500S™ Smart Antenna Installation and Operation Manual

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DESCRIPTION

Raven's all new 500S™ is designed to excel in challenging environments and is ideal for various applications and aggressive user scenarios.

The 500S™ is a multi-GNSS, high accuracy receiver that offers quick startup and reacquisition times.

FIGURE 1. 500S™ Antenna

NOTE: Throughout the rest of this manual the 500S™ Smart Antenna is simply referred to as 500S™.

KEY FEATURES

Key features of the 500S™ include:

- Wide open operating voltage range of 7-32 VDC, providing high transient protection for any power source.
- Ability to track SBAS solutions including WAAS and EGNOS.
- Ability to track GLONASS satellite constellation.

FEEDBACK

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual. Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better. To serve you best, please send an email with the following information to

techwriting@ravenind.com

-500S™ Smart Antenna Installation Guide
-Manual No. 016-0171-668 Rev. A
-Any comments or feedback (include chapter or page numbers if applicable).
-Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

500S™ INSTALLATION

DISPLAY, MOUNTING, AND CONNECTIONS

ADAPTER INSTALLATION

All connections and ports are located on the bottom of the unit (as shown below).
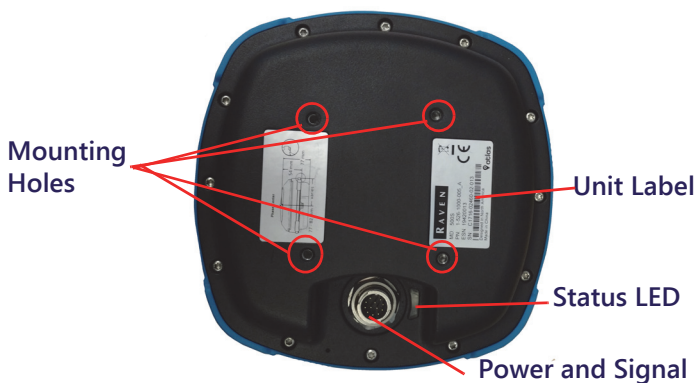
FIGURE 2. Bottom of 500S™

Mounting Holes

Unit Label

Status LED

Power and Signal

TABLE 1. Adapter Information

Port/Connection	Description
Mounting Holes	Four off-set mounting holes. Two adapters are shipped with the antenna as a single mounting kit. The first adapter includes a marine 1" standard, adaptable to 5/8" for use with magnetic mount.

STATUS LED

The 500S™ uses a single LED (see Figure 2 on page 3) that provides system information based on the LED color and status.

TABLE 2. Status LED

Color	Status
Blinking Red	The power is on
Blinking Amber	GNSS position is available
Blinking Any Color	The receiver is operational
Solid Color for Extended Period	The receiver has malfunctioned

500S™ MOUNTING

This section provides information on 500S™ antenna mounting locations and options.

SELECTING THE PROPER ANTENNA LOCATION

Proper antenna placement is critical to positioning accuracy.

To select the proper antenna location:

- Place the antenna with an unobstructed view of the sky. An obstructed view of the sky may impair system performance.
    - The GNSS engine computes a position based on measurement from each satellite to the internal GSS receiver.
- Mount the antenna on or close to the center of your point of measurement.
    - Ideal antenna placement on a vehicle is the center of the cab roof assuming there is a clear view of the sky.
- If possible, keep other antennas at least 91 cm (3') away from the 500S™ receiver.
- Position the antenna as high as possible.

ROUTING AND SECURING THE CABLES

Consider the following when routing cables:

- Do not run cables in areas of excessive heat.
- Do not expose cables to corrosive chemicals.
- Do not crimp or excessively bend cables.
- Coil up excess cable in the cab of the vehicle.

