# High Precision GNSS Receiver TN531 Series User Guide



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# **About This Guide**

Thank you for choosing Bivocom High Precision GNSS Receiver TN531 Series.

Please thoroughly read this user guide before you configure and install the device.

This manual is compatible with below models

Model	Description
TN531-LF	4G GNSS Receiver

# **Summary of Changes**

Date	Version	Notes	Editor
10-9-2024	V1.0	Initial new version	Caesar Chen

# **Table of Contents**

Copyright	2
Trademark	2
Disclaimer	2
About This Guide	
Summary of Changes	3
Table of Contents	4
1. Introduction	6
1.1 Overview	6
1.2 Applications	6
1.3 Dimensions	7
1.4 Specification	7
1.5 Definition of PIN and cables	9
1.5.1 Definition of PIN	9
1.6 Power supply requirement	10
1.7 LED Indicators	10
1.8 Mounting	11
1.9 Lightning protection instructions	11
2. Getting Started	12
2.1 Package Checklist	12
2.2 Installation	12
2.2.1 Install SIM/UIM Card	12
2.2.2 Install the 4 in 1 Cable	12
2.2.4 Connect cable of power adapter to TN531	12
2.2.5 Connect TN531 to PC/Laptop via RS232	13
3. Configuration Tool Setting	13
3.1 Config Tool	13
3.1.1 RTC Setting	14
3.1.2 Channel Setting	14
3.1.3 Hardware Interface	15
3.1.4 Terminal Parameters	20
3.1.5 Center Address	21
3.1.6 Other Center Setting	23
3.1.7 SMS Setting	
3.1.8 Data Storage Setting	24
3.2 Modbus RTU Protocol	25
4. Firmware Upgrade	
4.1 Local Upgrade	26
Appendix I AT Commands	27

1. Basic	Setting	27
2. Com S	Setting	27
3. Netwo	rk Address	29
4. Other	Settings	
Appendix II	Data Structure	32
••		

# 1. Introduction

### 1.1 Overview

The Bivocom TN531 is a state-of-the-art high-accuracy positioning solution designed to meet the rigorous demands of modern applications in structural health monitoring (SHM), deformation analysis, and disaster assessment. Packed with advanced features, this innovative device combines low power consumption with easy installation, ensuring seamless integration into a wide range of environments.

Equipped with built-in 4G connectivity and a GNSS antenna, the TN531 delivers reliable real-time data for effective monitoring. Its robust IP68 rating guarantees durability in harsh conditions, while the embedded MEMS tilt sensor and 6-axis inertial measurement unit (IMU) enhance positioning accuracy through effective compensation.

The TN531 supports real-time kinematic (RTK) positioning and adheres to industry standards such as RTCM and RINEX, making it an invaluable tool for applications in smart cities integration, geological disaster monitoring including tectonic movement detection, landslide monitoring, and volcanic activity, as well as flood monitoring. With features like 2x RS232, 1x RS485, and 1x pulse input, the TN531 offers versatile connectivity options, ensuring it meets the evolving needs of infrastructure and environmental monitoring.

### **1.2 Applications**

Unlock the potential of precision monitoring with the Bivocom TN531, the perfect solution for enhancing safety and efficiency in urban and natural settings.

Typical application as below.



### 1.3 Dimensions



Pipe thread

TN531 Base

# **1.4 Specification**

Interface	Description
System	CPU: Industrial 32-bit CPU
	Flash: 512KB
	SRAM: 256KB
	Data Storage Flash: 16MB
Cellular	Antenna: Built-in
Interface	SIM Slot: 1x Nano SIM
	ESD Protection 15KV
Serial Interface	Connector Terminal block, 3.5 mm female socket with lock
	Ports 1 × RS232(debug) + 1 × RS485
	Baud Rate 300bps to 230400bps
	ESD protection 8KV for RS232, 15KV for RS485
GNSS	Antenna: Built-in
	GPS: GPS L1C/A /L1C/L2C/ L5
	BDS: B1I/B2I/B1C/B2b/B2a/B3I
	Galileo: E1/E5a/ E5b

