

Industrial-grade ADS-B Ground Receiver

ADSB-RE1090L User Manual

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1. Introduction

The ADSB-RE1090L is an industrial-grade ADS-B ground receiver designed to provide stable ADS-B data services for high-reliability scenarios, especially for customers looking for an ADS-B ground receiver for long range coverage. Equipped with a high-performance receiving and processing module, it outputs ADS-B raw messages, CSV plain-text data, and JSON track data via an RJ45 Ethernet port. It is suitable for complex environments in civil aviation, general aviation, and low-altitude airspace supervision.



With the ADSB-RE1090L, customers gain access to valuable, customizable tracking capabilities tailored to a wide range of operational needs, including:

- Enhanced situational awareness across airfield, apron, and terminal areas.
- Airport surface movement monitoring and vehicle tracking.
- Support for low-altitude operations such as helicopter missions, flight school tracking, wind farm monitoring, and offshore/onshore oil and gas platform oversight.

- UAV and drone tracking.
- Monitoring of aircraft noise in airport vicinities.
- Calibration of radar and navigational aid (navaid) systems.
- Search and rescue operations in mountainous regions and valley surveillance.
- Applications in defense and electronic intelligence.
- Coordination of integrated vessel and helicopter operations.

Fully compliant with Mode-S and ADS-B standards, including ICAO Annex 10, ICAO Doc 9871, RTCA DO-260/A/B and ED-102/A/B, the ADSB-RE1090L ensures regulatory adherence and seamless compatibility with industry requirements.

Operating on the 1090 MHz frequency and supporting Mode S Extended Squitter (1090ES), the ADSB-RE1090L can also support Multilateration (MLAT) capabilities for high-precision aircraft tracking and surveillance. In addition, it's light, small, so can work as a portable ADS-B ground receiver.

Packing List:

No.	Item	Quantity	Remarks
1	ADSB-RE1090L	1 unit	Included
2	Power Cable	1 piece	Included
3	ADS-B Antenna and Bracket	1 set	Included
4	ADS-B Antenna Cable	1 piece (10 meters)	Included
5	Network Cable	1 piece	Included
6	GPS/BDS Antenna	1 set (includes 3-meter cable)	Included
7	ADS-B Display Software – adsbscope	1 set	supported
8	Virtual Radar Display Software – Virtual Radar	1 set	supported

2. Specifications

The ADSB-RE1090L ADS-B receiver system is capable of processing various types of ADS-B messages, including airborne and surface messages from civil aviation aircraft, general aviation aircraft, UAVs, as well as airport vehicle messages. This enables comprehensive surveillance of civil aviation aircraft, general aviation aircraft, UAVs, and airport vehicles equipped with ADS-B devices.

No.	Specifications	
1	Power Supply	DC12V 2A
2	Power Consumption	4W
3	Receiving Frequency	1090MHz
4	Sensitivity	$\leq -97\text{dBm}$
5	Receiving Range	> 400km(no interference, unobstructed)
6	Dynamic Range	$\geq 80\text{ dB}$
7	Update Rate	$\geq 1\text{ Hz}$
8	Target Capacity	> 700 targets
9	Processing Capability	> 3,500 /s
10	Data Format	ADS-B raw messages DF17/DF18 CSV plain text \ JSON plain text JSON plain text track data
11	Data Interface	RJ45 network port
12	Network Connection	Static IP or DHCP
13	Network Protocol	TCP/UDP
14	ADS-B Antenna Interface	N female
15	GPS/BDS Antenna Interface	SMA female
16	Dimensions	220*160*72mm (main body)
17	Weight	1260g
18	Operating Temperature	-20°C ~ +60°C
19	Storage Temperature	-20°C ~ +70°C
20	Storage Humidity	10% ~ 80%

3. Functions

- ADSB-RE1090L supports multiple output message formats: CSV plain text (decoded data, you can easily get longitude, latitude, altitude, speed, flight ID...), JSON (also decoded data), and DF17/DF18 raw messages.
- ADSB-RE1090L can output data with GPS timestamp.
- ADSB-RE1090L can be connected via network cables.
- ADSB-RE1090L IP address can be configured for direct connection with a computer without the need for routers. However, ADSB-RE1090L can also be configured to connect with a computer via routers, offering flexibility based on your setup preferences.
- ADSB-RE1090L supports static IP address and DHCP.
- A single ADSB-RE1090L unit can send ADS-B data to multiple clients simultaneously, enabling efficient data distribution across multiple devices or systems.
- ADSB-RE1090L is a portable ADS-B receiver.
- Optional: Data transmission via 4G/5G module.
- Optional: Output of ADS-B signal strength in dBm, which can be used for measuring propagation environment.

4. Interface Description



Interfaces:

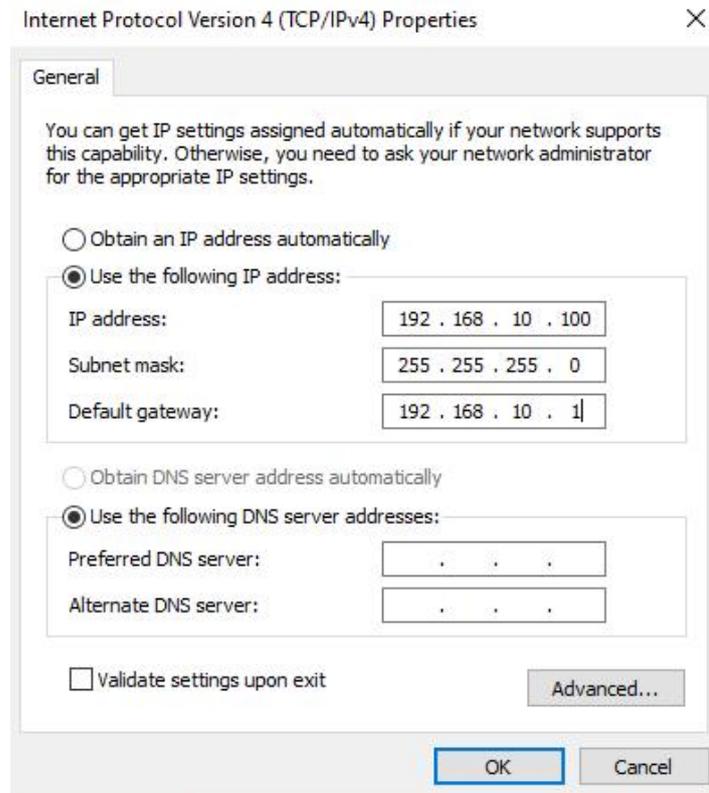
No.	Interface Name	Function
1	POWER	Power supply interface for main unit, DC 12V 2A
2	NETWORK	Data Interface, RJ45
3	GPS/BDS	GPS/BDS antenna interface, SMA female
4	ADS-B ANT	ADS-B antenna interface, N female

5. Connection

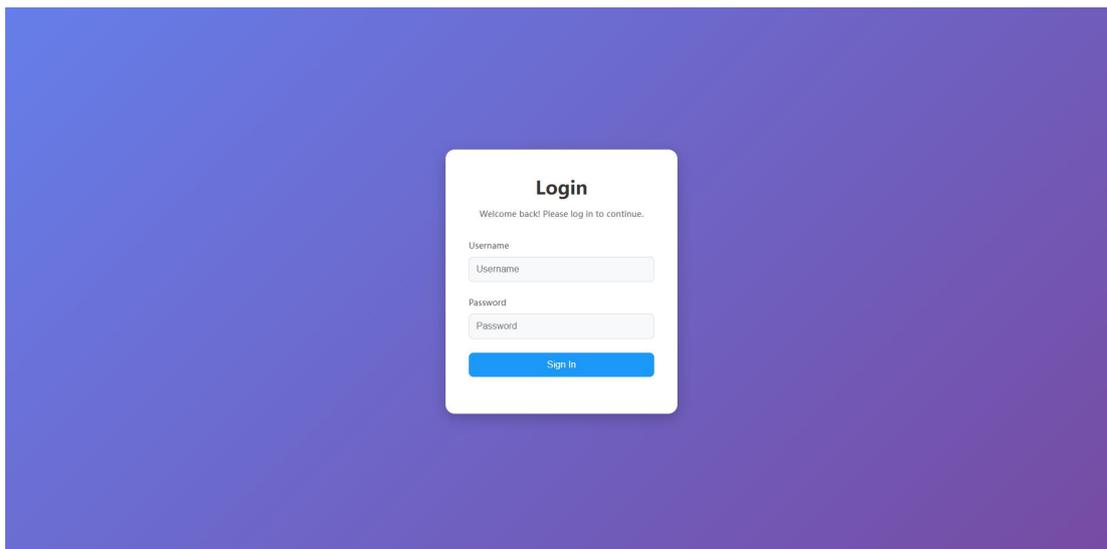
The default IP address of ADSB-RE1090L is 192.168.10.10. It must be connected to a computer via the network port, either directly or through a router.

