UC300 IoT Controller

Communication Protocol
(for LoRaWAN® Version)

Revision History

Date	Doc Version	Description
Mar. 31, 2022	V 1.0	Initial version
Nov. 2, 2023	V 1.1	Add downlink commands to get current data, control DO duration and debounce time.

Contents

1. Overview

UC300 uses the standard Milesight IoT payload format based on IPSO. All data are based on following format:

Channel1	Type1	Data1	Channel2	Type2	Data2	Channel 3	...
1 Byte	1 Byte	N Bytes	1 Byte	1 Byte	M Bytes	1 Byte	...

Note:

1) All explanations and examples in this document are based on HEX format.
2) For all Milesight IoT decoder examples please find files on https://github.com/Milesight-IoT/SensorDecoders

2. Uplink Payload

Uplink payloads of UC300 are made up of device information and sensor data.

2.1 Device Information

UC300 reports basic device information of device every time joining the network.

Channel	Type	Byte	Description
ff	01 (Protocol Version)	1	01 => V1
	09 (Hardware Version)	2	01 20 => V1.2
	0a (Software Version)	2	01 01 => V1.1
	0b (Power On)	1	Device is on

	16 (Device SN)	8	16 digits

Example:

ff0bff ff0101 ff166445b43411300001 ff090100 ff0a0101		
Channel	**Type**	**Value**
ff	0b(Power On)	ff(Reserved)
ff	01 (Protocol Version)	01 (V1)
ff	16 (Device SN)	64 45 B4 34 11 30 00 01
ff	09 (Hardware Version)	0100 (V1.0)
ff	0a (Software Version)	0101 (V1.1)

2.2 Sensor Data

UC300 reports sensor data according to reporting interval (20min by default). RS232 uplink doesn't have its own channel or type since it only forward RS232 terminal devices data to server transparently.

Channel	Type	Byte	Description
03 (DI 1)	00 (Digital Input)	1	00 = low, 01 = high
	c8 (Counter)	4	UINT32
04 (DI 2)	00 (Digital Input)	1	00 = low, 01 = high
	c8 (Counter)	4	UINT32
05 (DI 3)	00 (Digital Input)	1	00 = low, 01 = high
	c8 (Counter)	4	UINT32
06 (DI 4)	00 (Digital Input)	1	00 = low, 01 = high
	c8 (Counter)	4	UINT32
07 (DO 1)	01 (Digital Output)	1	00 = low, 01 = high
08 (DO 2)			
09 (PT100 1)	67 (Temperature)	2	INT16/10, , unit: °C
0a (PT100 2)			
0b (4-20mA 1)	02 (Analog Input)	4	UIN32/100, unit: mA
0c (4-20mA 2)			
0d (0-10V 1)			UIN32/100, unit: V
0e (0-10V 2)			
ff	19 (RS485)	Mutable (4-7)	Total: Byte 1+Byte 2+Byte 3+Value Byte 1: Channel ID

<table>
<tr><td></td><td></td><td></td><td>Byte 2: Data Size
Byte 3: Data Type
<table><tr><th>Code</th><th>Data Type</th></tr><tr><td>00</td><td>Coil</td></tr><tr><td>01</td><td>Discrete</td></tr><tr><td>02</td><td>Input16</td></tr><tr><td>03</td><td>Hold16</td></tr><tr><td>04</td><td>Hold32</td></tr><tr><td>05</td><td>Hold_float</td></tr><tr><td>06</td><td>Input32</td></tr><tr><td>07</td><td>Input_float</td></tr><tr><td>08</td><td>Input_int32_with upper 16 bits</td></tr><tr><td>09</td><td>Input_int32_with lower 16 bits</td></tr><tr><td>0a</td><td>Hold_int32_with upper 16 bits</td></tr><tr><td>0b</td><td>Hold_int32_with lower 16 bits</td></tr></table></td></tr>
<tr><td>ff</td><td>15 (Modbus collecting exception)</td><td>1</td><td>Channel ID of failed Modbus collection.</td></tr>
</table>

Note: Channel ID can be configured in ToolBox.

Channel ID	Description
00	RS485 (Modbus Master) Channel 1
01	RS485 (Modbus Master) Channel 2
02	RS485 (Modbus Master) Channel 3
...	...
0f	RS485 (Modbus Master) Channel 16

Examples:

1. Periodic packet:

1) Digital input/counter/output:

03 c8 16 00 00 00 04 00 00 05 00 00 06 00 01 07 01 00 08 01 01		
Channel	**Type**	**Value**
03 (DI 1)	c8 (Pulse Counter)	16 00 00 00 => 00 00 00 16 = 22
04 (DI 2)	00 (Digital Input)	00 => Low
05 (DI 3)	00 (Digital Input)	00 => Low
06 (DI 4)	00 (Digital Input)	01 => High
07 (DO 1)	01 (Digital Output)	00 => Low

08 (DO 2)	01 (Digital Output)	01 => High

2) RS485 Modbus channels:

ff 19 07 02 03 15 00					
Channel	**Type**	**Channel ID**	**Data Size**	**Data Type**	**Value**
ff	19 (RS485)	07 => Channel 8	02 => 2 bytes	03 => Hold 16	15 00 => 00 15 = 21

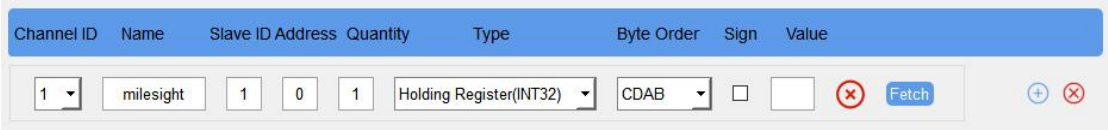
Note: When data type is holding register or input register, ToolBox can set different byte order. Take below Modbus register response from RS485 sensors as example:

Register Address	Value (Hex)
0	00 15
1	00 20

When using different byte orders, you can use ToolBox to fetch different results and the device will upload data with little endian order.