	GLONASS: G1/G2
	QZSS: L1C/A/L1C/L2C/ L5
Positioning	Static Accuracy: H: 2.5mm + 1ppm   V: 5mm + 1ppm
Accuracy	RTK Accuracy: H: 8mm + 1ppm   V: 15mm + 1ppm
	Cold /Hot Start: ≤18s / ≤1s
	Initialization Time: <5s
	Initialization Reliability: >99.9%
	PPS Accuracy: 20ns
Data Output	Data Format: NMEA 0183 V4.1, RTCM3.X
	Update Rate: Up to 20Hz
MEMS IMU	6-Axis: 3-axis gyroscope, 3-axis accelerometer for real-time compensated
Sensor	3-axis attitude angles
	Update Rate: Up to 20Hz
Power Supply	Standard Power: DC 12V/1.5A
and	Input Voltage: 9-35 VDC
Consumption	Communication: 12VDC@145mA
	Ingress Protection: IP68
Physical	Housing & Weight: Aluminum alloy(base)+ABS/PC Cover, 1550g, without
Characteristics	accessories
	<b>Dimensions:</b> $\Phi$ 200*150mm
	Mounting: Flange face, or pipe thread
Environmental	<b>Operating Temperature</b> -35°C to +75°C (-31°F to +167°F)
	Storage Temperature -40°C to +80°C (-40°F to +176°F)
	Relative Humidity 0% to 95% (non-condensing)
Software	Network Protocols: MQTT*, Transparent (TCP Client/Server, UDP
	Client/Server), Modbus Gateway (Modbus RTU to Modbus TCP), DNS, etc.
	Management: Config Tool, Cloud DMP (Device Management Platform)
Others	LED Indicators: System, Online, Power, Error
	Built-in: Watchdog, RTC, Timer
	Approvals: CE*, RCM*, FCC*
	Warranty Period:
	Standard: 12 Months
	Extended: 2-5 Years3
Standard	TN531 GNSS Receiver
Package	4 IN 1 Cable(Power in/out, RS232, RS485, PI)
Content	Power cable

### 1.5 Definition of PIN and cables

#### 1.5.1 Definition of PIN

There is 4 IN 1 Cable(Power in/out, RS232, RS485, PI) in standard package, the definition is as below.



No.	Port Definition	Interface Type	Function Definition
1	VIN+	DC nower input (Female)	RedPositive pole
2	VIN-	DC power input (Female)	BlackNegative pole
3	GND		5
4	232_RX	DB9	2
5	232_TX		3
6	VDD_OUT		1
7	PI	3 Pin terminal	2
8	GND		3
9	В	2 Din line	Black-RS485 B
10	A		Red-RS485 A

Aviation plug should be installed at the bottom of TN531, there are 4xLEDs and a pipe thread hole. A Nano SIM is needed to connect internet, the details as as below.



### 1.6 Power supply requirement

Devices are often used in complex environments, in order to adapt to the complex application environment and improve the stability of the system, the equipment uses advanced power technology. Users can use BIVOCOM 12VDC/1.5A power adapter to supply power to the device, or directly supply power to the device with DC 9-35V power supply. When the user supplies power to the device with an external power supply, the stability of the power supply must be ensured (the ripple is less than 300mV, and the instantaneous voltage does not exceed 35V), and the power supply is guaranteed to be more than 4W (excluding the power consumption of the external sensor).

Using Bivocom standard 12VDC/1.5A power adapter is highly recommended.

### **1.7 LED Indicators**

TN531 has 4 LED indicators, 'Power', 'System', 'Online', 'Error', as follows.



LED	Status	Description		
Indicator				
Power	On	Power on		
System Blink		Device is operating		
Online	On	Device is online, connecting		
		to remote server via cellular		
		network		
GNSS	On	RTCM32 data was collected		

### 1.8 Mounting

This device supports 1\*Pipe thread hole, the size of Screw thread is 5/8"-11, its robust IP68 rating guarantees durability in harsh conditions,TN531 can be installed at the top of pole body.

### **1.9 Lightning protection instructions**

When this device is connected to outdoor sensors (rain gauge, water level gauge, etc.), we suggest you take lightning protection measures (such as installing lightning arresters, etc.) to improve the safety level of the device.

# 2. Getting Started

### 2.1 Package Checklist

The following components are included in your TN531 package. Check the list before installation. If you find anything missing, Please feel free to contact Bivocom.

- 1. TN531 GNSS Receiver 1PCS
- 2. 4 IN 1 Cable(Power in/out, RS232,RS485, PI) 1 PCS
- 3. Power cable 1PCS

### 2.2 Installation

#### 2.2.1 Install SIM/UIM Card

TN531 supports Nano SIM/UIM only, so if you're using a Micro SIM or Normal SIM card, you may need to replace them into Nano SIM card. There is a protecting cover covers SIM card slot, you need to use M3\*12 screwdriver to unscrew 4 screws then plug or unplug SIM card.

Make sure your RTU is powered off, then put the SIM/UIM card to SIM slot with right direction, press it in and make sure it's locked and tightly matched. If you want to unplug SIM card, press SIM card edge and it will flick out.

Warning: Never install SIM/UIM card when RTU is powered on.

