

# Dragino RS485BL and SEM Three



## SEM Three



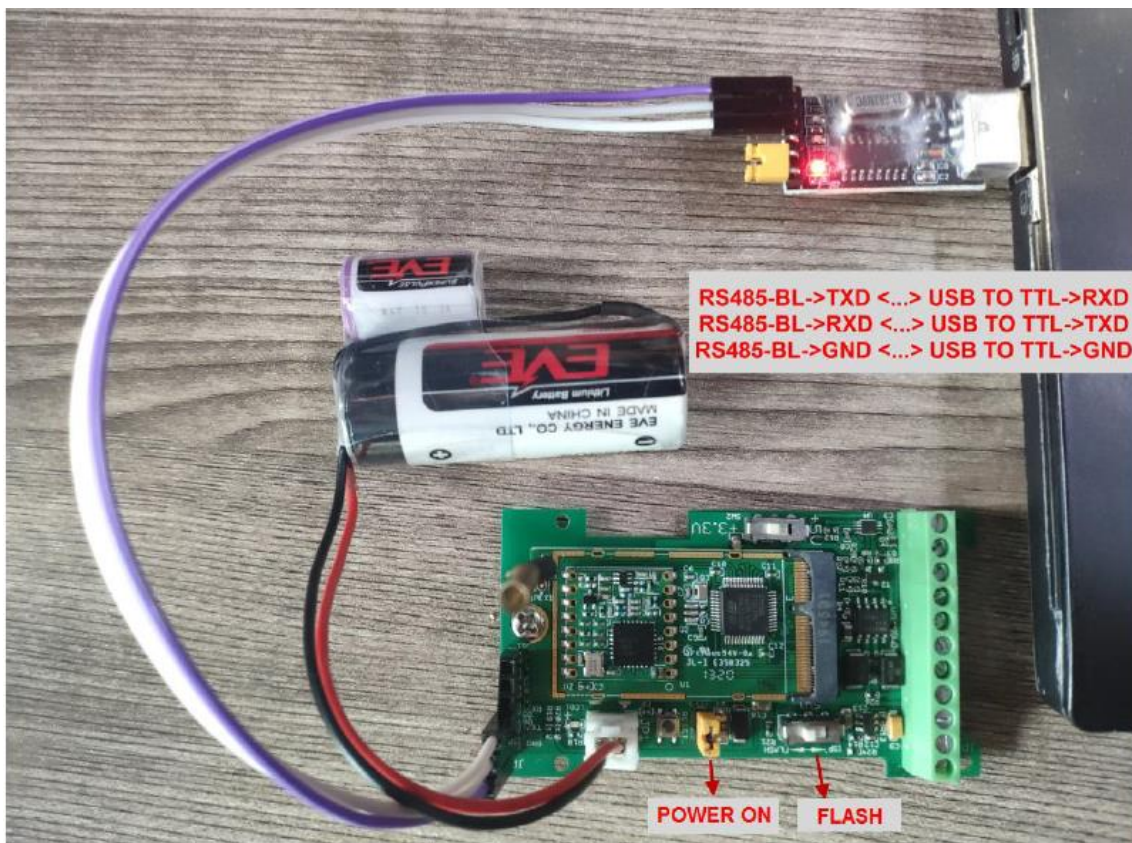
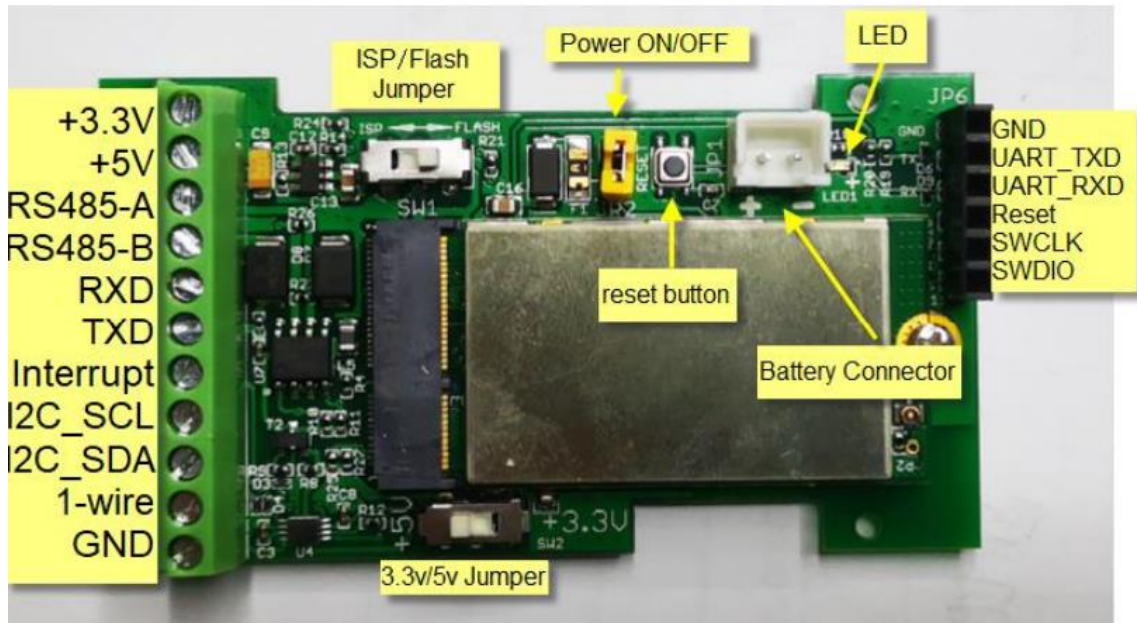
**SEM Three** is a three-phase energy meter that allows to monitor electrical parameters of your installation including active energy, reactive energy, voltage, current, power, maximum demand and more. These parameters are measured separately for each phase, what gives SEM Three high versatility to work as a three-phase analyzer or a triple single-phase analyzer.