Direct Connection:

- Connect ADSB-RE1090L directly to computer using a network cable.
- Configure the IP of the computer to the same network segment as the ADSB-RE1090L.

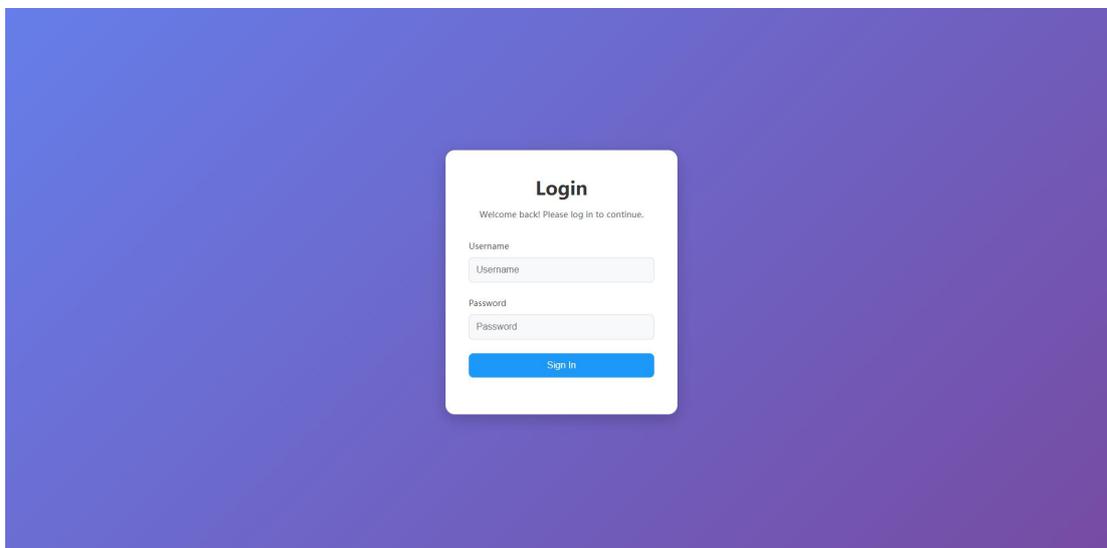


- Open a web browser, enter the ADSB-RE1090L IP 192.168.10.10. If the following interface appears, the device is successfully connected.



Router Connection Method:

- Connect the ADSB-RE1090L to the same router as the computer using a network cable (ensure the router's gateway is 192.168.10.1).
- Open a web browser, enter the ADSB-RE1090L IP address that has been assigned via DHCP. If the following interface appears, the device is successfully connected.



6. Configuration

1. Login

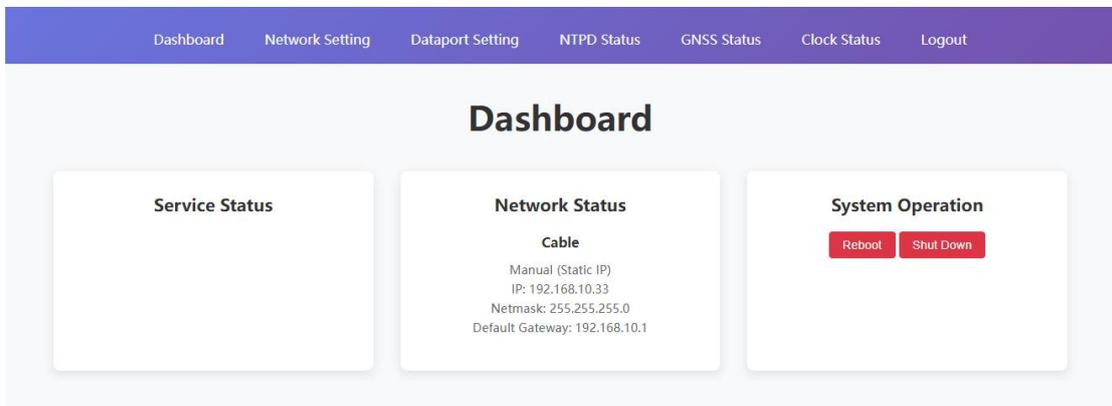
- **Username:** admin

- **Password:** chenbikeji

2. Dashboard

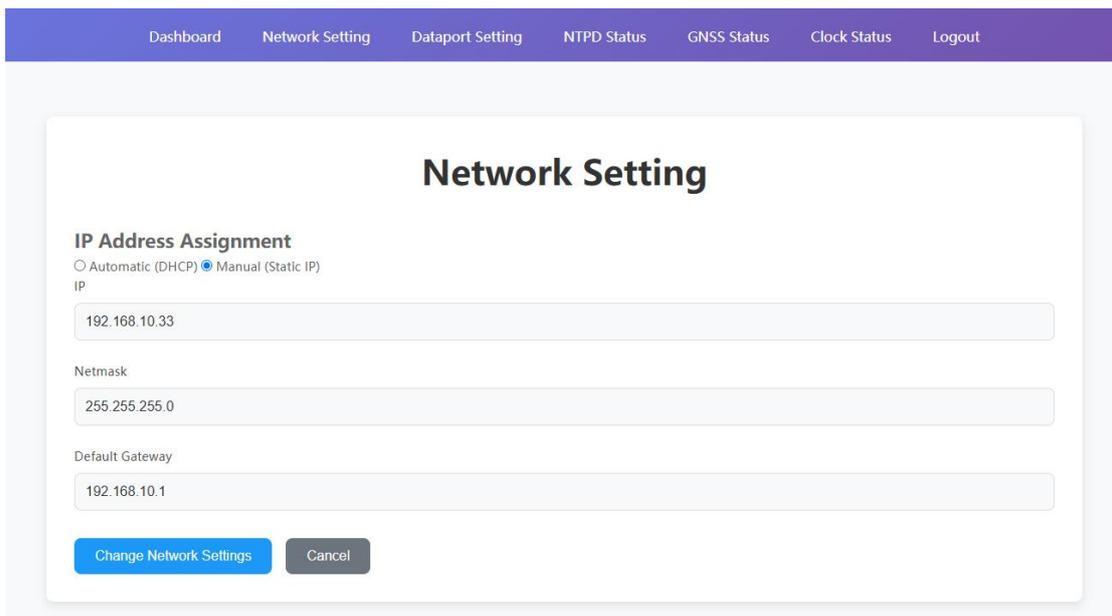
The configuration page is divided into two sections: the Menu Bar and the Status Bar.

- **Menu Bar:** Includes options for Network Setting, Dataport Setting, NTPD Status, GNSS Status, Clock Status and Logout.
- **Status Bar:** Displays the Service Status (indicating whether the device is receiving ADS-B signals), Network Status (showing the current network settings of the device), and System Operations (used for rebooting or shutting down the device).



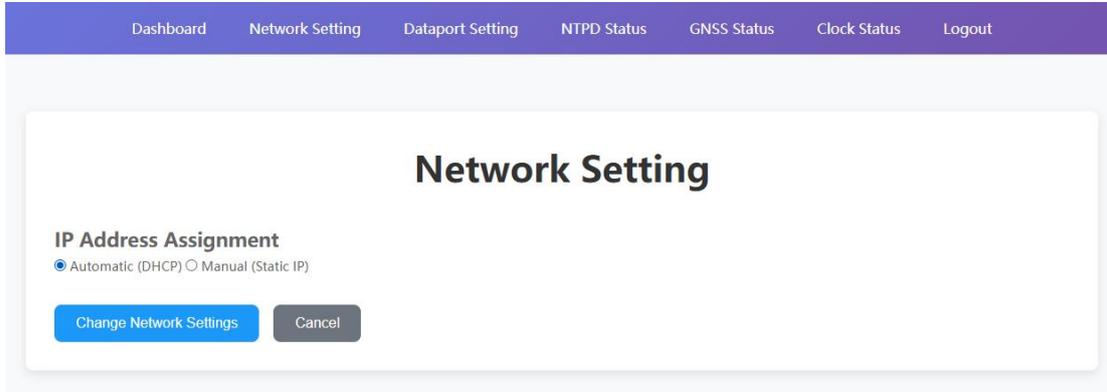
3. Network Configuration

There are two modes: Automatic (DHCP) and Manual (Static IP).



You can change the Static IP address or change to the Automatic (DHCP) mode. After

change, click Modify Network Configuration, and the changes will take effect after rebooting.



