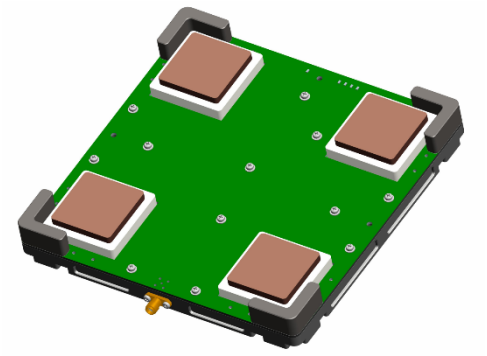
GPS CRPA Anti-interference Antenna Specification Sheet



1 Product Description

1.1 Product Requirements

When the GPS satellite signal reaches the ground user receiver, it is quite weak (approximately -130 dBm)，The weak interference signals may cause the GPS receiver to become unstable. Especially human malignant interference signal, which leads to a decrease in system accuracy, even inability to function properly, and loss of navigation ability， GPS anti-interference technology has become a key issue that satellite navigation receivers urgently need to solve.

To receive high-quality satellite signals, The GPS receivers must be：

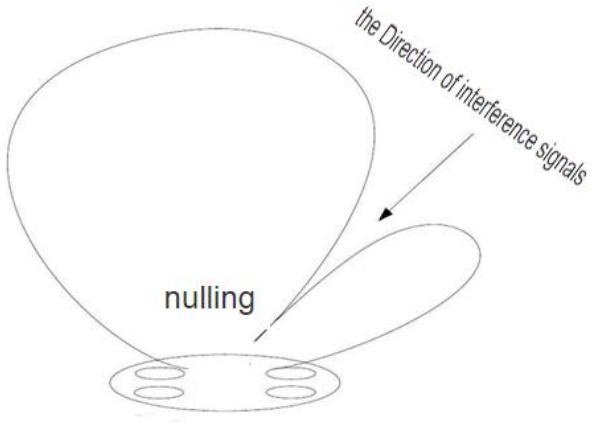
- ✓ By using GPS antennas, satellite signals can receive a certain gain；
- ✓ Remove as much interference as possible from signals other than satellite signals.

1.2 Product working mode

To eliminate (remove) interference signals from signals other than satellite signals， adopting adaptive antenna array technology， by combining the arrangement of four antenna arrays with adaptive signal processing, automatic control of antenna adjustment parameters is achieved，Align the main beam of the antenna pattern with the useful signal direction，Zero point points in real-time towards the direction of

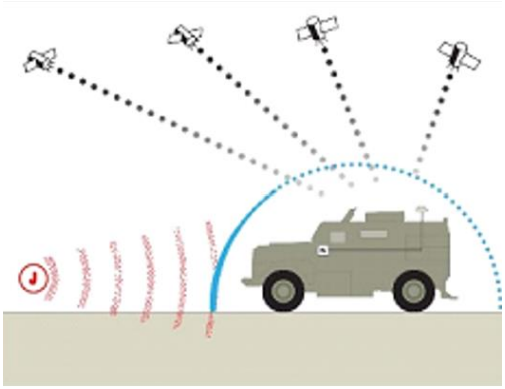
interference, achieving the purpose of anti-interference.

To complete the in-situ replacement of the antenna, we use a digital frequency shifter and a digital gain controller to directly perform vector operations on the antenna signal. We use Power Inversion (PI) scheme， on the premise that the satellite signal strength is much lower than the noise signal strength， Power ratio of flipped satellite signals to noise signals. It takes the minimum mean square difference between the reference signal and the array output as the objective function, and adjusts the weight vector of the array based on system error to minimize the objective function, thereby playing an adaptive adjustment role. The Power Inversion array directly takes the error signal as the output of the array, without the need to obtain information such as the incident direction and characteristics of the signal in advance, making it convenient to achieve. Simultaneously using the Least Mean Square (LMS) algorithm， The signals sent from each antenna channel are processed using an adaptive filtering algorithm, and the signals from each channel are adaptively zeroed and weighted for adjustment， which make it weight the amplitude gain and phase shift of the signals received by each array element accordingly， Thus, a zero point （nulling）, the direction of the interference source is generated in the overall antenna array pattern to suppress or reduce the impact of interference.