The design, occupying a single DIN rail module, allows that SEM Three can be placed easily at any installation.

The device has removal connectors for power supply (85-265 Vac), external current transformers (250 mA output) and RS-485 communications.

The communication of measured data works over Modbus RTU standard protocol.





In PC, User needs to set **serial tool**(such as [putty](#), SecureCRT) baud rate to **9600** to access to access serial console of RS485-BL. The default password is 123456. Below is the output for reference:

DRAGINO RS485-BL Device

Image Version: v1.3.2

LoRaWan Stack: DR-LWS-005

Frequency Band: EU868

DevEui= A8 40 41 BC 11 82 C9 ü

DRAGINO RS485-BL Device

Image Version: v1.3.2

LoRaWan Stack: DR-LWS-005

Frequency Band: EU868

DevEui= A8 40 41 BC 11 82 C9 44

Please use AT+DEBUG to see debug info

\*\*\*\*\* UpLinkCounter= 0 \*\*\*\*\*

TX on freq 868.100 MHz at DR 5  
txDone

---

123456

Correct Password

AT+APPEUI=?

a0 00 00 00 00 00 01 01

OK

AT+DEUI=?

a8 40 41 bc 11 82 c9 44

OK

a8 40 41 bc 11 82 c9 44

AT+APPKEY=?

1d 27 92 e9 a5 f9 6d 77 a2 e5 ad f6 e7 4f 4b 5b

OK

1d 27 92 e9 a5 f9 6d 77 a2 e5 ad f6 e7 4f 4b 5b

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Applications > dragino\_rs485-bl > Devices > 87654321 > Data

Overview

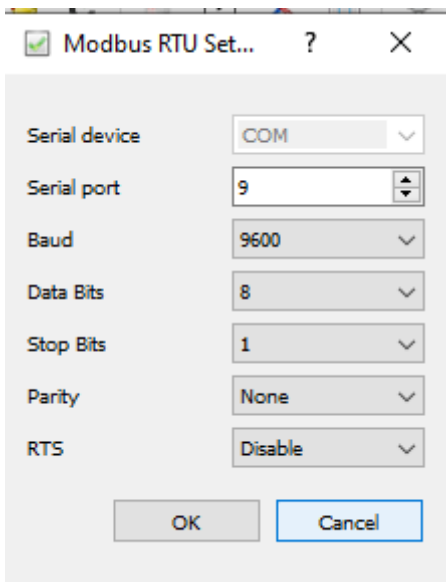
### APPLICATION DATA

Filters: uplink downlink activation ack error

time	counter	port		
21:48:13	1	2		payload: 0D43 01
21:47:16		0		
21:47:14	0	2	retry	payload: 0D4C 01
21:47:08				

dev addr: 26 01 4F B4 app eui: A0 00 00 00 00 01 01 dev eui: A8 40 41 BC 11 82 C9 44

