This area to be trimmed 1.0"

WARRANTY POLICY

NovAtel Communications Ltd. warrants that its Global Positioning System (GPS) products are free from defects in materials and workmanship, subject to the conditions set forth below, for the following periods of time:

GPSAntenna™ Module	One (1) Year
Cables	Ninety (90) Days

Date of sale shall mean the date of the invoice to the original customer for the product. NovAtel's responsibility respecting this warranty is limited solely to product replacement or product repair at an authorized NovAtel location only. Determination of replacement or repair will be made by NovAtel personnel or by technical personnel expressly authorized by NovAtel for this purpose.

This warranty will not extend to damage or failure resulting from misuse, neglect, accident, alteration, abuse, improper installation, non-approved antenna/cables/accessories, or operation in an environment other than that intended.

In no event will NovAtel be liable for any indirect, incidental, special or consequential damages whether through tort, contract or otherwise. This warranty is expressly in lieu of all other warranties, expressed or implied, including without limitation the implied warranties of merchantability or fitness for a particular purpose. The foregoing states the entire liability of NovAtel with respect to the products herein.

Any defective product should be returned, insured and freight prepaid, securely packaged, to the following address:

NOVATEL COMMUNICATIONS LIMITED
GPS Repair Centre
6732 - 8th Street N.E.
Calgary, Alberta, Canada
T2E 8M4

The Purchaser is responsible for any insurance on product during shipment and accepts all liability for loss of or damage. Please include a copy of your sales documentation, product serial number, and a detailed description of the problem you are experiencing.

You must obtain a Return Material Authorization (RMA) number by calling – 403-295-4900 before shipping any product to NovAtel.

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USER MANUAL

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GPSAntenna™ Model 501

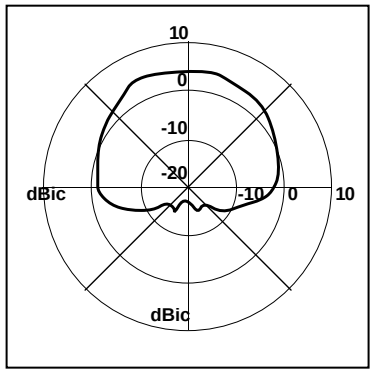
Introduction

The NovAtel GPSAntenna Model 501 is designed to provide superior performance over a wide range of GPS applications. It incorporates the following features:

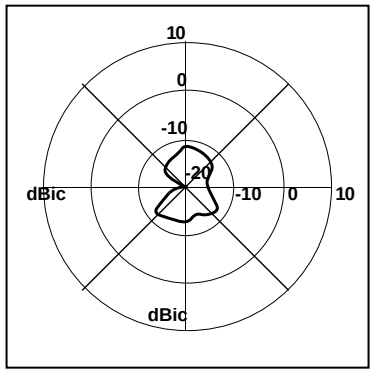
- L1 Center Frequency at 1575.42 MHz
- Enhanced Multipath Rejection
- Internal Low Noise Amplifier (LNA)
- Internal Interference Rejection Filter
- Low Noise Figure
- Small Size (11.4 cm Diameter x 5.7 cm Height)
- Single External TNC Connector
- Environmentally Sealed Radome
- Tripod 5/8" Coarse Thread Center Mounting
- Four Screw Fixed Mounting (Groundplane or Platform)

General

The GPSAntenna receives the C/A code signals from the NAVSTAR satellites. These signals are Right Hand Circular Polarization (RHCP) signals centered at 1575.42 MHz. The antenna module rejects the unwanted Left Hand Circular Polarization (LHCP) and out-of-band signals. The antenna then filters, amplifies and transfers the signals to the GPSCard™ for further processing. Figure 1 shows the typical antenna Elevation Gain Pattern for RHCP and LHCP signals.



Typical GPSAntenna Elevation Gain Pattern
Right Hand Circular Polarization



Typical GPSAntenna Elevation Gain Pattern
Left Hand Circular Polarization

Figure 1 GPSAntenna Elevation Gain Pattern

Note: These cables are selected to meet GPS performance requirements. If alternate coaxial cable type and lengths are required, use care in selecting appropriate cable replacement. NovAtel only guarantees operation with NovAtel-supplied cables.