1.3 Product usage scenarios

Airborne anti-interference



Vehicle anti-interference

2 Product indicators

2.1 Antenna characteristics

Antenna		
Item	Specifications	Comment
Frequency	GPS L1/L2/L5	
Polarization	RHCP	
Axial Ratio	3dB	min
VSWR	≤2.0	
Impedance	50Ω	
Horizontal coverage angle	360	
Antenna Numbers	4	
Antenna Isolation	>20dB	

2.2 LNA Characteristics

LNA		
Item	**Specifications**	**Comment**
Gain	30±2dB	
Noise Figure	≤1.5dB	
Passband fluctuation	±1.5dB	
VSWR	≤2.0	

2.3 Anti-jamming capability

Anti-jamming		
Item	**Specifications**	**Comment**
Input Signal	-130~-60dBm	
Suppression of interference	>35dB	Broadband
J/S Capability	>90dB	
Number of jamming sources	1~3	

2.4 Structural characteristics

Mechanical		
Item	**Specifications**	**Comment**
Connector	SMA-F	
Dimensions	174mm*174mm*26mm	
Weight	0.65 Kg	

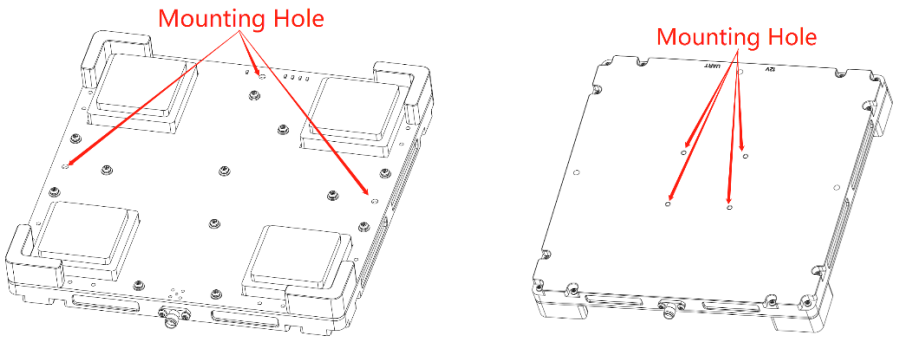
2.5 Environmental characteristics

Environmental		
Item	**Specifications**	**Comment**
Operating Temperature	-40C~+85C	
Relative Humidity	Up to 95%	
Vibration	10 to 55Hz with 1.5mm amplitude 2hours	
Cooling Mode	Heat Conduction	
Altitude	⩽5000M	
Environmentally Friendly	ROHS Compliant	

