

## SPECTRACOM GPS ANTENNA CONSIDERATIONS

Spectracom offers a reliable outdoor GPS antenna and a convenient indoor, window-mount GPS antenna for its GPS-based products. We also offer an in-line preamplifier (to extend the cable length between the antenna and the device) and a variety of accessories that will help you get the most from your installation.

A GPS splitter is available to eliminate the need and expense for a second antenna/cable run when two synchronization systems are desired. Spectracom also offers a surge protector to help protect the receiver and connected devices from lightning damage.

The recommended antenna is the Model 8225, which is an active GPS outdoor antenna tuned to receive 1575.42 MHz L1 band satellite transmissions. The received signals are passed through a narrow band-pass filter and a preamplifier within the antenna. The active antenna circuitry provides 30 dB of gain and requires +5 VDC at 27 milliamps (provided by a Spectracom GPS receiver over the antenna coax).

Each Spectracom antenna is terminated with a type “N” female connector. Two models are available. The Model 8225 features a weatherproof, compact design measuring 3.5 inches in diameter. The Model 8228 window-mount antenna features an “L” bracket and mounting tape for ease of installation.

### ANTENNA LOCATION

The GPS antenna must have an unobstructed line of sight to the sky. Rooftops that are clear of other structures or geographic features overhead, with views to the horizon, generally make good installation locations. Such a clear view allows the antenna to track the maximum number of satellites throughout the day. Installations with obstructed views may experience reduced reception quality may not be able to track simultaneously the maximum number of satellites.

When installing your GPS antenna, select a site at which the antenna will not become buried in drifting or accumulated snow. It should not be covered by foliage or placed in a position where it could become obstructed in this way. Whenever possible, avoid placing the GPS antenna in close proximity to broadcast antennas.

The Model 8225 includes a PVC mast and two hose clamps that can be used to attach the mast assembly to a stanchion on the roof. Spectracom also offers a weighted flat-roof mount stand (Model 8213) that can be used to hold the antenna.

**NOTE:** The antenna should not be installed near television and FM radio transmitters. Certain frequencies are harmonics of the GPS signal and can inhibit reception. The next page of this document includes a table of the frequencies that can interfere with GPS reception (in order of magnitude, from most to least significant affect on GPS).

TV CHANNEL	RADIO FREQUENCY (MHz)
66	104.8 - 105.2
23	98.3 - 98.7
10	92.5 - 92.9
6	87.3 - 87.7
5	

**Table 1. GPS Signal Harmonics**

The Model 8228 window-mount antenna should not be installed in windows that contain metallic tinting or screening on or inside the glass. Metallic tinting and screening can attenuate the GPS signal to unusable levels. Spectracom highly recommends using a hand-held GPS receiver to confirm GPS reception capabilities inside your facility prior to the purchase of a Model 8228 window-mount antenna.

**NOTE:** The Model 8228 window-mount antenna is not recommended for use with NetClock Options 04 (Rubidium oscillator) and 05 (OCXO oscillator). A NetClock with one of these oscillators installed must track at least four satellites continuously to maintain synchronization. A window-mount antenna rarely provides tracking of at least four satellites without interruption.

The Spectracom NetClock may be purchased (or equipped after purchase) with an optional modem (Option 03). This modem allows the NetClock to synchronize using a telephone line instead of the GPS signal. This is useful if one or more of the following conditions exist:

- The distance between the GPS antenna and the GPS receiver is greater than 700 feet.
- The roof of the facility is not accessible.
- The GPS antenna will be located near one of the few television or FM radio stations whose signals are harmonics of GPS.