#### 2.2.2 Install the 4 in 1 Cable

There is 1\*4 in 1 Cable in the package(Power in/out, RS232, RS485, PI), please install the cable to the button of TN5321, sensors/PLC/microcontrollers can connect to the cable.

#### 2.2.4 Connect cable of power adapter to TN531

The power supply of TN531 is barrel connector(4 in 1 cable), we suggest you use the power cable in the package. Bivocom's standard power supply is 1.5A/12VDC. If you have to use your own power supply, make sure the power range is 9-35VDC and it is stable enough(Ripple shall be less than 300mV, and Instantaneous voltage shall not larger than 35V), meanwhile, power shall over 4W.

Warning: Incorrect connection of the power cable may cause damage of device.

#### 2.2.5 Connect TN531 to PC/Laptop via RS232

Use USB-RS232 adapter(DB9 interface) to connect to the RS232 female port of TN531. For definition of RS232 serial port, please refer to item <u>1.5.1</u> respectively.

# 3. Configuration Tool Setting

In this chapter, you'll learn more details about how to configure the RTU via the configuration tool.

### 3.1 Config Tool

In the previous section, after finish the TN531 installation and connect it with your laptop via RS232 female port, you may need an RS232 to USB adaptor if your laptop doesn't support DB9 interface.

Open the RTU config tool, there are serial port settings of your laptop, select the right COM port, and Baud Rate (the default is 115200). Normally it will automatically detect the right port and has linked the connection by default. If not, please change it accordingly.

TN521&TN531-H212-V2.40	- 0 3	×	×
CONFIGURATION			A
CONFIGURATION  Channel parameter sett  channal01  channal02  channal03  channal03  channal04  channal05  channal06  channal06  channal08  channal09  channal11  channal12  channal12  channal12  channal15  channal16  channal16  channal16  channal18  channal18  channal19  channal29  channal20  channal29  channal20  chan		1	
Serial number: COM5			
BAUD: 115200 -	RELOAD Save para Load para Factory Restart		
check bit: None	Save configuration to file Configure from configuration file <<		Device version Device signal IMEI Clear log

Click 'Reload' button Reload to reload the initial settings from the device, then you are allowed to configure all settings on the tool. Click 'Save' Save when settings changed. 'Restart' Restart it to quit the configuration mode and go into work mode(communication mode). Note: You have to 'Reload' it before change any settings when in work mode.

On the configuration tool board, you are also allowed to perform 'Factory', 'Save para' and 'Load para', Check



'Device version', 'Device signal' and 'Clear' the syslog.

RELOAD	Save para	Load para	Factory	Restart					
Save configuration to file	Configur	e from configuration	file		Device version	Device signal	IMEI	Clear log	

After entering into configuration mode, you are able to change all the settings on tool panel, as below detailed explanations.

#### 3.1.1 RTC Setting

You can set the RTC time according to the current system time, or you can enter the time manually.

IN521&TN531-H212-V2.40	—	×
Channel parameter settings  Download Tools debug tool  CONEFIGURATION  Channel parameter settin  channal01 [Serial00  channal02 [Serial01  channal05  channal05  channal06  channal06  channal08  channal09  channal10  channal12  channal12  channal14  channal15  channal16  channal16  channal16  channal17  channal17  channal17  channal17  channal18  commode  COM1  COM	et	
BAUD:     115200 v       check bit:     None v       close port     Save configuration to file         Configure from configuration file	Restart <<	

#### 3.1.2 Channel Setting

You can configure the channel storage length and hardware interface when you configure the channels.

Note: channel01~03 are set for built-in 6-Xis MEMS sensor by default, please start configure from channel04.

TN521&TN531-H212-V2.40					- 🗆	×
channal04 none						
channal04  none	Channel storage length: 0	KB	Hardware interface:	none	•	
Serial number: COM1						
BAUD: 115200 -	RELOAD	Save para	Load para Fa	actory	Restart	
check bit: None close port	Save configuration to file	Configure	from configuration file		<<	

Parameter Name	Description
CH storage length	The size of the stored data, Unit: KB
Hardware Interface	Serial port(COM0-COM2, 2 ports in total)
	Pulse input(PI0, 1 ports in total)

#### 3.1.3 Hardware Interface

#### 1) Serial Port

For serial port setting, there are 3 main partners to configure, 'Channel attribute', 'Communication parameters' and 'Alarm parameters'.