Note 1: When you change ADSB-RE1090L static IP, please make sure the IP address, Netmask and gateway are correct. And make sure you remember all these configurations. Otherwise, you may not be able to access ADSB-RE1090L.

Note 2: After switching to Automatic mode, the ADSB-RE1090L must be connected to a router with the DHCP function enabled. Otherwise, you will not be able to log in to the ADSB-RE1090L. ADSB-RE1090L shows as “receiver” in the router DHCP device list.

4. Dataport Setting

The Dataport Setting includes three sections: Message Output Configuration, Plaintext Output Configuration, and Latitude/Longitude Settings.

Dashboard Network Setting Dataport Setting NTPD Status GNSS Status Clock Status Logout

Dataport Setting

Message Output Configuration

TCP Service Port
50007

Plaintext Output Configuration

Broadcast Address
255.255.255.255

Target Udp Port
50005

Lat/Lng Settings

Lng
120

Lat
36

Save

- **Message Output:** Configures ADSB-RE1090L output raw DF messages. TCP protocol is used, and you can set the TCP server port. The ADSB-RE1090L acts as the TCP server, while the computer acts as the TCP client. Multiple computers can receive the messages simultaneously.
- **Plaintext Output:** Configure ADSB-RE1090L output decoded plaintext ADS-B data. UDP protocol is used, and you can set the unicast address and the target UDP port.
- **Lat/Lng Settings:** Input the ADSB-RE1090L installation site latitude and longitude, supporting two decimal places. Wrong input would cause the decoding of airport surface aircrafts ADS-B messages decoding failure.

5. NTPD Status

The NTPD Status is used to view the current status of the time synchronization service. By default, the time service is enabled upon device startup. If the service is in a stopped state, it should be manually started.

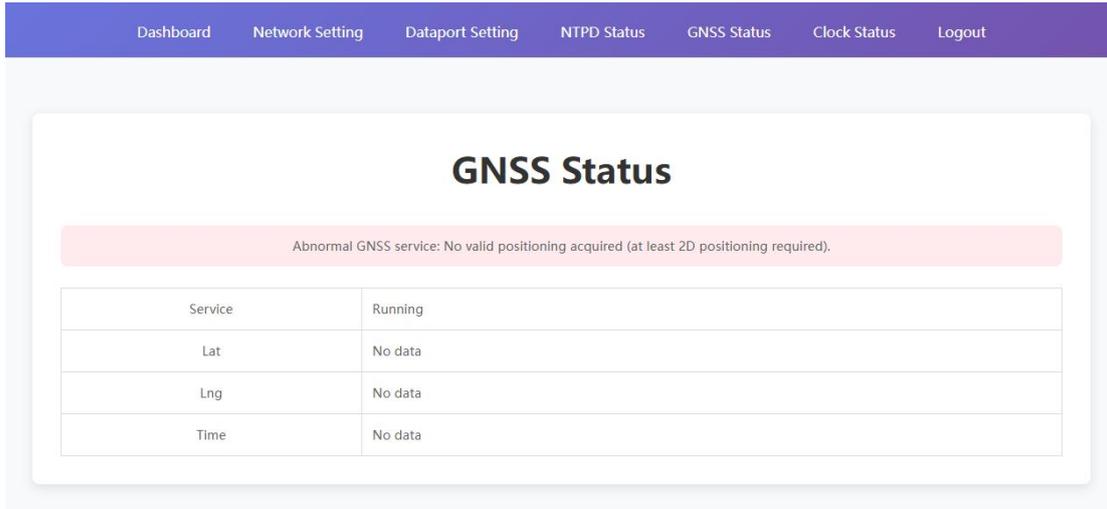
Service	运行中																														
Time Source	<table border="1"><thead><tr><th>remote</th><th>refid</th><th>st</th><th>t</th><th>when</th><th>poll</th><th>reach</th><th>delay</th><th>offset</th><th>jitter</th></tr></thead><tbody><tr><td>SHM(0)</td><td>.GPS.</td><td>0</td><td>I</td><td>-</td><td>16</td><td>0</td><td>0.000</td><td>0.000</td><td>0.000</td></tr><tr><td>*203.107.6.88</td><td>100.107.25.114</td><td>2</td><td>u</td><td>66</td><td>128</td><td>377</td><td>13.479</td><td>-0.162</td><td>0.574</td></tr></tbody></table>	remote	refid	st	t	when	poll	reach	delay	offset	jitter	SHM(0)	.GPS.	0	I	-	16	0	0.000	0.000	0.000	*203.107.6.88	100.107.25.114	2	u	66	128	377	13.479	-0.162	0.574
remote	refid	st	t	when	poll	reach	delay	offset	jitter																						
SHM(0)	.GPS.	0	I	-	16	0	0.000	0.000	0.000																						
*203.107.6.88	100.107.25.114	2	u	66	128	377	13.479	-0.162	0.574																						

6. GNSS Status

The GNSS Status is used to view the current status of the GNSS service. After connecting the GPS antenna and adjusting it to a location with signal reception, it may take a few minutes to capture satellites. Please be patient. If the following page appears, it indicates that the GNSS system is working normally.

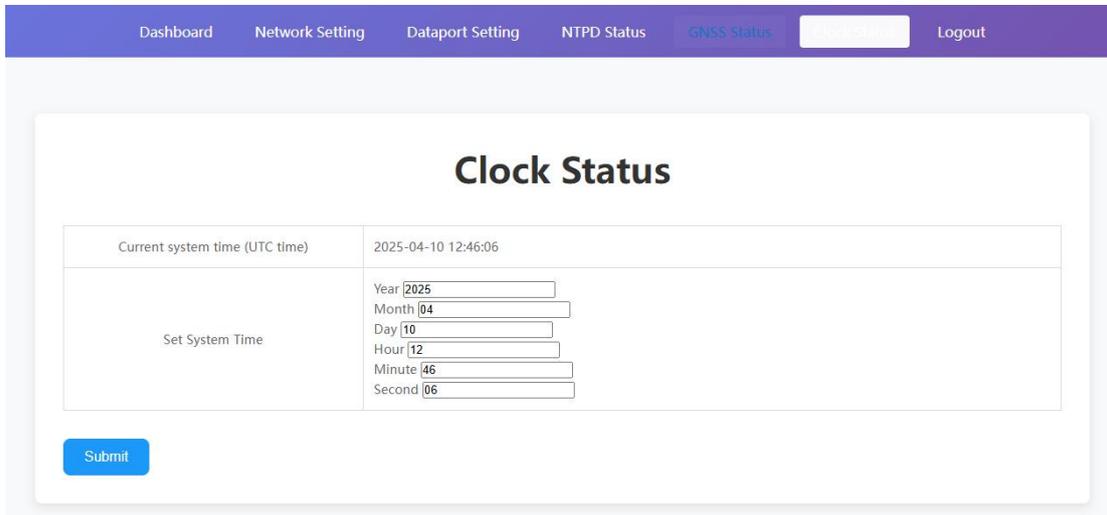
Service	Running
Lat	36.694405333
Lng	119.1488725
Time	2025-04-10 12:45:44

If the following page appears, it indicates that the GNSS service has started normally, but the GNSS antenna is either not connected or is not receiving satellite signals properly. Please connect the antenna or adjust its position.



7. Clock Status

This section is used to check the current system clock status. If the clock status is abnormal (i.e., the time deviates from the current time), it will affect message time synchronization. When the time deviation is too large and exceeds the system's automatic time synchronization threshold, the automatic time synchronization will fail, and manual time adjustment will be required to Set System Time.



