	0	0	0	0	0	
400011-400020	0	0	0	0	0	0	0	0	0	0	
400021-400030	0	0	0	0	D	0	0	0	0	0	
400031-400040	0	0	0	0	D	0	0	0	0	0	
400041-400050	0	0	0	0	D	0	0	0	0	0	
400051-400060	0	0	0	0	0	0	0	0	0	0	
400061-400070	0	0	0	0	0	0	0	0	0	0	
400071-400080	0	0	0	0	0	0	0	0	0	0	
400081-400090	0	0	0	0	0	0	0	0	0	0	
400091-400100	0	0	0	0	D	0	0	0	0	0	
400101-400110	0	0	0	0	D	0	0	D	0	0	
400111-400120	0	0	0	0	D	0	0	0	0	0	
400121-400130	0	0	0	0	D	0	0	0	0	0	
400131-400140	0	0	0	0	0	0	0	0	0	0	
400141-400150	0	0	0	0	0	0	0	0	0	0	
400151-400160	0	0	0	0	0	0	0	0	0	0	
400161-400170	0	0	0	0	0	0	0	0	0	0	
400171-400180	0	0	0	0	0	0	0	0	0	0	
400181-400190	0	0	0	0	D	0	0	0	0	0	
400191-400200	0	0	0	0	0	0	0	0	0	0	
400201-400210	0	0	0	0	0	0	0	0	0	0	
00 01 02 28 27 28	03 04 29 3	05 05 07 31 32 33	08 09 10 34 35 38	11 12 13 37 38 39	14 15 1 40 41 4	17 18 1 2 43 44 4	20 21 46 47	22 23 24 2 48 49 50		 Ver. 8.2	Comms

S-232 MODBUS PL	C Sim-server Settings	>
-RS-232 Port		ОК
Port	COM5*	Cancel
Baud rate	9600 💌	lf vou see a little *
Parity	None	next to the COM port.
Data bits	8 💌	or being used by
Stop bits	1 •	another program.
RTS control	Enable 💌	
– Server settings –		
Responsivenes	s (ms) 0	(0 to 10 000 ms)
Load register Units are all of	values at startup. off at startup. 🛛 🕅	Use Long Timeouts.
-Advanced setting	js —	
Perform MOE	BUS - MOSCAD (row/to	able) checks
🗖 Allen-Bradley	/ master mode PLC	
Chockeym calc	ulation isusing CBC	(2-bytes 🔻

(4) Click the comms.

MODBUS RTU	7 RS-232 PLC	C - Simulator (port	:: COM5 9600,8,N,1	(,R-on)						_ L	X
Connected (1) : (re	eceived/ser	t) (0/0) Serv. read	data. Pu	c 🔴 Tx: 🛑					🛔 🔒 🗗	© 者 🗤 🚟 🗖	1 🖪 ሾ
Address: O H @	o vo F	lolding Regs (400	1000) 💌 🍨 Fmt	decimal +/- 💌	Prot MODBUS P	S-232				•	Clone Log
Address	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9	
400001-400010	0	0	0	0	0	0	0	0	0	0	
400011-400020	0	0	0	0	0	0	0	0	0	0	
400021-400030	0	0	0	0	0	0	0	0	0	0	
400031-400040	0	0	0	0	0	0	0	0	0	0	
400041-400050	0	0	0	0	0	0	0	0	0	0	
400051-400060	0	0	0	0	0	0	0	0	0	0	
400061-400070	0	0	0	0	0	0	0	0	0	0	
400071-400080	0	0	0	0	0	0	0	0	0	0	
400081-400090	0	0	0	0	0	0	0	0	0	0	
400091-400100	0	0	0	0	0	0	0	0	0	0	
400101-400110	0	0	0	0	0	0	0	0	0	0	
400111-400120	0	0	0	0	0	0	0	0	0	0	
400121-400130	0	0	0	0	0	0	0	0	0	0	
400131-400140	0	D	0	0	0	0	0	0	0	0	
400141-400150	0	0	0	0	0	0	0	0	0	0	
400151-400160	0	0	0	0	0	0	0	0	0	0	
400161-400170	0	0	0	0	0	0	0	0	0	0	
400171-400180	0	0	0	0	0	0	0	0	0	0	
400181-400190	0	0	0	0	0	0	0	0	0	0	
400191-400200	0	D	0	0	0	0	0	0	0	0	
400201-400210	0	0	0	0	0	0	0	0	0	0	
00 01 02	03 04	05 08 07	08 09 10	11 12 13	14 15 1	17 18 1	9 20 21 2	2 23 24 2		Т	Comms
									111		