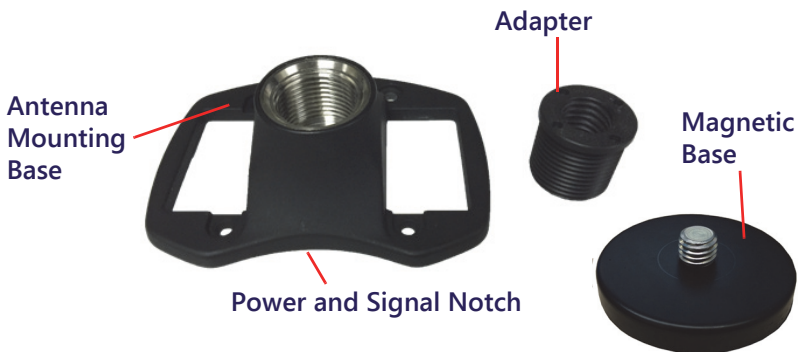**NOTE:**   Keep as large of a bend radius as possible when coiling.

- Secure the cable using plastic tie wraps as necessary.
- Do not run cables near high voltage or strong RF noise and transmitter sources.

MOUNTING OPTIONS

500S™ only allows for the following pole mounting options. To install the antenna:

1. Use the provided screws to secure the antenna mounting base to the antenna. Verify the power and signal notch on the antenna mounting base faces towards the power and signal connection on the bottom of the antenna.
2. Install the adapter in the threaded hole of the antenna mounting base.
3. If needed, secure the magnet mounting base to the roof cap.
4. Thread the adapter pole over the existing survey pole or to the magnet mounting base.

FIGURE 3. Pole Mounting Components

Adapter

Antenna Mounting Base

Magnetic Base

Power and Signal Notch

5. Thread the antenna onto the mounting base antenna until snug.

Warning: Hand-tighten only. Damage resulting from over-tightening is not covered by the warranty.

POWERING ON THE 500S™

POWER CONSIDERATIONS

500S™ accepts an input voltage of 7-32 VDC. For best performance use a clean and continuous power supply. When applying 12 VDC, 500S™ will draw approximately 3.2 W.

CONNECTING TO A POWER SOURCE

500S™ uses a single cable for power and data input/output.

Warning: Do not apply a voltage higher than 32 VDC. This will damage the receiver and void the warranty.

500S™ features reverse polarity protection to prevent excessive damage if the power leads are accidentally reversed. With the application of power the 500S™ automatically proceeds through an internal startup sequence; however, it is ready to communicate immediately.

500S™ OPERATION

Both GNSS and differential correction of 500S™ are preconfigured. The receiver will work out of the box, and for most applications, little to no user setup is necessary. When powered for the first time the 500S™ will perform a "cold start," which involves acquiring the available GNSS satellites in view and the SBAS differential service.

GNSS OPERATION

The GNSS internal receiver is always operating regardless of the mode of operation. The following sections describe the general operation of the internal receiver.

AUTOMATIC TRACKING

The internal GNSS receiver of the 500S™ searches for GNSS satellites, acquires the signals, and manages the navigation information required for positioning and tracking.

RECEIVER PERFORMANCE

The 500S™ works by finding four or more GNSS satellites in the visible sky and uses information from the satellites to compute a position within 2.5 m (98.5"). Since there is some error in the GNSS data calculations, the 500S™ also tracks a differential

correction. The 500S™ uses these corrections to improve position accuracy to better than 0.6 m (24″).

TROUBLESHOOTING

TABLE 3. Troubleshooting

Issue	Possible Solution
Receiver fails to power	• Verify polarity of power leads. • Verify the CR7™ is powered on. • Check integrity of power cable connections. • Check the power input voltage (7 - 32 VDC). • Check current restrictions imposed by power source (maximum is 500 mA at 12 VDC).
No communication data from the 500S™	• Check the receiver power status. • Verify the baud rate settings match. • Check settings on the CR7™ console. If needed, redetect serial devices.
No valid data from the 500S™	• Verify it is tracking four or more GNSS satellites. • Check integrity and connectivity of power and data cable connections. • Verify the baud rate settings match.
Random binary date from 500S™	• Verify the RCTM or the BIN messages are note being accidentally output. • Verify the baud rate settings match. • Potentially, the volume of data requested to be output could be higher than the current baud rate supports. Try using a higher baud rate for communications or decreasing the number of messages and/or baud rates.
No GNSS lock	• Check the integrity of the antenna's power/data cable. • Verify the antenna's view of the sky. • Verify the lock status and signal-to-noise ratio (SNR) of GNSS satellites.
No GNSS position	• Verify the antenna's view of the sky, especially toward GNSS satellites. • Set the satellite selection to automatic mode.

