

**Phoenix 300™ DPGS Receiver with
USB Installation and Operation
Manual**

P/N 016-0171-548 Rev. C 04/15

E23137

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Receiver Overview

Thank you for purchasing the Raven Phoenix 300 DGPS receiver with USB. The Phoenix 300 receiver is designed to provide highly accurate and reliable DGPS navigation and positioning solutions for yield mapping and monitoring, swathing, custom applications, and other precision farming functions while operating in the rugged agricultural environment.

The Phoenix 300 receiver is a sophisticated, dual frequency receiver with superior impulse noise performance while the 120-channel GPS system provides quick and stable satellite acquisition. The Phoenix 300 provides reliable tracking of GNSS signals automatically using various correction services including satellite based augmentation systems (SBAS) and terrestrial radio and cellular network services.

The Phoenix 300 receiver features a front panel display for simple configuration and operation. The Phoenix 300 also features two bidirectional RS-232 serial interface ports to provide GPS data to peripheral devices.

USB Capability

The Phoenix 300 receiver with USB features a USB port on the back of the unit which may be used for updates, feature authorization, and data logging.

Note: *This manual contains information on settings and operation of the Phoenix 300 with USB. Descriptions of operation, features, and settings contained herein may not be applicable to prior Phoenix 300 hardware revisions. Please contact a local Raven dealer for additional questions regarding capabilities or further assistance.*

Updates

Updates for Raven manuals as well as software updates for Raven products are available at the Applied Technology Division web site:

www.ravenhelp.com

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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

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-Phoenix 300 Installation & Operation Manual

-Manual No. 016-0171-548 Rev. C

-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.

Thank you for your time.

Overview of DGPS Systems

While an in-depth study may be required to fully understand Global Positioning Systems, or GPS, a brief description can be useful to understand the operation and limitations of these systems.

GPS is a general term used for satellite-based, global navigation satellite systems (GNSS) operated and maintained by various organizations and government agencies around the world. Originally intended for military purposes, GPS capabilities have been extended to civilian applications and may be used to provide highly accurate position and navigation information.

A GPS system consists of constellation of satellites above the earth's surface. Each satellite continually transmits a coded radio message containing the satellite position and time that the signal is transmitted. A GPS receiver on the ground then receives signals from several satellites, decodes the messages and calculates a position in the longitude and longitude coordinate system.

To calculate the position, the receiver uses an equation based upon the following formula:

$$DISTANCE = RATE \times TIME$$

The equation calculates the time it took for each radio signal to travel from the satellite and reach the GPS antenna. The rate used in this formula is the known velocity of the radio signals transmitted from each GPS satellite. Time is determined using a code matching technique within the GPS receiver.

Sources of Error

Accuracy of a GPS receiver depends upon the ability of the receiver to correctly calculate the time signals from each satellite take to reach the GPS antenna. There are several natural conditions which can introduce error into this calculation and may cause problems when operating any GPS navigation system or receiver.

Four of the primary sources which can introduce errors are:

- Ionospheric and tropospheric delays on the radio signal
- Signal multi-path or reflection
- Receiver clock biases
- Orbital satellite (ephemeris) position errors

GPS is a line-of-sight system which means that a clear path must exist between the satellite and the GPS antenna. Obstructions such as buildings, trees, parts of the vehicle like a fiberglass or metal roof, and human bodies may interfere or completely block signals from the GPS receiver. Moreover, items such as electrical motors, generators, alternators, strobe lights, radio transmitters, microwave dishes, radar, other active antennas, etc., all generate electrical and magnetic fields which can interfere with GPS or L-Band signals.