Let's connect PC to SEMThree



Active power phase 1	API1	0x06-0x07		W	4
----------------------	------	-----------	--	---	---

Measuring power: 8 Watts at 230V

QModMaster

File Options Commands View Help

Modbus Mode: RTU Slave Addr: 72 Scan Rate (ms): 2000

Function Code: Read Input Registers (0x04) Start Address: 6 Hex

Number of Registers: 2 Data Format: Dec Signed:

0 8 x x

Bus Monitor

Raw Data

```
[RTU]> Tx > 22:13:07:032 - 48 04 00 06 00 02 9F 93
[RTU]> Rx > 22:13:07:056 - 48 04 04 00 00 00 08 22 86
[RTU]> Tx > 22:13:09:026 - 48 04 00 06 00 02 9F 93
[RTU]> Rx > 22:13:09:050 - 48 04 04 00 00 00 08 22 86
[RTU]> Tx > 22:13:11:032 - 48 04 00 06 00 02 9F 93
[RTU]> Rx > 22:13:11:056 - 48 04 04 00 00 00 08 22 86
[RTU]> Tx > 22:13:13:024 - 48 04 00 06 00 02 9F 93
[RTU]> Rx > 22:13:13:048 - 48 04 04 00 00 00 08 22 86
[RTU]> Tx > 22:13:15:025 - 48 04 00 06 00 02 9F 93
[RTU]> Rx > 22:13:15:048 - 48 04 04 00 00 00 08 22 86
```

ADU

Bus Monitor

Raw Data

```
[RTU]>Tx > 22:14:47:465 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:47:488 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:49:469 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:49:492 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:51:469 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:51:493 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:53:463 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:53:486 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:55:464 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:55:487 - 48 04 04 00 00 00 08 22 86
```

ADU

```
Type : Tx Message
Timestamp : 22:14:41:464
Slave Addr : 48
Function Code : 04
Starting Address : 0006
Quantity of Registers : 0002
CRC : 9F93
```

Bus Monitor

Raw Data

```
[RTU]>Tx > 22:14:47:465 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:47:488 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:49:469 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:49:492 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:51:469 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:51:493 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:53:463 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:53:486 - 48 04 04 00 00 00 08 22 86
[RTU]>Tx > 22:14:55:464 - 48 04 00 06 00 02 9F 93
[RTU]>Rx > 22:14:55:487 - 48 04 04 00 00 00 08 22 86
```

ADU

```
Type : Rx Message
Timestamp : 22:14:47:488
Slave Addr : 48
Function Code : 04
Byte Count : 04
Register Values : 00 00 00 08
CRC : 2286
```

