Model AS0099200 GNSS Active Timing Antenna

The Arbiter Systems®, Inc. Model AS0099200 GNSS Active Antenna is intended for precision timing and navigation applications. It is designed for nominal 5-volt systems and contains internal voltage regulation, providing consistent performance over an input voltage range from 3.4 Vdc to 5.5 Vdc. This exclusive feature ensures that performance does not degrade with long antenna cables as can happen with other antennas due to the dc resistance of the antenna cable causing a drop in power supply voltage. While not optimized for 3-volt operation, the Model AS0099200 antenna will operate with dc power down to 2.75 Vdc, delivering acceptable performance with all GNSS engines.

The Active Antenna is designed for long life in challenging environments. The radome is molded of ASA resin for excellent weatherability. Weather-resistant EPDM O-ring seals are standard. A plated and threaded metal coupling nut provides outstanding corrosion resistance and accepts both 1 in - 14 marine mount and 0.75 in NPT pipe thread. Exposed assembly screws are stainless steel. A separate mounting bracket kit is also offered (p/n AS0044600).

The Model AS0099200 features a built-in LED with weatherproof light pipe to indicate when the antenna is receiving power. This helps simplify installation and commissioning by signalling that the antenna is correctly connected to the GNSS receiver.

This antenna has exceptional rejection of interfering signals, low noise figure, and high gain. With a specified temperature range down to - 55 °C, the Active Antenna is usable in almost any location worldwide.

A separate in-line preamplifier (p/n AS0044700) provides 21 dB of gain for applications that require longer antenna cable runs, up to 315 m (1033 ft).

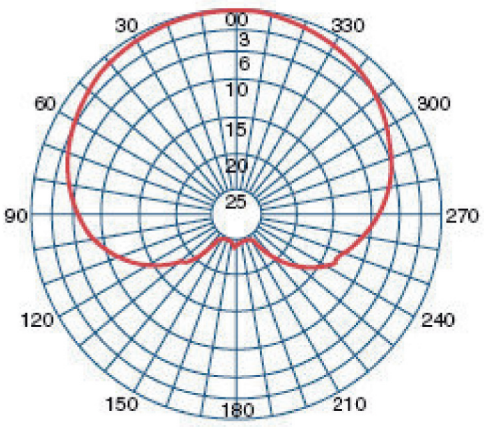
Both active antenna and in-line preamplifier are compatible with existing and proposed L1-band Global Navigation Satellite Systems (GNSS), including GPS, GLONASS, and Galileo; and L1-band Satellite Based Augmentation Systems (SBAS) such as WAAS, EGNOS, and MSAS.

