



Installation Manual



Slingshot™ Base Station

Disclaimer

While every effort has been made to ensure the accuracy of this document, Raven Industries assumes no responsibility for omissions and errors. Nor is any liability assumed for damages resulting from the use of information contained herein.

Raven Industries shall not be held responsible or liable for the effects of atmospheric conditions and sunspot activity on the performance of our products. Raven Industries cannot guarantee the accuracy, integrity, continuity, or availability of the GNSS signal from the U.S. Department of Defense/NAVSTAR GNSS satellites, the OmniSTAR correction service, or the WAAS correction service. Raven Industries accepts no responsibility for the use of the signal for other than the stated purpose.

Raven Industries cannot guarantee the availability, integrity, or continuity of cellular or wireless signals from any wireless or cellular service provider. Raven Industries accepts no responsibility for the use of cellular service for other than the stated purpose.

Raven Industries shall not be responsible or liable for incidental or consequential damages or a loss of anticipated benefits or profits, work stoppage or loss, or impairment of data arising out of the use, or inability to use, this system or any of its components.

Chapter 1	<i>Important Safety Information</i>	1
	FCC Statement:	1
Chapter 2	<i>Introduction & Preparation</i>	3
	Introduction	3
	Base Station Preparation	4
	Antenna Installation	4
	Base Station Antenna Mounting	5
	Care & Maintenance	6
Chapter 3	<i>Base Station Installation & Start Up</i>	7
	Installation & Start Up	7
	Surveying the Base Station Location	9

CHAPTER

1

Important Safety Information

NOTICE

Read this manual and the safety information provided within before installing the Slingshot™ base station.

- Follow all safety information presented within this manual.
- Be sure to review local building codes prior to erecting or modifying any structure for mounting the base station antenna. Contact a professional electrician for more information.
- If you require assistance with any portion of the installation, contact the Raven Industries, Applied Technology Division for support.

FCC Statement:

This device complies with Part 15 of FCC rules. Operation of this device is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment generates, uses and may radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio or television technician for help

WARNING

- Only personnel qualified to work on raised platforms or trained to use fall protection equipment should install or perform maintenance on the base station antenna.
- Be sure to follow all safety guidelines when working on raised platforms or elevation. Contact a qualified training facility for additional information.

CAUTION

- Raven Industries does not supply lightning arresting equipment. Refer to local building and electrical codes and contact a professional electrician for more information regarding lightning arresting equipment.
- Make sure the entry point into any building or structure is properly sealed to prevent moisture from migrating into the building and causing damage to the Slingshot™ base station or other property.
- Ensure that the power cable is the last cable to be connected.

CHAPTER

2

Introduction & Preparation

Introduction

The Slingshot™ base station is designed to provide subscribed field hubs with RTK level GNSS corrections via a cellular service provider. Correction information is sent from the Slingshot base station to the Raven Slingshot server and back to a field hub to supply the guidance correction information to the guidance device.

Use this guide to:

- Prepare the base station installation site.
- Mount the Slingshot base station antenna.
- Route the antenna cable.

Note: *Follow the instructions provided in the Base Station Preparation section on page 4 and mount the base station antenna before installing the Raven Slingshot base station.*

Base Station Preparation

The following items are required before the Raven Slingshot™ base station may be set up:

- A dedicated, broadband internet connection (DSL, cable, etc.) with a public IP address and DHCP support.
- A dry, temperature controlled environment suitable for computer equipment with a connection to a dedicated internet line and adequate power receptacles.
- An uninterruptible power supply (UPS) installed per instructions provided with the device.
- A location within reach of the base station antenna mounting location and cable (maximum cable length 200' [60 m]).

To ensure the most efficient installation, complete the following items prior to receiving the Raven Slingshot base station:

1. Contact your internet service provider to have a dedicated, broadband internet connection installed. The internet connection must be always on and available via an unblocked, public IP address. **Dial up connections are not supported.**
2. Set up the provided uninterruptible power supply UPS as described in the instruction sheet provided with the device. The UPS should be set up in the location where the base station will be located when set up.
3. Complete the procedure outlined in *Antenna Installation* section on page 4. Route the antenna cable to the location of the Slingshot base station. Raven recommends contacting a qualified electrician to route the cable into the building.

Antenna Installation

Before mounting the Slingshot base station antenna, select a site which meets the following conditions to ensure optimal performance:

- Ensure the antenna location provides a clear, 360° view of the sky.
- Antenna should be mounted as far from reflective objects (i.e. metal buildings, water bodies) as possible and should be higher than surrounding obstructions (i.e. tree lines, power lines, etc.).
- If obstructions or reflective surfaces are within 100' (30m), mount the Slingshot base station as high as possible to minimize interference and/or multipath reflections. If no obstructions or reflective surfaces are within this range, mount the antenna as low as possible.
- Use a sturdy mounting bracket with a 5/8" -11 NC thread. The thread must be between 3/8" to 7/8" long to ensure proper mounting and avoid damage to the antenna casing. If the thread length is longer than 7/8" (22mm), use two jam nuts to shorten the exposed thread.

