51WG5   -APRS Tracker-

Manual

APRS 51WG5 tracker is an advanced embedded APRS tracking device.

It has the following functions:

51WG5 is a professional APRS device that uses the international standard APRS digital code to directly locate each other through radio U/V signals.

This device does not need a special interface radio station, and directly connects to the ordinary radio's hand microphone port (transmitting positioning signal) and SP port (receiving positioning signal).

Adapt to most common radio stations, so that common radio stations can easily play APRS.

This device does not need mobile phone network support, and can be directly used for receiving and sending each other through radio, and is widely used in outdoor sports, rescue and other occasions.

Make it easy for the most radio stations to use APRS.

Built-in WIFI, universal, can quickly connect to the map server, and quickly establish an APRS gateway.

Built-in 2.0+4.0 dual-mode Bluetooth, support Android and Apple APP.

This machine contains complete TRACK /DIGI /IGATE functions.

The open data format is convenient for users to develop applications such as maps, and supports online and offline map applications.

Introduction to APRS Track function:

Support fixed station FIXED, sports SPORT, 2 kinds of station modes

Supports a complete TRACK tracker, supports smart, timing, and queue beacons

Support additional beacon information, mileage, number of satellites, voltage, etc.

Support mileage calculation, support accumulated mileage or automatic reset

Support automatic icon (TRACK smart mode)

Dual-mode Bluetooth

Built-in the latest 2.0+4.0 dual-mode Bluetooth, compatible with Android and Apple

Support apps such as Flow Cloud, APRSdroid, LOCUS, Aowei, etc.

Support Bluetooth output KISS hex, UI, GPWPL, KISS ASC, GS232B and other protocols

Support Bluetooth output GPS data (GPRMC+GPGGA), support mixed output

Support two-way transparent transmission of Bluetooth KISS data

Support wireless Bluetooth setting parameters

APRS DIGI Relay

Support complete DIGI relay function, support custom relay name,

Support relay remote opening and closing function

Rich interface

Integrated 3.5mm GPS/Beidou interface, automatic identification of GPS Beidou module

Integrated WS3 weather station interface

USB communication interface

Remote

Support RF remote control peripheral sensor input and relays and other telemetry control modules

APRS Algorithm

Built-in advanced CMX hardware compiling algorithm

Built-in 8-level digital level adjuster (both transmitting and receiving)

Data analysis

Built-in advanced algorithm, supports rich data analysis functions

Support heading, true north position, relative motion azimuth calculation

Support Maidenhead grid positioning system

Support APRS distance, horizontal angle, elevation angle and other trigonometric functions calculation

Built-in trigonometric calculator, supports automatic tracking control of G5500 aircraft, ships, etc.

51WG5 main device:

DC 7-15V input, power reverse connection protection

Built-in auxiliary sensors such as input voltage detection

Support user independent firmware upgrade

Support offline use, no need of network, direct mutual positioning

Setup software

Supporting PC setting software (Chinese, English) (Requires .NET 4.0)

Front

Backside

Connectors
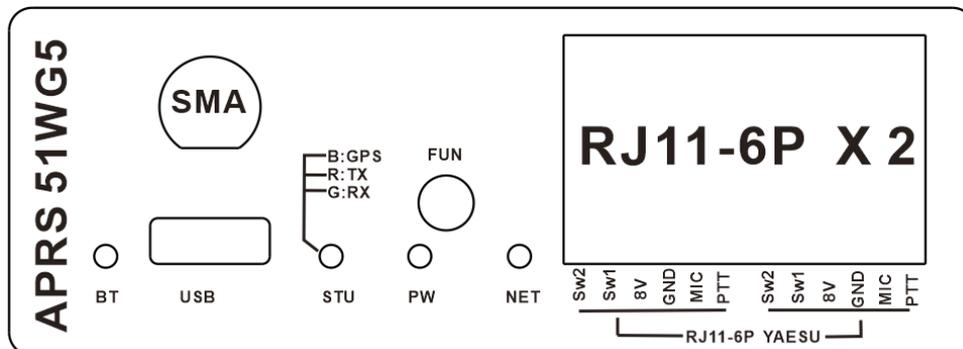
Front panel

BT indicator

When the Bluetooth is connected, the built-in Bluetooth pairing password 1234, the Bluetooth name is the call sign of the phone

Flashing: Bluetooth and mobile phone/PC are not connected

Steady on: Bluetooth and mobile phone/PC successfully connected

Off: Bluetooth is off or not installed

USB communication socket:

Micro USB mobile phone universal, used for PC settings, firmware upgrades, etc.

STU status LED (three-color light):

Blinking blue: GPS power is on and positioning is in progress

Steady blue: GPS positioning is successful

Red: launch beacon

Green: The beacon was successfully received

The beacon will be transmitted only when the GPS positioning is successful. When the mainboard starts, the LED lights up white for 1 second, indicating the completion of the self-check.

PW system running indicator:

System running light, flashes with the system

NET indicator (WIFI)

Indicate whether the WIFI/4G network is connected to the map server

Blinking: connecting to the server

Steady on: Successfully connected to the server

Off: WIFI off

SMA socket

The reserved WIFI , external antenna SMA socket

RJ11-6P double socket

This socket is a double socket, the left and right sockets, the line sequence is the same, the line sequence definition is shown in the mark, and the line sequence definition is the same as the YAESU hand microphone.

Note: This socket is only connected to the radio's hand microphone port, and must not be connected to other ports of the radio.
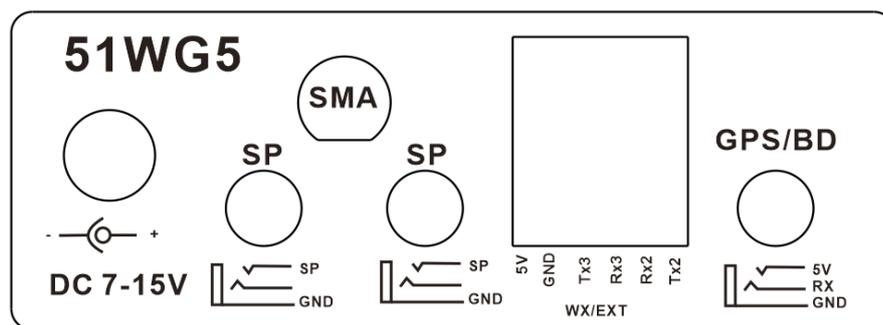
Backside panel

DC power socket
Outer diameter 5.5/inner core 2.1, center positive, DC 5-15 power input, built-in reverse connection protection.