So the right command for the Dragino RS485-LN are

Active Power Phase 1

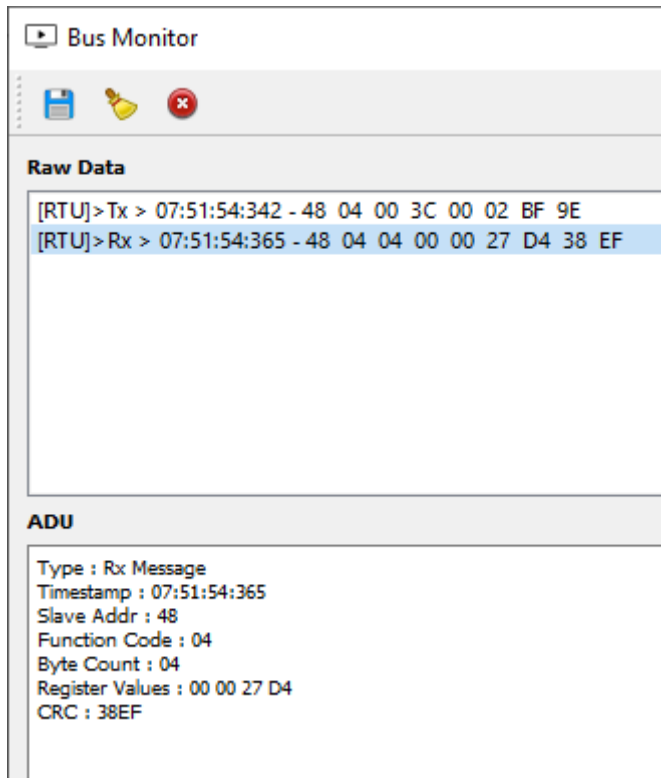
AT+COMMAND1=48 04 00 06 00 02,1

AT+DATA CUT1=9,1,4+5+6+7

Active energy phase 1	AE1	0x3C-0x3D	Wh	4
-----------------------	-----	-----------	----	---

The screenshot shows the QModMaster software interface. The main window has a menu bar (File, Options, Commands, View, Help) and a toolbar. Below the toolbar are several configuration fields: Modbus Mode (RTU), Slave Addr (72), Scan Rate (ms) (2000), Function Code (Read Input Registers (0x04)), Start Address (3C), Data Format (Dec), and Signed (unchecked). A table below these fields shows a row with address 0 and value 10196, with several 'x' marks in the columns. At the bottom, a status bar displays 'RTU : COM9 | 9600,8,1,None Base Addr : 0', 'Packets : 2', and 'Errors : 0'. To the right, a 'Bus Monitor' window is open, showing 'Raw Data' with two lines: '[RTU]>Tx > 07:51:54:342 - 48 04 00 3C 00 02 BF 9E' and '[RTU]>Rx > 07:51:54:365 - 48 04 04 00 00 27 D4 38 EF'. Below the raw data is an 'ADU' section which is currently empty.

This is a detailed view of the Bus Monitor window. It features a toolbar with icons for save, refresh, and close. The 'Raw Data' section contains the same two lines of data as the previous screenshot: '[RTU]>Tx > 07:51:54:342 - 48 04 00 3C 00 02 BF 9E' and '[RTU]>Rx > 07:51:54:365 - 48 04 04 00 00 27 D4 38 EF'. The 'ADU' section is now populated with the following details: Type : Tx Message, Timestamp : 07:51:54:342, Slave Addr : 48, Function Code : 04, Starting Address : 003C, Quantity of Registers : 0002, and CRC : BF9E.



So the right command for the Dragino RS485-LN are

Active Energy Phase 1

AT+COMMAND2=48 04 00 3C 00 02,1

AT+DATA CUT2=9,1,4+5+6+7

Let's connect Dragino to PC

AT Commands	Description	Example
AT+BAUDR	Set the baud rate (for RS485 connection). Default Value is: 9600.	AT+BAUDR=9600 Options: (1200,2400,4800,14400,19200,115200)
AT+PARITY	Set UART parity (for RS485 connection). Default Value is: no parity.	AT+PARITY=0 Option: 0: no parity, 1: odd parity, 2: even parity
AT+STOPBIT	Set serial stopbit (for RS485 connection). Default Value is: 1bit.	AT+STOPBIT=0 for 1bit AT+STOPBIT=1 for 1.5 bit AT+STOPBIT=2 for 2 bits

AT+BAUDR=?

9600

OK



AT+PARITY=?

0

OK

AT+STOPBIT=?

0

OK

Let's configure the parameters reading

Power Phase1

AT+COMMAND1=48 04 00 06 00 02,1

OK

AT+DATACUT1=9,1,4+5+6+7

OK



Warning The Things Network is shutting down v2 clusters later this year. Start moving your applications and devices

Applications > dragino\_rs485-bl > Devices > 87654321 > Data

## APPLICATION DATA

Filters

	time	counter	port	
▲	08:10:43	10	2	payload: 0D 3E 01 00 00 00 00
▲	08:09:43	9	2	payload: 0D 3E 01
▲	08:08:43	8	2	payload: 0D 3E 01

Energy Phase1

AT+COMMAND2=48 04 00 3C 00 02,1

OK

AT+DATA CUT2=9,1,4+5+6+7

OK



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Applications > dragino\_rs485-bl > Devices > 87654321 > Data