GPSAntenna Specifications

Electrical

Center Frequency	1575.42 MHz
Bandwidth	10 MHz (-1 dB)
Gain Pattern	> 0 dBic to 75˚ from vertical
	> -3 dBic to 85˚ from vertical
	< -10 dBic 120˚ from vertical
Polarization	Right hand circular at all angles above the horizon
Axial Ratio	< 1 dB
LHC Multipath Rejection	> 10 dB
Phase Center Stability	< 10˚ RMS (5 mm) above 15˚ elevation

Physical

Size	114 mm diameter x 58.6 mm height
Weight	300 grams
Mounting	Tripod 5/8 inch Coarse Thread
	Four screws #6-32

Environmental

Operating Temperature	-40˚C to +85˚C (-40˚F to +185˚F)
Storage Temperature	-50˚C to +95˚C (-58˚F to +203˚F)
Operating Humidity	100%
Altitude	5,000 meters

Low Noise Amplifier

Power	99 mW
	(4.5 ± 0.5Vdc @ 22 mA max)
Gain	23 dB
Noise Figure	3.0 dB typical (3.6 dB maximum)
Interference Rejection	>15 dB for f > 1715 MHz
	f < 1435 MHz

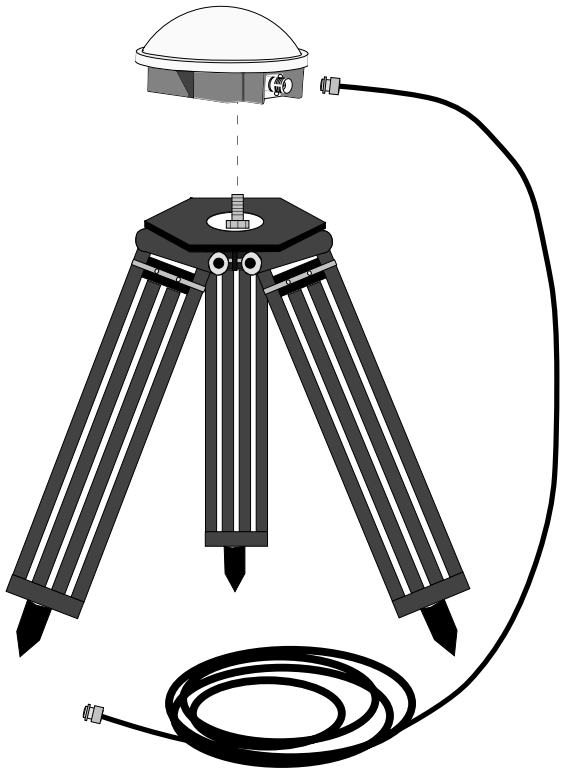


Figure 4 Antenna/Tripod Mounting

Non-Standard Platform Mounting

In some cases it will be necessary to custom fabricate your own mounting platform. The base of the GPSAntenna has provisions for four mounting screws (#6-32 UNC) for mounting onto a flat surface platform and six screws for mounting onto a ground plane. Refer to the enclosed GPSAntenna template for exact screw hole locations. The template is drawn on a 1:1 scale.

Antenna Cable

The GPSAntenna has been designed for use with the NovAtel Standard 5–meter coaxial cable. This high quality cable has been selected to meet the GPSAntenna performance requirements. If greater lengths of cable are required for longer installation runs, NovAtel offers 15-meter and 30-meter options.

The Model 501 GPSAntenna has a precise phase center (5 mm RMS), making it ideal for surveying applications. Additionally, its design provides enhanced multipath interference rejection.

The active GPSAntenna consists of an L1 frequency antenna element integrated with an internal interference rejection filter and Low Noise Amplifier (LNA). The element is enclosed within a radome with an attached mounting base. A single TNC connector carries both the GPS signal to the receiver and the 4.5 volt power to the LNA.

The GPSAntenna is 11.4 cm in diameter and 5.9 cm high, and weighs only 300 grams. Several mounting options are provided for installing the antenna. These features minimize the work required for antenna installation. Figure 2 shows the physical appearance of the GPSAntenna Model 501.