SP socket
Two SPs are connected in parallel, 3.5mm interface, any one is connected to the SP port of the radio, and any one is connected to an external speaker.

WX/EXT expansion interface
Used to connect weather station, RJ11-6P specification, line sequence see mark.

GPS/BD interface
3.5mm interface, see mark for line sequence, used to connect GPS/BD module.

SMA socket
The reserved WIFI or 4G, external antenna SMA socket mounting

hole.

3 commonly used radio jumpers

Three commonly used radio jumpers are connected to the radio's hand microphone and 51WG5. The following is a detailed description.

51WG5 uses 3 signal wires of MIC PTT GND of the hand microphone port to realize the function of controlling the radio station to transmit APRS signals.

According to this principle, you can make different jumpers yourself to adapt to your own radio station.

Note: The hand microphone jumper is only connected to the radio's hand microphone port, and must not be connected to other ports of the radio.

FT7900

FT-1802/1807/FT1907/FT7800/FT7900/8800/8900
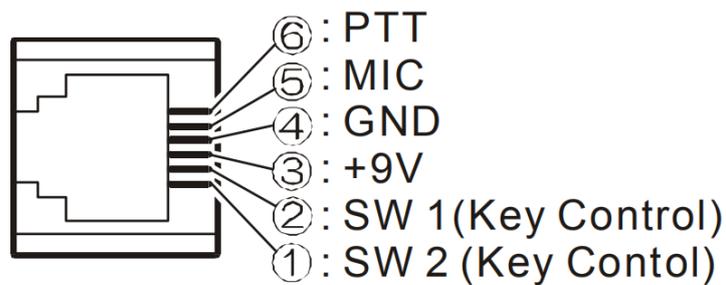
⑥ : PTT
⑤ : MIC
④ : GND
③ : +9V
② : SW 1(Key Control)
① : SW 2 (Key Contol)

YAESU FT7900 等手咪口接口定义
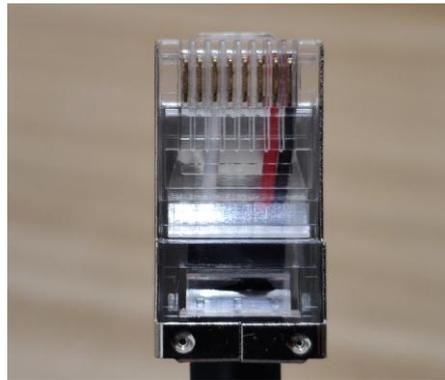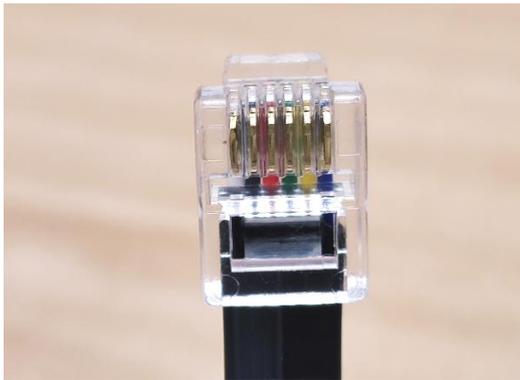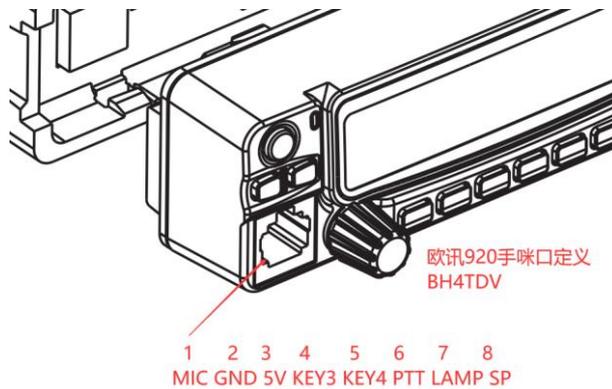
Woxun 920

Woxun 920

Woxun 920，1=MIC 2=GND 6=PTT
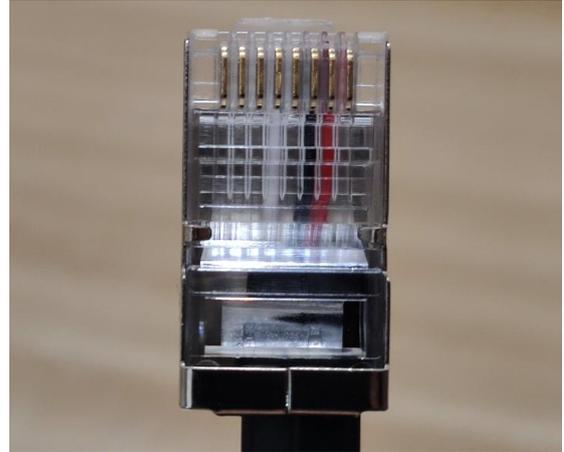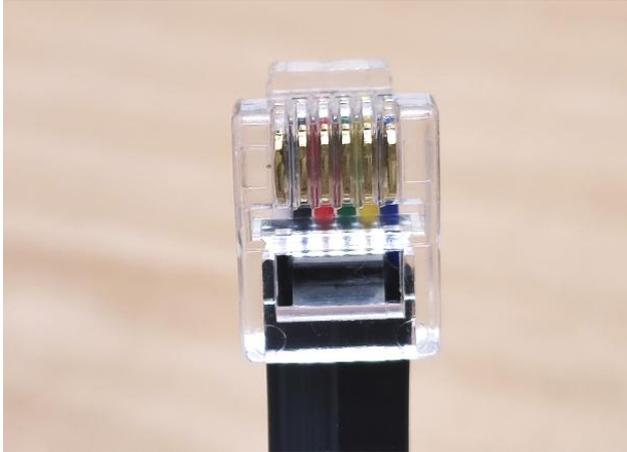
ICOM 2720 2730