Filters

	time	counter	port	
▲	08:16:43	16	2	payload: 0D 3E 01 00 00 00 00 00 00 00 00 00 00 00 00 00
▲	08:15:43	15	2	payload: 0D 3E 01 00 00 00 00 00
▲	08:14:43	14	2	payload: 0D 3E 01 00 00 00 00 00
▲	08:13:43	13	2	payload: 0D 3E 01 00 00 00 00 00
▲	08:12:43	12	2	payload: 0D 3E 01 00 00 00 00 00
▲	08:11:43	11	2	payload: 0D 3E 01 00 00 00 00 00
▲	08:10:43	10	2	payload: 0D 3E 01 00 00 00 00 00
▲	08:09:43	9	2	payload: 0D 3E 01

### Power Phase 2

Active power phase 2	API2	0x6A-0x6B		W	4
----------------------	------	-----------	--	---	---

AT+COMMAND3=48 04 00 6A 00 02,1

AT+DATA CUT3=9,1,4+5+6+7

AT+COMMAND3=48 04 00 6A 00 02,1

OK

AT+DATA CUT3=9,1,4+5+6+7

OK

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Applications > dragino\_rs485-bl > Devices > 87654321 > Data

Filters: uplink downlink activation ack error

time	counter	port	payload
08:24:44	24	2	0D 3E 01 00 00 00 00 00 00 00 00 00 00 00 00 00
08:23:43	23	2	0D 3E 01 00 00 00 00 00 00 00 00 00 00 00 00 00

### Energy Phase 2

Active energy phase 2	AE2	0xA0-0xA1	Wh	4
-----------------------	-----	-----------	----	---

AT+COMMAND4=48 04 00 A0 00 02,1

AT+DATA CUT4=9,1,4+5+6+7

AT+COMMAND4=48 04 00 A0 00 02,1

OK

AT+DATA CUT4=9,1,4+5+6+7

OK

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Applications > dragino\_rs485-bl > Devices > 87654321 > Data

Filters: uplink downlink activation ack error

time	counter	port	payload
08:26:44	26	2	0D 3C 01 00 00 00 00 00 00 00 00 00 00 00 00 00
08:25:44	25	2	0D 3E 01 00 00 00 00 00 00 00 00 00 00 00 00 00
08:24:44	24	2	0D 3E 01 00 00 00 00 00 00 00 00 00 00 00 00 00
08:23:43	23	2	0D 3E 01 00 00 00 00 00 00 00 00 00 00 00 00 00

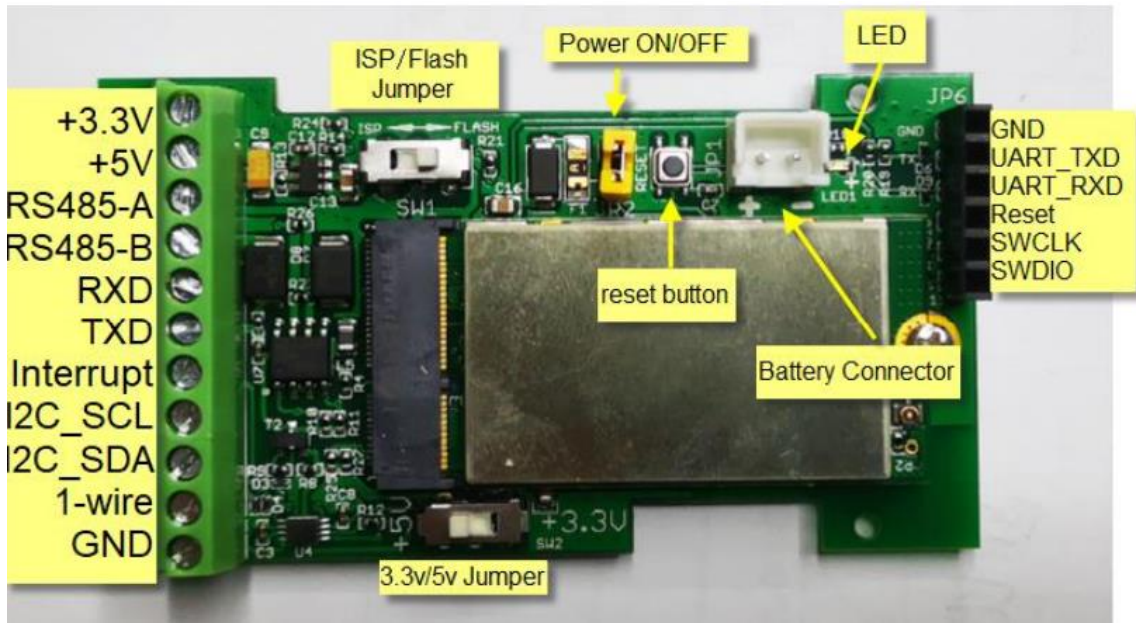
### Power Phase 3

Active power phase 3	API3	0xCE-0xCF	W	4
----------------------	------	-----------	---	---