#### a) Channel attribute

TN521&TN531-H212-V2.40	- 🗆 X
channal04 none	
Download Tools	hardware interface
CONFIGURATION	Channel storage length: 48 KB Hardware interface: Serial04
Channel parameter settin  channal01 Serial00  channal02 Serial01  channal02 Serial02	Channel attribute communication parameters Alarm parameters
- channal04   none - channal05	Collection enabled: open  Monitoring factors: waterlevel
	Data collection time: 10 (0-65535s) Sampling base value: 0.00
	Power on delay: 10 (0-255s) Sampling correction value: 0.00
channal11 channal12 channal13 channal14 channal15 channal16 channal17 channal18	Accuracy of data collection: 1 Collection unit: m
Serial number: COM1	
BAUD: 115200 -	RELOAD Save para Load para Factory Restart
check bit: None	Save configuration to file Configure from configuration file <<

Parameter Name	Description
Collection enabled	Enable or disable data acquisition
Data collect time	Setting acquisition time interval, from 0-65535s
	You can configure a time that TN531 will wait for the time you've
Power on delay	set before it sends data acquisition request to your field sensor.
	The accuracy of data, 0.01, 0.1, 1, 1000 to choose, and you can
	also set up the number you want.
	For example, you're collecting data at 0.001m, and you want to
	store the data in mm format, choosing 1000, that means your
Accuracy of data collection	server will receive data at 1mm format.
Monitoring factors	Setting the factor to report to server.
	Assumed base value of sampling.
	By configuring this value, the data received at server is an accurate
	data.
	For example, the base value of water level gauge is 10m, and final
Sampling Base Value	water level is 20m, that means the data change is 10m.
	Correct the sampling value.
	If the data has fixed error, you can set a corrected value to correct
Sampling Corrected Value	it.
Collection Unit	Choose the unit for the type of data.(cm, m, m3/s)

#### b) Communication parameters

This is to configure the communication parameter of this channel on TN531, as well as Modbus parameter.

channal04   none	
Download Tools     debug tool     CONFIGURATION	hardware interface       Channel storage length:       48       KB       Hardware interface:       Serial04
	Channel attribute communication parameters Alarm parameters
- channal04 Inone - channal05	Serial port RS485-0   Mobus Device address: 1 (0-255)
channal06 channal07	baud rate:         9600         Image: Function code:         3         (0-255)
channal08 channal09	checksum: 8N1  Register address: 0 (0-65535)
channal10 channal11	Sensor protocol: MODBUS RTU  Number of registers: 1 (0-255)
	Data Structure: Unsigned 16bit BA
<ul> <li>∽ channal15</li> <li>~ channal16</li> <li>~ channal17</li> </ul>	
- channal18	
erial number: COM1 💌	
AUD: 115200 -	RELOAD Save para Load para Factory Restart
heck bit: None 🔽	Save configuration to file Configure from configuration file <<<

#### c) Alarm

TN521&TN531-H212-V2.40	-
channal04   none Download Tools - debug tool CONFIGURATION - channel parameter settin - channal01   Serial00 - channal02   Serial03 - channal03   Serial03 - channal05 - channal06 - channal06 - channal07 - channal08 - channal09 - channal10 - channal11 - channal12 - channal13 - channal14 - channal15 - channal16 - channal18 - channal18	hardware interface   Channel storage length:   48   KB   Hardware interface:   Serial04   Channel attribute   communication parameters   Alarm upper limit value:   Alarm linkage type:   No association   Image limit value:   Alarm linkage type value:   DO low/K disconnect   Alarm threshold:
Serial number: COM1  V BAUD: 115200  V	
check bit: None	RELOAD     Save para     Load para     Factory     Restart       Save configuration to file     Configure from configuration file     <

Parameters	Description
	You can set a maximum value for alarm, once it
Alarm upper limit value	exceeds this value, RTU will send alarm message
	You can set a minimum value for alarm, once it
Alarm lower limit value	exceeds this value, RTU will send alarm message
	You can set a value that if the data surpass this
Alarm threshold	value RTU will sent alarm message

#### 2) Pulse Input

For Pulse Input, there are 2 main parameters to configure, Basic and Alarm.

#### a) Basic

I521&TN531-H212-V2.40	- 0
channal04 none	
CONFIGURATION  Channel parameter sett  Channel 01   none  Channal02   none  Channal03   none	hardware interface       Channel storage length:     48       KB     Hardware interface:       PI0
	Collection enabled: Open   Accuracy of data collection: 1
channal08 channal09 channal10	Counting method:       Rising edge coun       Monitoring factors:         Power on delay:       (0-255s)       Sampling base value::
	Data unit: Sampling correction value:
- channal14 channal15 channal16 channal17 channal18 channal19 channal20	Anti shake time: (ms)
erial number: COM1	
AUD: 115200 -	RELOAD Save para Load para Factory Restart
close port	Save configuration to file Configure from configuration file <<