Run RS485-LN/BL command and monitor if it is correct.

6.5.4 Example – Test the CFGDEV command

RS485-LN sent below command:

AT+CFGDEV=01 03 20 00 01 85 c0,1 to RS485 network, and PC is able to get this command and return commands from MTU to show in the serial tool.

We can see the output from the Serial port tool to analyze. And check if they are expected result.

	_	~	[17:27:30.555] 123456
		-	[17:27:36.585] Correct Password
		_	[17:27:39.338] AT+CFGDEV=01 03 00 20 00 01,1
SEND receive		 -	[17:27:39.422] AT+CFGDEV=01 03 20 00 01 85 c0 ,1 [17:27:39.430] RETURN DATA: [17:27:40.497] [17:27:40.499] 01 03 02 00 00 b8 44 [17:27:40.693] [17:27:40.699] OK
			AT_CECDEV_01 03 00 20 00 01 1

We can also use ModRSsim2 to see the output.

17:09:26.391 Starting server(s) 17:09:26.392 Starting comms emulation : MODBUS RS-232 17:09:26.393 Port COM6 opened. 17:09:26.393 Port VO buffers configured. 17:09:26.394 Port configured 9600.8.N.1 17:09:26.394 Timeouts configured (100ms/500ms) 12:09:26.394 Modem status : [CTS_][DSR_][FibIG_] 17:18:32.517 RX01 03 00 20 00 01 7:18:32.518 RX:95 C0 01 03 22 00 17:18:32.518 Rx:9DUSize is 256 17:18:32.518 Read Holding Regs from 32 for 1. 17:18:32.518 TX11 03 02 00 00 R5 44		
00 01 02 02 04 05 05 07 09 09	19 11 12 13 14 15 16 17 19 20 21 22	23 24 25 <u>A</u>
net 10 10 10 10 10 10 10 10 10 10 10 10 10	International and the state International and the state <t< td=""><td>▲ <u>发送</u></td></t<>	▲ <u>发送</u>
COM12 OPENED 9600 8 NONE 1 OFF Rv: 16 297 Bytes	AT+CFGDEV-01 03 00 20 00 01,1	Alithon

6.5.5 Example – Test CMD command sets.

Run **AT+SENSORVALUE=1** to test the CMD commands set in RS485-LN.

Serial port tool:

[17,97,90,417] 01 02 00 20 00 01 95 C0 01 02 02 00 00 88 44 01 02 00 20 00	[17:27:40.699] OK
	[17:30:01.230] AT+GETSENSORVALUE=1
01 85 C0 01 03 02 00 00 B8 44 01 03 00 21 00 01 D4 00 01 03 02 00 00 B8 44	
01 03 00 22 00 01 24 00 01 03 02 00 20 B9 9C 01 03 00 23 00 01 75 C0 01 03	
02 00 00 B8 44 01 03 00 24 00 01 C4 01 01 83 01 80 F0	[17,20,01,260]
	[17:30:01.200]
	[17:30:01.261] UK
	[17:30:03.349]
	[17:30:03.351] CMD1 = 01 03 00 20 00 01 85 c0
	[17:30:03.401]
	[17:30:03.402] RETURN1 = 01 03 02 00 00 b8 44
	[17:30:03.440]
	[17:30:03, 441] CMD2 = 01 03 00 21 00 01 d4 00
	[17:30:03 487]
	[17:30:02, 401] RETURN2 = 01 02 02 00 00 b8 44
	[17, 30, 03, 491] [LI 0102 = 01 03 02 00 00 03 44
	[17:30:03.552] CMD3 - 01 03 00 22 00 01 24 00
	[17:30:03.571] KETUKN3 = 01 03 02 00 20 69 9c
	[17:30:03.611]
	[17:30:03.611] CMD4 = 01 03 00 23 00 01 75 c0
	[17:30:03.661] RETURN4 = 01 03 02 00 00 b8 44
	[17:30:03.700]
	[17:30:03.702] CMD5 = 01.03.00.24.00.01 c4.01
	[17:30:03 751]
	[17,20,02 751] PETURNE - 01 92 01 90 40 00 00
	[17:30:03.751] ABIUANS - 01 83 01 80 10 00 00
1	[[[11:30:03.114]