❷ MICROPHONE CONNECTOR [MIC]
Connects the supplied or an optional microphone.
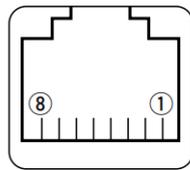
① +8 V DC output (Max. 10 mA)
② Channel up/down
③ 8 V control IN
④ PTT
⑤ GND (microphone ground)
⑥ MIC (microphone input)
⑦ GND
⑧ Data IN

ICOM 2720 2730，4=PTT 6=MIC 7=GND

IC-2730 IC-2720(Radio side headphone)

51WG5 comes with a dedicated power cord.

Connected in series with the power cord of the radio, split out a DC plug to supply power .
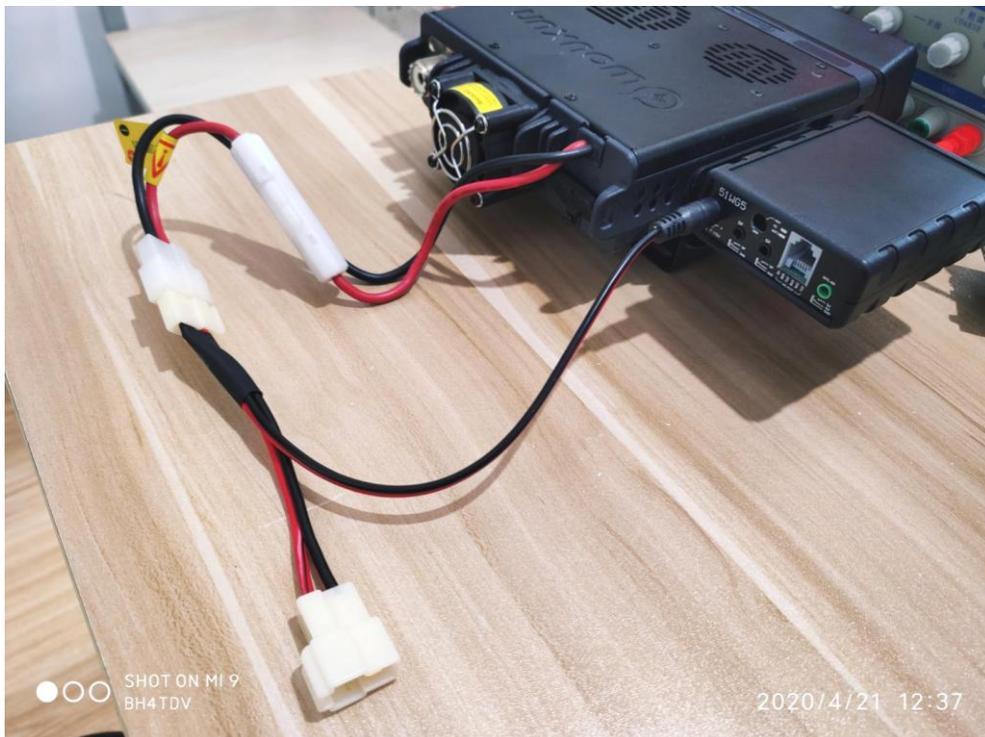
SP line connection method

51WG5 does not need a special interface, and directly decodes the APRS signal through the data signal output by the radio SP port.

Connection method of external monitor speaker

PC programing

The following setting software interface is for reference only, the version is constantly updated, there

may be differences

Hardware connection:

1. Connect the APRS 51WG5 series with the mobile phone USB data cable (provided by yourself)

2. Open the 51 series general setting software and select the correct port number.

3. Read settings or modify settings, and the host automatically saves them.

Note: Basic knowledge, set parameters, pay attention to the input method, input in English, do not use

full-width characters, try not to copy information from other documents, so as not to bring in hidden

characters.

Input full-width characters, garbled characters will be displayed when the data is read out, and the

51WG5 motherboard may not work properly.

Writing hidden characters may also make the 51WG5 board work abnormally

When the setting data is garbled, delete the garbled data and rewrite it.

Connect the USB Cable to the PC.

In addition to the USB connection, the parameters can also be set through the PC Bluetooth connection.

Note that some USB cables have incomplete line sequence and can only be used for charging and cannot recognize the USB port.
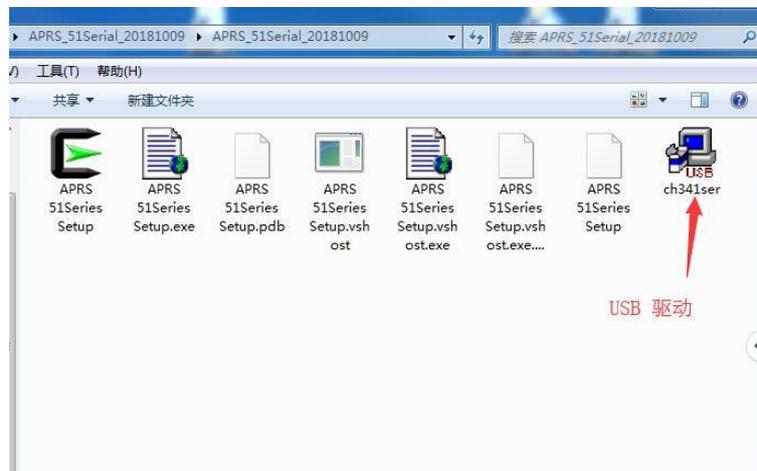
For the first use, please install the USB CH340 driver.