Issue	Possible Solution
500S™ LED not blinking after connection to power	• Check to see if the power supply is functioning properly. • Ensure cable is completely seated and secured to the 500S™ connector.
500S™ LED displays solid color content (not blinking)	• Power-cycle the receiver.

TECHNICAL SPECIFICATIONS

TABLE 4. GNSS Sensor Specifications

Item	Specification
Receiver Type	GNSS L1
Signals received	GNSS and GLONASS
Channels	114
GNSS sensitivity	-142 dBm
SBAS tracking	3-channel, parallel tracking
Update rate	10 Hz standard
Cold start	< 60 s typical (no almanac or RTC)
Warm start	< 30 s typical (almanac and RTC)
Hot start	< 10 s typical (almanac, RTC, and position)
Maximum speed	1,850 kph (1,149 mph)
Maximum altitude	18,288 m (60,000 ft)

TABLE 5. Horizontal Accuracy

Item	Specification	
	RMS (67%)	2DRMS (95%)
SBAS (WAAS)	.3 m (11")	.6 m (23")
Autonomous, no corrections	1.2 m (47")	2.4 m (94")

TABLE 6. Communication Specifications

Item	Specification
Serial	2 full-duplex RS-232
Baud Rates	4800 - 115200
Data I/O protocol	NMEA 0183

TABLE 7. Power Specifications

Item	Specification
Input Voltage	7 - 32 VDC with reverse polarity operation
Power Consumption	< 3.2 W nominal GNSS (L1/L2), GLONASS (L1/L2)
Current Consumption	0.26 nominal GNSS (L1/L2), GLONASS (L1/L2)

Item	Specification
Power Isolation	No
Reverse Polarity Protection	Yes
Antenna Voltage	Internal Antenna

TABLE 8. Environmental Specifications

Item	Specification
Operating Temperature	-40° to +70° (-40° F to +158° F)
Storage Temperature	-40° to +85° (-40° F to +185° F)
Humidity	95% non-condensing
Shock and Vibration	Mechanical Shock: EP455 section 5.14.1
	Operational Vibration: EP455 Section 5.15.1 Random
EMC	CE (ISO 14982 Emissions and Immunity), FCC Part 15, Subpart B, CISPR 22
Enclosure	IP67

TABLE 9. Mechanical Specifications

Item	Specification
Dimensions	15.8 cm L x 15.8 cm W x 7.9 cm H (6.2" L x 6.2" W x 3.2" H)
Weight	< 1.05 kg (<2.30 lbs)
Power/Data Connector	12-pin male
Antenna Mounting	1-14 UNS-2A female, 5/8-11 UNC2B adapter, and surface mount available

LIMITED WARRANTY

WHAT DOES THIS WARRANTY COVER?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

HOW LONG IS THE COVERAGE PERIOD?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

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, labor, or other 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.

EXTENDED WARRANTY

WHAT DOES THIS WARRANTY COVER?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

DO I NEED TO REGISTER MY PRODUCT TO QUALIFY FOR
THE EXTENDED WARRANTY?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

WHERE CAN I REGISTER MY PRODUCT FOR THE EXTENDED WARRANTY?

To register, go online to www.ravenhelp.com and select Product Registration.

HOW LONG IS THE EXTENDED WARRANTY COVERAGE PERIOD?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

WHAT IS NOT COVERED BY THE EXTENDED 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, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. 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.