N95S31B NB-IoT Temperature & Humidity Sensor User Manual

last modified by Xiaoling

on 2023/04/28 15:52

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1. Introduction

1.1 What is N95S31B NB-IoT Sensor Node

The Dragino N95S31B is a **NB-IoT Temperature and Humidity Sensor** for Internet of Things solution. It is used to measure the **surrounding environment temperature and relative air humidity precisely**, and then upload to IoT server via NB-IoT network^{*}.

The temperature & humidity sensor used in N95S31B is SHT31, which is fully calibrated, linearized, and temperature compensated digital output from Sensirion, it provides a strong reliability and long-term stability. The SHT31 is fixed in a **waterproof anti-condensation casing** for long term use.

N95S31B supports different uplink methods include **TCP**, **MQTT**, **UDP** and **CoAP** for different application requirement.

N95S31B is powered by **8500mAh Li-SOCI2 battery**, It is designed for long term use up to several years. (Real-world battery life depends on the use environment, update period. Please check related Power Analyze report).

* make sure you have NB-IoT coverage locally.

N95S31 in a NB-IoT Network



N95S31B NB-IoT Outdoor Temperature & Humidity Sensor NB-IoT Station

1.2 Features

- NB-IoT Bands: B1/B3/B8/B5/B20/B28 @H-FDD
- Monitor Temperature & Humidity via SHT31
- AT Commands to change parameters
- · Uplink on periodically
- · Downlink to change configure
- IP66 Waterproof Enclosure
- Ultra-Low Power consumption
- AT Commands to change parameters
- Micro SIM card slot for NB-IoT SIM
- 8500mAh Battery for long term use

1.3 Specification

Common DC Characteristics:

- Supply Voltage: 2.1v ~ 3.6v
- Operating Temperature: -40 ~ 85 °C

NB-IoT Spec:

- B1 @H-FDD: 2100MHz
- B3 @H-FDD: 1800MHz
- B8 @H-FDD: 900MHz
- B5 @H-FDD: 850MHz
- B20 @H-FDD: 800MHz
- B28 @H-FDD: 700MHz

Battery:

- Li/SOCI2 un-chargeable battery
- · Capacity: 8500mAh
- Self Discharge: <1% / Year @ 25°C
- Max continuously current: 130mA
- Max boost current: 2A, 1 second

1.4 Applications

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

Smart Factory

1.5 Pin Definitions & Switch

N95S31B use the mother board from NBSN95 which as below.



1.5.1 Jumper JP2

Power on Device when put this jumper.

1.5.2 BOOT MODE / SW1

1) ISP: upgrade mode, device won't have any signal in this mode. but ready for upgrade firmware. LED won't work. Firmware won't run.

2) Flash: work mode, device starts to work and send out console output for further debug

1.5.3 Reset Button

Press to reboot the device.

1.5.4 LED

It will flash:

- 1. When boot the device in flash mode
- 2. Send an uplink packet

2. Use N95S31B to communicate with IoT Server

2.1 How it works

The N95S31B is equipped with a NB-IoT module, the pre-loaded firmware in N95S31B will get environment data from sensors and send the value to local NB-IoT network via the NB-IoT module. The NB-IoT network will forward this value to IoT server via the protocol defined by N95S31B.

The diagram below shows the working flow in default firmware of N95S31B:



2.2 Configure the N95S31B

2.2.1 Power On N95S31B



2.2.2 Test Requirement

To use N95S31B in your city, make sure meet below requirements:

- Your local operator has already distributed a NB-IoT Network there.
- The local NB-IoT network used the band that N95S31B supports.
- Your operator is able to distribute the data received in their NB-IoT network to your IoT server.

Below figure shows our testing structure. Here we have NB-IoT network coverage by China Mobile, the band they use is B8.

N95S31B supports different communication protocol such as :

- CoAP (120.24.4.116:5683)
- raw UDP (120.24.4.116:5601)
- MQTT (120.24.4.116:1883)
- TCP (120.24.4.116:5600)

We will show how to use with each protocol. The IP addresses above are our test server. User need to change to point their corresponding server.

NBSN95 network example in Dragino office



2.2.3 Insert SIM card

Insert the NB-IoT Card get from your provider.

User need to take out the NB-IoT module and insert the SIM card like below:



2.2.4 Connect USB - TTL to N95S31B to configure it

User need to configure N95S31B via serial port to set the **Server Address** / **Uplink Topic** to define where and how-to uplink packets. N95S31B support AT Commands, user can use a USB to TTL adapter to connect to N95S31B and use AT Commands to configure it, as below.



Connection:

- USB TTL GND <----> GND
- USB TTL TXD <----> UART_RXD

USB TTL RXD <----> UART_TXD

In the PC, use below serial tool settings:

- Baud: 9600
- Data bits: 8
- Stop bits: 1
- Parity: None
- Flow Control: None

Make sure the switch is in FLASH position, then power on device by connecting the jumper on N95S31B. N95S31B will output system info once power on as below, we can enter the **password: 12345678** to access AT Command input.