7. Data Format

1. Raw Message

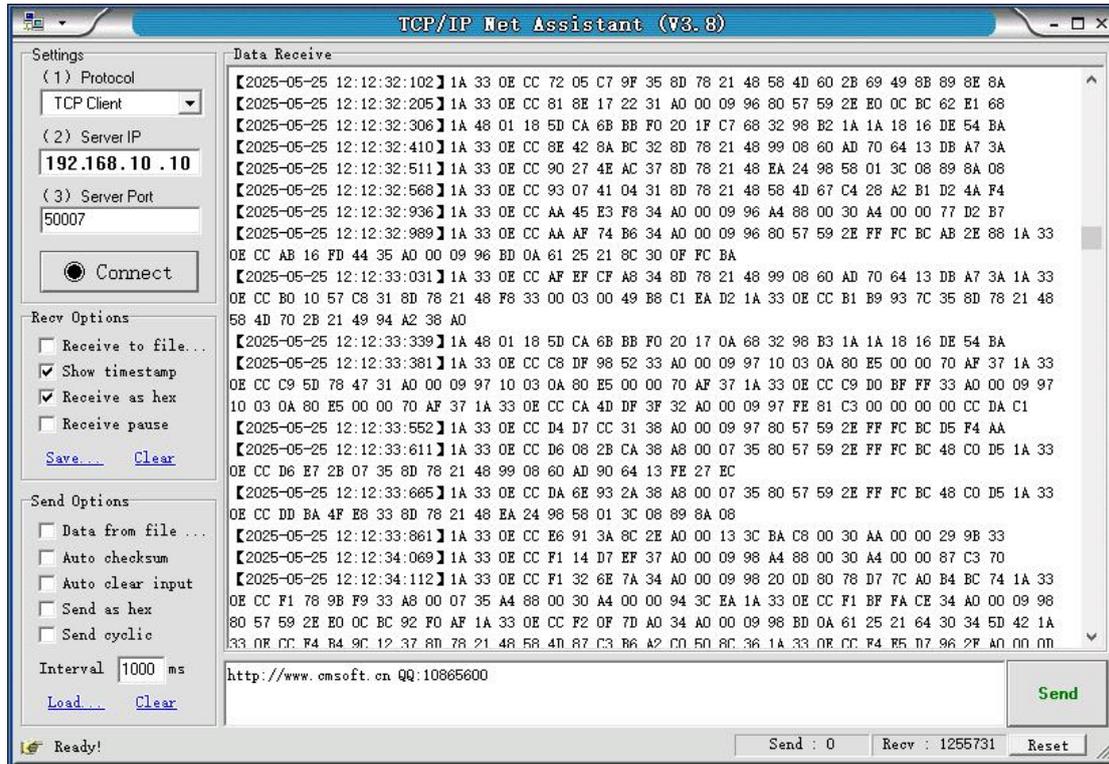
You can receive ADS-B raw message information via TCP. To configure this, open the

network debugging tool and set it as follows:

Protocol Type: TCP Client

Server IP Address: 192.168.10.10 (the IP address of the ADSB-RE1090L)

Server Port: 50007 (the TCP port set in the Dataport Setting).



Raw Message Data Example:

```
1A 33 0F E4 A1 CA 43 1F 3B A0 00 0E B0 80 17 45 33 E0 1C D2 5F EC 02
1A 33 0F E4 A2 44 5A FB 3B A0 00 0E B0 BD 9A 59 2A FF E4 00 12 03 8A
1A 33 0F E4 A2 C0 87 11 3D A0 00 0E B0 BD 9A 59 2A FF E4 00 12 03 8A
1A 33 0F E4 A4 6C 80 97 37 8D 78 10 F0 E1 1F 3A 00 00 00 00 CB 7B E9
```

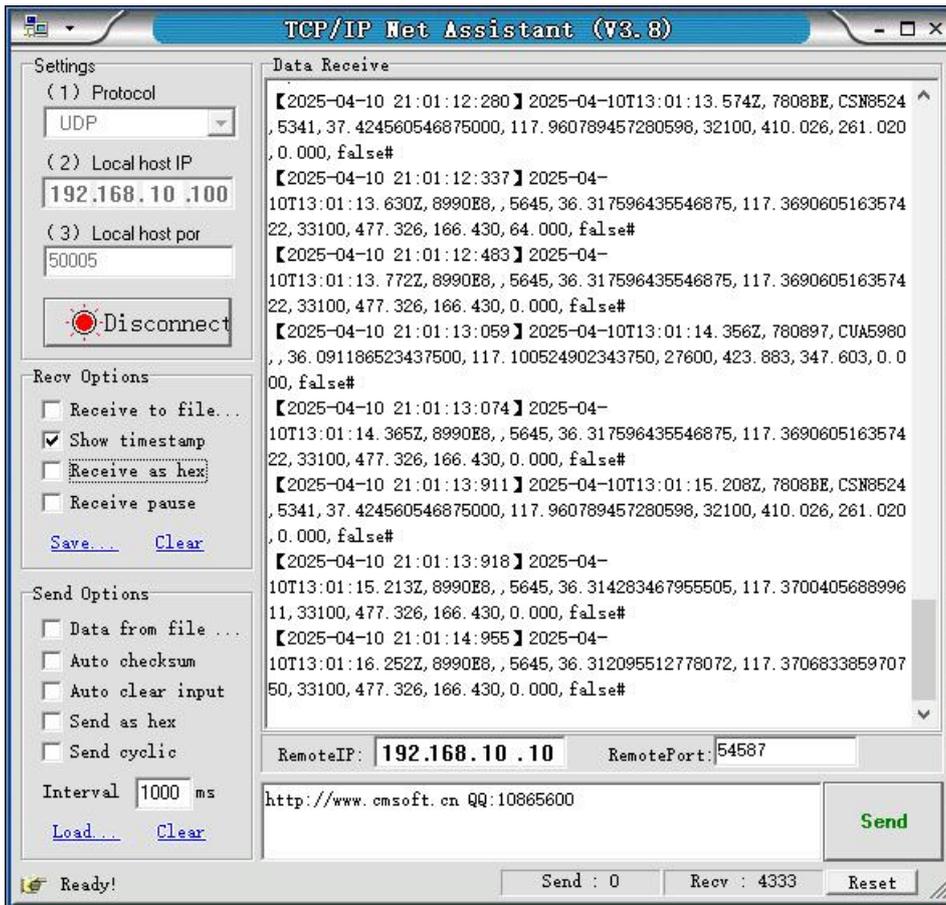
Data Item Description of the Message:

Byte	Data Example	Description
1	1A	Escape character <esc> (hexadecimal representation: 0x1a)
2	33	14 bytes: Identifier for Mode-S long frame
2	32	7 bytes: Identifier for Mode-S short frame
3-8	0F E4 A4 6C 80 97	6 bytes: timestamp
9	37	1 byte: signal level

10-23	8D 78 10 F0 E1 1F 3A 00 00 00 00 CB 7B E9	14 bytes: Mode-S long frame
10-16	5D 78 0D E5 A4 5A DF	7 bytes: Mode-S short frame

2. CSV Plaintext Data

To receive the decoded plaintext via UDP, open the network debugging tool and configure it as follows:



Decoded CSV Plaintext Data Example:

```
2025-01-23T06:23:04.006Z,780BA5,CSN5849,5673,36.009475708007812,117.01738357543
9453,25600,391.175,351.621,64.000,false#
2025-01-23T06:23:04.144Z,780EF1,CHB6279,6276,36.855422973632812,118.87224562624
6681,24600,444.933,96.582,0.000,false#
```

Data Description:

Data	Description	Remarks
------	-------------	---------

2025-01-23T 06:23:04.006Z	Time Stamp	In ISO 8601 format in the format: yyyy-MM-ddTHH:mm:ss.zzzZ
780BA5	ICAO Address	in hexadecimal
CSN5849	Call Sign	8 characters output
5673	SSR code	4-digit in octal
36.009475708007812	Latitude	Latitude in decimal degrees, North is positive, South is negative
117.01738357543945 3	Longitude	Longitude in decimal degrees, East is positive, West is negative
25600	Pressure Altitude	Feet
391.175	Ground Speed	Knots
351.621	Heading	Decimal, in degrees, clockwise to true north
64.000	Vertical Rate	Meters per minute, negative for descent, positive for ascent
false	Air/Ground Indicator	GND stands for ground; AIR stands for air

Note: If one data item is missing, the value will be left empty and will not be output.

3. JSON Plaintext Track Data

To receive JSON plaintext track data, use the HTTP service. The data is output in standard JSON format.

To access the data, enter the following URL in your browser:

<http://192.168.10.10:8888>

(Note: Replace 192.168.10.10 with the IP address of your ADSB-RE1090L device.)