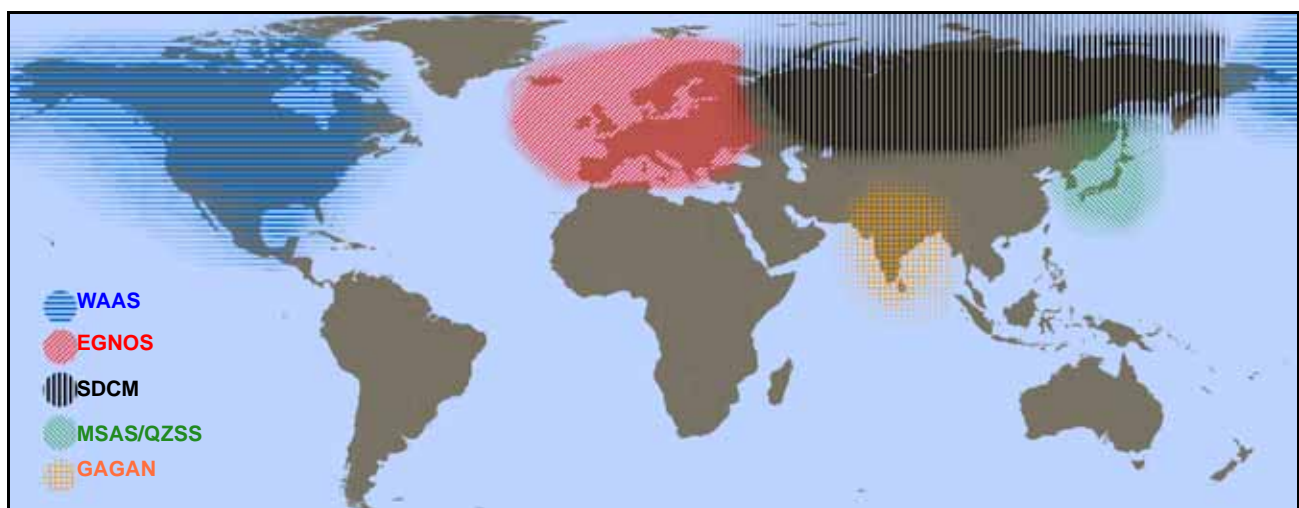
Differential GPS (DGPS) Correction Sources

A correction signal or differential source from a known, stationary location on the surface of the earth may be used to correct for the common sources of error and may also be capable of enhancing the accuracy and precision of a GPS receiver. The following sections offer brief descriptions of the available differential correction sources which may be used with the Phoenix 300 receiver.

SBAS (Satellite Based Augmentation System)

Regional SBAS corrections are differential services administrated by various private and government agencies around the world. Many of these services are available without subscription or cost for agricultural use.

FIGURE 1. Regional SBAS Correction Sources



Note: Using SBAS corrections outside of the coverage areas indicated above can significantly degrade the position solution provided by the Phoenix 300 receiver.

The Phoenix 300 is compatible with the following SBAS differential correction services:

WAAS (Wide Angle Augmentation System). A correction service primarily covering the United States and available, without subscription, for agricultural use. WAAS corrections may also be used in some areas of Canada and Mexico.

More information is available at the Federal Aviation Administration (FAA) web site:

www.faa.gov

EGNOS (European Geostationary Navigation Overlay Service). Correction services which use the GPS satellite network developed by the U.S. and augmented to provide differential corrections within European countries.

More information is available at the European Space Agency (ESA) web site:

www.esa.int

SDCM (System for Differential Corrections and Monitoring). SDCM is an SBAS which utilizes both the GPS and GLONASS satellite constellations for positioning data developed by the Russian government.

More information may be found at the Russian system of differential correction and monitoring web site:

www.sdc.ru/

MSAS (Multi-functional Satellite Augmentation System). Service developed for differential corrections in Japan.

QZSS (Quasi-Zenith Satellite System). A system parallel with the MSAS services in Japan.

More information available at the QZSS web site:

www.qzs.jp

GAGAN (GPS Aided Geo Augmented Navigation). Regional SBAS system available for use in India.

More information available at the European Space Agency (ESA) web site:

www.esa.int

NovAtel GLIDE

The NovAtel GLIDE feature can be used either in conjunction with a SBAS correction signal as a position smoothing feature or as an autonomous correction source for areas with limited SBAS coverage. Both options are available as a standard feature of the Phoenix 300 receiver.

GS

The GS subscription service delivers corrections without the need for a local reference station. GS corrections may be delivered to the vehicle cabin either via a satellite based correction signal or via a cellular network and the Slingshot[®] Field Hub[™].

The Field Hub provides a link for wireless communication from the vehicle cabin via the cellular network and provides access to the internet via a Raven field computer or other web enabled devices.

Note: *GPS engine firmware OEM 6.400 or newer and an authorization code are required for GS correction services. Refer to the Receiver Display Menu section on page 13 for assistance with verifying the firmware version installed on the receiver or contact a local Raven dealer for information on correction services available for Phoenix 300 receivers.*

Omnistar® VBS, XP, or HP

The Omnistar system is a full-time differential GPS broadcast system, delivering corrections to the world's major land masses from a worldwide array of reference sites. Data from these reference sites flows to Network Control Centers (NCC's) where the corrections are decoded, checked, and repackaged in a highly efficient format for broadcast. The data is then up converted for transmission to communication satellites which broadcast over geographical areas. Communication links with each reference site include a dial-up line to serve as backup to leased lines to allow control of the receivers.