🧧 友善串口调试助手				_		×
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第日设置 [3] 第日 USB-SERIAL CH340 (COM6) ▼ [3] 波特率 9600 ▼ [4] 数据位 ◎ ▼ [4] 校验位 None ▼ [4] 停止位 1 ▼ [5] 流 控 None ▼ [6] 「 ASCII ○ Nex [7] 「 最示財詞 [1] 发送设置 ○ ASCII ○ Nex 「 自动操行 ○ 兄示发送 [1] 「 見示时词 [5] ア ASCII ○ Nex [自动重发 1000 ÷ ex	GINO NSE01 NB-Io IGINO NSE01 NB-Io Ige Version: v1.1 IoT Stack : D-BC Stocol in Used: T 285JNBIOT has res 233]Echo mode tur 111]The IMEI numb 991]The IMSI numb rrently set frequ 1662]Signal Stren	ST! J Sensor Node .0 95-002 CP ponded. ned off successfull er is:8650570492710 er is:4600459541007 ency band:5,8,3 gth:26	y. 187. 162.			_
					发送	£
						•
COM6 OPENED, 9600, 8, NONE, 1, OFF	Rx: 353 Bytes	Tx: 0 Bytes				

Note: the valid AT Commands can be found at: <u>https://www.dropbox.com/sh/mlpd6l05bogvaf6/</u> AABwAJLMttqG7i--AyZcQkoua?dl=0

2.2.5 Use CoAP protocol to uplink data

Note: if you don't have CoAP server, you can refer this link to set up one: <u>http://wiki.dragino.com/xwiki/</u> <u>bin/view/Main/Set%20up%20CoAP%20Server/</u>

Use below commands:

- AT+PRO=1
- // Set to use CoAP protocol to uplink
- AT+SERVADDR=120.24.4.116,5683 // to set CoAP server address and port
- AT+URI=5,11,"mqtt",11,"coap",12,"0",15,"c=text1",23,"0" // Set COAP resource path

For parameter description, please refer to AT command set

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件(E)编辑(E)视图(V) 工具			
o 💘 kni 📟 👎 💳			
串口设置	[26998]Signal Strength:28		
串 □ USB-SE(COM22) ▼	[28630]*****Upload start:1*****		
波特率 9600 🔻	[29168]remaining battery =3216 mv		
数据位 8 ▼	[29963]DS18B20(1) temp is 22.44 [30102]adc mU(1):3213.00		
校验位 None 🔻	[30131]Use Sensor is SHT20		
停止位 1 🔹 🔻	[30249]HUMIOLTY =39.05 %PN [30280]tem =22.90 C		
流 控 None ▼	[32469]Create a CoAP context successfully		
按	[37085]Upload data successfully		
● ASCII ◯ Hex	[39186]*****End of upload*****		
□ 自动换行			
□ 自动换行 ☑ 显示发送			
 □ 自动换行 ☑ 显示发送 □ 显示时间 			
 □ 自动换行 ☑ 显示发送 □ 显示时间 发送设置 			
 □ 自动换行 ☑ 显示发送 □ 显示时间 发送设置 ③ ASCII ○ Hex 			
 □ 自动换行 ☑ 显示发送 □ 显示时间 发送设置 ③ ASCII ○ Hex □ 重复发送 1000 ● ms 			
 □ 自动换行 ☑ 显示发送 □ 显示时间 发送设置 ④ ASCII ○ Hex □ 重复发送 1000			
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 □ 自动换行 ☑ 显示发送 □ 显示时间 发送设置 ● ASCII ○ Hex □ 重复发送 1000 ◆ ms 		<u>کن</u>	ž

After configure the server address and **reset the device** (via AT+ATZ), NDDS75 will start to uplink sensor values to CoAP server.

MQTT.fx - 1.7.1	-	o ×
File Extras Help		
local mosquitto	Connect Disconnect	
Publish Subscribe Scripts Bro	oker Status Log	
соар	Subscribe QoS 0 QoS 1 QoS 2 Autoscroll	
Coap	coap	1 QoS 0
	соар	2 QoS 0
	соар	3 QoS 0
Tanice Collecto		
	соар	2
	05-01-2021 09:58:55.35935168	QoS 0
	724031607457006e0cf81b0100dc000cf700e3018b	
	Payload decoded by Plain Text Decoder	•

2.2.6 Use UDP protocol to uplink data(Default protocol)

- AT+PRO=2 // Set to use UDP protocol to uplink
- AT+SERVADDR=120.24.4.116,5601 // to set UDP server address and port
- AT+CFM=1 // If the server does not respond, this command is unnecessary

文件(F) 编辑(E) 视图	(V) 工具(T) 帮助(H)	-		×
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 串口设置 串口 USB-SE(COI 波特率 9600 数据位 8 校验位 None 停止位 1 流控 None 接收设置 ● ASCII ○ K 目动换行 	<pre>[74554]Signal Strength:27 [76186]*****Upload start:3***** [76724]remaining battery =3205 mv [77519]DS18B20(1) temp is 22.56 [77658]adc_mU(1):3204.00 [77687]Use Sensor is SHT20 [77805]Humidity =39.26 %rh [77836]tem =23.29 C [78895]Open UDP port successfully [83038]Sending data [85668]Datagram is sent by RF [87739]Close the port successfully [88779]*****End of upload***** Password timeout</pre>			
 □ 显示发送 □ 显示时间 发送设置 ● ASCII ○ He □ 重复发送 1000 	Zn 🗘			
 □ 显示发送 □ 显示时间 发送设置 ● ASCII ○ He □ 重复发送 1000 	Zm 🗘		发	送