The fixed request port is 8888.

```

1 [
2 {
3   "acid": "CH7664",
4   "acid_last_update": "2025-01-23T06:36:22.712Z",
5   "altitude_baro": 23600,
6   "altitude_baro_last_update": "2025-01-23T06:36:24.554Z",
7   "ground": false,
8   "ground_last_update": "2025-01-23T06:36:24.554Z",
9   "ground_speed": 362.558990722527,
10  "ground_speed_last_update": "2025-01-23T06:36:04.441Z",
11  "heading": 276.8113922244995,
12  "heading_last_update": "2025-01-23T06:36:04.441Z",
13  "icao_addr": "780688",
14  "last_update": "2025-01-23T06:36:24.554Z",
15  "vertical_rate_baro": 0,
16  "vertical_rate_baro_last_update": "2025-01-23T06:36:04.441Z"
17 },
18 {
19   "acid": "T071507",
20   "acid_last_update": "2025-01-23T06:35:46.538Z",
21   "altitude_baro": 20700,
22   "altitude_baro_last_update": "2025-01-23T06:36:16.623Z",
23   "ground": false,
24   "ground_last_update": "2025-01-23T06:36:25.135Z",
25   "ground_speed": 408.8275920238261,
26   "ground_speed_last_update": "2025-01-23T06:36:25.135Z",
27   "heading": 96.74256860639846,
28   "heading_last_update": "2025-01-23T06:36:25.135Z",
29   "icao_addr": "781B7F",
30   "last_update": "2025-01-23T06:36:25.206Z",
31   "latitude": 36.84544372558594,
32   "longitude": 119.02273178100586,
33   "position_last_update": "2025-01-23T06:36:16.623Z",
34   "vertical_rate_baro": 0,
35   "vertical_rate_baro_last_update": "2025-01-23T06:36:25.135Z"
36 },
37 {
38   "acid": "CDG2203",
39   "acid_last_update": "2025-01-23T06:35:39.846Z",
40   "altitude_baro": 31100,
41   "altitude_baro_last_update": "2025-01-23T06:36:23.300Z",
42   "ground": false,
43   "ground_last_update": "2025-01-23T06:36:24.354Z",
44   "ground_speed": 460.2195128414266,
45   "ground_speed_last_update": "2025-01-23T06:36:24.354Z",
46   "heading": 167.3226530108672,
47   "heading_last_update": "2025-01-23T06:36:24.354Z",
48   "icao_addr": "780D0A",
49   "last_update": "2025-01-23T06:36:24.354Z",
50   "latitude": 36.43657619670286,
51   "longitude": 117.32743932845746,
52   "position_last_update": "2025-01-23T06:36:23.300Z",
53   "vertical_rate_baro": -64,
54   "vertical_rate_baro_last_update": "2025-01-23T06:36:24.354Z"
55 },
56 {
57   "acid": "CH6261",
58   "acid_last_update": "2025-01-23T06:36:16.103Z",
59   "altitude_baro": 32100,
60   "altitude_baro_last_update": "2025-01-23T06:36:24.158Z",
61   "ground": false,
62   "ground_last_update": "2025-01-23T06:36:24.607Z",
63   "ground_speed": 373.68703482994985,
64   "ground_speed_last_update": "2025-01-23T06:36:24.607Z",
65   "heading": 260.9157790756205,
66   "heading_last_update": "2025-01-23T06:36:24.607Z",
67   "icao_addr": "780B19",
68   "last_update": "2025-01-23T06:36:24.607Z",
69   "latitude": 37.42418192200741,
70   "longitude": 117.95763762100883,

```

Decoded JSON Data Example:

```

{
  "altitude_baro": 22600,
  "altitude_baro_last_update": "2025-01-23T06:37:14.213Z",
  "ground": false,
  "ground_last_update": "2025-01-23T06:37:14.485Z",
  "ground_speed": 396.50472884948044,
  "ground_speed_last_update": "2025-01-23T06:37:14.485Z",
  "heading": 182.89126959679598,
  "heading_last_update": "2025-01-23T06:37:14.485Z",
  "icao_addr": "7820E2",
  "last_update": "2025-01-23T06:37:14.485Z",
  "latitude": 36.20709228515625,
  "longitude": 117.28546142578125,
  "position_last_update": "2025-01-23T06:37:14.213Z",
  "squawk": "4136",
  "squawk_last_update": "2025-01-23T06:37:02.356Z",
  "vertical_rate_baro": 0,
  "vertical_rate_baro_last_update": "2025-01-23T06:37:14.485Z"
},
{

```

```

"acid": "CDG2230 ",
"acid_last_update": "2025-01-23T06:36:46.170Z",
"altitude_baro": 20700,
"altitude_baro_last_update": "2025-01-23T06:37:15.406Z",
"ground": false,
"ground_last_update": "2025-01-23T06:37:15.406Z",
"ground_speed": 438.308110807911,
"ground_speed_last_update": "2025-01-23T06:37:14.160Z",
"heading": 130.55875881014302,
"heading_last_update": "2025-01-23T06:37:14.160Z",
"icao_addr": "7809A2",
"last_update": "2025-01-23T06:37:15.406Z",
"latitude": 36.25309753417969,
"longitude": 117.35332489013672,
"position_last_update": "2025-01-23T06:37:15.406Z",
"squawk": "0052",
"squawk_last_update": "2025-01-23T06:37:01.379Z",
"vertical_rate_baro": 0,
"vertical_rate_baro_last_update": "2025-01-23T06:37:14.160Z"
},
    
```

Data Description:

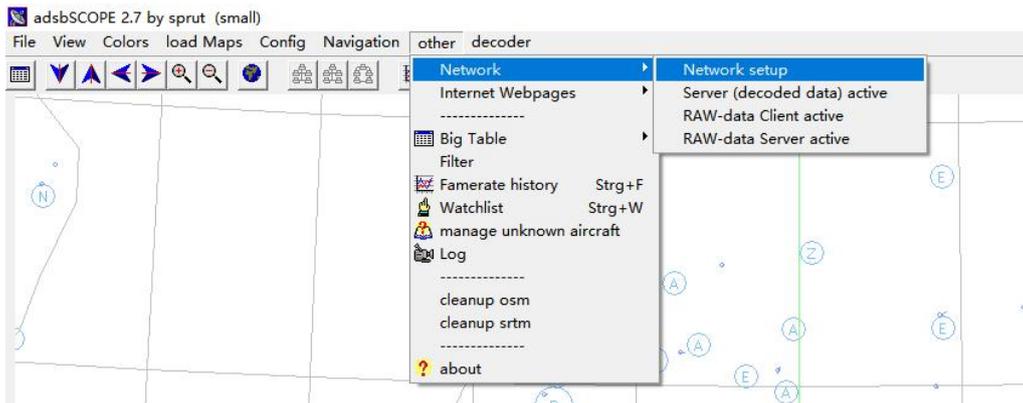
Data Items	Example Data	Descriptions
acid	CDG2230	Callsign
acid_last_update	2025-01-23T06:36:46.170Z	Last Updated Time of Callsign
altitude_baro	20700	Pressure Altitude (feet)
altitude_baro_last_update	2025-01-23T06:37:15.406Z	Last Updated Time of Pressure Altitude
ground	false	Ground Indicator, true indicates on the ground, false indicates in the air
ground_last_update	2025-01-23T06:37:15.406Z	Last Updated Time of Ground Indicator
ground_speed	438.308110807911	Ground Speed (knots)
ground_speed_last_update	2025-01-23T06:37:14.160Z	Last Updated Time of Ground Speed
heading	130.55875881014302	Heading Angle (degrees)
heading_last_update	2025-01-23T06:37:14.160Z	Last Updated Time of Heading Angle

icao_addr	7809A2	ICAO 24-bit Address
last_update	2025-01-23T06:37:15.406Z	Last Updated Time of Track
latitude	36.25309753417969	Latitude (degrees)
longitude	117.35332489013672	Longitude (degrees)
position_last_update	2025-01-23T06:37:15.406Z	Last Updated Time of Position
squawk	0052	Secondary Code
squawk_last_update	2025-01-23T06:37:01.379Z	Last Updated Time of Secondary Code
vertical_rate_baro	0	Vertical Rate (feet/minute)
vertical_rate_baro_last_update	2025-01-23T06:37:14.160Z	Last Updated Time of Vertical Rate

8. ADS-B Display Software adsbscope

The ADSB-RE1090L can be connected to the ADS-B display software adsbscope. The detailed steps are as follows:

- (1) Open the ADS-B display software adsbscope.
- (2) In the top menu, go to other, then select Network, then Network setup.



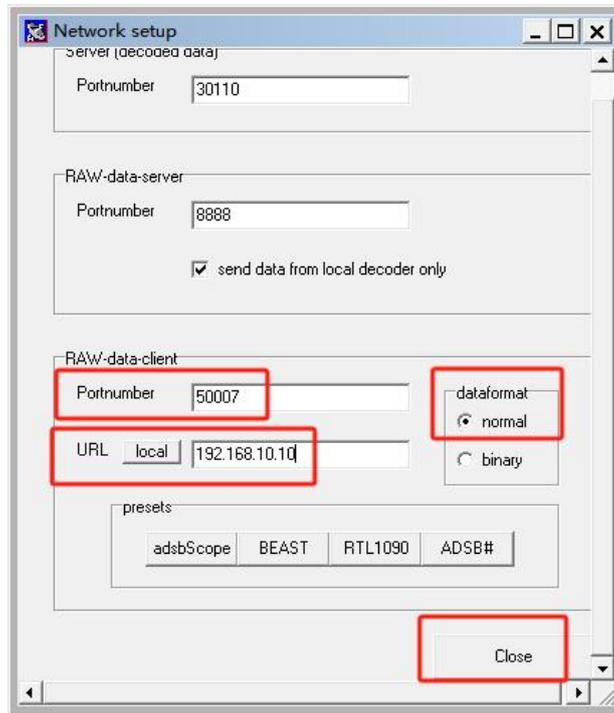
- (3) In the pop-up window, enter the following:

Port number: Fill in the Dataport Setting—>Message Output Configuration—>TCP Server Port used.