Parameter Name	Description
Collection enabled	Enable or disable data acquisition
Counting Method	No, rising edge, falling edge, double edge
	You can configure a time that TN531 will wait for the time you've set before it
Power on delay	sends data acquisition request to your field sensor.
Data Unit	mm, cm, m, m3/s
	The accuracy of data, 0.01, 0.1, 1, 1000 to choose, and you can also set up the
	number you want.
	For example, you're collecting data at 0.001m, and you want to store the data
Accuracy of data	in mm format, choosing 1000, that means your server will receive data at 1mm
collection	format.
Monitoring factors	Setting the factor to report to server.
	Assumed base value of sampling.
	By configuring this value, the data received at server is an accurate data.
	For example, the base value of water level gauge is 10m, and final water level
Sampling Base Value	is 20m, that means the data change is 10m.
Sampling Corrected	Correct the sampling value.
Value	If the data has fixed error, you can set a corrected value to correct it.

#### b) Alarm

channal04 none	
CONFIGURATION  Channel parameter sett  Channal01  none  channal02  none  channal03  none  channal03  none  channal05  none  channal05  none  channal06  channal07  channal07  channal09  channal10  channal11  channal12  channal12  channal14  channal15  channal16  channal16  channal17	hardware interface   Channel storage length:   48   KB   Hardware interface:   PIO   Channel attribute   Alarm parameters   Alarm linkage type:   No association   Alarm linkage type value:   DO low/K disconne   Alarm threshold:
erial number: COM1  COM1 Channal20 Channal20 COM1 Channal20 Channa	RELOAD     Save para     Load para     Factory     Restart       Save configuration to file     Configure from configuration file     <

Parameters	Description
	You can set a value that if the data surpass this value
Alarm threshold	RTU will sent alarm message

#### 3.1.4 Terminal Parameters

Configure the com ports settings at "Com Setting" page, only the RS232-1 and RS485-0 be supported on standard TN531.

Note: RS485-1 setting only available if your TN531 is customized support up to 2-RS485 ports.

TN521&TN531-H212-V2.40		-		×
Terminal parameters  Download Tools  debug tool  CONFIGURATION  Channel parameter settings  Terminal parameters  Center address parameters  Other parameters of the ce SMS parameters Serial port transmission parai Storage settings and data q	Debugging level: 2   Device baud rate: 115200   Data bit stop bit checksum 8N1   device number: 1			
Serial number: COM5	Low battery voltage(V): 11.5			
BAUD: 115200 -	RELOAD Save para Load para Factory	Resta	rt	
check bit: None 💌	Save configuration to file Configure from configuration file			

Parameters	Description
	0(no log)
Debug Level	1(Part of important logs export from RS232/RS485)
	2(Part of important logs export from RS232/RS485)
Baud Rate	300bps~115200bps
Data, Stop and Parity Bit	8N1, 8O1, 8E1
Device Number	The number of RTU
Battery Current	Unit: V

#### 3.1.5 Center Address

You can configure the data center for GNSS and other sensors' data, there are up to 2 data center can be configured.

enter address parameters		
- channal151none	Server address and port number	
channal16Inone	Number of servers (when greater than 1, the backup center is invalid):	
- channal 7 Inone		
- channal18Inone	Main GNSS channel: TCP   Primary GNSS address + port: isodev.picp.net	26127
- channal19Inone		
- channal201none		
- channal21 Inone		
- channal221none		
- channal231none		
channal25Inone	Backup GNSS chann TCP   Backup GNSS address and port	10122
channal27Inone		
channal20Inone		
channal301none		
- Terminal narameters		
Center address naramet		
Center address paramet     Other parameters of the	Domain name resolution DNS parameters	
<ul> <li>Center address paramet</li> <li>Other parameters of the</li> <li>SMS parameters</li> </ul>	Domain name resolution DNS parameters	
Center address paramet     Other parameters of the     SMS parameters     Serial port transmission (	Domain name resolution DNS parameters Main Center Domain Name Server Address:	
Center address paramet     Other parameters of the     SMS parameters     Serial port transmission       Strange settings and da	Domain name resolution DNS parameters Main Center Domain Name Server Address:	
Center address paramet     Other parameters of the     SMS parameters     Serial port transmission 1     Storage settings and da	Domain name resolution DNS parameters     Main Center Domain Name Server Address:     Backup Center Domain Name Server Address	
Center address paramet     Other parameters of the     SMS parameters     Serial port transmission 1     Storage settings and da	Domain name resolution DNS parameters Main Center Domain Name Server Address: Backup Center Domain Name Server Address	
Center address paramet     Other parameters of the     SMS parameters     Serial port transmission       Storage settings and da	Domain name resolution DNS parameters Main Center Domain Name Server Address Backup Center Domain Name Server Address	
Center address paramet     Other parameters of the     SMS parameters     Serial port transmission       Storage settings and da	Domain name resolution DNS parameters Main Center Domain Name Server Address Backup Center Domain Name Server Address	
Center address paramet Other parameters of the SMS parameters Serial port transmission   Storage settings and da	Domain name resolution DNS parameters     Main Center Domain Name Server Address:     Backup Center Domain Name Server Address	
Center address paramet     Other parameters of the     SMS parameters     Serial port transmission       Storage settings and da     ial number: COM5	Domain name resolution DNS parameters     Main Center Domain Name Server Address:     Backup Center Domain Name Server Address     RELOAD     Save para     Load para     Factory	Restart
Conter address paramet Other parameters of th SMS parameters Serial port transmission   Storage settings and da tial number: COM5 UD: 115200	Domain name resolution DNS parameters         Main Center Domain Name Server Address:         Backup Center Domain Name Server Address         RELOAD       Save para         Load para       Factory	Restart