☐ 120.24.4.116 - SecureCRT	_		\times
文件(F) 编辑(E) 查看(V) 选项(O) 传输(T) 脚本(S) 工具(L) 帮助(H)			
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120.24.4.116			×
Received b'r@1`tW\x00n\x0c\xe7\x1b\x01\x00\xdc\x00\x0c\xe6\x00\	xe1\x01	\x88'	from
Reply:b'r@1`tW\x00n\x0c\xe7\x1b\x01\x00\xdc\x00\x0c\xe6\x00\xe1	\x01\x8	8'	
Received b'r@1`tW\x00n\x0c\xe7\x1b\x01\x00\xdc\x00\x0c\xe6\x00\	xe1\x01	\x88'	from
<pre>(223.104.255.116 , 1//18). Reply:b'r@1`tW\x00n\x0c\xe7\x1b\x01\x00\xdc\x00\x0c\xe6\x00\xe1</pre>	\x01\x8	8'	
Received b'r@1`tW\x00n\x0c\xef\x1c\x01\x00\xdc\x01\x0c\xee\x00\	xe1\x01	∖x90'	from
(223.104.255.116', 17719).	\v01\v0	0'	
Received b'r@1`tW\x00n\x0c\xef\x1c\x01\x00\xdc\x01\x0c\xee\x00\	xe1\x01	∖x90'	from
('223.104.255.116', 17719).	\ w01 \ w0	. '	
Received b'r@1`tW\x00n\x0c\xef\x1c\x01\x00\xdc\x01\x00\x0c\xee\x00\xec	xe0\x01	\x86'	from
('223.104.255.116', 17720).		(,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Reply:b'r@1`tW\x00n\x0c\xed\x1c\x01\x00\xdc\x00\x0c\xec\x00\xe0	\x01\x8	6'	from
('223.104.255.116', 17720).	xeo/xor	\X80	Trom
Reply:b'r@1`tW\x00n\x0c\xed\x1c\x01\x00\xdc\x00\x0c\xec\x00\xe0	\x01\x8	6'	-
Received b'r@1`tW\x00n\x0c\xef\x1c\x01\x00\xdc\x00\x0c\xee\x00\	xe0\x01	\x83'	from
Reply:b'r@1`tW\x00n\x0c\xef\x1c\x01\x00\xdc\x00\x0c\xee\x00\xe0	\x01\x8	3'	
Received b'r@1`tW\x00n\x0c\xef\x1c\x01\x00\xdc\x00\x0c\xee\x00\	xe0\x01	\x83'	from
(223.104.255.116', 1//21). Penly:b'r@1`tw\x00n\x0c\xef\x1c\x01\x00\xdc\x00\x0c\xee\x00\xe0	x01\x8	3'	
Received b'r@1`tW\x00n\x0c\xef\x1c\x01\x00\xdc\x00\x0c\xee\x00\	xe0\x01	∖x86'	from
('223.104.255.116', 17722).	\	C 1	
kebih:p Let tm/xnnu/xnc/xet/xrc/x01/x00/xgc/xn0/xoc/xee/x00/xe0	XUT/X8	0	

2.2.7 Use MQTT protocol to uplink data

N95S31B supports only plain MQTT now it doesn't support TLS and other related encryption.

- AT+PRO=3
- AT+SERVADDR=120.24.4.116,1883
- AT+CLIENT=CLIENT
- AT+UNAME=UNAME
- AT+PWD=PWD
- AT+PUBTOPIC=f9527
- AT+SUBTOPIC=Ns9527
- $\ensuremath{{/\!/}}$ Set to use MQTT protocol to uplink
- // Set MQTT server address and port
- // Set up the CLIENT of MQTT
- // Set the username of MQTT
- // Set the password of MQTT
- // Set the sending topic of MQTT
- // Set the subscription topic of MQTT

User Manual for LoRaWAN End Nodes - N95S31B NB-IoT Temperature & Humidity Sensor User Manual

🔤 友善串口调试助手		-		×
文件(E) 编辑(E) 视图(V) 工具(E)	帮助(日)			
📄 褬 🔚 🚥 🕂 — 🕨				
串口设置 串 □ USB-SE(COM22) ▼ 波特率 9600 ▼ 数据位 8 ▼ 校验位 None ▼ 停止位 1 ▼ 流 控 None ▼ 協收设置 ● ASCII ○ Hex 目动执行 型 显示发送 显示时间 发送设置 ● ASCII ○ Hex 重重复发送 1000 ▼ ms	33048]Signal Strength:28 34680]*****Upload start:1***** 35218]remaining battery =3211 mv 36013]DS18B20(1) temp is 22.38 36152]adc_mU(1):3209.00 36181]Use Sensor is SHT20 36299]Humidity =39.39 %rh 36330]tem =22.76 C 38568]Opened the MQTT client network successfully 41673]Server ACK not received 44710]Server ACK not received 447147]Server ACK not received 55468]Subscribe to topic successfully 56616]Upload data successfully 57654]Did not receive the downlink data 58862]Close the port successfully 59902]*****End of upload*****			
A	T+PR0=3	^	发	送
	0-041	•]	
COM22 OPENED, 9600, 8, NONE, 1, O	Tx: 0 Bytes Tx: 0 Bytes			