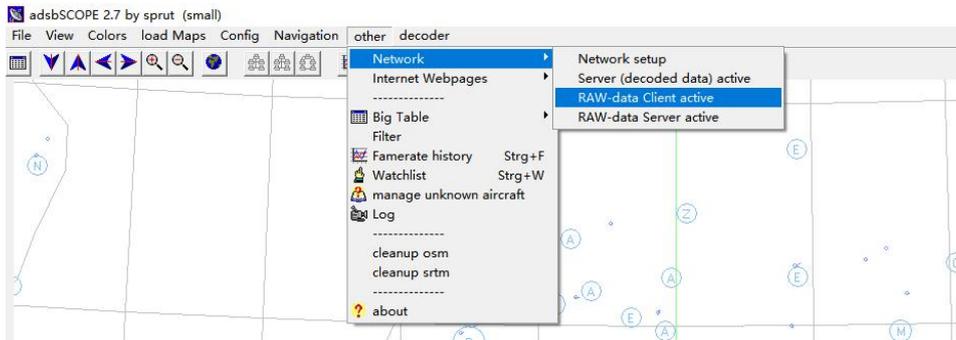
URL: Enter the ADSB-RE1090L IP address.

Data format: Select normal.

Click the Close button.

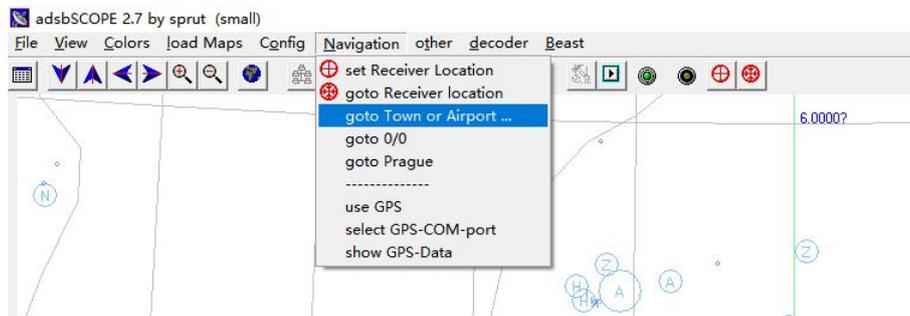


(4) Then, click Network in the top menu again, and select RAW-data Client active.



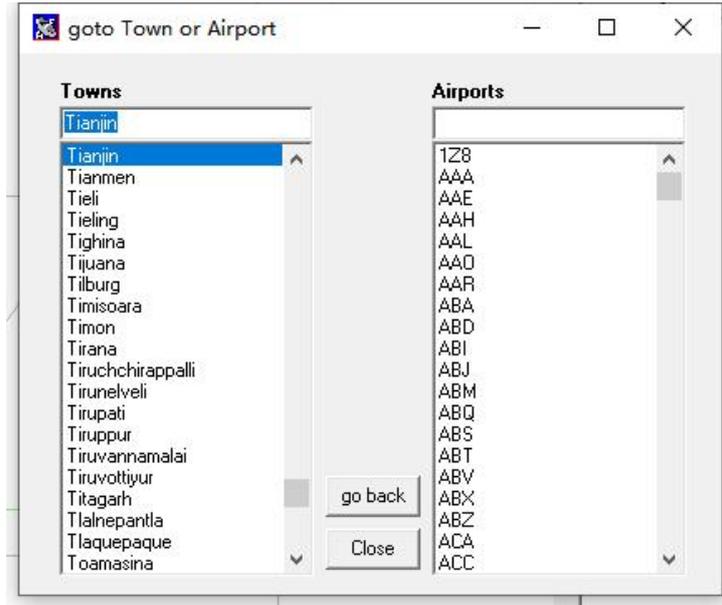
(5) Now you should see the received data on the right side of the software.

(6) Next, select Navigation in the menu and then select Goto Town or Airport....



(7) In the pop-up window, input the name of the nearest Town or Airport (in English).

Select it from the query list below, then click Close at the top right corner.

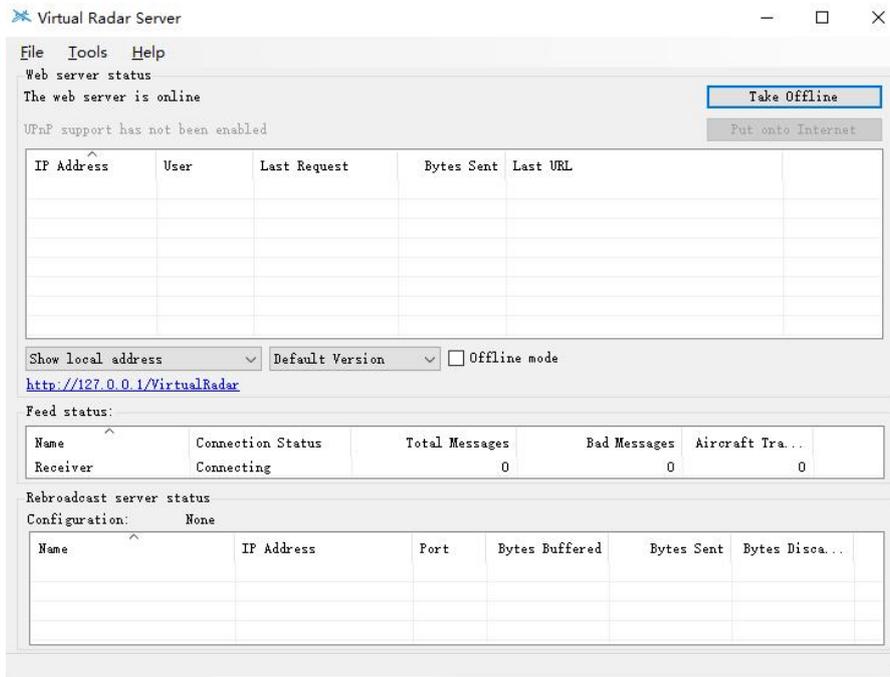


(8) The ADS-B display software will now show the aircrafts' location properly.

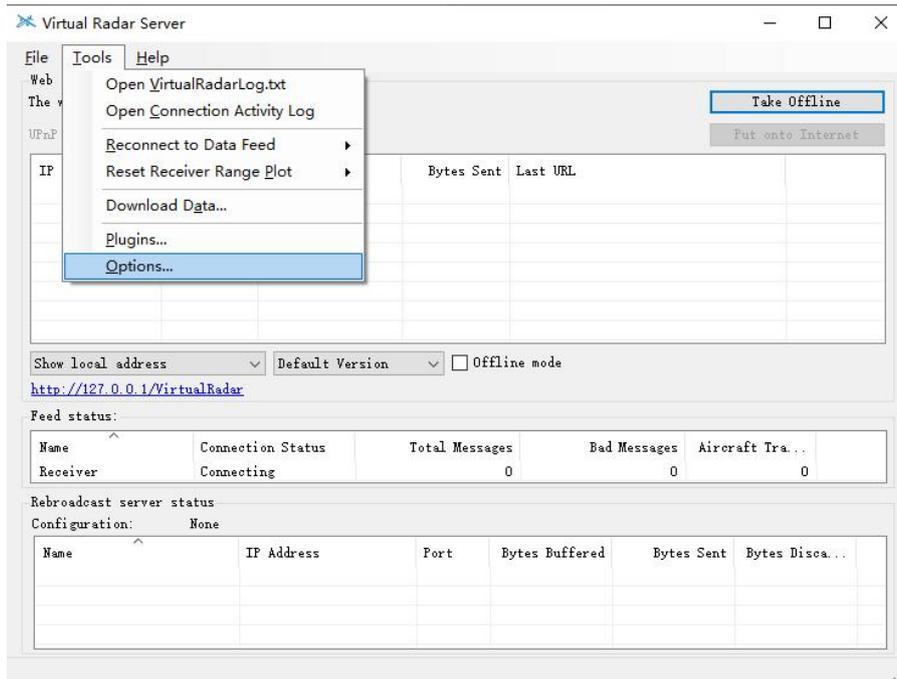
9. ADS-B Display Software Virtual Radar

The configuration method for Virtual Radar is as follows:

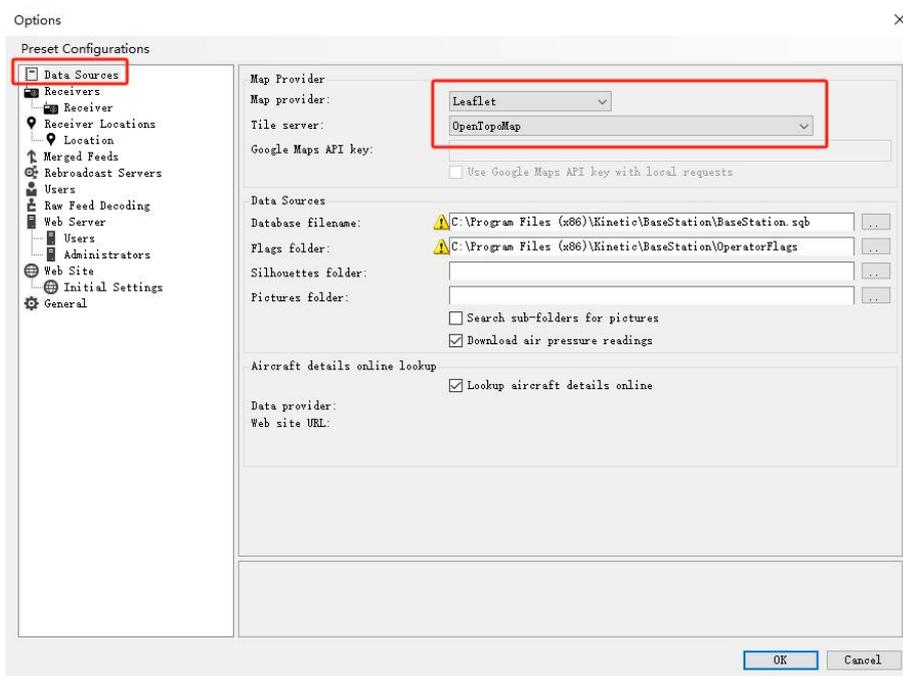
(1) Open the Virtual Radar software.



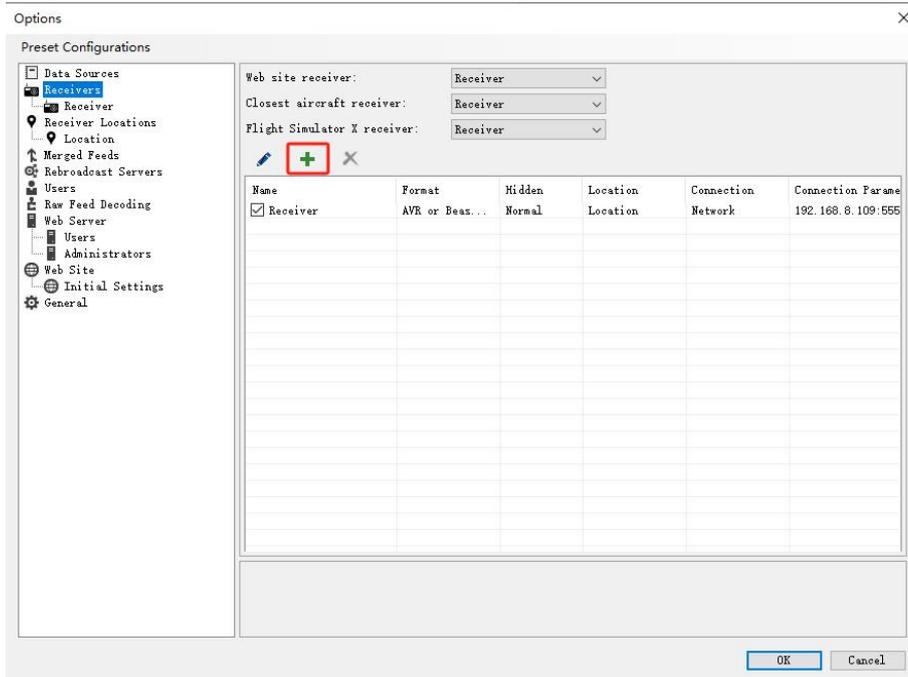
(2) Click on **Tools** → **Options**.



(3) In the **Data Sources** interface, select **Leaflet** for Map Provider and **OpenTopoMap** for Tile Server.

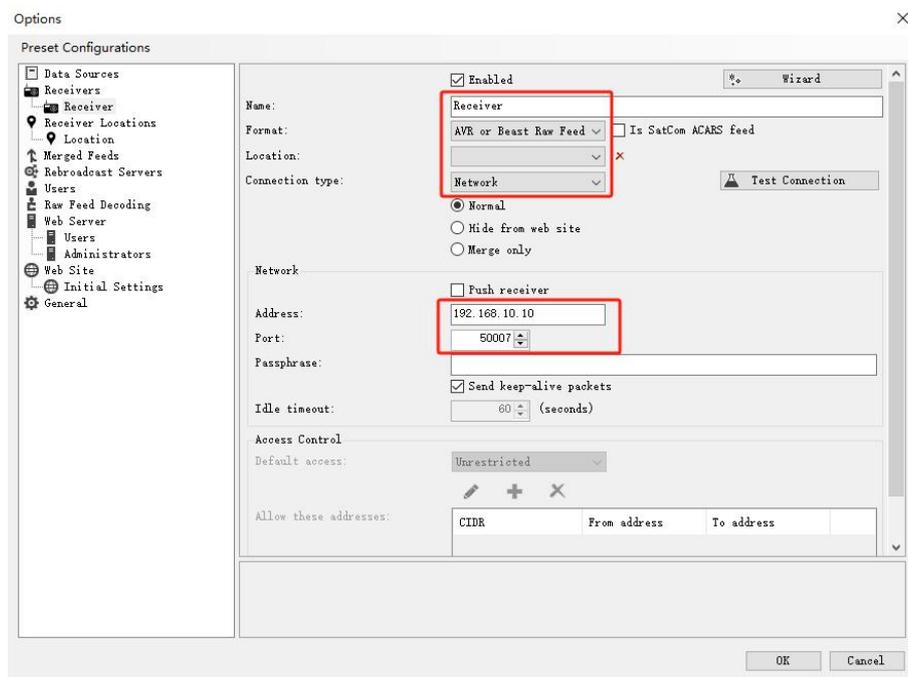


(4) Click on **Receiver** on the left side, then click the + button on the right.

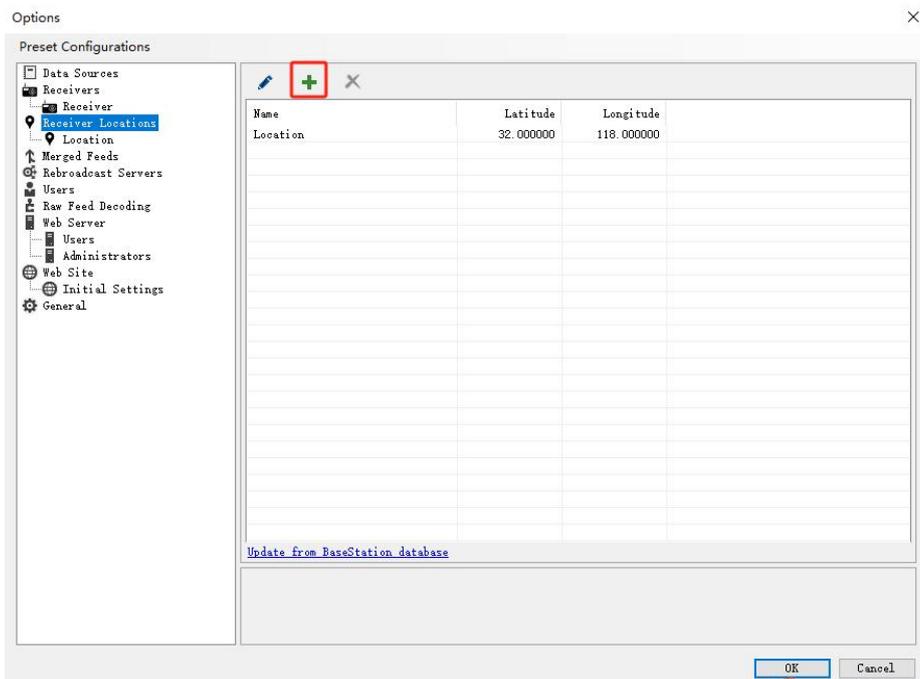


(5) In the **Receiver** window, enter the **receiver** name, select the format: **AVR or Beast Raw Feed**, choose connection type as **Network**, then enter the receiver's IP address and port below.