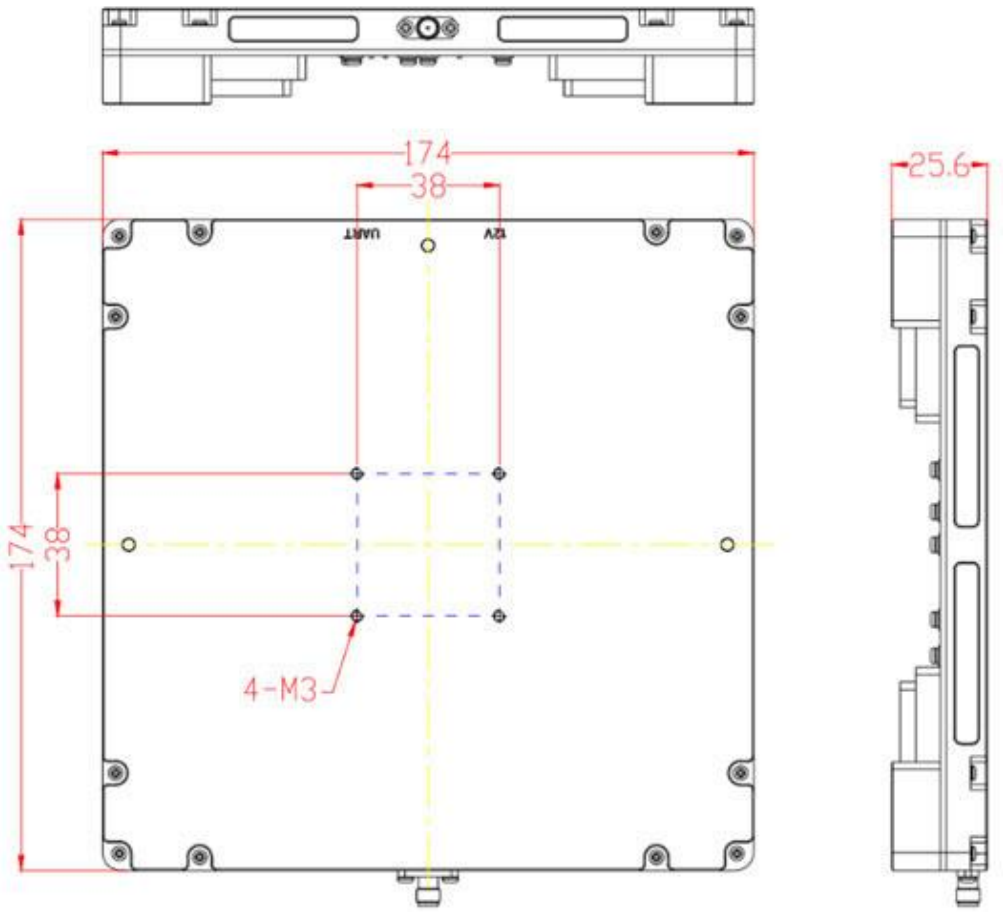
3 Interface Description

3.1 Dimensions

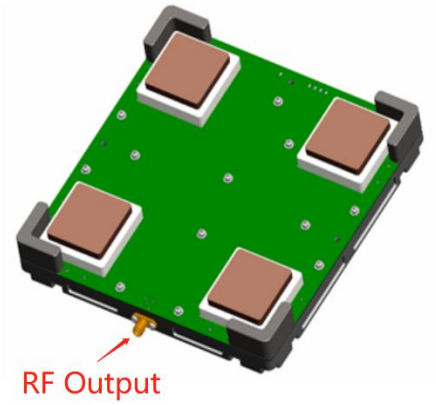
Mounting hole

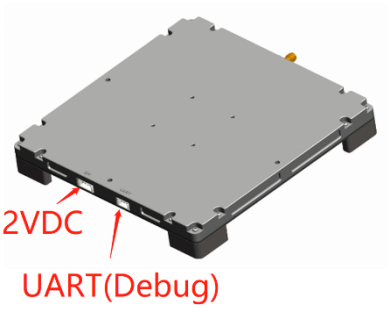


Size unit (mm)