MQTT.fx - 1.7.1	- 0	×
File Extras Help		
local mosquitto	- 🔅 Connect Disconnect	
Publish Subscribe Scripts Br	roker Status Log	
f9527	Subscribe QoS1 QoS1 QoS2 Autoscrol	0°*
19527	f9527	1 QoS 0
Dump messages Mute Unsu	19527	2 QoS 0
	f9527	3 QoS 0
Topics Collecto		
	f9527	1
	05-01-2021 10:04:08.36248728	QoS 0
	724031607457006e0ccd1b0100dc000ccc00e10186	
		8

To save battery life, N95S31B will establish a subscription before each uplink and close the subscription 3 seconds after uplink successful. Any downlink commands from server will only arrive during the subscription period.

MQTT protocol has a much high-power consumption compare vs UDP / CoAP protocol. Please check the power analyze document and adjust the uplink period to a suitable interval.

2.2.8 Use TCP protocol to uplink data

This feature is supported since firmware version v110

AT+PRO=4 // Set to use TCP protocol to uplink
 AT+SERVADDR=120.24.4.116,5600 // to set TCP server address and port

🔤 友善串口调试助手		-		\times
文件(E) 编辑(E) 视图(⊻) 工具(I) 帮助(日)			
😼 🎅 🗔 🚥 🕂 —	🕨 🔢 😹 🤸 🖃 🌣			
串口设置	[62520]Signal Strength:26			
串 🛛 USB-SE(COM22) 🔻	[64153]*****Upload start:3*****			
波特率 9600 🔻	[64691]remaining battery =3201 mv			
数据位 8 ▼	[65486]DS18B20(1) temp is 22.75 [65625]adc mV(1):3200.00			
校验位 None ▼	[65654]Use Sensor is SHT20			
停止位 1 🔹	[65803]tem =23.37 C			
流 控 None ▼	[66862]Open TCP port successfully [67937]Connect to the server			
接收设置 ● ASCII ○ Hex □ 自动换行 ☑ 显示发送 □ 显示时间 发送设置 ● ASCII ○ Hex □ 重复发送 1000 ♀ ms	[71818]Received downlink data: 724031607457006E0C811A0100E3000C8000E901A0 [72933]Close the port successfully [73973]*****End of upload*****			
		^		
		- 1	发	ž
		~		
				-
COM22 OPENED, 9600, 8, NONE, 1	I, OFF Rx: 508 Bytes Tx: 0 Bytes			
🔚 120.24.4.116 - SecureCRT	-	-		×
文件(E) 编辑(E) 查看(V)	选项(O) 传输(I) 脚本(S) 工具(L) 帮助(H)			
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120.24.4.116				X

```
Received b'r@1`tw\x00n\x0c\xe2\x1d\x01\x00\xdc\x00\x0c\xe1\x00\xe1\x01\x8d' from
('223.104.255.116', 30606).
Reply:b'r@1`tw\x00n\x0c\xe2\x1d\x01\x00\xdc\x00\x0c\xe1\x00\xe1\x01\x8d'
^CTraceback (most recent call last):
File "tcp_server.py", line 14, in <module>
buf = sock.recv(1024)
KeyboardInterrupt
root@izwz9gilgOpbfmlww6nvamZ:~/python#
```

2.2.9 Change Update Interval

User can use below command to change the uplink interval.

AT+TDC=600 // Set Update Interval to 600s

NOTE: Since firmware version is v1.2:

By default, the device will send an uplink message every 2 hours. Each Uplink Include 8 set of records in this 2 hour (15 minute interval / record).

2.3 Uplink Payload

N95S31B has different working modes for the connections of different types of sensors. This section describes these modes. User can use the AT Command **AT+MOD** to set NBSN95 to different working modes.

For example:

AT+CFGMOD=2 // will set the N95S31B to work in MOD=2 distance mode which target to measure distance via Ultrasonic Sensor.

The uplink payloads are composed in ASCII String. For example:

0a cd 00 ed 0a cc 00 00 ef 02 d2 1d (total 24 ASCII Chars) . Representative the actually payload:

0x 0a cd 00 ed 0a cc 00 00 ef 02 d2 1d Total 12 bytes

NOTE:

- 1. All modes share the same Payload Explanation from HERE.
- 2. By default, the device will send an uplink message every 1 hour.

2.3.1 Payload Analyze

2.3.1.1 Before Firmware v1.2

N95S31B uplink payload includes in total 21 bytes.

Size(bytes)	6	2	2	1	1	5	2	2
Value	Device ID	<u>Ver</u>	<u>BAT</u>	Signal Strength	MOD 0X01	Reserve/ Same as NBSN95 CFGMOD=1	Temperature By SHT31	<u>Humidity</u> By SHT31
						No function here.	,	,

If we use the MQTT client to subscribe to this MQTT topic, we can see the following information when the NB sensor uplink data.