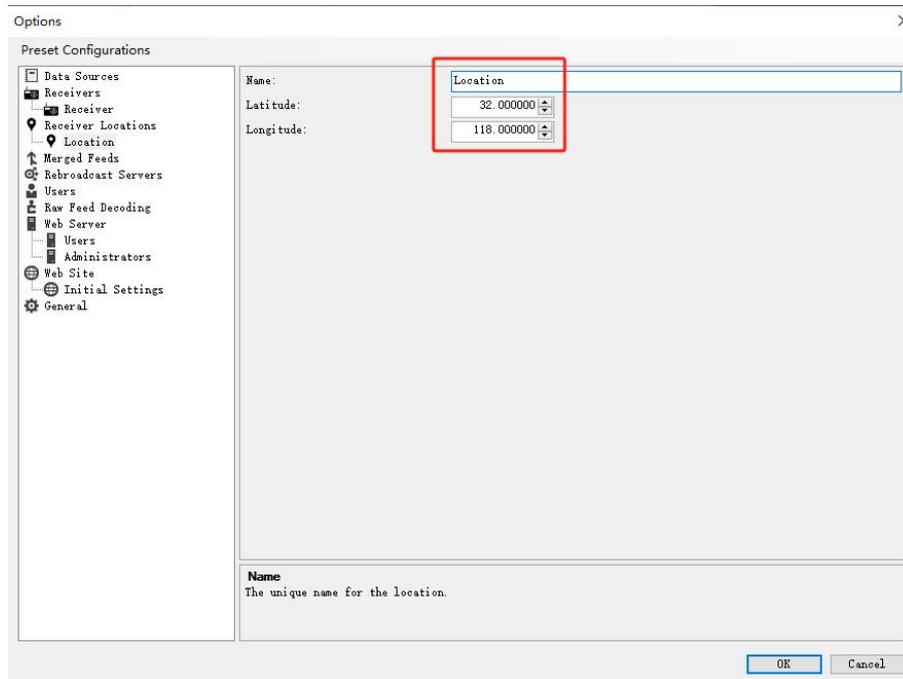
For ADSBS600, the address is **192.168.10.10** and the port is **50007**.



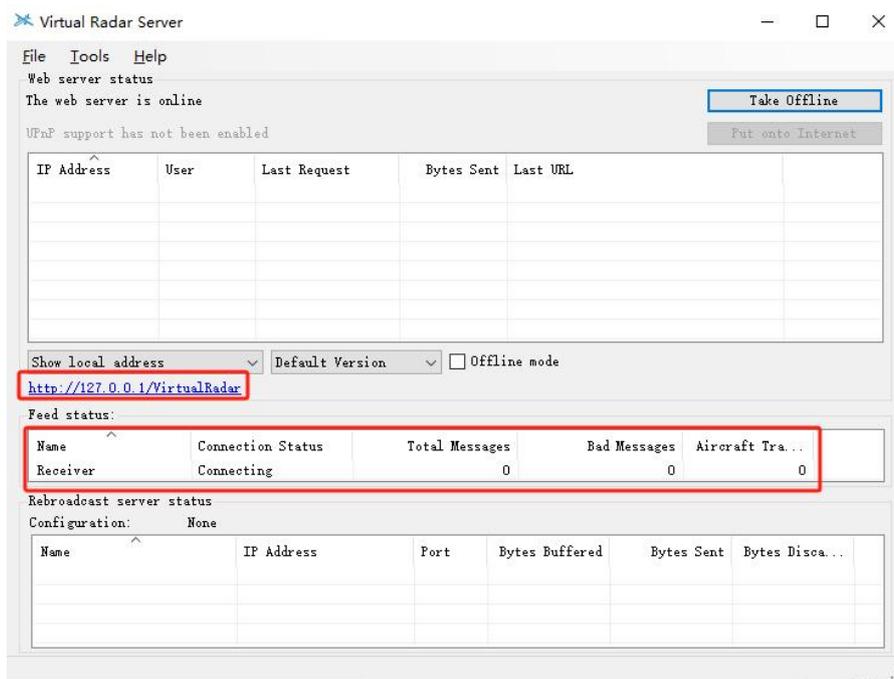
(6) Click on **Receiver Locations** on the left side, then click the + button on the right.



(7) Enter the current receiver's location name and its latitude and longitude (precision is not critical), then click Confirm.



(8) Return to the main interface, confirm that the data source is properly connected and receiving data, then click the link for the web display platform in the center.



(9) In the pop-up web interface, the aircraft positions can be viewed normally.

10. ADS-B Antenna



- High Quality Fiberglass
- Sturdy Durable Anticorrosive.
- Aluminum Alloy Base. The base is perfectly made of aluminum and firm enough to against strong wind and other terrible weather.
- Waterproof Sealing Technology. The top and bottom of antenna are used double sided waterproof processing and effectively against rainy weather.
- Stable performance
- High gain

- Lower VSWR

Specifications:

No.	Specifications	
1	Frequency Range	1060-1120MHz
2	Bandwidth	60MHz
3	Gain	6dBi
4	VSWR	≤1.5
5	Direction Type	Omnidirectional
6	Polarization	Vertical polarization
7	Length	60cm
8	Weight	0.6kg
9	Connector Type	N female
10	Mounting Type	Mast mount

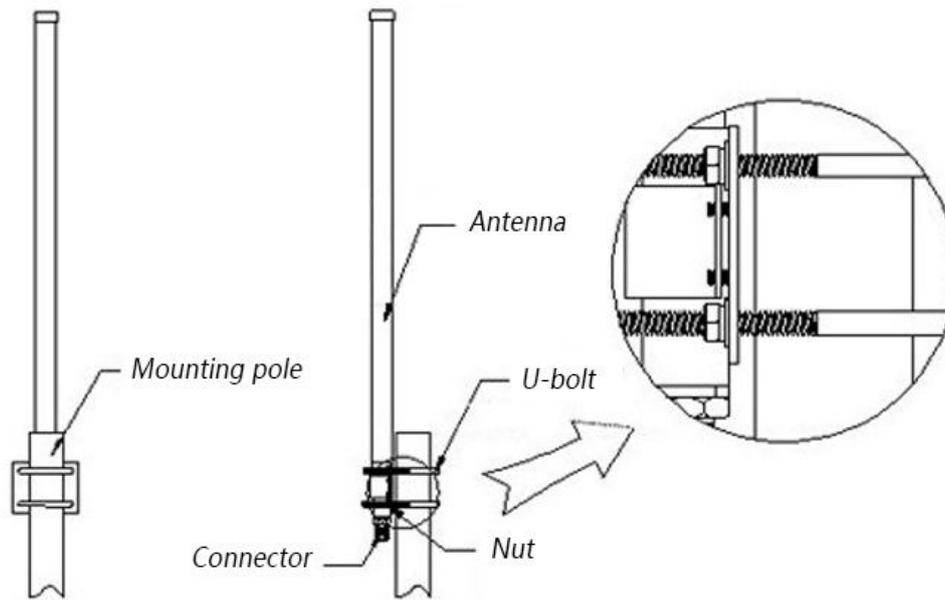
Mounting Method:

The antenna should be installed in an open area, free from tall surrounding obstructions. A certain installation height is required—the higher the antenna, the better the signal reception.

The antenna should be mounted vertically to ensure its polarization aligns with that of the aircraft’s transmitted signal, which will provide optimal reception performance.

Compatible with pole diameters ranging from $\Phi 30$ mm to $\Phi 60$ mm; $\Phi 50$ mm is recommended.

Mounting method as shown in the figure:



11. GNSS Antenna



Specifications:

No.	Specifications	
1	Frequency Range	1550 – 1580MHz (covering GPS \ BDS)

2	Gain	28dBi(including LNA)
3	Impedance	50Ω
4	Polarization	RHCP
5	Noise Figure	≤1.5dB
6	DC Supply Voltage	3~5V
7	Supply Current	20mA
8	Cable Length	3m
9	Connector	SMAMale
10	Mounting Method	Magnetic Absorption

12. Customization

All our products can be supplied tailored to your specific needs and customized with your brand and logo. We tailor designs, enclosures, features, and data formats to meet your specifications. Our OEM services empower you to launch unique products swiftly and risk-free.

13. Why Choose Us

- Comprehensive product range to meet users' needs for various levels of ADS-B ground station systems.
- Easy installation and use, with no complex configuration or high technical requirements for engineers. Simple and user-friendly.
- Complete after-sales service, providing technical support and services to help users maximize product benefits.
- Support for remote upgrades, assisting users in accessing the latest product features.
- Independent product development with customization options based on user requirements, including form factors, logo, software, hardware, performance, and functionality.