Parameter	Description	
	Supports up to 5 data center, when choose number over	
Data Center Number	1, backup is invalid	
	The protocol to report GNSS data, support TCP, SMS,	
	Beidou Satellite, maritime satellite, PSTN, Shortwave,	
Main GNSS channel	serial port and UDP	
Center Addr+Port	Domain name or IP address supported	

### 3.1.6 Other Center Setting

N521&TN531-H212-V2.40			- 0	×
Other parameters of the center				
Download Tools     debug tool     CONFIGURATION     Channel parameter settings     Terminal parameters     Center address parameters     Other parameters     SKS parameters     Serial port transmission parameters     Storage settings and data q	Dialup Settings Wireless network APN: APN username: APN password: LCP he APN Dialing Center Number:	eat time (in seconds): nect time (0-65535 seconds): artbeat time (seconds):		
···· Storage settings and data q				
Serial number COM5				
BAUD: 115200 -	RELOAD Save para Load para	Factory	Restart	
check bit: None	Save configuration to file Configure from configura	tion file	<<	]

Parameter	Description
APN	APN of SIM card from your local carriers
Username	Username of APN
Password	Password of APN
APN Dialing Center	Call center number of APN
	Heartbeat time, 60 seconds is suggested for
Heartbeat Time	TCP mode, and 31 seconds for UDP
Reconnect Time Interval	Waiting time for disconnection reconnection
LCP Heartbeat Interval	LCP level detection, keep it as default

### 3.1.7 SMS Setting

TN521&TN531-H212-V2.40	-		×
SMS parameters			
<ul> <li>- channal15</li> <li>- channal16</li> <li>- channal17</li> <li>- channal17</li> <li>- channal19</li> <li>- channal20</li> <li>- channal21</li> <li>- channal23</li> <li>- channal23</li> <li>- channal23</li> <li>- channal24</li> <li>- channal25</li> <li>- channal26</li> <li>- channal27</li> <li>- channal28</li> <li>- channal30</li> <li>- Terminal parameters</li> <li>- Center address paramete</li> <li>- Other parameters of the</li> <li>- Storage settings and dat</li> </ul>	SMS configuration :  SMS authorization number :  Multiple numbers separated by commas)		
BAUD: 115200 -	RELOAD Save para Load para Factory Resta	rt	
check bit: None	Save configuration to file Configure from configuration file <<		

Parameter	Description	
SMS Setting	Open, Close	
	Authorized phone number to receive SMS,	
SMS Setting Authorized Number	multi number will be separated by comma	

### 3.1.8 Data Storage Setting

TN521&TN531-H212-V2.40	-		×
Storage settings and data queries			
- channal15 - channal16 - channal17 - channal18 - channal20 - channal21 - channal22 - channal23 - channal24 - channal26 - channal26 - channal28 - channal28 - channal29 - channal29 - channal29 - channal29 - channal20 - SMS parameters of the - SMS parameters - Serial port transmission pi - Storage settings and dat	Delete data   hardware interface: all   Ime-on: 2024/9/10   Ime-on: 2024/9/10   End Time:   2024/9/10 Image: Export data		
BAUD: 115200 -	RELOAD Save para Load para Factory Resta	art	
check bit: None close port	Save configuration to file Configure from configuration file		

Parameter	Description
Delete channel	Delete the storage record
Expert data	Export the data record

### 3.2 Modbus RTU Protocol

Please refer to Bivocom Modbus RTU protocol instruction for more details.

# 4. Firmware Upgrade

### 4.1 Local Upgrade

Make sure the RTU TN531 is connected to your PC via RS232 cable, you can keep the device power off at this moment.