WQTT.fx - 1.7.1	- 0	×
File Extras Help		
local mosquitto	Connect Disconnect	
Publish Subscribe Scripts Br	oker Status Log	
f9527	Subscribe QoS1 QoS1 QoS2 Autoscrol	0°*
19527	f9527	1 QoS 0
Dump Messages Mute Unau	19527	2 QoS 0
	19527	3 OoS 0
l'opics Collecto	f9527	1
	05-01-2021 10:04:08.36248728	QoS 0
	724031607457006e0ccd1b0100dc000ccc00e10186	
	Payload decoded by Plain Text Decoder	-

The payload is ASCII string, representative same HEX: 0x724031607457 006e 0ccd 1b 01 00dc000ccc 00e1 0186

where:

- Device ID: 0x724031607457 = 724031607457
- Version: 0x006e=110=1.1.0
- BAT: 0x0ccd = 3277 mV = 3.277V
- **Signal:** 0x1b = 27
- Model: 0x01 = 1
- Ox00dc000ccc= reserve, ignore in N95S31B
- Temperature by SHT31: 0x00e1 = 225 = 22.5 °C
- Humidity by SHT31: 0x0186 = 390 = 39.0 %rh

2.3.1.2 Since Firmware v1.2

In this mode, uplink payload includes 91 bytes in total by default.

Each time the device uploads a data package, 8 sets of recorded data will be attached. Up to 32 sets of recorded data can be uploaded.

Size(bytes)	8	2	2	1	1	2	1	2	2	2	4	2	2	4
Value	Device ID	Ver	BAT	Signal	MOE	TemDS18B20	Interrupt	ADC	SHTTEM	SHTHUM	Time	SHTTEM	SHTHUM	Time
	Strength stamp								stamp					

If we use the MQTT client to subscribe to this MQTT topic, we can see the following information when the N95S31B uplink data.

Image: Data State Im	MOTT & - 171		
Connect Image: Connect Publish Subscribe Scripts Broker Status Log pub Image: Connect Image: Connect Image: Connect Image: Connect pub Image: Connect Image: Connect Image: Connect Image: Connect pub Image: Connect Image: Connect Image: Connect Image: Connect Image: Connect pub Image: Connect			
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Publish Subscribe Scripts Broker Status Log pub Import Subscribe Color Import Import pub Import Import Import Import Import Import pub Import Import <t< th=""><th>local mosquitto</th><th>Connect Disconnect</th><th>🖬 🔴 📗</th></t<>	local mosquitto	Connect Disconnect	🖬 🔴 📗
pub • Subscribe QSS QoS1 QS2 Addxcroll CC* pub QSG QSG QQSG QQSG QSG QC* Dump Messages Mule Quadratic QQSG QC* Quadratic QQSG QC* Topics Collector (0) Scan Stop QC* pub Q @B641105C758782000c 0d0f0cc010000000300514000063199d3cc0113023163199d120113023163199d3r0111 QcsG QC* @B641105C75878372000c 0d0f0cc010000000300514000063199d3cc0113023163199d120113023163199d3r01110234c53199d3r01110234c53199dar30112023263199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463199dar30112023463190dar300000000000000000000000000000000000	Publish Subscribe Scripts Broker Status	Log	
pub pub 1 Dump Messages Mult Question pub 2 Qosio Qosio pub 2 Qosio Qosio Qosio Qosio Qosio Qosio Pub 2 Qosio Qosio Qosio Qosio Pub 2 06-09-2022 15:44:09.56649872 Qosio 66:09-2022 15:44:09.56649872 Qosio 60:09-2022 15:44:09.56649872 Qosio 60:09-2022 15:44:09.56649872 Qosio 60:09-2022 15:44:09.5664987 Qosio	pub	Subscribe	50 QoS1 QoS2 Autoscroll
pub 2 QoS 0 Cos 0 Topics Collector (0) Scan Stop C pub 2 Cos 0 08-09-2022 15:44:09.56649872 Cos 0 08-09-2022 15:44:09.56649872 Cos 0 1 08-09-2022 15:44:09.56649872 Cos 0 0242631996eb Payload decoded by Plain Text Decoder Payload decoded by Plain Text Decoder	pub	pub	1 QoS 0
Topics Collector (0) Scan Stop 05* pub 2 08-09-2022 15:44:09.56649872 Qot 0 F868411056758782000c0d0 f0c010000000030051400006319943c01130231631994120113023163199c5 e0112023763199baat0112023263199baf60111023b631999a70112023b631999a70112023b631999a701120242631998a70111 D242631996eb Payload decoded by Plain Text Decoder *	Comp Prevages (Prace Construction	pub	2 QoS 0
Image: Control (0) Scan Stop () pub 2 08-09-2022 15:44:09.5664/9872 Qos 0 2 1 08-09-2022 15:44:09.5664/9872 Qos 0 1 08-09-2022 15:44:09.5664/9872			
Topics Collector (0) Scan Stop @ pub 2 08-09-2022 15:44:09.566498372 Qos 0 (6684/110567587820600c.00090000300514/0000603199d3c01130231631994120113023163199450 2 0 (7684/110567587820600c.00090000300514/0000603199d3c011302316319941201130231631994370112023b631999a70112023b631999a70112023b631999a70112023b631999a70112023b631999a70112023b631999a70112023b631999a7011202426319983f0111 0242631996eb			
Topics Collector (0) Scan Stop @ pub 2 06-09-2022 15:44:09.56649872 QoS 0 F8684.11056758782000c0d0f9c010000000300514000063199d3c0113023163199d120113023163199c5 e0112023263199a760112023b631999a70112023b631999a70112023b631999a70112023b631999a70112023b631999a70112023b631999a70112023b631999a70112023b631999a70112022b631999a70112023b631998r011			
Image: Control (0) Scan Stop OS pub 2 08-09-2022 15:44:09.56649872 QoS 0 F868411056758782000c:0d0f0c010000000300514000063199d3c0113023163199d120113023163199c5 e0112023763199baa0112023263199af60111023b631999a70112023b631999bf3011202426319988f30111 Payload decoded by Plain Text Decoder			
Topics Collector (0) Scan Stop OC pub 2 08-09-2022 15:44:09.56649872 QoS 0 F868411056758782000c0d0f0c010000000300514000063199d3c0113023163199d1201130231631999c5 e0112023763199baa0112023263199af60111023b631999a70112023b631998f3011202426319983f0111 0242631996eb Payload decoded by Plain Text Decoder	اط ا	_	
08-09-2022 15:44:09.56649872 QoS 0 7868411056758782000c0d0f0c010000000300514000063199d3c0113023163199d120113023163199c5 e0112023763199aa0112023263199af60111023b631999a70112023b631998f3011202426319988f0111 0242631996eb Payload decoded by Plain Text Decoder	Topics Collector (0) Scan Stop OS-	nub	
08-09-2022 15:44:09:56649872 QoS 0 f8664.11056758782000cc0d0f0cc100000000300514000063199d3c01130231631994120113023163199e5 e0112023763199baa0112023263199af60111023b631999a70112023b631998f3011202426319983f0111 0242631996eb Payload decoded by Plain Text Decoder		pub	2
19868411056758782000c0d0f0c010000000300514000065199d3c0113023163199d120113023163199c5 e0112023763199baa0112023263199af60111023b631999a70112023b631998f3011202426319983f0111 0242631996eb Payload decoded by Plain Text Decoder		08-09-2022 15:44:09.56649872	QoS 0
Payload decoded by Plain Text Decoder		f86841056758782000c0d0f0c010000000300514000063199 e0112023763199baa0112023263199af60111023b631999a701: 0242631996eb	13c01130231631990120113023163199c5 12023b631998f3011202426319983f0111
		Payload	decoded by Plain Text Decoder