The satellite broadcast is received at the machine location, demodulated, and passed to a processor that reformats the data into corrections for use by the Phoenix 300 receiver. When using an Omnistar correction service, atmospheric corrections are applied to the data from multiple sites which are then combined to provide an optimal correction for the machine location. These corrections, recast in RTCM SC-104 format, are used by the Phoenix 300 receiver for maximum accuracy.

Note: *Contact Omnistar for details and subscription information.*

RTK (Real-Time Kinematic)

RTK systems utilize a fixed, local GPS receiver or 'base station' to provide a highly accurate correction signal to a GPS receiver within the base station coverage area.

The Phoenix 300 is capable of interfacing with a Slingshot® Field Hub™ to receive RTK level corrections via a cellular network.

Note: *Contact a local Raven dealer for more information or to obtain an RTK authorization code for the Phoenix 300 receiver.*

Mounting GPS Receiver Equipment

The following sections contain procedures and guidelines for installing the Phoenix 300 DGPS receiver. Please read the following sections carefully before beginning the installation procedure to avoid potential issues or damage to the receiver.

DGPS Receiver

Mount the receiver using the elongated holes in the flange assembly. Tighten the support screws securely to prevent jarring or bouncing of the receiver.

DGPS Antenna Mounting

To ensure the best possible signal reception, the following recommendations should be considered when selecting the DGPS antenna mounting position.

- Mount the DGPS antenna to the tallest point of the vehicle using the standard magnet mount.
- Make sure that the DGPS antenna has a clear 360° view of the sky.
- Mount the antenna as far as possible from sources of magnetic or electrical interference such as alternators, strobe lights, radio transmitters, microwave dishes, radar, or cellular antennas.
- The simplest setup is achieved by mounting the antenna on the center-line of the vehicle.


Aerial Antenna Mounting Plate (Optional)

An optional aerial antenna mounting plate (P/N 063-0172-971) is included with kits featuring an MBA-6 (helix) style antenna. If no suitable magnetic mounting location exists on the vehicle, this mounting plate may be affixed to the tallest point of the vehicle to provide a magnetic surface for mounting the GPS antenna.

Antenna Cable

A 15 foot [4.6 m] antenna cable (P/N 115-0171-117) is supplied with standard Phoenix 300 receiver kits. Other cable lengths or extension cables are also available if necessary by contacting a local Raven dealer. Additional cable may be added as long as the voltage drop across the cable does not exceed 0.5V DC. This does not normally present a problem if the cable length is 50 feet or less.

Powering the GPS Receiver

	⚠ CAUTION
<p>Before powering this receiver, make sure the antenna is connected. The Phoenix 300 receiver is reverse-power protected. A direct path exists between the ground pin of the power connector and the chassis. If power is reversed with the chassis grounded, a short exists between power and ground and the power wire could be damaged or even catch fire. This is not a problem unique to the Phoenix 300 receiver, as any grounded equipment will have the same issue.</p>	

The Phoenix 300 is designed to operate between 9V and 16V DC. The unit is reverse-voltage and over voltage power protected to reduce the possibility of damage during installation.

1. Route the supplied power cable (P/N 115-0171-118) to a clean source of power (e.g. vehicle battery, logic power bus bar, etc.).

Note: *The optional Slingshot adapter cable (P/N 115-0171-998) to connect a Phoenix 300 and Slingshot Field Hub to a system with the Raven generation 2 cabling platform installed. Contact a local Raven dealer for additional assistance with options available for specific installation applications.*

2. Connect the red wire from the supplied power cable to a positive (+) power source.
3. Connect the black wire to a negative (-) power or ground.

Note: *If power and ground connections are reversed, the internal self-resetting fuse will open and power will be removed. If this occurs, disconnect the power connector from the back of the GPS receiver, connect the power lead wires as instructed above and reconnect power to the receiver. After verifying that power connections are installed properly, it is safe to reconnect the receiver and peripheral devices.*

If an automotive power adapter is used, verify that the vehicle has a negative ground system before connecting the Phoenix 300. If an AC adapter is used, be sure to connect the adapter to an AC power source.

Initial Startup

During the initial start up of the Phoenix 300, the GPS receiver will search for satellites and download almanac data necessary for operation. The initial start up may take up to 15 minutes.

- Make sure the antenna is connected to the receiver before powering up the receiver.
- Connect power to the Phoenix 300 receiver and verify that the front panel display is illuminated.
- Connect the serial cable provided between the Phoenix 300 receiver and any peripheral equipment.

Subscription Services

If a correction source requiring a subscription will be used with the Phoenix 300 receiver, contact the service provider or a local Raven dealer for additional assistance with activating the subscription.