ModRSsim2:



6.5.6 Test with PC

If there is still have problem to set up correctly the commands between RS485-LN and MTU. User can test the correct RS485 command set in PC and compare with the RS485 command sent out via RS485-LN. as long as both commands are the same, the MTU should return correct result.

Or User can send the working commands set in PC serial tool to Dragino Support to check what should be configured in RS485-LN.

Connection method:



Link situation:

[16:03:35.274]	CMD4 = 01 03 00 23 00 01 75 c0	4
[16:03:35.320]	RETURN4 = 01 03 02 08 98 be 2e	
[16:03:35.367]	CMD5 = 01 03 00 24 00 01 c4 01	
[16:03:35.412]	RETURN5 = 01 03 02 08 98 be 2e	
[16:03:35.444]	Payload = 01	
[16:03:35.951]		
[16:03:35.961]	[134251]***** UpLinkCounter= 11 *****	
[16:03:35.992]	[134252]TX on freq 910700000 Hz at DR 0	
[16:03:36.245]	[134545]RX on freq 923300000 Hz at DR 8	
[16:03:36.287]	[134547]txDone	
[16:03:41.239]	[139539]RX on freq 924500000 Hz at DR 10	
[16:03:41.281]	[139571]RX on freq 923300000 Hz at DR 8	
[16:03:41.311]	[139573]rxTimeOut	
[16:03:46.016]		
[16:03:46.019]	CHD1 = 01 03 00 20 00 01 85 c0	
[16:03:46.065]	RETURN1 = 01 03 02 08 c0 bf d4 00 00 00 00 00 00 00 00 00 00 00 00	
00 00 00 00		
[16:03:46.204]	CMD2 = 01 03 00 21 00 01 d4 00	
[16:03:46.252]	RETURN2 = 01 03 02 08 c0 bf d4	
[16:03:46.297]	CND3 = 01 03 00 22 00 01 24 00	
[16:03:46.344]	RETURN3 = 01 03 02 08 c0 bf d4	
[16:03:46.374]	CMD4 = 01 03 00 23 00 01 75 c0	
[16:03:46.421]	RETURN4 = 01 03 02 08 c0 bf d4	
[16:03:46.467]	CMD5 = 01 03 00 24 00 01 c4 01	
[16:03:46.515]	RETURN5 = 01 03 02 08 c0 bf d4	
[16:03:46.545]	Payload = 01	
[16:03:47.052]		
[16:03:47.057]	[145352]***** UpLinkCounter= 12 ****	
[16:03:47.088]	[145354]TX on freq 910500000 Hz at DR 0	
[16:03:47.347]	[145646]RX on freq 923300000 Hz at DR 8	
[16:03:47.383]	[145648]txDone	
[16:03:52.340]	[150639]RX on freq 923900000 Hz at DR 10	
[16:03:52.376]	[150671]RX on freq 923300000 Hz at DR 8	
[16:03:52.407]	[150673]rxTimeOut	
_		-