AT+COMMAND5=48 04 00 CE 00 02,1

AT+DATA CUT5=9,1,4+5+6+7





THE THINGS NETWORK COMMUNITY EDITION CONSOLE

Applications Gateways Support

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Applications > dragino\_rs485-bl > Devices > 87654321 > Data

Overview

### APPLICATION DATA

Filters: uplink downlink activation ack error

time	counter	port	
08:49:53	0		
08:49:53	0	2	payload: 0D 48 01 00 00 00 00 00 00 27 D4 00 00 00 00 00 27 BB 00 00 00 00 00 27 FB
08:49:43			dev addr: 26 01 20 DD app eui: A0 00 00 00 00 00 01 01 dev eui: A8 40 41 BC 11 82 C9 44

Here we have the three values of Energy on phase 1, 2 and 3

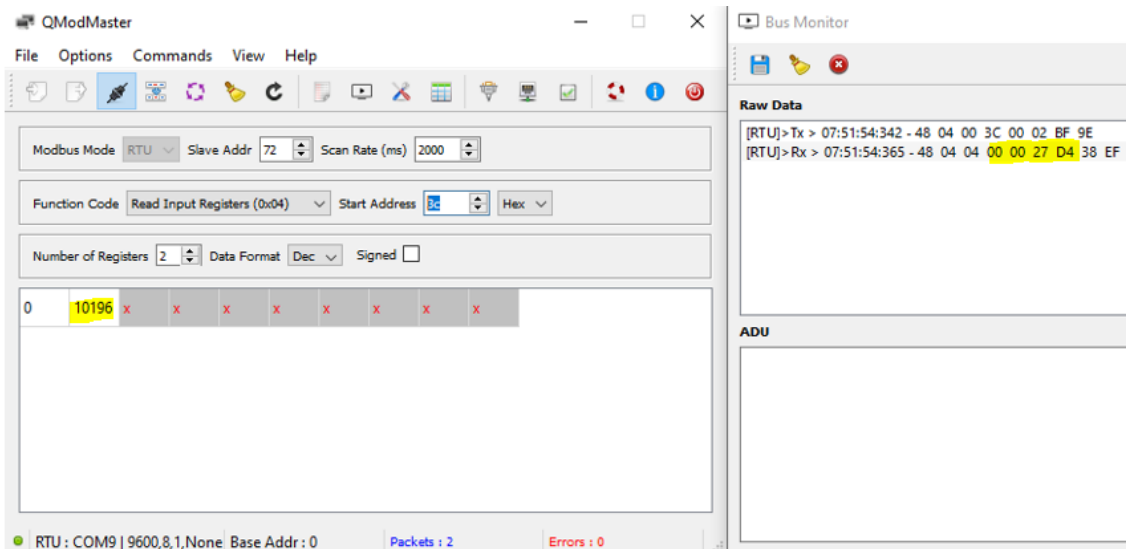
0D480100000000000027D400000000000027BB00000000000027FB