#### 1) Click download

Download Tools debug tool CONFIGURATION Channel parameter sett channal01 [Serial00 channal02 [Serial01 channal03 [Serial02 channal03 [Serial02 channal05 [none channal06 [none channal07 [none channal07 [none channal10]none channal10 [none channal12 [none channal12 [none channal15 [none channal15 [none channal17 [none channal17 [none channal17 [none channal17 [none channal18 [none	Program APP  Load Download Clear	A
rial number: COM5		v

- 2) Click "Load", and find the firmware you want to upgrade, then click download.
- 3) Power on the RTU, start to upgrade.
- 4) When it shows "download success ok", that means firmware upgrade completed and successfully.

# Appendix I AT Commands

# 1. Basic Setting

Configuration Item	AT Command	Description
		X: device ID
Device ID	AT+IDNT=x	Example: AT+IDNT=12345678
		Set Modbus work mode
Modbus work mode	AT+MBCHNNL=x	X: 0 disable MODBUS
		1 Network RTU
		Example: AT+MBCHNNL=1
		Set SIM Card No.
Device SIM Number	AT+SIMNO=xx	Xx: the max length is 19
		Example: AT+SIMNO=13812345678
Modbus Device Address		Set the Modbus Device Address
(1-255)	AT+MBADDR=xx	Xx: device address
		Example: AT+MBADDR=2
		Set Work Mode
Work Mode	AT+PROTTXT=xx	Xx: 0 DTU
		1 MODEM
		Example: AT+PROTTXT=0
		Xx: Second value
Modbus Update Interval	AT+MBUPSEC=xx	Example: AT+MBUPSEC=10
		Example:
RTC Setting	AT+EXCCLK=XX	AT+EXCCLK=2019/04/19,16:51:00,5

# 2. Com Setting

Configuration Item	AT Command	Description
Function switch	AT+COMIFENyy=xx	yy: 1=RS232-1 2=RS485-0 xx: 0=disable 1=enable Example: AT+COMIEEN01=0
		yy:

	1	
Baud rate	AT+COMSPEEDyy=xx	1=RS232-1
		2=RS485-0
		xx: Baud rate
		Example:
		AT+TRANCOMSPEED01=11520
		0
		уу:
Frame Interval	AT+COMFRMINTRyy=xx	1=RS232-1
		2=RS485-0
		xx: frame interval value
		Example:
		AT+COMFRMINTR01=30
		уу:
Databit, Parity, Stopbit	AT+COMPARITYyy=xx	1=RS232-1
		2=RS485-0
		x: 8N1,8E1,8O1
		Example:
		AT+COMPARITY01=8E1
		уу :
		1-10
		X:command content
Command Content	AT+DETAILCONTyy=x	Example:
		AT+DETAILCONT03=01 03 00 00
		00 22 C5 D3
		уу:
		1-10
		X: 0=string 1=HEX
hex	AT+DETAILCODEyy=x	Example:
		AT+DETAILCODE03=1
		уу:
		1-10
Interval Time	AT+DETAILTIMEyy=x	X: second
		Example:
		AT+DETAILTIME03=10
		уу:
		1-10
		X: 0
COM Choose	AT+DETAILCOMyy=x	1 RS232-1
		2 RS485-0
		Example:
		AT+DETAILCOM03=2

### 3. Network Address

Configuration Item	AT Command	Description
		Set the number of datacenter
Data Center	AT+SERNUM=x	x: 0-5, 0=disable this feature
		Example: AT+SERNUM=1
		Set the channel communication protocol
		yy: 01-05=center No.
		x: 0 ftcp
		1 CTCP
Protocol	AT+TRANMODEyy=xx	2 HTCP
		3 NUDP
		4 CUDP
		5 HUDP
		Example: AT+TRANMODE01=1
		yy: 01-05=center No.
Cache	AT+SERSVLENyy=xx	x: Cache size
		Example: AT+SERSVLEN01=10
		yy: 01-05=main server, 06-10=backup
		server
Main Addr	AT+MULTISERyy=xx	xx: address
		Example:
		AT+MULTISER01=isodev.picp.net
		yy: 01-05=main server port accordingly,
		06-10=backup server port
Port	AT+MULTIPORTyy=xx	x: 0-65535
		Example: AT+MULTIPORT01=10121
		yy: 01-05 center No.
		xx: 0 Rs232-1
		1 Rs485-0
Com Select	AT+SERCOMTYPEyy=xx	Example: AT+SERCOMTYPE01=1
		yy: 01-05=center No.
Offline Data Storage	AT+SERSVOFFyy=xx	xx: 0 disable
		1 enable
		Example: AT+SERSVOFF01=0
		xx: DNS address
Main DNS Server	AT+MULTIDNS01=xx	Example: AT+MULTIDNS01=8.8.8.8
		xx: Backup DNS server
Backup DNS Server	AT+MULTIDNS02=xx	Example: AT+MULTIDNS02=8.8.8.8