Note: *When using the OmniSTAR DGPS correction service in North America, call OmniSTAR at 888-883-8476 to activate the OmniSTAR subscription.*

Phoenix 300 receivers with GPS engine firmware OEM 6.400 or newer are not compatible with OmniSTAR correction services. Contact a local Raven dealer for information on correction services available for Phoenix 300 receivers.

Normal Operation

After the initial start up, the receiver will operate in “Normal Mode.” The receiver will acquire satellites, or converge, within a few minutes after subsequent power ups. Depending upon the source of differential corrections, the Phoenix 300 should be ready for operation within a few minutes.

Note: *Additional time may be required for specific correction sources and current conditions. Convergence times may also be affected by configuration of the Phoenix 300. Please review Chapter 4, Configuration Menus, and understand the settings for the specific correction source which will be used during field operations.*

The Slingshot® GS and RTK services are constantly streaming corrections over the cellular network. Once the Slingshot Field Hub™ is powered up, it will automatically connect to the Slingshot wireless service (if activated) and begin transmitting the appropriate level corrections to the Phoenix 300 receiver within a few minutes.

Be aware of possible satellite obstructions which may interfere with GPS operation. Refer to the Sources of Error section on page 3 for a review of possible sources of DGPS interference.

Note: *For high precision performance, watch the Horizontal Dilution of Precision (HDOP) value should be 2.5 or less. See the GPS Display Menu section on page 15 for more information.*

Overview

Note: Prior to using the Phoenix 300, gently peel away the protective film covering the front panel display.

The Phoenix 300 receiver is configured at the factory to operate in automatic mode. This allows the receiver to begin operation quickly following initial installation. The front panel display allows the vehicle operator to reconfigure the receiver, switch to an alternate differential source, and review performance statistics during operation.

The keypad arrows are used to navigate through the display and configuration menus.





The following sections offer descriptions of the information displayed on the Phoenix 300 receiver front panel.

The following sections contain information about the menus and screen displays used to view GPS and differential information during operation of the Phoenix 300 receiver. For information on configuring the Phoenix 300 receiver, refer to Chapter 4, *Configuration Menus*.

Home Display Screen

The Home screen is displayed when the receiver is powered up.

Note: Press the  and  arrow keys at the same time to return to the Home screen at any time.

The receiver Home screen display the following information when the receiver is powered on:




TABLE 1. Phoenix 300 Display Information

Example Character(s)	Description
D	Differential modes: C = Converging (all modes), D = WAAS or autonomous GLIDE, O = OmniSTAR HP/XP, P = GS - Slingshot GS, T = GS - Satellite, R = RTK/Decimetric, Blank = GPS only
3	Type of position solution (None, 2 Dimensional, 3 Dimensional)
08	Number of satellites used in position solution
H01	Horizontal Dilution of Precision (HDOP)
HP	Selected source of differential corrections with its associated age of data. SBAS = SBAS, GLDE = GLIDE, SGS = GS - Slingshot, GS = GS - Satellite, HP = OmniSTAR HP, XP = OmniSTAR XP or G2, VBS = OmniSTAR VBS, RTK = RTK
System OK	The second line is reserved for warning messages (OK, Poor SV Tracking, High AOD, High GDOP, High HDOP, Single Solution, Hgt Constrained, No Pos Solution, Antenna Fault)

Note: In the event of signal loss when using GS corrections, the receiver will continue to operate in a converged state for up to 300 seconds. During this condition, the age of correction display will count up to 99 and stop. The receiver will continue for another 200 seconds before convergence is lost. When using GS corrections, the receiver will not automatically revert to a SBAS correction source.


If the RTK correction signal is lost for several minutes, the receiver may revert to a SBAS correction source (if available) until the RTK correction signal is restored. The Home screen will still display 'RTK' as the selected correction source, however the differential mode will display 'D,' along with the age of SBAS correction updates (between 3 to 9 seconds). The RTK Display screen will display the SBAS differential satellite PRN instead of the base station ID number.

OmniSTAR® XP/HP Restart

If the OmniSTAR XP or HP service is set as the differential source, press the  key from the Home screen to access the XP/HP Auto-Restart screen.



This screen displays the XP/HP restart status. When using the OmniSTAR XP or HP correction source, restart status is the last position, or “seed,” where the receiver received an OmniSTAR correction and may be stored for subsequent receiver start ups to reduce the time required for the receiver to converge or lock onto OmniSTAR correction.