Model AS0099200 GNSS Antenna

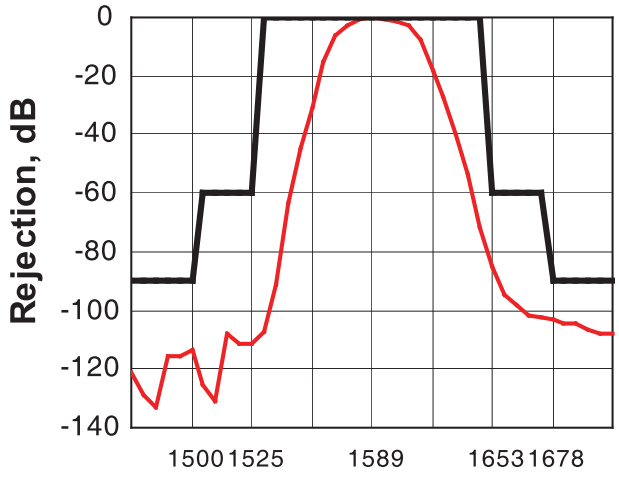
Status LED and Sealed Connector

AS0099200 Specifications

Center Frequency	1589 MHz nominal (GNSS L1 band)
Gain	LNA: + 38 dB at 1575 MHz, nominal Antenna element: + 5 dBi (at zenith); - 1 dBi (10 ° elevation) Total, including antenna element: + 43 dBi (at zenith)
Input Impedance	50 Ω; compatible with 75 Ω cable
Polarization	Right-hand circular (RHCP)
Out of Band Rejection	> 60 dB, for f < 1525 MHz and f > 1653 MHz > 90 dB, for f < 1500 MHz and f > 1678 MHz
Noise Figure	LNA: 2.7 dB typical at 1575 MHz Overall including antenna element: 1.0 dB typical (at zenith)
Bandwidth	Compatible with GPS L1 C/A signal and proposed 1575 MHz GNSS signals: GPS L1C, Galileo L1F, GLONASS L1OC Also compatible with L1 SBAS signals
Group Delay	47 ns, typical
Output 3rd Order Intercept	+ 7 dBm, typical, 1575 MHz + 1576 MHz two-tone test
Output 1 dB Compression	+ 1 dBm, typical
Power Requirement	3.4 Vdc to 5.5 Vdc, 29 mA nominal; internally regulated Operational to 2.75 Vdc
Status Indicator	Bi-Color LED: Green (normal); Orange (power < 3.3 Vdc)
Temperature	- 55 °C to + 65 °C, operating
Connector	Type F coaxial receptacle, environmentally sealed
Enclosure	ASA Thermoplastic with EPDM O-ring seals; meets IP68 of ANSI/EN IEC 60529 and NEMA Types 4X and 6P (when mated to sealed type F connector)
EMS (pending)	IEC 61000-4-2 ESD; 8 kV contact, 15 kV air discharge IEC 61000-4-5 1.2/50 µs Lightning Surge; 4 kV/1 kA
Mounting	Metal coupling nut for 1 inch - 14 marine mount and 0.75 inch NPT thread Nut: 1.25 inch hex, corrosion-resistant plating Separate mounting bracket also available (AS0044600) Mounting hardware is grounded to connector and LNA
Dimensions	80 mm hex (across flats) x 84 mm tall, including connector (3.2 in x 3.3 in)



Antenna Directivity Pattern (Vertical)



Frequency, MHz

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Typical Cable Length Configurations

For dc power input of 4.5 Vdc minimum, at receiver end of cable (5 Vdc with inline preamplifier)

15 m - 100 m (50 ft to 328 ft) [1]	No in-line preamplifier; Size 6 cable [2]
90 m - 195 m (300 ft to 640 ft) [1]	No in-line preamplifier; Size 11 cable [3]
100 m - 175 m (328 ft to 574 ft) [1]	One in-line preamplifier; Size 6 cable [2,4]
195 m - 315 m (640 ft to 1033 ft) [1]	One in-line preamplifier; Size 11 cable [3,5]

Conversions are approximate, based on 30 m = 100 ft.

[1]Maximum cable length limited by attenuation.

[2]Times Fiber T6T77 or equivalent – total dc resistance 118 ohm/km, attenuation 270 dB/km maximum.

[3]Times Fiber T11T60 or equivalent – total dc resistance 55 ohm/km, attenuation 179 dB/km maximum.

[4]In-line preamplifier is ideally located at 100 m (328 ft) from GNSS clock.

[5]In-line preamplifier is ideally located at 120 m (400 ft) from GNSS clock.

Delay Calculation

For precise timing applications, the delay of the antenna system must be taken into account when configuring the receiver. This delay consists of two components: (a) the delay of the antenna cable(s); and (b) the delay of the LNA in the active antenna. The cable delay T_C can be found from:

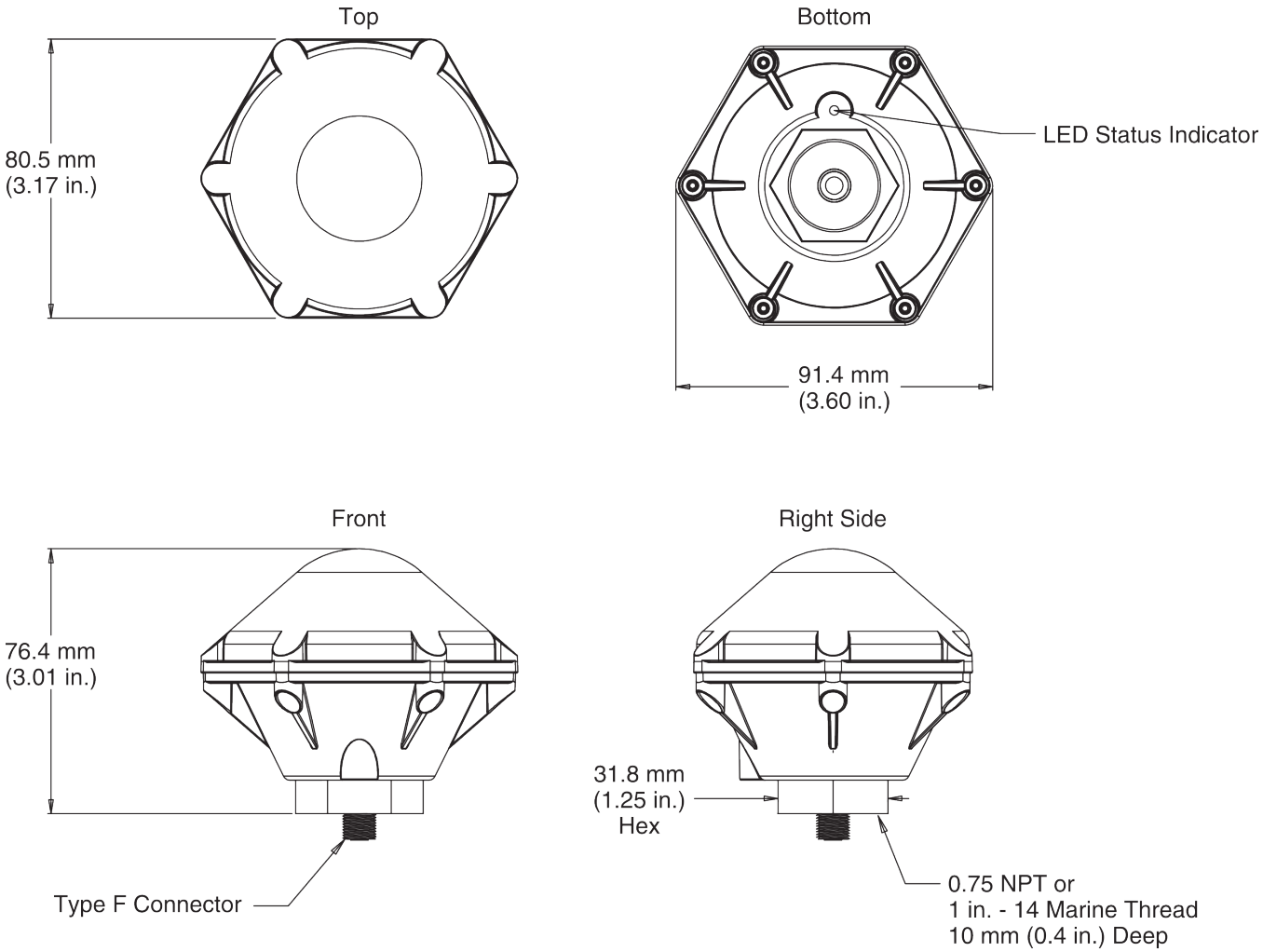
$$T_c = \frac{L}{cv}$$

Where L is the cable length in meters; c is the speed of light (3.0 x 10^8 m/s); and v is the velocity factor of the cable expressed as a number less than 1. For example, v is 85 % or 0.85 for the cables listed above. You must determine the correct value for v for the cable you are using from the cable documentation. For the cables shown above, cable delay is 3.92 ns/m. For example, for L = 30 m, T_C = 118 ns.

This value is added to the measured group delay of the active antenna LNA, which is largely a function of the bandpass filters in the LNA. Generally, the greater the rejection of the bandpass filters, the greater the delay. (Most active antennas do not provide this delay, which leads to an uncompensated error in timing performance.) The resulting total delay value must be entered into the receiver for the most accurate timing performance. For this example: 118 ns cable delay + 47 ns antenna delay = 161 ns. Enter this number as “Antenna Delay” in the GNSS clock.

For navigation or frequency-control applications, time offsets due to the fixed delay of the antenna system are of no consequence, so this delay may safely be ignored. (For timing applications having lower performance requirements, you may also be able to ignore this delay.)

Outline Drawings with Dimensions and Mounting Details:



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