The payload is ASCII string, representative same HEX:

0x <u>f868411056758782</u> 000c 0d0f 0c 01 0000 00 0030 0114 0231 63199d3c 0113023163199d12 0113023163199c5e 01120237

0112023b631998f3 011202426319983f 01110242631996eb

where:

- Device ID: f868411056758782 = f868411056758782
- Version: 0x000c=120=1.2
- BAT: 0x0d0f = 3343 mV = 3.343V
- Singal: 0x0c = 12
- Mod: 0x01 = 1
- TemDS18B20: 0x0000= 0 = 0
- Interrupt: 0x00= 0
- adc: 0x0030= 48

- **SHTTEM:** 0x0114= 276 = 27.6
- **SHTHUM:** 0x0231 =561=56.1%
- Time stamp : 0x63199d3c =1662342011 (Unix Epoch Time)
- SHTTEM,SHTHUM,Time stamp : 0113023163199d12
- 8 sets of recorded data: SHTTEM,SHTHUM,Time stamp : 0113023163199c5e,

2.3.2 Device ID

By default, the Device ID equal to the last 6 bytes of IMEI.

User can use AT+DEUI to set Device ID

Example:

AT+DEUI=A84041F15612

The Device ID is stored in a none-erase area, Upgrade the firmware or run AT+FDR won't erase Device ID.

NOTE: When the firmware version is v1.2 and later firmware:

By default, the Device ID equal to the last 15 bits of IMEI.

User can use AT+DEUI to set Device ID

Example:

AT+DEUI=868411056754138

2.3.3 Version Info

These bytes include the hardware and software version.

Higher byte: Specify hardware version: always 0x00 for N95S31B

Lower byte: Specify the software version: 0x6E=110, means firmware version 110

For example: 0x00 6E: this device is N95S31B with firmware version 110.

2.3.4 Battery Info

Ex1: 0x0B45 = 2885mV Ex2: 0x0B49 = 2889mV

2.3.5 Signal Strength

NB-IoT Network signal Strength.

Ex1: 0x1d = 29

- 0 -113dBm or less
- 1 -111dBm
- 2...30 -109dBm... -53dBm

31 -51dBm or greater

99 Not known or not detectable

2.3.6 Temperature & Humidity

The device will be able to get the SHT31 temperature and humidity data now and upload to IoT Server.