# 4. Other Settings

Configuration Item	AT Command	Description
		xx: APN value
APN	AT+APN=xx	Example: AT+APN=nbiot
		xx: APN username value
APN Username	AT+USERNAME=xx	Example: AT+USERNAME=test1
		xx: APN password value
APN Password	AT+USERPASSWORD=xx	Example:
		AT+USERPASSWORD=testpwd
		Set the APN call center
Call center	AT+CALLNO=xx	xx: call center value
		Example: AT+CALLNO=
		x: 0-65535 second, 0=disable
Heartbeat Interval	AT+HRTSEC=x	heartbeat
		Example: AT+HRTSEC=40
		x: 0-65535 second
Reconnect Time	AT+RECONSEC=x	Example: AT+RECONSEC=10
		x: keepalive interval
TCP Keepalive	AT+KPLVMIN=x	Example: AT+KPLVMIN=12
		X: 0 auto
		1:GSM only
		2:TD-SCDMA only
		3:WCDMA only
Network Selection	AT+NETMODE=x	4. CDMA only
		5. HDR only
		6. LTE only
		Example: AT+NETMODE=0
		x : 0=No, 1=Yes,
FTCP Transfer Meaning	AT+CONVERT=x	Example: AT+CONVERT=0
		X: register data
Custom Login Data	AT+SELFLGN=x	Example: AT+SELFLGN=hello
		Set the heartbeat data
Custom heartbeat Data	AT+SELFHRT=x	X: heartbeat data value
		Example: AT+SELFHRT=hello
Custom Login data type	AT+SELFLGNHEX=x	Set the custom register data
		type
		x : 0=string,1=hex
		Example: AT+SELFLGNHEX=0
		Set the custom heartbeat data
Custom heartbeat data	AT+SELFHRTHEX=x	type



Туре	x : 0=string,1=HEX
	Example: AT+SELFLGNHEX=0

# Appendix II Data Structure

No	Parameter	Description	Example
		unsigned 16bit integer	Example: 01 03 02 11 22 0D 34
0	Unsigned 16bit AB	(2 byte), low byte first	Note: HEX 2211
			DEC 8721
		unsigned 16bit integer	Example: 01 03 02 11 22 0D 34
1	Unsigned 16bit BA	(2 byte), high byte first	Note: HEX 1122
			DEC 4386
		Signed 16bit integer	Example: 01 03 02 11 22 0D 34
2	Signed 16bit AB	(2 byte), low byte first	Note: HEX 2211
			DEC 8721
		Signed 16bit integer	Example: 01 03 02 11 22 0D 34
3	Signed 16bit BA	(2 byte), high byte first	Note: HEX 1122
			DEC 4386
		Unsigned 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
4	Unsigned 32bit ABCD	(4 byte)	Note: HEX 44332211
			DEC 1144201745
		Unsigned 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
5	Unsigned 32bit BADC	(4 byte)	Note: HEX 33441122
			DEC 860098850
		Unsigned 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
6	Unsigned 32bit CDAB	(4 byte)	Note: HEX 22114433
			DEC 571556915
	Unsigned 32bit DCBA	Unsigned 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
7		(4 byte)	Note: HEX 11223344
			DEC 287454020
		Unsigned 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
8	Signed 32bit ABCD	(4 byte)	Note: HEX 44332211
			DEC 1144201745
		Signed 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
9	Signed 32bit BADC	(4 byte)	Note: HEX 33441122
			DEC 860098850
		Signed 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
10	Signed 32bit CDAB	(4 byte)	Note: HEX 22114433
			DEC 571556915
		Signed 32bit integer	Example: 01 03 02 11 22 33 44 C6 C3
11	Signed 32bit DCBA	(4 byte)	Note: HEX 11223344



			DEC 287454020
		Signed 32bit float	Example: 01 03 02 11 22 33 44 C6 C3
12	Float ABCD	(4 byte)	Note: HEX 44332211
			Float 716.532288
		Signed 32bit Float	Example: 01 03 02 11 22 33 44 C6 C3
13	Float BADC	(4 byte)	Note: HEX33441122
			Float 0.000000
		Signed 32bit Float	Example: 01 03 02 11 22 33 44 C6 C3
14	Float CDAB	(4 byte)	Note: HEX22114433
			Float 0.000000
		Signed 32bit Float	Example: 01 03 02 11 22 33 44 C6 C3
15	Float DCBA	(4 byte)	Note: HEX11223344
			Float 0.000000