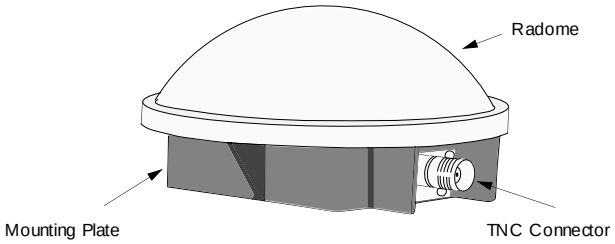


Figure 2 GPSAntenna Model 501

Antenna Assembly

The antenna assembly is environmentally protected within the radome and the mounting plate. The only external connection is the TNC connector which links the antenna assembly to the GPSCard™. The GPSAntenna assembly consists of the following major components:

- Radiator Element
- LNA Assembly
- Mounting Plate
- Radome

Radiator Element

The Radiator Element is a unique metalized molded part with enhanced performance relative to typical microstrip antennas. Excellent polarization characteristics are obtained at all angles of incidence due to its unique shape. This allows tracking of satellites to near the horizon while rejecting the cross polarized signals from unwanted reflections.

LNA Assembly

The LNA board inside the antenna assembly filters the received signals from the antenna, thereby rejecting any chance of interference degrading the GPS signals. A Low Noise Amplifier section providing a gain of 23 dB and a noise figure of 3.0 dB follows. An RF cable connects this amplified signal to the TNC connector for the external connection to the receiver board. This connector is sealed against the side to the mounting plate with an environmental gasket. The connector feeds the GPS signals to the GPS Receiver while accepting 4.5 Vdc to power the LNA circuitry.

Mounting Plate

The mounting plate provides:

- A platform to attach the radiator element and the LNA board
- A mount for the TNC connector
- With the radome, provides environmental protection for the internal circuits
- A 5/8" coarse threaded hole in the base for a tripod mount
- Holes threaded for #6-32 screws for alternative mounting

The antenna can be mounted on a common surveying tripod using the 5/8" tripod threaded hole. Four extra mounting holes threaded for #6-32 screws are provided under the mounting plate for alternative mounting configurations. Another set of six threaded holes for #6-32 screws is provided directly under the antenna to allow mounting of large ground planes for additional multipath rejection.

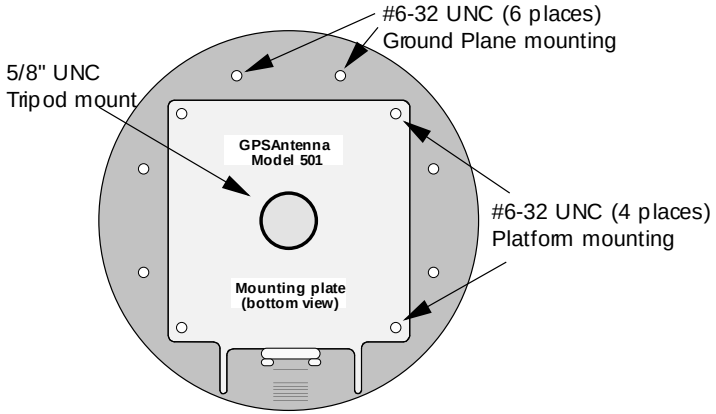


Figure 3 GPSAntenna Base

Radome

The radome is attached to the mounting plate and protects the radiator from performance degradation in outside environments. The low loss material ensures that the received signals are not attenuated.

Installation

Selecting a site

For best reception, choose an antenna location that has a clear view of the sky down to the horizon in all directions. This will ensure that all satellites in view can be tracked without obstruction. In some cases it may be required to mount the antenna on an elevated structure to ensure unobstructed reception.

It is important to note that large structures near the antenna may block reception of satellite signals, and metallic structures could cause multipath reception.

NovAtel's GPSAntenna is designed to minimize the effects of multipath reception. However, if additional multipath reduction is required, the GPSAntenna can be mounted onto a flat ground plane or the optional GPSAntenna Choke Ring ground plane.

Tripod Mounting

Refer to Figure 4 for mounting onto a standard surveyor's tripod. Ensure that the tripod platform is level before mounting the GPSAntenna. It may be necessary to secure the tripod legs to weights if you are surveying in a windy environment or if it will be left standing for an extended period of time.

- Connect the coaxial cable TNC-male connector to the GPSAntenna
  TNC-female connector; screw on finger-tight.
- Set the GPSAntenna onto the tripod platform.
- Secure the GPSAntenna to the platform with the standard 5/8" mounting bolt.