3.2 Interface

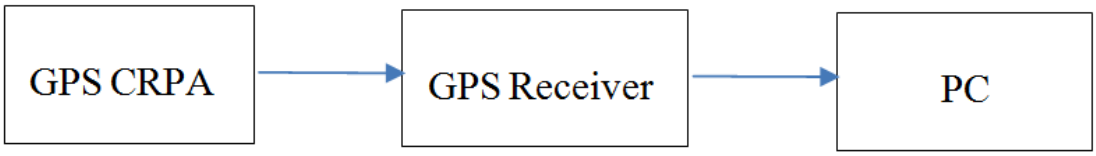


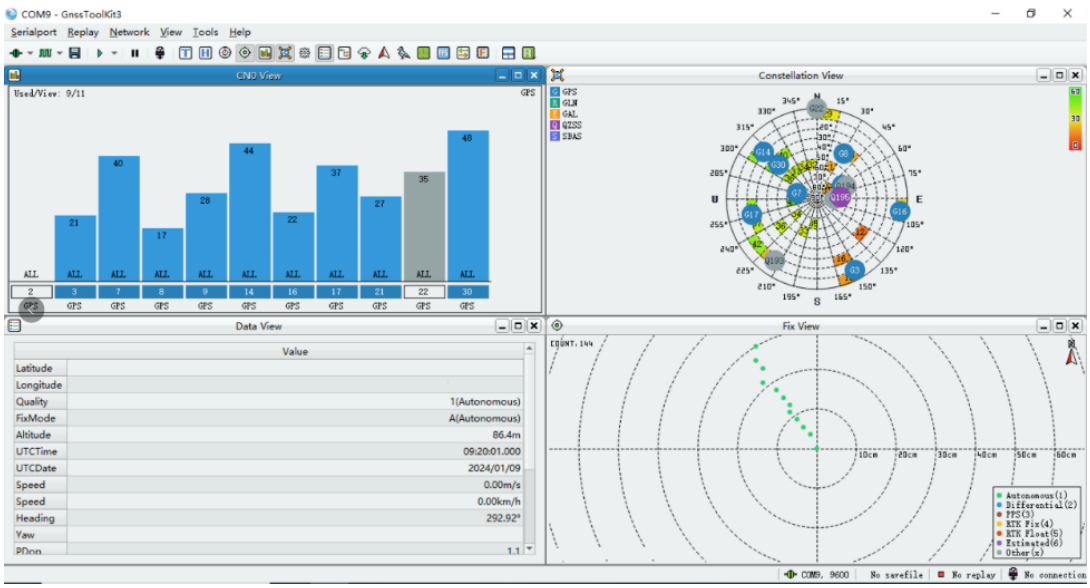


4 Testing procedure

4.1 Connecting the GPS receiver

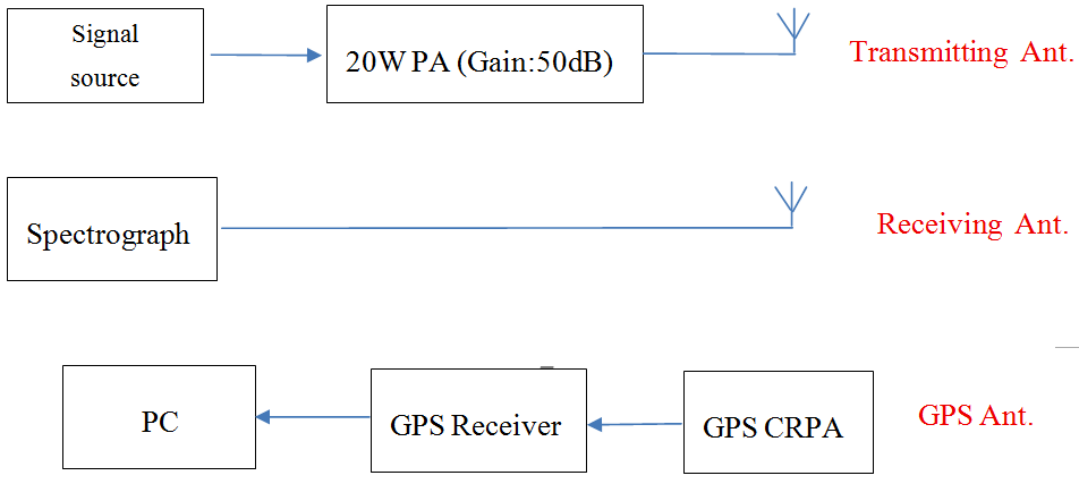
Connect the GPS antenna according to the following diagram, through the PC software, it is possible to observe the number of GPS satellites received by the GPS receiving module and the signal quality of each satellite.