- No seed is available if the screen displays “**NOT AVAILABLE.**”
- If a seed is available for storage, “**NOT STORED**” will be displayed on this screen. Press the  arrow key to change the state to “**DO RESTORE.**” The receiver will store the last seed position for use on the next startup.
- If a seed is available upon startup, this screen will display “**RESTORING.**”

3

Receiver Display Menu

Access the Receiver display menu to view the receiver model, Raven serial number, and firmware version.


Receiver Information

From the Home screen, press the  key to view the receiver information.



This screen displays the receiver serial number and the receiver software version number.

GPS Engine Information

Press the  key to view the NovAtel® GPS engine model number and the activation code.




Press the  key to view the NovAtel® GPS firmware version, and serial number.



GPS Display Menu

Access the GPS display menu to view detailed GPS information during operation. For GPS configuration settings and features, refer to the *Correction Configuration Menu* section on page 27 or the *SBAS Configuration Menu* section on page 29.

GPS Signal Information

From the Home screen, press the  key until the GPS Display screen is displayed.




This screen displays a more detailed view of the information displayed on the home screen:

D	Differential modes: C = Converging (all modes), D = WAAS or autonomous GLIDE, O = OmniSTAR HP/XP, P = GS - Slingshot GS, T = GS - Satellite, R = RTK/Decimetric, Blank = GPS only
3x	Type of position solution (None, 2 Dimensional, 3 Dimensional)
SatsTrk	The number of satellites used in the differential correction and the number of satellites being tracked



Dilution of Precision (DOP) Information

Press the  key to display the PDOP, HDOP, VDOP, and TDOP values currently observed by the receiver.




The term “DOP” (Dilution of Precision) is an estimation of error caused by spacing between the satellites being tracked and used in the GPS solution. Smaller values denote better accuracy. A value of 9.9 is displayed when there are not enough satellites being tracked to provide a usable GPS solution.

TABLE 2. Dilution of Precision Abbreviations

DOP	Definition
H (HDOP)	Horizontal
V (VDOP)	Vertical
T (TDOP)	Time
P (PDOP)	Position

Position Information

Press the  key to display the Latitude and Longitude Coordinate screen.



These values indicate the current vehicle position in geographic coordinates.


Speed and Course Over Ground (COG) Information

Press the  key to view the GPS Speed and Course Over Ground.



Note: The Phoenix 300 receiver speed is shown in miles per hour. Metric display is not available on the receiver display.

Standard Deviation Information

Press the  key to view the deviation screen.



Note: Standard Deviation is a representation of the accuracy of the receiver.

The lower, left value is the standard latitudinal deviation. The lower, right value is the standard longitudinal deviation. The value displayed in the top, right corner of the screen is the horizontal standard deviation displayed in meters.



OmniSTAR[®] Display Menu


Note: The OmniSTAR display menu may only be available if “OmniSTAR HP/XP” is selected on the Correction Mode screen. Refer to the Correction Configuration Menu section on page 27 for more information on selecting the correction source.

Phoenix 300 with USB receivers with the following part numbers are compatible with the OmniSTAR correction service using GPS engine firmware version 6.40 or lower:

- 063-0173-502,
- 063-0173-559, and
- 063-0173-560.

See the Receiver Display Menu section on page 13 section for assistance with verifying the firmware version installed on the receiver. Contact a local Raven dealer for information on correction services available for Phoenix 300 receivers with newer firmware versions or additional assistance.


Access the OmniSTAR display menu to view subscription status and expiration information or service communication information right on the Phoenix 300 display. For OmniSTAR configuration options and features, refer to the OmniSTAR[®] Configuration Menu section on page 35.

Note: Press the  key until the OmniSTAR screen is displayed.



This screen displays the region for currently selected on the receiver. To provide the best possible correction signal to the receiver, make sure that this setting is properly configured via the OmniSTAR[®] Configuration Menu section on page 35.

Carrier and Signal Status

Press the  key to view the CNR and signal status screen.



CNR (Carrier to Noise Ratio) is the signal strength of the correction signal to noise. As this value increases, noise level may cause interference, position accuracy or precision issues, or cause the system to lose differential all together.

The CNR display also provides the status of OmniSTAR correction signal reception. This screen may display **Signal Locked** or **No Signal Lock** when operating with OmniSTAR correction enabled.

Virtual Base Station Subscription Information

Press the  key to display the VBS (Virtual Base Station) time remaining until expiration in weeks, days, and seconds.




Press the  key to display the OmniSTAR VBS subscription status.



Note: Contact OmniSTAR for more information or to extend services.

OmniSTAR HP Expiration Information

Press the  key to display the HP expiration information. The remaining time until expiration in weeks, days, and seconds is displayed on this screen.




Note: Contact OmniSTAR for more information or to extend services.