For Bluetooth wireless connection, install the CP210X driver.
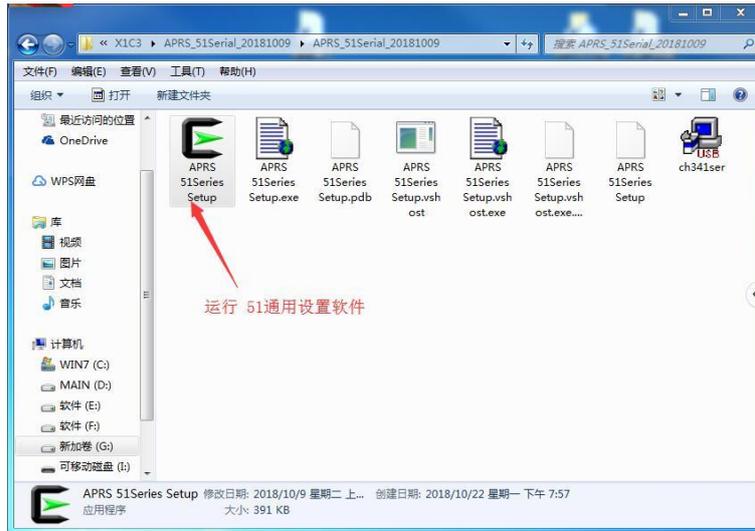
Run the 51 Series PC client setup software, APRS 51Series Setup 20xxxxxx

# APRS setup software instructions

Note: The setting software supports most of the 51 series APRS devices, and the motherboard is different, some settings may be invalid.

Note: The version is constantly updated, the interface is for reference only, the latest version is 20190723
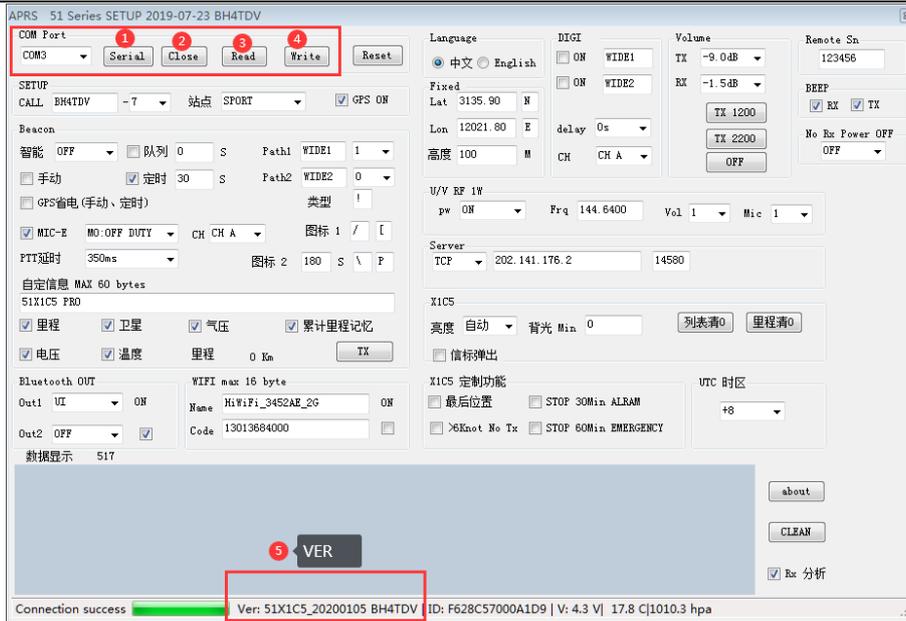
Basic operation:

Open PC client software, SERIAL search port, OPEN open port, READ read, modify settings, WRITE write.
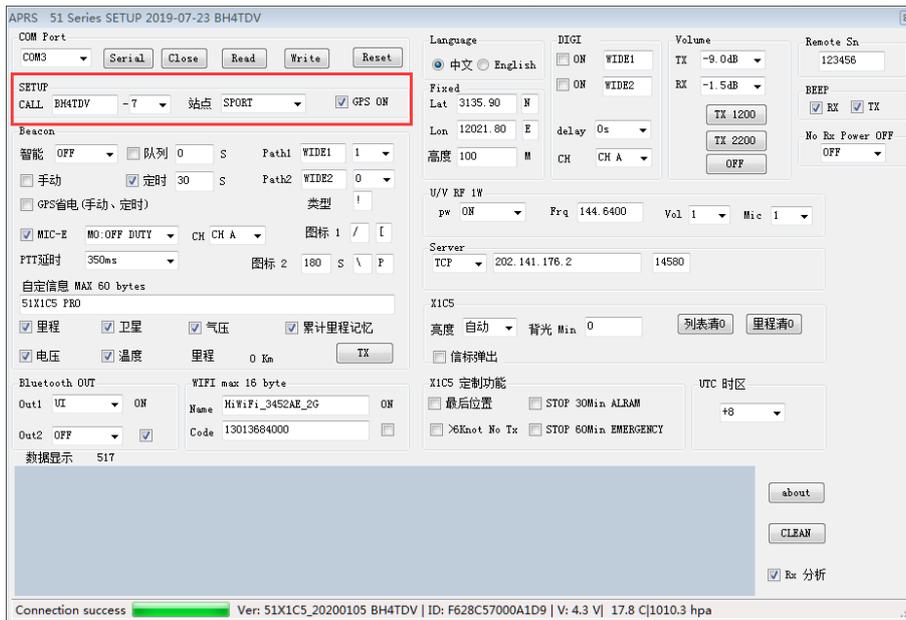
Basic Settings

CALL Set the local call sign, the default call sign NOCALL, numbers or English capitals, up to 6 digits

The dual-mode Bluetooth name of this machine is the same as the call sign of this machine.

SSID Beacon SSID, default 7, parameter value range 0-15.

Site type:

SPORTS: Set this machine as a mobile site

Use GPS real-time data to send various types of beacons

Use GPS real-time latitude and longitude data to calculate the relative distance to the other party, true north, relative direction, etc.

FIXED: Set this machine as a fixed site

Use the set longitude and latitude of the fixed station to send various types of beacons

Use the set longitude and latitude of the fixed site to calculate the relative distance, true north, and relative direction to the other party.