FIGURE 1. Example Antenna Mounting with Jam Nuts



- The antenna mount should provide a solid base for the antenna and should not allow the antenna to move in any direction.
- Mount the antenna with the thread adapter and TNC cable connector facing toward the ground.
- Make sure the entry point into any building or structure is properly sealed to prevent moisture from migrating into the building and causing damage to the Slingshot™ base station or other property. Use a drip loop to keep moisture away from the entry point.

FIGURE 2. Drip Loop Example



- To prevent damaging the antenna cable, do not route cables through potential crimp points such as doors or windows. Avoid severe bends in the cable as this may also cause damage to the cable.

TABLE 1. LMR 400 Antenna Cable Bending Specifications

Specification	Units
Bend Radius (Installation)	1.0 in [25.4 mm]
Bend Radius (Repeated)	4.0 in [101.6 mm]
Bending Moment	0.5 ft.-lb. [0.68 N-m]

Base Station Antenna Mounting

To install the Slingshot base station antenna:

1. Verify that the thread on the antenna mount does not extend more than 7/8" (22 mm) to ensure the plastic inside the antenna receptacle is not damaged when the mount is inserted. If the thread length is longer than 7/8" (22 mm), use two jam nuts to shorten the exposed thread.
2. Thread the metal adapter on the bottom of the antenna onto the mount.

Note: The metal adapter is fixed to the antenna body. Do not attempt to remove this piece.

3. Using a wrench, tighten the antenna adapter to the mount to secure the base station antenna.
4. Remove the dust cap from the TNC connector on the antenna.

5. Attach one end of the provided base station antenna cable to the antenna and route to the selected base station location.

Note: *If the antenna will be mounted on a tower structure, be sure to leave enough slack in the antenna cable to allow for expansion and contraction of the structure to avoid damaging the cable. Raven recommends contacting a certified electrician to assist with cable installation and routing.*

If the antenna cable will be routed into a building, be sure to use a drip loop to prevent moisture from entering the building by wicking along the cable. Also be sure to seal any building penetrations properly to prevent moisture and condensation.

Care & Maintenance

The base station antenna is designed to withstand the elements, including rain, snow, and dust. To ensure that the antenna continues to perform as desired, keep the radome (top surface of the antenna) clear of snow and ice and clear any debris as necessary.

Ensure that the TNC antenna cable connector remains clean and dry. If the cable will be disconnected from the antenna for any length of time, replace the dust cap on the antenna.

CHAPTER

3

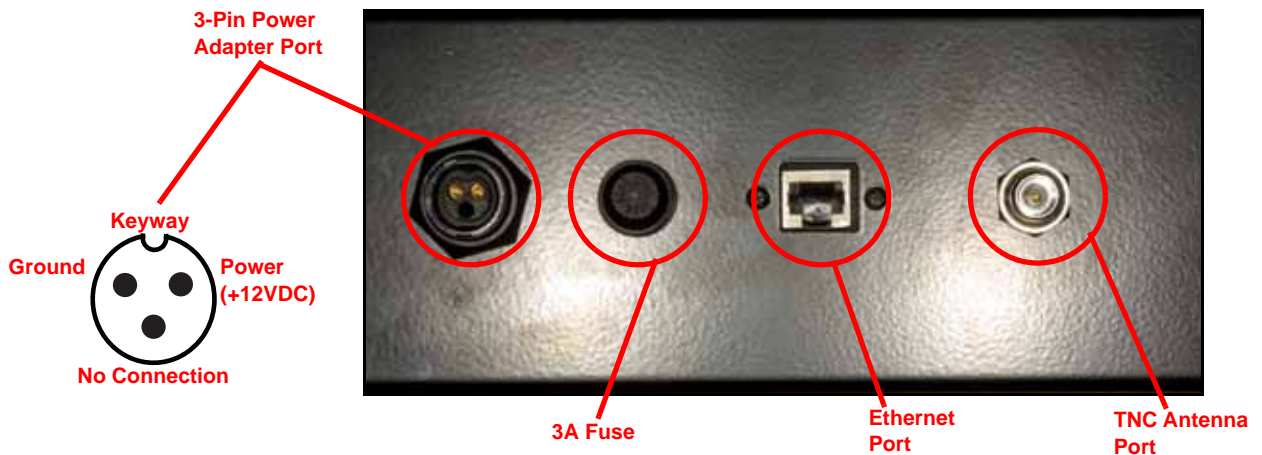
Base Station Installation & Start Up

A Raven Precision Agriculture Specialist (PAS) assigned to your area will contact you to coordinate installation and set up of the Slingshot™ base station.