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No.	Time	Source	Destination	Proto Length	h Info	
Г	506 13.407465	123.57.29.3	6 10.130.2.113	MQTT 7	79 Publish Message [COAPTEXT]	
L	507 13.607613	10.130.2.11	3 123.57.29.36	TCP 5	54 53218 → 1883 [ACK] Seq=1 Ack=26 Win=4346 Len=0	
	Checksum: 0x3	c2c [unverifi	.ed]			^
	[Cnecksum Sta	tus: Unveriti	.ed J			
	Urgent pointe	r: 0				
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₽ .	[TIMescamps] TCD_moviesd (3E hutton)				
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4 MO	Telemetry Tra	J	col Publish Massaga			_
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0020	02 71 07 5b	cf e2 d9 fc	b4 6f 70 d2 28 c9 50 18	·q·[····	· op · (· P ·	
0030	00 e5 3c 2c	00 00 30 17	00 08 43 4f 41 50 54 45	<,0	· · COAPTE	
0040	58 54 <mark>0c cc</mark>	1a 01 00 d7	00 0c c4 00 ec 02 95	XT	·····	
0 2	Message (mqtt.m	nsg), 13 字节			分组: 559 ・ 已显示: 2 (0.4%) 配置	Default
				Y		

Convert the read byte to decimal and divide it by ten.

Example:

Temperature: Read:00ec (H) = 236(D) Value: 236 /10=23.6°C

Humidity: Read:0295(H)=661(D) Value: 661 / 10=66.1, So 66.1%

2.4 Downlink Payload

By default, N95S31B prints the downlink payload to console port.

Downlink Control Type	FPort	Type Code	Downlink payload size(bytes)
TDC(Transmit Time Interval)	Any	01	4
RESET	Any	04	2
INTMOD	Any	06	4

Examples:

Set TDC

If the payload=0100003C, it means set the END Node's TDC to 0x00003C=60(S), while type code is 01.

Payload: 01 00 00 1E TDC=30S

Payload: 01 00 00 3C TDC=60S

Reset

```
If payload = 0x04FF, it will reset the N95S31B
```

• INTMOD

```
Downlink Payload: 06000003, Set AT+INTMOD=3
```

2.5 Humidity and Temperature alarm function

AT Command:

AT+ SHHUM=min,max

² When min=0, and max \neq 0, Alarm higher than max

² When min \neq 0, and max=0, Alarm lower than min

² When min \neq 0 and max \neq 0, Alarm higher than max or lower than min

Example:

AT+ SHHUM=50,80 // Alarm when humidity lower than 50.

AT+ SHTEMP=min,max

- ² When min=0, and max \neq 0, Alarm higher than max
- ² When min \neq 0, and max=0, Alarm lower than min
- ² When min \neq 0 and max \neq 0, Alarm higher than max or lower than min

Example:

AT+ SHTEMP=20,30 // Alarm when temperature lower than 20.

2.6 Set the number of data to be uploaded and the recording time

AT Command:

- AT+TR=900 // The unit is seconds, and the default is to record data once every 900 seconds.(The minimum can be set to 180 seconds)
- AT+NOUD=8 // The device uploads 8 sets of recorded data by default. Up to 32 sets of record data can be uploaded.

The diagram below explains the relationship between TR, NOUD, and TDC more clearly:



2.7 Read or Clear cached data

AT Command:

- AT+CDP // Read cached data
- AT+CDP=0 // Clear cached data

нн хш	on	
串 🛛 Silicon(COM8 🕶	Password timeout	
波特率 9600 ▼	[82498]Humidity =53.82 %rh	
	[82528]tem =27.44 C	
数据位 8 ▼	[82957]Humidity =53.49 %rh	
检验位 None ▼	[82987]tem =27.45 C	
10000102	[83416]Humidity =53.44 %rh	
停止位 1 🔹 🔻	[83446]tem =27.40 C	
· 协 W	[83875]Humidity =53.49 %rh	
流控 Mone 🔹	[83905]tem =27.54 C	
البخارية	[84232]Password Correct	
接收设置	30.60 65.70 Thu Sep	1 16:35:04 2022
● ASCII ○ Hex	30.70 67.50 Thu Sep	1 16:38:03 2022
□白釉梅行	26.30 40.20 Fr1 Sep	2 03:17:26 2022
	27.30 57.80 Inu Sep	8 07:16:59 2022
□ 显示发送	27.40 57.80 Inu Sep	8 07:22:39 2022
□ 显示时间	27.40 57.10 Inu sep	8 07:25:39 2022
	27.30 57.10 Inu sep	8 07:28:39 2022
发送设置	27.40 50.20 INU Sep	0 07:34:14 2022
ASCTT O How	27.40 50.70 IIIU Sep	0 07:07:14 2022
C Rocii O nex	27.50 50.10 IIIU Sep	0 07:40:14 2022
重复发送 1000 🔶 ms	27.50 50.10 Ilu Seh	0 07.43:14 2022

2.8 Battery & Power Consumption

N95S31B uses ER26500 + SPC1520 battery pack. See below link for detail information about the battery info and how to replace.