WS: Do not set

GPS switch ON/OFF

If used in a fixed location, you can select OFF to save battery power.
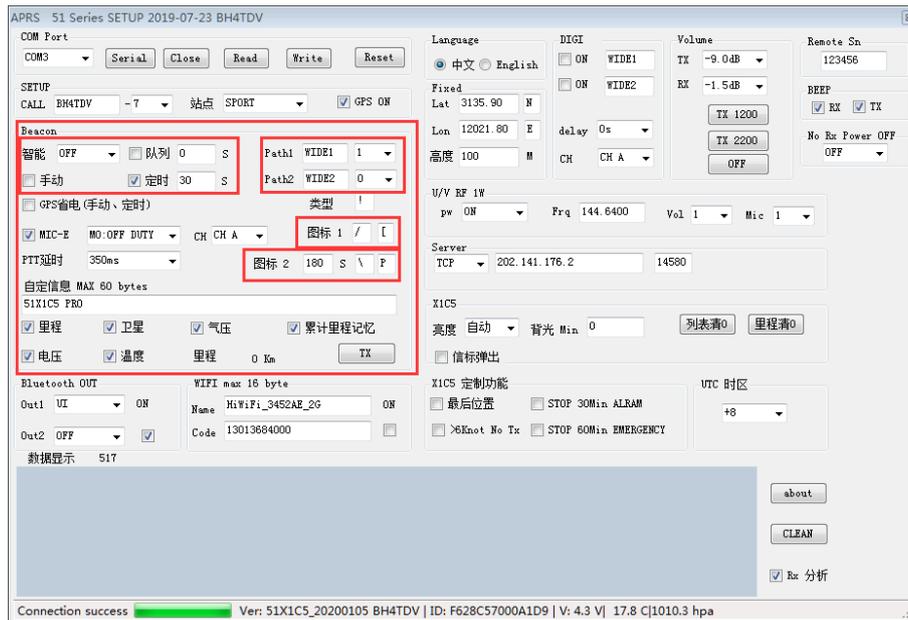
Track beacon mode:

Divided into 4 types, smart mode, manual mode, queue mode, and timing mode.

You don't need to enable all of them. Generally, you only need to enable one of them, or you can disable all of them.

Track beacon function settings

Note: In the case of the Sport site type, no matter which of the following beacon modes, it will only be transmitted after the effective positioning of GPS.

Smart mode:

When GPS is positioned, it will automatically launch a beacon according to the heading and speed.

Manual mode:

After GPS positioning, long press F1 (X1C5), and each time you press the PTT button (UV98) of the mobile station itself, when you release it, it will automatically follow and launch a beacon.

Timing mode:

After GPS positioning, the beacon will be automatically transmitted according to the set time.

Queue mode:

Transmit according to the set time seconds within 1 minute,

Note: The time base is different from general timing transmission. The actual launch time is always the set time + 1 second.

For example, if the queue time is 0 seconds, it will be transmitted according to the following time rule.

GPS power saving

When it is manually pressed or the time is reached, the GPS will be turned on automatically, and the GPS will be hot-started, and the positioning will be performed within a few seconds, and then the transmitter will be transmitted and the GPS will be turned off again.

Note: Only manual mode or timing mode is valid.

PATH 1, PATH 2

The relay forwarding and forwarding times with the name WIDE1 or WIDE2 are required.

Default setting: WIDE1-1 WIDE2-0, which means that the relay named WIDE1 is required to be forwarded once, and WIDE2 is not required to be forwarded.

MIC-E

The beacon data is compressed and transmitted, which effectively shortens the transmission time, reduces the probability of data being interfered by other signals in the air, and improves the decoding success rate of the receiver.

PTT delay

Before transmitting the signal, the PTT trigger delay, when the other party's SQL response is slow, you can increase the PTT delay parameter.
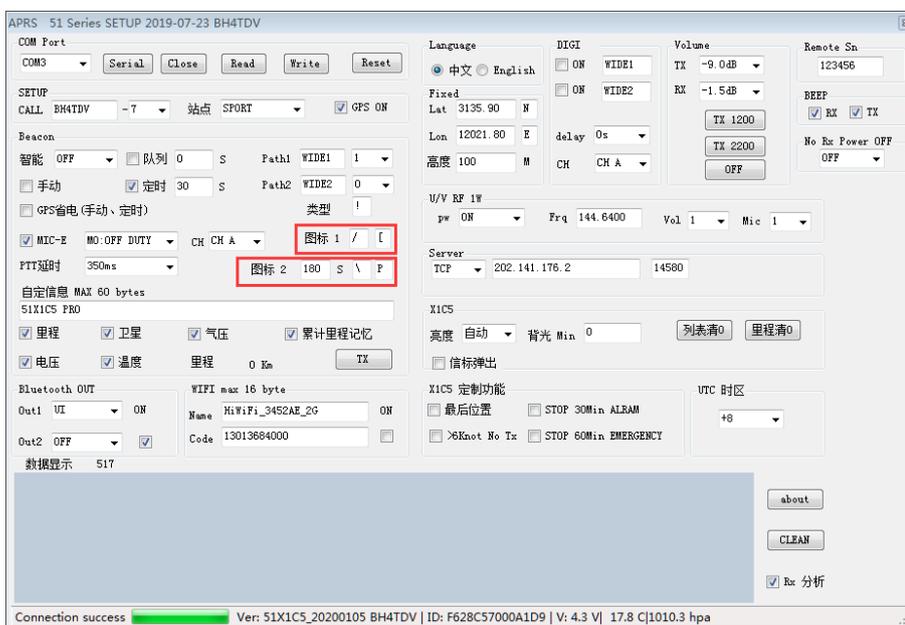
Icon 1:

! Represents the data type character, a fixed length of 1 word, generally do not need to be changed. If you need to modify, refer to the APRS protocol manual

/ Represents the icon set, generally do not need to be changed. If you need to modify, refer to the APRS protocol manual.