OmniSTAR Subscription Information

Press the  key to display the OmniSTAR HP subscription status.



OmniSTAR Satellite Frequency

Press the  key again to display the satellite frequency and baud rate.




OmniSTAR Serial Number

Press the  key again to display the OmniSTAR serial number.



OmniSTAR Service ID Number

Press the  key to display the OmniSTAR Service ID number.

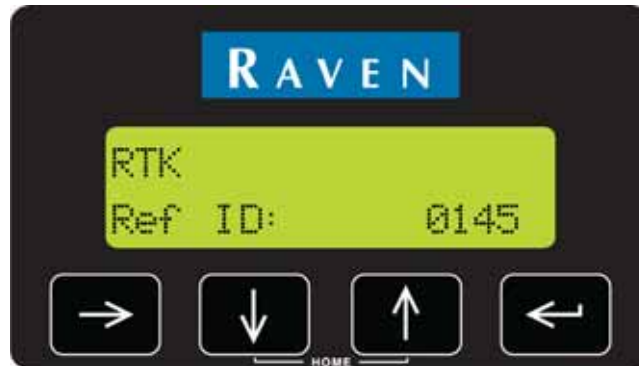


RTK Display Menu

Note: The RTK display menu may only be available if “RTK” is selected on the Correction Mode screen. Refer to the Correction Configuration Menu section on page 27 for more information on selecting the correction source.

Access the RTK display menu to view reference or base station information. For RTK configuration options and features, refer to the RTK Configuration Menu section on page 39.

Press the  key until the RTK Reference ID screen is displayed.



The reference ID displayed is the identification number assigned to the base station which the Phoenix 300 receiver is currently using for RTK corrections.

Baseline Information

Press the  key to display the RTK baseline, or distance from the base station location.




Use this screen to help determine whether or not the vehicle is within range of RTK level corrections from the base station.

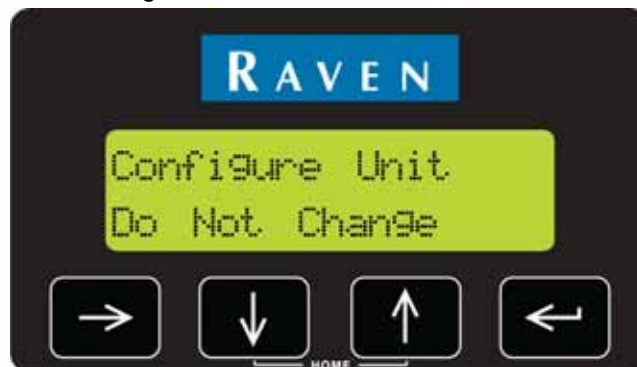
Utility Options Menu




Access the Utility Options to configure the Phoenix 300 to operate with other devices such as a Raven Radar speed sensor or Raven SmarTrax automated steering system.




Unit Preset Configuration Settings

Press the  key to access the Configure Unit screen.



Press the  key and use the  or  keys to cycle through the available presets. Select one of the available presets to set up the Phoenix 300 communication settings as shown in the *Pre-Defined Setting Configurations* section on page 24.

Press the  key again to select the currently displayed preset. The Phoenix 300 will automatically configure the port baud rates and message output settings. Once the preset is applied, the display will return to **Do Not Change**.

Note: Select **Do Not Change** to cancel any changes to the baud or messages rate settings.

Pre-Defined Setting Configurations

The following presets are available and may be helpful to quickly configure the Phoenix 300 GPS receiver. The settings may be adjusted after the preset is applied to customize the GPS receiver for the equipment or application needs. See the following chart for each of the specific configuration setting values.

TABLE 3. Phoenix 300 Receiver Preset Configurations

Configuration Setting	Presets			
	Do Not Change	Zero All	Raven SmarTrax	Raven Classic
Port A Baud Rate	Current Setting	38400	19200	19200
Port A Messages	Current Settings	None	GGA - 0.1 (10 Hz) VTG - 0.1 (10 Hz) ZDA - 10 (0.1 Hz)	GGA - 0.1 (10 Hz) VTG - 0.1 (10 Hz)
Port B Baud Rate	Current Setting	38400	19200	4800
Port B Messages ^a	Current Settings	None	GGA - 0.2 (5 Hz) VTG - 0.2 (5 Hz) ZDA - 1 (1 Hz)	GGA - 1 (1 Hz) RMC - 1 (1 Hz) VTG - 1 (1 Hz)
Optimization	Current Setting	None	No Change	Pass-to-Pass
HP Seed Mode	Current Setting	Manual	No Change	No Change
Radar Min Speed	Current Setting	0	0	0
Radar Clamp Speed	Current Setting	0	0	0
Radar Hold Time	Current Setting	0	0	0
Differential	Current Setting	None	No Change	WAAS

a. If the receiver is configured for RTK corrections, the port B output is automatically disabled. For other correction sources, the port B output messages will be set as described.