27 Hex =39 in Decimal

D4 Hex = 212 in Decimal

$39 * 256 + 212 = 9984 + 212 = 10196$  Wath

Yes



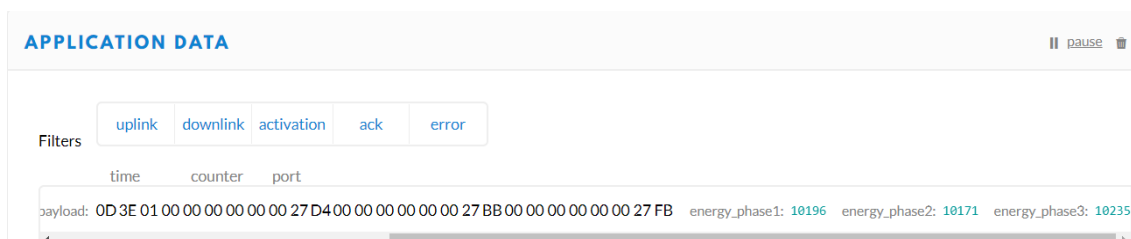
So we can build the payload decoder



```

1 function Decoder(bytes, port) {
2   // Decode an uplink message from a buffer
3   // (array) of bytes to an object of fields.
4   var decoded = {};
5
6   if (port === 2) decoded.energy_phase1 = 256*bytes[9]+bytes[10];
7   if (port === 2) decoded.energy_phase2 = 256*bytes[17]+bytes[18];
8   if (port === 2) decoded.energy_phase3 = 256*bytes[25]+bytes[26];
9
10  return decoded;
11 }

```



And same with Power

decoder

converter

validator

encoder

```
1 function Decoder(bytes, port) {
2   // Decode an uplink message from a buffer
3   // (array) of bytes to an object of fields.
4   var decoded = {};
5   if (port === 2) decoded.power_phase1 = 256*bytes[5]+bytes[6];
6   if (port === 2) decoded.energy_phase1 = 256*bytes[9]+bytes[10];
7   if (port === 2) decoded.power_phase2 = 256*bytes[13]+bytes[14];
8   if (port === 2) decoded.energy_phase2 = 256*bytes[17]+bytes[18];
9   if (port === 2) decoded.power_phase3 = 256*bytes[21]+bytes[22];
10  if (port === 2) decoded.energy_phase3 = 256*bytes[25]+bytes[26];
11
12  return decoded;
13 }
```

Applications > dragino\_rs485-bl > Data

Filters  uplink  downlink  activation  ack  error

time counter port

### Payload

0D 3C 01 00 00 00 00 00 00 27 D4 00 00 00 00 00 00 27 BB 00 00 00 00 00 00 27 FB

### Fields

```
{
  "energy_phase1": 10196,
  "energy_phase2": 10171,
  "energy_phase3": 10235,
  "power_phase1": 0,
  "power_phase2": 0,
  "power_phase3": 0
}
```

Let's connect The SEM Three to the installation

Phase 1 is the swimming pool (1800 watts)

Phase 2 is the fridge (7 watts in stand by, 146 watts with the compressor on)

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Applications > dragino\_rs485-bl > Data

12:21:18 51 2 dev id: [87654321](#) payload: 0D 35 01 00

**Uplink**

**Payload**

0D 35 01 00 00 07 1F 00 00 28 26 00 00 00 92 00 00 27 C5 00 00 00 00 00 00 27 FB

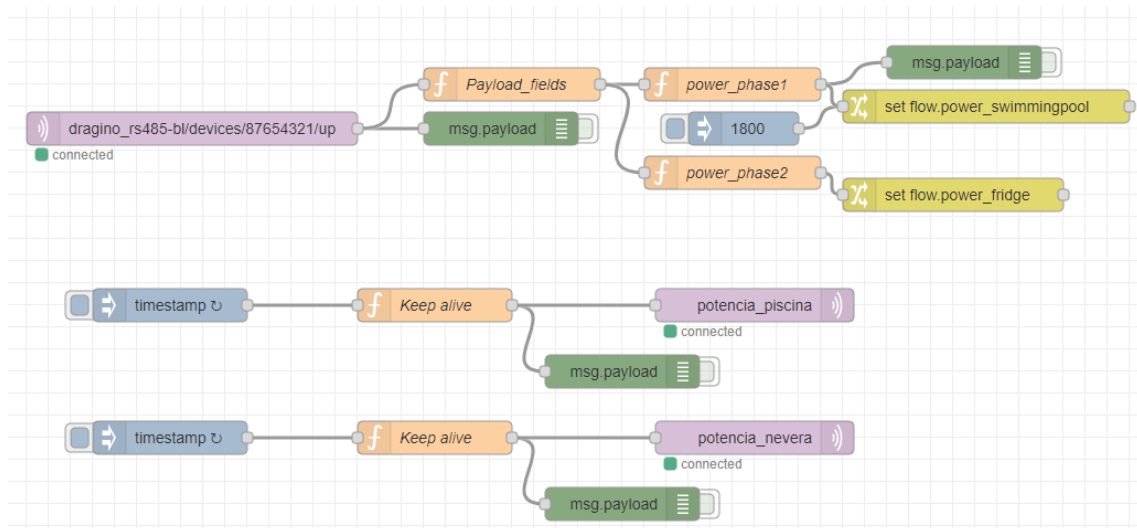
**Fields**

```

{
  "energy_phase1": 10278,
  "energy_phase2": 10181,
  "energy_phase3": 10235,
  "power_phase1": 1823,
  "power_phase2": 146,
  "power_phase3": 0
}