> Indicates the icon style displayed on the server map, with a fixed length of 1 word. Refer to "APRS Icon Set" to change it.

Automatic icon 2:

Only valid in smart mode.

Three parameters: waiting time, 2nd icon and 2nd icon set.

180 waiting time, in seconds

/ Indicates the second icon set

P represents the second icon

In smart mode, when the static time reaches the set waiting time, the second icon is automatically changed.

Custom information (Note 1)

Up to 60 characters in English and 20 characters in Chinese. The shorter the custom message, the better.

Beacon options

Mileage: The mobile station beacon contains the automatically calculated mileage. Not included in fixed station beacons.

Satellite: The mobile station beacon contains the number of effective satellites. Not included in fixed station beacons.

Air pressure: mobile station and fixed station beacons include auxiliary air pressure sensor data.

Voltage: Mobile station and fixed station beacons contain battery voltage sensor data.

Temperature: Mobile station and fixed station beacons include auxiliary temperature sensor data.

Note: Due to the size and structure of the machine, the temperature data is for reference only.

Note 1:

The shorter the custom information, the better, and the fewer beacon options, the better.

The longer the data, the longer the transmission time, and the greater the probability of the signal receiving air interference, which may reduce the decoding rate of the other party.

Mileage memory

When this option is checked, the real-time mileage will be automatically saved in synchronization and automatically every time the beacon is launched.

If you don't check this option, the mileage will be automatically reset to 0 next time you turn on the machine

TX test key

When in a fixed station, press this button, the mobile station will automatically transmit once, with the beacon at the fixed station position

When in the mobile station, when the GPS has been effectively positioned, press this button, the mobile station will automatically transmit a real-time position beacon.
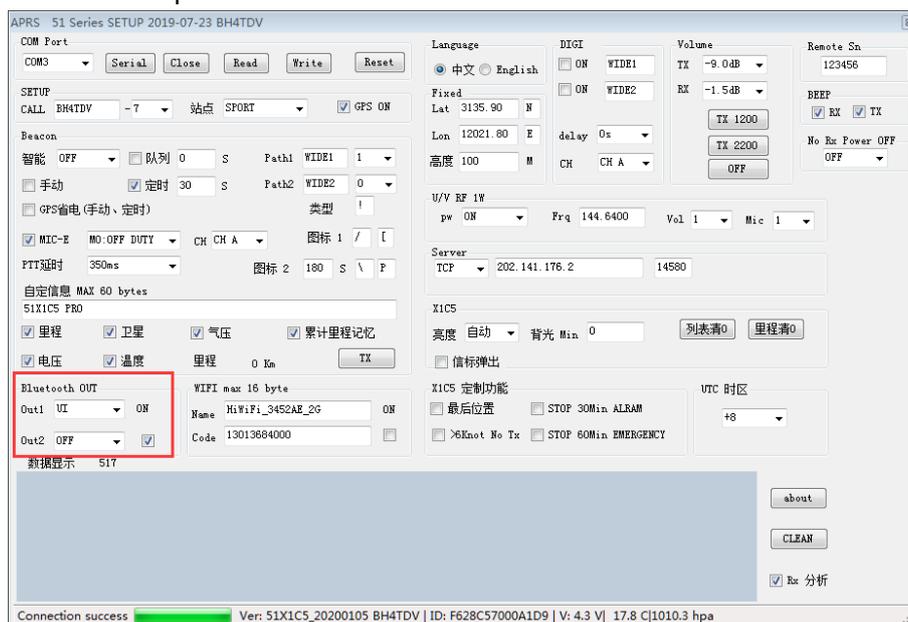
This machine has built-in 2.0+4.0 dual-mode Bluetooth settings, pairing password 1234, and the Bluetooth name is the same as the call sign of this device.

OUT 1   Bluetooth data output 1, 9600 rate

KISS HEX   output standard KISS data commands, used in various standard APRS PC software

For example: Liuyun Android version, Liuyun PC version, APRSdroid, YAAC, etc.

UI   output standard UI text data, used to upload server, or user secondary development

GPWPL   output standard GPWPL waypoint data, user smart navigator, APRSdroid, Aowei, LOCUS MAP, etc.

KISS ASC   output standard KISS ASC data commands for secondary development by users

GS232B   outputs standard GS-232B format data commands for G5500 rotator control

OFF   Turn off output data

OUT 2   Bluetooth data output 2, 9600 rate

GPS   outputs GPS data (GNRMC+GNGGA), which can be mixed and output with OUT 1 at the same time.

OFF   Turn off GPS output

Bluetooth power switch

ON/OFF
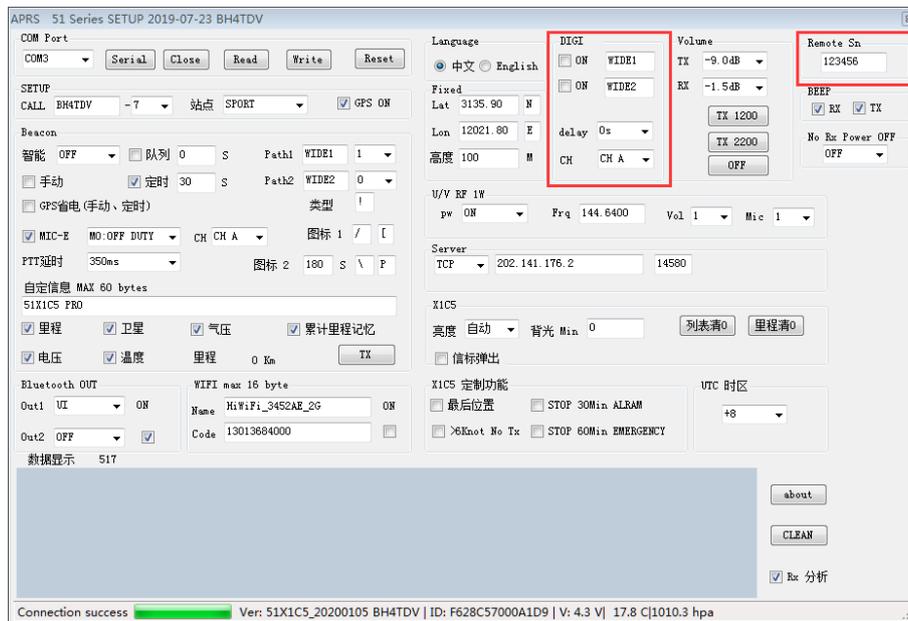
APRS digital relay DIGI function

2 repeater names can be set

Repeater name 1: Default WIDE1 numbers or English capitals, up to 6 digits

Repeater name 2: Default WIDE2 numbers or English capitals, up to 6 digits

Forwarding condition: When the machine receives a valid beacon,

And the beacon contains the local relay name, and the number of forwarding is greater than 1,

This machine will forward once, and reset the number of forwarding times, reduce it once, and re-pack and send.