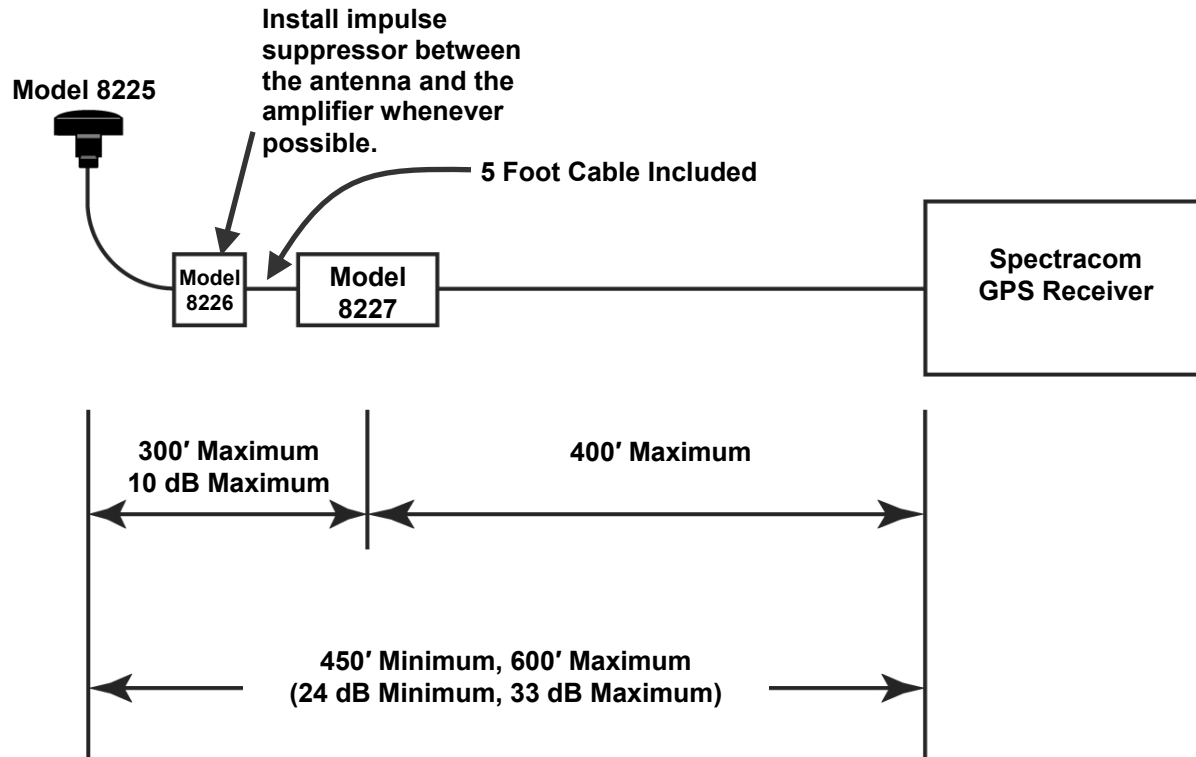
#### **ANTENNA CABLE AND ACCESSORIES**

Spectracom recommends low-loss coaxial cable such as Times Microwave LMR-400 for the GPS antenna cable.

The attenuation characteristics of the LMR-400 or equivalent at the L1 frequency (1575.42 MHz) limit the antenna cable length to a maximum of 300 feet (350 feet for Spectracom Model 8100 series products).

Spectracom offers standard and plenum-rated GPS cable assemblies terminated with weatherproof, male, type N connectors already installed.

The Model 8228 includes a 50 foot antenna cable to run between the antenna and the GPS receiver. Spectracom recommends the distance between the antenna and GPS receiver be no greater than 50 feet.



<sup>1</sup>Minimum cable required for Models 8183, 8183ES, and 8189.

**Figure 1. Antenna Installation Diagram**

Specify part number CAL7xxx for standard and CALP7xxx for plenum-rated cables, where xxx equals the length in feet. Contact Spectracom for standard antenna cable lengths.

Do not allow either cable to be placed in standing water, as water may permeate the coax jacket over time.

On flat roof installations, the coax can be suspended by cable hangers or placed in sealed PVC conduit. Apply a weather-proofing sealant or tape over all outdoor connections.

Spectracom offers an inline Preamplifier, Model 8227, for use with installations in which the antenna cable length exceeds 300 feet.

The receiver powers the GPS antenna and the inline Preamplifier (if installed). The Preamplifier permits an additional 400 feet of coax cable length, extending the antenna-to-receiver distance to 700 feet.

Spectracom recommends the installation of a lightning protection device in the antenna line to protect the receiver and connected devices. We offer a surge suppressor, Model 8226, to shunt potentially damaging voltages on the antenna coax to ground. We also offer a grounding kit (P/N 8226-0002-0600) that consists of a copper grounding plate, mounting hardware, 20 feet of copper strap, 10 feet of ground wire, and ground clamps.

When the installation of a Model 8226 surge suppressor is desired and the approximate installation location of the Model 8226 is known, *Spectracom highly recommends purchasing two lengths of GPS*

*cable* (one for the antenna to the surge suppressor and one for the surge suppressor to the receiver) rather than using a single length of cable to span the distance from the antenna to the GPS receiver.

Two field installable “N” type connectors are included with the Models 8226 and 8227, allowing the cable to be cut in order to install either unit. *Cutting the cable is not recommended unless absolutely necessary.* If the connectors are not properly installed, they could fail latently, causing a loss of GPS reception.

### **MODEL 8225 ANTENNA SPECIFICATIONS**

#### Electrical Specifications

Type:	Active
Frequency:	1575.42 MHz
Temperature Range:	-30° to 80° C (-22° to 176°F)
Gain:	30 dB
Connector:	N type, female
Recommended Cable:	LMR-400 equivalent
Maximum Cable Length:	300 feet; longer cable lengths require Model 8227 Preamplifier
Power:	5 Volts, 27 milliamps, powered by receiver

#### Mechanical Specifications

Assembled Length:	24 inches (60 cm)
Housing Diameter:	3.5 inches (8.9 cm)
Housing Material:	PVC
Assembled Weight:	1.3 lbs. (.60 kg)
Shipping Weight:	3.5 lbs. (1.6 kg)
Mounting:	Hose clamps (furnished) on vent pipe

### **MODEL 8228 ANTENNA SPECIFICATIONS**

#### Electrical Specifications

Type:	Active
Frequency:	1575.42 MHz
Temperature Range:	-40° to 212°F (-40° to 100°C)
Gain:	28 dB
Connector:	SMA, male
Cable length:	50 feet (15 meters)
Power:	5 Volts, 20 milliamps, powered by receiver

#### Mechanical Specifications

Dimensions:	2.0L x 1.7W x .7H inches (50L x 43W x 18H mm)
Weight:	1.4 oz. (40 grams), less cable
Mounting:	Window bracket is secured using double-sided adhesive foam tape

### **RUNNING A GPS CABLE THROUGH A CONDUIT**

GPS antenna cabling can be installed through a conduit as desired (either by itself or with other cables in the same conduit). The conduit dimensions must be large enough to accommodate the “N” type connectors, which are approximately 0.8 inches across, and the GPS cable itself, which is about 0.4 inches across. Using a conduit that is too small or whose bend radius is too tight will prove difficult during installation (and may actually damage the cable). The minimum bend radius of the antenna cable is 1 inch.