MODBUS RTU RS-232 PLC - Simulator (port: COM16 9600,8,N,1,R-on)	- 0	×
Connected (1) : (received/senf) (82/82) Serv. read data. Po: ● Tx ●	🛔 🛔 🖉 🍦 🖤 🗾 💻	ti P
Pause Stop tracking Clear Show times	Г	Log
16 03 55 969 m, PDUSize is 256 16:03 55 969 Lead Holding Regs from 34 for 1. 16:03 55 97 RX/5 C0 16:03 55 97 RX/5 C0 16:03 55 97 RX/5 C0 16:03 55 97 RX/5 C0 16:03 55 97 Read Holding Regs from 35 for 1. 16:03 55 77 Read Holding Regs from 36 for 1. 16:03 55 78 RX/0 10 02 08 F2 IE 01 16:03 55 78 RX/0 10 02 08 F2 IE 01 16:03 55 786 RX/0 10 02 00 F2 IE 01 16:03 55 786 Read Holding Regs from 36 for 1. 16:04 57 17 RX/01 03 02 08 F2 IE 01 16:04 57 17 RX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F2 IE 01 16:04 72 50 FX/01 03 02 00 F3 IX 01 16:04 72 50 FX/01 03 02 00 F3 IX 01 16:04 72 50 FX/01 03 02 00 F3 IX 01 16:04 72 50 FX/01 03 02 00 F3 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 03 02 00 F4 IX 01 16:04 72 50 FX/01 00 FX/01 FX/01 00 FX/01 00 FX/01 00 FX/01 00 FX/01 00 FX/01 00 FX		1
1 1971 1976 1971 1978 1974 1975 1978 1977 1978 1978 1978 1978 1972 1978 1976 1978 1978 1978 1978 1978 1978 1978 197 1978 1978 1978 1978 1978 1978 1978 1978	A T Re V Ver. 8.214	gisters 2.7

6.6 Where to get the decoder for RS485-LB/LS?

The decoder for RS485-LB/LS needs to be written by yourself. Because the sensor to which the user is connected is custom, the read device data bytes also need custom parsing, so there is no universal decoder. We can only provide <u>templates</u> for decoders (no intermediate data parsing part involved)

6.7 How to connect RS485-LB node to UART distance sensor?

Take the A16-15 as an example, but the same setup can support different distance sensors, compare specifications see this link to DDS04-LB.



• Connection:



• AT command configuration:

AT+MOD=2

AT+COMMAND1=01 02 03 04 05 ,0 AT+SEARCH1=1,ff AT+DATACUT1=4,2,2~3 AT +CMDDL1=1000

Serial Port Utility - Personal Edition			×
<u>Eile Edit V</u> iew <u>T</u> ools <u>C</u> ontrol <u>H</u> elp			
📄 🚥 ▶ 🚺 🔳 😋 🕂 — 🛅 🐯 COM6(USB-Enhanced-SERIAL CH91	l02) 🔻		
AT+5VT=3000			
AT+3V3T=0			
AT+INTMOD=2			
AT+MOD=2			
AT+MBFUN=0			
AT+BAUDR=9600			
AT+DATABIT=8			
AT+PARITY=0			
AT+STOPBIT=1			
AT+DATAUP=0			
AT+PAYVER=1			- 1
AI+COMMAND1=01 02 03 04 05 ,0 AI+SEARCH1=1,++ AI+DAIAG	2011=4,2,2	2~3	
		-	J
AT+COMMAND2=0,0 AT+SEARCH2=0,0 AT+DATACUT2=0,0,0 A		=0	
AT+COMMAND3=0,0 AT+SEARCH3=0,0 AT+DATACUT3=0,0,0 A		=0	
AT+COMMAND4=0,0 AT+SEARCH4=0,0 AT+DATACUT4=0,0,0 A		=0	
AT+COMMANDS=0,0 AT+SEARCHS=0,0 AT+DATACUTS=0,0,0 A		=0	
AT+COMMANDE=0,0 AT+SEARCHE=0,0 AT+DATACUTE=0,0,0 A		=0	
AT+COMMAND/=0,0 AT+SEARCH/=0,0 AT+DATACUT/=0,0,0 A		=0	T
AT+COMMAND8=0,0 AT+SEARCH8=0,0 AT+DATACUT8=0,0,0 A		=0	
AT+GETSENSORVALUE=1			1
		Sen	d
AT+GETSENSORVALUE=1			•
COM6 OPENED, 9600, 8, NONE, 1, OFF Rx: 6,201 Bytes Tx: 364 Bytes			