If the number of retransmissions in the beacon is 0, no retransmission is performed.

APRS digital relay is a process of receiving, decoding, re-encoding, and sending each time it is forwarded. Therefore, no matter how many times it is forwarded, the signal quality will always be the best, which is different from traditional analog voice relay.

APRS digital relay, because the beacon contains the specified number of retransmissions, it will not be

retransmitted indefinitely

DELAY

Before forwarding, the delay is X seconds. When there are multiple relays, the forwarding time can be staggered appropriately to effectively prevent the beacon collision in the air.

CH channel (UV98 effective)

Use CHA or CHB forwarding

**Remote password**

The default password 123456 must be 6 digits

Can remotely switch relays, control external relays and sensors, etc.

A valid beacon is received, and the beacon contains a password and instructions, the following operations will be performed.

1. Command A0 to close DIGI 1

2. Command A1 to open DIGI 1

3. Command B0 to close DIGI 2

4. Command B1 to open DIGI 2

5. Command R0 to reset and restart

For example: Send customized information via 51TNC, fill in the customized information 123456A0 After sending this beacon, the relay DIGI 1 will be closed
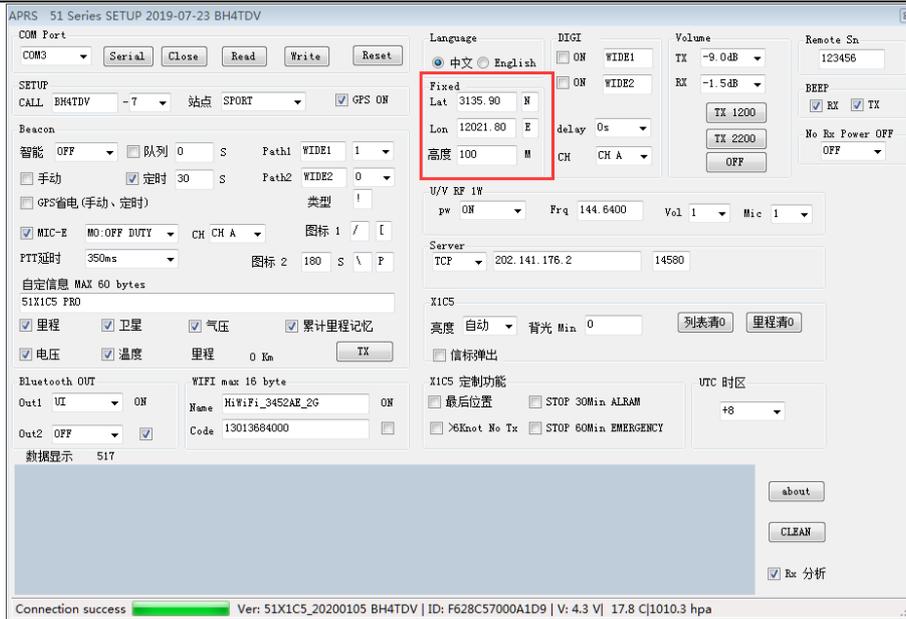
Fixed station settings

lat represents the latitude used by the fixed station, with a fixed length of 7 digits (including the decimal point), and degrees and minutes. Sub-format.

N/S fixed length 1 digit

lon represents the longitude used by a fixed station, with a fixed length of 8 digits (including decimal points), and degrees and minutes. Sub-format.

W/E fixed length 1 bit

For example: 3135.90 means 31 degrees and 35.90 minutes. 12021.80 means 120 degrees 21.80 minutes.

There are three commonly used latitudes and longitudes: degrees, degrees and minutes, and degrees, minutes and seconds. APRS uses the degree and minute format, with 2 decimal places reserved.
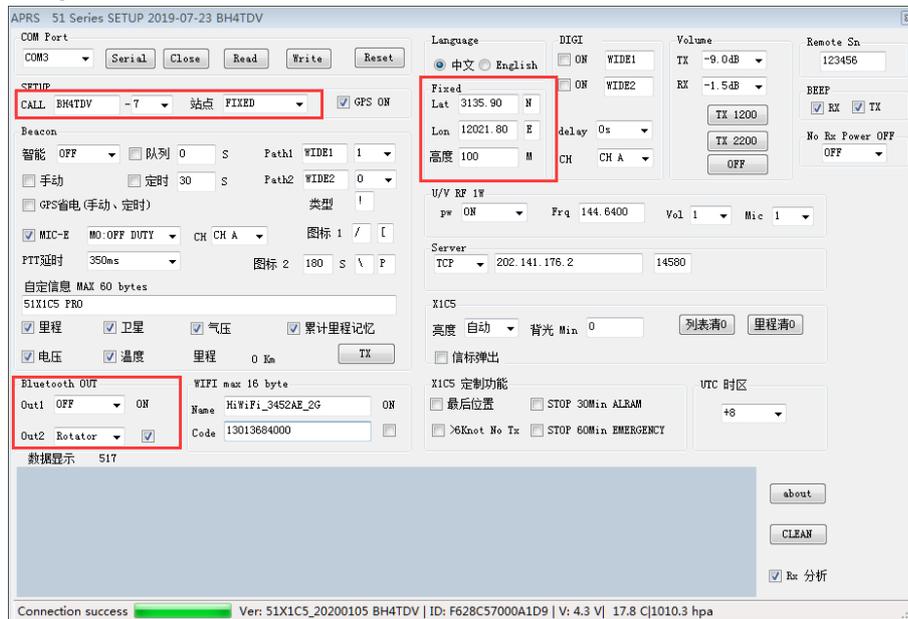
This device has a built-in trigonometric function calculator, distance, azimuth, elevation and other multiple analysis algorithms

When used to track an aircraft, you need to set the local latitude, longitude, altitude (in meters), and the call sign of

the target aircraft.