Radar Configurations

Press the  key again and press either the  or  key to access the Radar Configuration menu.



Note: Refer to the *Simulated Radar Speed Configuration Screens* section on page 26 for additional information regarding the Radar Configuration Screen.


Contrast Setting

Press the  key to display the LCD Contrast screen (if available).



Press the  key and use the  or  keys to adjust the screen contrast as necessary.





Note: Phoenix 300 firmware limits the contrast between 22% and 85%.

Press the  key again to lock in the desired setting.

Backlight Mode

Press the  key to display the LCD Backlight screen.




Press the  key and use the  or  keys to toggle the backlight setting on or off. Press the  key again to lock in the desired setting.

Simulated Radar Speed Configuration Screens

The Radar configuration screens may be used to configure the simulated radar speed output from the receiver.


Minimum Speed Setting


The Min. Speed screen displays the minimum speed at which a simulated radar speed will be output.

Press the  arrow key to edit the minimum speed.




Speed Clamp Setting


Press the  key to view the Clamp Speed screen. The simulated radar speed output will be held constant when the actual speed drops below the clamp speed and is greater than the Min. Speed setting.

Press the  arrow key to edit the clamp speed.



Speed Hold Setting


Pressing the  key will display the Hold Time screen. This screen displays and allows the operator to adjust the simulated radar speed hold time. When a loss of navigation occurs, the simulated radar speed output is held constant for a length of time specified with the Hold Time setting.

Press the  arrow key to edit this value.



Correction Configuration Menu

Access the Correction Configuration menu to set the differential correction source used with the Phoenix 300 receiver.


Press the  key until the Correction Configuration screen is displayed.






Note: *If 'None' is selected, the Phoenix 300 will not receive a differential correction signal. In this mode, the position reported by the receiver is only accurate to within 30 feet [9 m] of the actual vehicle position.*


Phoenix 300 receivers with GPS engine firmware OEM 6.400 or newer are not compatible with OmniSTAR correction services. See the Receiver Display Menu section on page 13 section for assistance with verifying the firmware version installed on the receiver. Contact a local Raven dealer for information on correction services available for Phoenix 300 receivers with newer firmware versions or for additional assistance.

Correction Source

Press the  key to access the Correction Mode screen.



Press the  key and use the  or  arrow keys until the desired correction source setting is flashing on the screen.

Press the  key to select the displayed setting.

The Phoenix 300 may be used with the following differential correction sources:

TABLE 1. Differential Correction Sources


Service ^a	Description
None	No differential corrections selected. Receiver will report raw GPS data to report a position to within 30 feet [9 m].
SBAS	Satellite Based Augmentation System such as WAAS, EGNOS, MSAS, QZSS, GAGAN, or SDCM.
GLIDE	GPS smoothing algorithm and autonomous positioning solution proprietary to NovAtel [®] Inc.
OmniSTAR [®] XP/G2/HP ^b	Satellite based, dual band subscription services privately administered by OmniSTAR.
OmniSTAR [®] VBS ^b	Satellite based, single band subscription services privately administered by OmniSTAR.
GS-Satellite	A dual band, satellite based subscription service available through Raven industries. Contact a local Raven dealer for additional information or to activate services.
GS-Slingshot	Subscription service utilizing a Slingshot Field Hub for position solution and access to wireless data. Contact a local Slingshot dealer for additional information or to activate services.
RTK	Real Time Kinematic - Ground based solution suitable for localized sub-inch corrections. RTK services require administration of a local base station.

a. If the correction source is not available in the correction mode selection, an authorization code will be required before the receiver can be used with the correction service. Contact a local Raven or Slingshot dealer for additional information or assistance.

b. The OmniSTAR[®] VBS, HP, and XP correction sources require a subscription to OmniSTAR services. Contact OmniSTAR for subscription information.


SBAS Configuration Menu

Access the SBAS Configuration menu to manually select the differential satellite PRN (pseudo-random noise) value or allow the receiver to automatically select the differential satellite signal for corrections when using a satellite based augmentation system (SBAS) correction source.




Press the  key until the SBAS Configuration screen is displayed.




Current SBAS Configuration

Press the  key and the current configuration is displayed.



Press the  key and use the  or  arrow keys to manually select the PRN of the desired differential satellite. Select a value between 120 and 138.

Press the  key to select the displayed PRN number.