Data Type	Byte Order	Fetch Result	Uplink (HEX)
Holding/Input Register (INT16)	AB	21 (0x15)	15 00 (BA)
	BA	5376 (0x1500)	00 15 (AB)
Holding/Input Register (INT32)	ABCD	1376288 (0x00150020)	20 00 15 00 (DCBA)
	CDAB	2097173 (0x00200015)	15 00 20 00 (BADC)
	BADC	352329728 (0x15002000)	00 20 00 15 (CDAB)
	DCBA	536876288 (0x20001500)	00 15 00 20 (ABCD)
Holding/Input Register (INT32 with upper 16 bits)	/	21 (0x15)	15 00 00 00
Holding/Input Register (INT32 with lower 16 bits)	/	32 (0x20)	20 00 00 00

If UC300 fails to connect the Modbus data, it will an error message.



ff 15 00		
Channel	**Type**	**Value**
ff	15 (Poll Failed)	00 => Channel 1

3) Analog input (4-20mA):

0b 02 02 06 00 00 0c 02 00 00 00 00		
Channel	**Type**	**Avg Value**
0b (4-20mA 1)	02 (Analog Input)	02 06 00 00 => 00 00 06 02 = 1538/100 = 15.38 mA
0c (4-20mA 2)	02 (Analog Input)	00 00 00 00 = 0

4) Analog input (0-10V):

0d 02 47 01 00 00 0e 02 00 00 00 00		
Channel	**Type**	**Avg Value**
0d (0-10V 1)	02 (Analog Input)	47 01 00 00 => 00 00 01 47 = 327 /100 = 3.27 V
0e (0-10V 2)		00 00 00 00 = 0

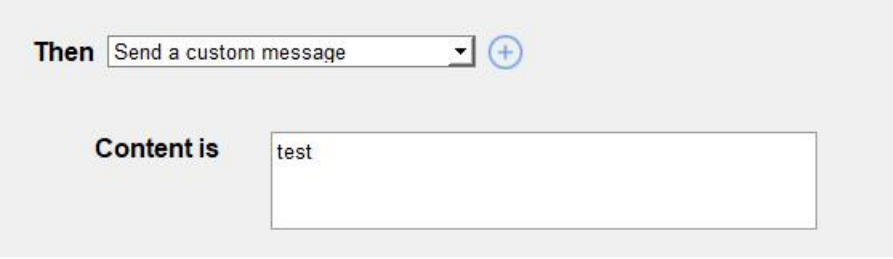
5) PT100 input:

09 67 17 01 0A 67 00 00		
Channel	**Type**	**Avg Value**
09 (PT100 1)	67 (PT100 Input)	17 01 => 01 17 = 279 /10 = 27.9 °C
0a (PT100 2)		00 00 00 00 = 0 °C

2. DI/DO change packet: reports when DI or DO status changes.

08 01 01		
Channel	**Type**	**Value**
08 (DO 2)	01 (Digital Output)	01 => High

3. Custom message: take below example,



74 65 73 74
Value
Hex to Ascii: 74 65 73 74=> t e s t

3. Downlink Payload

Downlink is used for controlling the UC300 via network server remotely. Downlink port (Application port) is 85 by default and can be configured via ToolBox.

Note: only one downlink command can be sent to control device everytime.

Item	Channel	Type	Description
DO1	07	/	Open: 01ff, Close: 00ff
DO2	08	/	Open: 01ff, Close: 00ff
Reporting Interval	ff	03	2 Bytes, unit: s
Reboot		10	ff
Time Zone		17	2 Bytes, UTC timezone * 10
DI/DO Debounce Time		91	5 Bytes, **Byte 1:** 00=All, 01=DI1, 02=DI2, 03=DI3, 04=DI4, 05=DO1, 06=DO2 **Byte 2-5:** Debounce time, unit:ms, range: 0~5000ms
DO Duration Control		93	6 Bytes, **Byte 1:** 01=DO1, 02=DO2 **Byte 2:** 00=close, 01=open **Byte 3-6:** Duration time, unit:ms, 0 means permanent
Enquiry Current Data		94	ff

Examples:

1. Control DO1 to open (takes effect only when DO is enabled)

0701ff	
Channel	**Value**
07	01ff=open

2. Control DO2 to open for 6s (takes effect only when DO is enabled)

ff93 02 01 70170000		
Channel	**Type**	**Value**
ff	93 (DO Control)	02=DO2, 01=open 70 17 00 00=>00 00 17 70=6000ms=6s

3. Set the reporting interval as 20 minutes.

ff 03 b0 04		
Channel	**Type**	**Value**

ff	03 (Reporting Interval)	b0 04 => 04 b0 = 1200 s = 20 mins

4. Reboot the device.

ff10ff		
Channel	**Type**	**Reversed**
ff	10 (Reboot)	ff

5. Set time zone as UTC-2.

ff17ecff		
Channel	**Type**	**Value**
ff	17	ec ff => ff ec = -20 the time zone is UTC-2

-END-