```

Now let's visualize these values on the mobile pone






You can find the code here



<https://github.com/xavierflorensa/SEMthree-Dragino-RS485-BL-power-meter>






### Edit mqtt in node



Delete Cancel Done


**Properties**   

 Server eu.thethings.network:1883 

 Topic dragino\_rs485-bl/devices/87654321/up



 QoS 2 


 Output auto-detect (string or buffer) 

 Name Name


### Edit mqtt in node > Edit mqtt-broker node

Delete Cancel Update


**Properties**  

 Name Name

**Connection** Security Messages

 Server eu.thethings.network Port 1883

Enable secure (SSL/TLS) connection

 Client ID Leave blank for auto generated

Keep alive time (s) 60  Use clean session

Use legacy MQTT 3.1 support

Edit mqtt in node > **Edit mqtt-broker node**

Delete Cancel Update

**Properties**

Name

Connection Security Messages

Username

Password

**Edit function node**

Delete

**Properties**

Name

Setup Function

```
1 var msg1 = { payload: msg.payload.length };
2 msg1.payload = JSON.parse(msg.payload);
3 msg1.payload = msg1.payload.payload_fields;
4
5 return msg1;
```

### Edit function node

Delete

#### ⚙ Properties

📌 Name

Setup

Function

```
1 var a = msg.payload;  
2 msg.payload=a.power_phase1;  
3 return msg;
```

### Edit function node

Delete

#### ⚙ Properties

📌 Name

Setup

Function

```
1 var a = msg.payload;  
2 msg.payload=a.power_phase2;  
3 return msg;
```

### Edit change node

Delete C

---

**⚙ Properties**

---

**👤 Name**

---

**☰ Rules**

---

**☰**  ▼  ▼  
to  ▼

### Edit change node

Delete

---

**⚙ Properties**

---

**👤 Name**

---

**☰ Rules**

---

**☰**  ▼  ▼  
to  ▼

## Edit inject node

Delete

Cancel

### ⚙ Properties

📌 Name

Name

≡ msg. payload = ▼ timestamp

≡ msg. topic = ▼ a<sub>z</sub>

+ add

Inject once after 0.1 seconds, then

🔄 Repeat

interval ▼

every

2



seconds ▼

### Edit function node

Delete

**Properties**

Name

Setup **Function**

```
1 msg.payload=flow.get('power_swimmingpool')
2 return msg;
```

### Edit mqtt out node

Delete Cancel

**Properties**

Server

Topic

QoS  Retain

Name

### Edit function node

Delete

#### ⚙ Properties

📌 Name

Setup

Function

```
1 msg.payload=flow.get('power_fridge')
2 return msg;
```

### Edit mqtt out node

Delete

#### ⚙ Properties

🌐 Server

☰ Topic

⊛ QoS  Retain

📌 Name

Potencias L'Escala Edit

SWIMMINGPOOL

1937Watts

13:08:45-202


POTENCIA NEVERA

49Watts

13:08:45-56



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Applications >  dragino\_rs485-bl > Data

▲ 13:08:18 98 2 dev id: [87654321](#) payload: 0D35 01 00

### Uplink

#### Payload

0D 35 01 00 00 07 91 00 00 2D C5 00 00 00 31 00 00 2A 48 00 00 00 00 00 00 27 FB

#### Fields

```
{  
  "energy_phase1": 11717,  
  "energy_phase2": 10824,  
  "energy_phase3": 10235,  
  "power_phase1": 1937,  
  "power_phase2": 49,  
  "power_phase3": 0  
}
```