Select ROTATOR (GS-232B communication protocol) for Bluetooth output.

When an APRS beacon with a designated call sign is received, the true north position between the aircraft and the station is calculated in real time.

And calculate the distance between the aircraft and the station in real time, as well as the altitude difference, and calculate the elevation angle through the trigonometric function.

This machine will convert to GS-232B format through true north position and elevation angle, and output via Bluetooth to control the G5500 rotator to realize the function of automatically tracking the aircraft.

About APRS latitude and longitude conversion

There are three commonly used latitude and longitude formats: degrees, minutes, minutes, seconds.

1 degree = 60 minutes 1 minute = 60 seconds.

Suppose my location: Latitude 25.091095 degrees Longitude 121.647661 degrees

Converted into degree minutes:

0.091095x60=5.4657 //decimal point X60

05.47 //The integer part is less than 2 digits, the first digit is filled with 0, and the decimal point is reserved for 2 digits (rounded)

25X100+05.47=2505.47 //Degree X100 and add together Latitude fill in 2505.47N

Longitude conversion is the same as above:

0.647661X60=38.86

121X100+38.86=12138.86 //Degree X100 and add Longitude 12138.86E
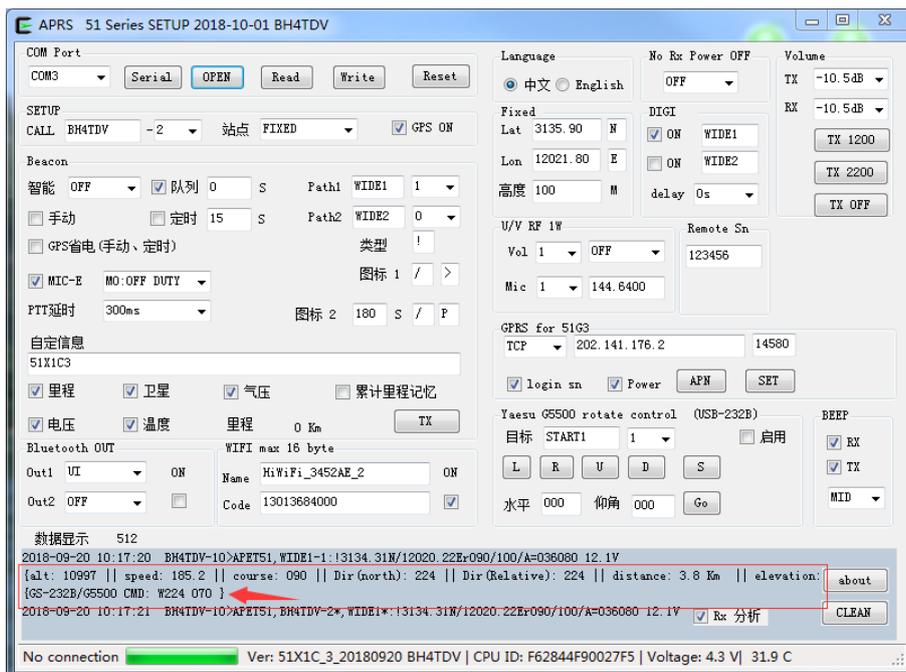
The device has a built-in data analysis function. When a valid beacon is received, the analysis data will be displayed on the debugging interface. When the display is not required, RX analysis is not checked.
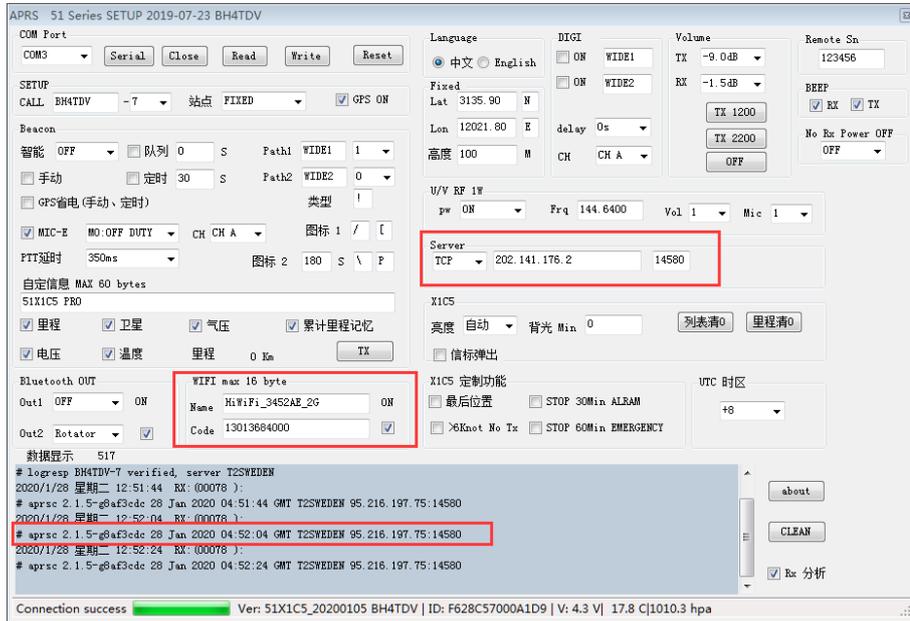
WIFI and server settings

The length of the WIFI name and password must be less than 16 bytes, and the password is allowed to be blank.

Map server:

The default TCP 202.141.176.2 (support domain name or IP) port number 14580