- Decoder: Decoding refer to this link.
- Example in TTN:

THE THINGS	THE THINGS STACK SANDBOX	Cvervier 0	w 🗖 Applications	🚔 Gateways 🛛 👫	Organizati	ons										Do su	UI Sandbox pport plan ①	3	раорао
111 zero				Applications > zero 3	End devi	ces > RS485LB > Live	ata												
0verview	v			E RS485L	B 86ec8db99e	200													
🙏 End devic	ices			↑5 ↓2 (Nwk) ③	Last acti	wity 16 seconds ago 🕲													
🗐 Live data	i			Overview Live da	ata Mes	saging Location I	ayload format	ters Gener	al settings										
<> Payload fi	formatters 🗸	Time	Туре		Data prev	lew									Verbose stream	×		ON II	Pause 📋 Cle
夫 Integratio	ons 🗸	↑ 10:23:50	Forward uplink data	message	DevAddr:	26 08 A0 FE 💠 🐚	Payload: {	BatV: 3.276	, EXTI_Trigge:	r: "FALSE",	Payver: 1,	distance: "903m	•• 3 OC CC	01 03 87 🗘	FPort: :	2 Data ra	te: SF98W126	SNR: -10	RSSI: -110
🔐 Collabora	ators	↑ 10:23:50	Successfully proces	sed data message	DevAddr:	26 08 A0 FE 💠 🚡													
Ov API keys		↑ 10:23:37	Forward uplink data	message	DevAddr:	26 08 A0 FE 💠 🐞	Payload: {	BatV: 3.27,	EXTI_Trigger	"FALSE", I	Payver: 1,	distance: "1150mm	•* } 0C C6	01 04 7E 🗘	FPort: 3	2 Data ra	te: SF98W126	SNR: -7.8	5 RSSI: -116
🔅 General s	settings	 ↑ 10:23:37 ↑ 10:23:20 ↑ 10:23:20 	Successfully proces Forward uplink data Successfully proces	sed data message message sed data message	DevAddr: DevAddr: DevAddr:	26 0B A0 FE ↔ 56 26 0B A0 FE ↔ 56 26 0B A0 FE ↔ 56	Payload: {	BatV: 3.27,	EXTI_Trigger	: "FALSE", F	Payver: 1,	distance: "3514ee	••• } 0C C6	01 0D BA 🔗	FPort:	2 Data ra	te: SF9BW125	SNR: 2 R	SSI: -94
		↓ 10:23:02	Schedule data downl	ink for transmissi	DevAddz:	26 08 A0 FE 💠 🛍	Rx1 Delay:	5											
		↑ 10:23:02 ↑ 10:23:02	Forward uplink data Successfully proces	message sed data message	DevAddr: DevAddr:	26 0B A0 FE ↔ 🚡 26 0B A0 FE ↔ 🚡	Payload: {	BatV: 3.27,	EXTI_Trigger	: "FALSE", I	Payver: 1,	distance: "665mm"	• } OC C6 (01 02 99 🔿	FPort: 2	Data rat	e: SF9BW125 S	IR: 7.2	R55I: •94
		↓ 10:22:22	Schedule data downl	ink for transmissi	DevAddr:	26 08 A0 FE 🛛 🖌	Rx1 Delay:	5											
		↑ 10:22:21	Forward uplink data	message	DevAddr:	26 08 A0 FE 💠 🐞	Payload: {	BatV: 3.258	, EXTI_Trigge	r: "FALSE",	Payver: 1,	distance: "3467	••••* } OC 8	A 01 0D 88 <	FPort:	2 Data r	ate: SF128W128	SNR: 5.	.8 RSSI: -96
		↑ 10:22:21	Successfully proces	sed data message	DevAddr:	26 08 A0 FE 💠 🖺													
		↑ 10:22:11	Forward join-accept	message	DevAddr:	26 08 A0 FE 🗠 🐚	JoinEUI:	F1 88 F8 D9 FC	068 F1 00 ↔	DevEU3	I: 00 35 86	EC 8D 89 9E 01 <	D 🖷						
		↑ 10:22:09	Successfully proces	sed join-request	DevAddr:	26 0B C1 84 🜼 🐚	JoinEUI:	F1 88 F8 D9 FC	68 F1 00 🔿	DevEU3	I: 00 35 86	EC 8D 89 9E 01 <	- B						