Battery Info & Power Consumption Analyze .

3. Access NB-IoT Module

Users can directly access the AT command set of the NB-IoT module.

The AT Command set can refer the BC35-G NB-IoT Module AT Command: <u>https://www.dragino.com/downloads/index.php?dir=datasheet/other_vendors/BC35-G/</u>

文件(E) 编辑(E) 视图(V) 工具(T) 帮助(H)			
] 🖹 ∞ ▶ ■ C· +			
 串口设置 満 □ USB-SERIAL CH340 (COM20 ▼ 波特室 9600 ▼ 数据位 8 ▼ 検验位 None ▼ 停止位 1 ▼ 流 控 None ▼ 接收设置 ▲ ASCII C Hex 目动执行 ▽ 显示发送 □ 显示时间 - 发送设置 	AT+CSQ [00-01-01 00:03:51]Password Incorrect 12345678 [00-01-01 00:03:55]Password Correct AT+CSQ +CSQ:7,99 OK AT+NBAND? +NBAND:8 OK		
ⓒ ASCII ○ Hex □ 自动重发 1000 ÷ ms	AT+NBAND?	发送	
COM20 OPENED, 9600, 8, NONE, 1, OFF Rx: 115 Bytes Tx: 37 Bytes			

4. Using the AT Commands

4.1 Access AT Commands

See NBSN95 AT Command in this link for detail: <u>https://www.dropbox.com/sh/jao1xt9kw5r3yq4/</u> <u>AAAMpJkZzExF2JLbRWxGoQ9Na?dl=0</u>

AT+ <cmd>?</cmd>	: Help on <cmd></cmd>
AT+ <cmd></cmd>	: Run <cmd></cmd>
AT+ <cmd>=<value></value></cmd>	: Set the value
AT+ <cmd>=?</cmd>	: Get the value

General Commands

AT	: Attention
AT?	: Short Help
ATZ	: MCU Reset
AT+TDC	: Application Data Transmission Interval
AT+CFG	: Print all configurations
AT+CFGMOD	: Working mode selection
AT+INTMOD	: Set the trigger interrupt mode
AT+5VT	: Set extend the time of 5V power

AT+PRO	: Choose agreement			
AT+WEIGRE	: Get weight or set weight to 0			
AT+WEIGAP	: Get or Set the GapValue of weight			
AT+RXDL	: Extend the sending and receiving time			
AT+CNTFAC	: Get or set counting parameters			
AT+SERVADD	R : Server Address			
AT+TR : Ge	et or Set record time			
AT+APN	: Get or set the APN			
AT+FBAND	: Get or Set whether to automatically modify the frequency band			
AT+DNSCFG	: Get or Set DNS Server			
AT+GETSENS	ORVALUE : Returns the current sensor measurement			
AT+NOUD	: Get or Set the number of data to be uploaded			
AT+CDP : R	ead or Clear cached data			
AT+SHTEMP:	Get or Set alarm of temp			
AT+SHHUM: (Get or Set alarm of moisture			
COAP Management				
AT+URI	: Resource parameters			
UDP Management				
AT+CFM	: Upload confirmation mode (only valid for UDP)			
MQTT Manag	ement			
AT+CLIENT	: Get or Set MQTT client			
AT+UNAME	: Get or Set MQTT Username			
AT+PWD	: Get or Set MQTT password			

- AT+PUBTOPIC : Get or Set MQTT publish topic
- AT+SUBTOPIC : Get or Set MQTT subscription topic

Information

AT+FDR	: Factory Data Reset
AT+PWORD	: Serial Access Password

5. FAQ

5.1 How to Upgrade Firmware

User can upgrade the firmware for 1) bug fix, 2) new feature release.

Please see this link for how to upgrade: <u>http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20Upgrade</u> %20Instruction%20for%20STM32%20base%20products/#H2.HardwareUpgradeMethodSupportList

Firmware Download: https://www.dropbox.com/sh/fr8w23rb951512i/AACSJeGQg-7ZjKhAl_Sn57H6a?dl=0

Notice, N95S31B and LSN50v2 share the same mother board. They use the same connection and method to update.

6. Trouble Shooting

6.1 Connection problem when uploading firmware

Please see: <u>http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20Upgrade%20Instruction%20for</u> %20STM32%20base%20products/#H3.3Troubleshooting

6.2 AT Command input doesn't work

In the case if user can see the console output but can't type input to the device. Please check if you already include the **ENTER** while sending out the command. Some serial tool doesn't send **ENTER** while press the send key, user need to add ENTER in their string.

6.3 Not able to connect to NB-IoT network and keep showing "Signal Strength:99".

This means sensor is trying to join the NB-IoT network but fail. Please see this link for <u>trouble shooting for</u> <u>signal strenght:99</u>.

7. Order Info

Part Number: N95S31B-YY

8. Packing Info

Package Includes:

- N95S31B NB-IoT Temperature and Humidity Sensor
- External antenna x 1

Dimension and weight:

- Device Size: 13.0 x 5 x 4.5 cm
- Device Weight: 150g
- Package Size / pcs : 14.0 x 8x 5 cm
- Weight / pcs : 180g

9. 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