Note: Be sure that all required items outlined in Chapter 2, Introduction & Preparation, have been completed prior to installing the base station.

Installation & Start Up

FIGURE 1. Base Station Connectors



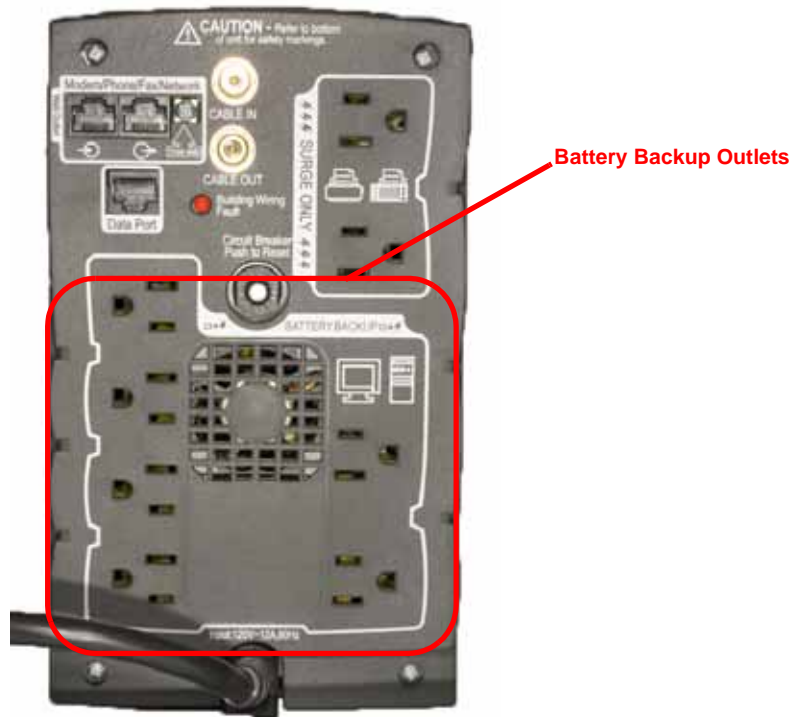
1. Setup the Slingshot base station unit in the determined location.

Note: The base station tray is compatible with a 2U 19" server rack for optional mounting.

2. Connect the antenna cable routed from the base station antenna to the TNC connector on the base station.
3. Connect the ethernet cable from the dedicated internet connection to the ethernet port on the base station.
4. Connect the three pin connector on the power adapter cable to the three pin power plug on the base station.

5. Route the power adapter cable to one of the battery backup plugs on the UPS.

FIGURE 2. UPS Battery Backup Outlets



6. Press the power button on the Slingshot™ base station to power up the unit.

FIGURE 3. Slingshot Base Station Modem Power Button



As soon as the Slingshot base station is powered up and receiving GNSS, the base station will begin convergence to determine the base station location. This process may take up to 15 minutes. Once complete, the base station is pre-programmed to begin communicating with the Raven Slingshot server and will begin broadcasting corrections for use by rover units within the coverage area.

7. After the first fifteen minutes, the "AUX" and "COM2" LED indicators should blink once per second if corrections are being sent to the Raven Slingshot server.
8. Test the UPS by unplugging the power cord from the wall outlet. Verify that power to the Slingshot base station is not interrupted and the battery backup is functioning properly.

Surveying the Base Station Location

After the initial installation and convergence, the Slingshot™ base station will continue to broadcast corrections to the Slingshot server in a demonstration mode. This mode is adequate for conducting client demonstrations of the Slingshot system and will provide RTK level corrections to any subscribers so clients may begin using RTK guidance from the Slingshot base station immediately.

To provide the best possible corrections over time, the Slingshot base station position should be surveyed and transitioned to a fixed operation mode. The Raven Network Operations Center will assist with this transition to process the base station location, fix the position and permanently program the location into the base station.

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Limited Warranty

What Does this Warranty Cover?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Product under normal use, maintenance, and service.

How Long is the Coverage Period?

Raven Applied Technology Division products are covered by this warranty for 24 months after the date of purchase. This warranty coverage applies only to the original owner and is non-transferrable.

How Can I Get Service?

Bring the defective part and proof of purchase to your Raven Dealer. If your Dealer agrees with the warranty claim, the Dealer will send the part and proof of purchase to their distributor or to Raven Industries for final approval.

What Will Raven Industries Do?

Upon confirmation of the warranty claim, Raven Industries will, at our discretion, repair or replace the defective part and pay for return freight.

What is not Covered by this Warranty?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit or other special damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty

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Installation Guide
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