7. Trouble Shooting

7.1 Downlink doesn't work, how to solve it?

Please see this link for debug: LoRaWAN Communication Debug

7.2 Why I can't join TTN V3 in US915 /AU915 bands?

It might about the channels mapping. Please see for detail: Notice of Frequency band

7.3 Possible reasons why the device is unresponsive:

- 1. Check whether the battery voltage is lower than 2.8V
- 2. Check whether the jumper of the device is correctly connected



3. Check whether the switch here of the device is at the ${\tt ISP}~({\tt The}~{\sf switch}~{\sf can}~{\sf operate}~{\sf normally}~{\sf only}~{\sf when}~{\sf it}~{\sf is}~{\sf in}~{\tt RUN})$



7.4 Why can't customers see the device's data in the server when the data is too long?

This is due to the limitation of the lorawan protocol, and the fixed DR needs to be adjusted to improve this problem.

Please refer to the following link for the number of bytes limited by different frequencies and different DRs in the lorawan protocol

lora-alliance.org/wp-content/uploads/2021/05/RP002-1.0.3-FINAL-1.pdf

Example:

2.4.6 EU863-870 Maximum payload size

The maximum **MACPayload** size length (*M*) is given by the following table. It is derived from limitation of the PHY layer depending on the effective modulation rate used taking into account a possible repeater encapsulation layer. The maximum application payload length in the absence of the OPTIONAL **FOpts** control field (*N*) is also given for information only. The value of N MAY be smaller if the **FOpts** field is not empty:

Data Rate	М	N						
0	59	51						
1	59	51						
2	59	51						
3	123	115						
4	230	222						
5	230	222						
6	230	222						
7	230	222						
8	58	50						
9	123 115							
10	58	50						
11	123 115							
12:15	Not defined							

Table 12: EU863-870 maximum payload size (repeater compatible)

Please refer to the following command to fix DR

AT+ADR=0

AT+DR=3

Downlink command:

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20AT%20Commands%20and%20Downlink %20Command/#H7.4DataRate

7.5 How to solve the problem that the sensor requires a pull-up resistor on the RS485A ${\tt pin?}$

1. Upgrade the firmware to a dedicated firmware, which will consume more power and cannot enter low power mode.

If necessary, please contact our technical support email:

support@dragino.com

2. Use AT command:

AT+RS485POWER=1

8. Order Info

```
Part Number: RS485-LB-XX-YY or RS485-LS-XX-YY
```

XX:

- EU433: frequency bands EU433
- EU868: frequency bands EU868
- KR920: frequency bands KR920
- CN470: frequency bands CN470
- AS923: frequency bands AS923
- AU915: frequency bands AU915
 US915: frequency bands US915
- IN865: frequency bands IN865
- RU864: frequency bands RU864
- KZ865: frequency bands KZ865

YY: Hole Option

12: With M12 waterproof cable hole 16: With M16 waterproof cable hole

9. Packing Info

Package Includes:

- RS485-LB or RS485-LS x 1
- Stick Antenna for LoRa RF part x 1
- Program cable x 1

Dimension and weight:

- · Device Size: cm
- Device Weight: g
- Package Size / pcs : cm
- Weight / pcs : g

10. Support

- Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different timezones we cannot offer live support. However, your questions will be answered as soon as possible in the before-mentioned schedule.
- Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to support@dragino.com