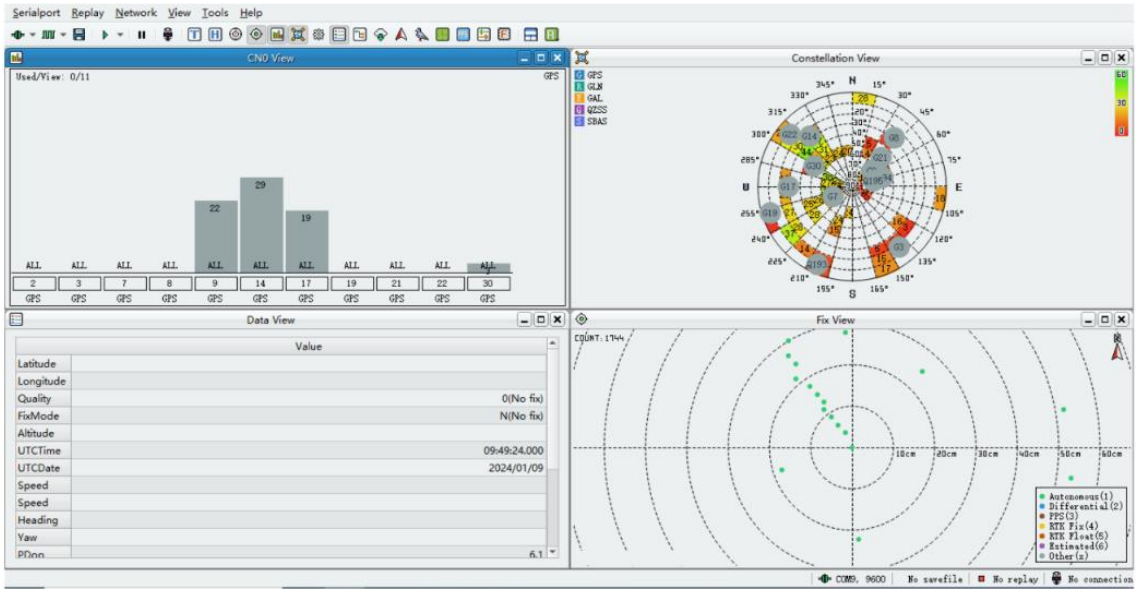


4.2 Adding interference signals

Using a signal source to transmit single frequency interference through an omnidirectional antenna, with a frequency point of 1.574GHz. Measure the interference power received by GPS calibration antenna through a spectrograph.

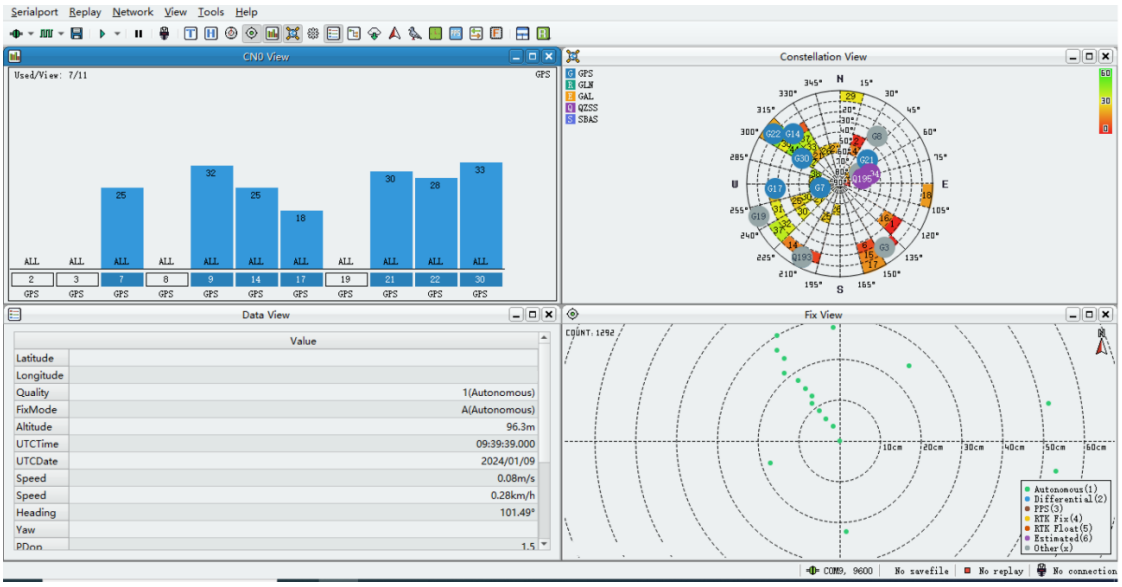


Turn off the CRPA function. Gradually increase the output of the signal source and increase the interference power. When the power amplifier outputs 10dBm, the GPS receiving module is interfered and cannot receive signals anymore (See the figure below).



4.3 Capability assessment of interference suppression

At this point, turn on the CRPA function, the GPS receiving module is able to receive signals again and resume operation (See the figure below).



Continue to increase the output of interference signal sources and increase the interference power. When the amplifier outputs 40dBm, the GPS receiving module is disturbed and cannot receive signals anymore (See the figure below).