Note: *The SBAS number is the satellite PRN currently used for differential corrections. If this screen displays "SBAS AUTO" the Phoenix 300 will automatically select the satellite with the best signal to noise ratio for differential corrections.*

Setting the Phoenix 300 to Auto may cause the receiver to switch differential satellites during operations.

GS - Satellite Configuration Menu


The GS Configuration menu will provide the following settings when configured for satellite based GS services. Contact a local Raven dealer for additional information or to activate a GS subscription.

Note: *The GS configuration menu is only available if “GS” is selected on the Correction Mode screen. Refer to the Correction Configuration Menu section on page 27 for more information on selecting the correction source.*

Press the  key until the GS configuration screen is displayed.



Accuracy Warning


Press the  key to display the accuracy warning screen.




The accuracy warning value sets the allowable horizontal accuracy (or standard deviation) for field operation. Once the receiver determines the position solution meets the set value, the solution will be considered converged and the appropriate status will be displayed on the Home screen.

Note: *Higher values will allow the receiver to converge faster, but will allow more horizontal position error. Smaller values will provide a more accurate position, but will take longer to converge and are more likely to lose a converged status during field operations.*

Press the  key and use the  or  arrow keys to modify the accuracy warning value.




Press the  key again to save the displayed setting.


Beam

Press the  key to view the current region, or beam, setting.



The beam identification is used to select the correct satellite for the region of operation.

Press the  key and use the  or  arrow keys until the desired region is flashing on the screen.

Press the  key to select the displayed setting.

The following service region identities are available on the Phoenix 300 receiver:


TABLE 2. Region Identities

ID	Description	ID	Description
98W	North America and Western South America	IOR	Eastern Europe and Africa, Asia, and Western Australia
AORW	Eastern North America and South America	143.5E	Eastern Asia and Australia
AORE	Eastern South America, Western Europe and Africa	POR	Eastern Asia and Australia and Western North America
25E	Europe, Africa, and Western Asia		

Note: Visit the Raven web site below for additional information and assistance with the region beam identities.

www.ravenhelp.com


Activation Code

Press the  key to display the activation code for the receiver.



This code will be used to activate GS-Satellite subscription services for the receiver.


Operating Mode

Press the  key to display the operating mode screen.



This screen displays the current GS subscription status for the receiver. Contact a local Raven dealer to reactivate services if the screen displays "Disabled" for the operating mode.


Expiration Date

Press the  key to display the GS expiration date. The remaining time until expiration in years and days is displayed on this screen.



Note: Contact a local Raven dealer for more information or to extend services.


Hours Remaining

Press the  key to view the total hours remaining for the GS subscription.



Note: Contact a local Raven dealer for more information or to extend services.

Satellite CNR

Press the  key to view current carrier noise ratio (CNR)




This value provides an indication of the strength of the correction signal received.

GS - Slingshot Configuration Menu


Access the GS Configuration menu to set up communications with the Slingshot Field Hub. Contact a local Slingshot dealer for assistance with activating Slingshot wireless services.

Note: *The following settings will only be displayed in the GS Configuration menu if “GS - Slingshot” is selected on the Correction Mode screen. Refer to the Correction Configuration Menu section on page 27 for more information on selecting the correction source.*

Press the  key until the Slingshot GS Configuration screen is displayed.



Accuracy Warning


Press the  key to display the accuracy warning screen.




The accuracy warning value sets the allowable horizontal accuracy (or standard deviation) for field operation. Once the receiver determines the position solution meets the set value, the solution will be considered converged and the appropriate status will be displayed on the Home screen.

Note: *Higher values will allow the receiver to converge faster, but will allow more horizontal position error. Smaller values will provide a more accurate position, but will take longer to converge and are more likely to lose a converged status during field operations.*




Press the  key and use the  or  arrow keys to modify the accuracy warning value.

Press the  key again to save the displayed setting.

Baud Rate Settings

Press the  key to display the Port B Baud Rate Setting.



Press the  key and use the  or  arrow keys to select a different baud rate for the correction messages sent to the Phoenix 300 receiver.

OmniSTAR[®] Configuration Menu


Access the OmniSTAR Configuration menu to configure the Phoenix 300 for OmniSTAR DGPS services. Contact OmniSTAR to activate an OmniSTAR subscription.

Note: *The OmniSTAR configuration menu may only be available if “OmniSTAR HP/XP” is selected on the Correction Mode screen. Refer to the Correction Configuration Menu section on page 27 for more information on selecting the correction source.*

Press the  key until the OmniSTAR Configuration screen is displayed.







Service ID and Region

Press the  key to view the current Service ID number and region setting.



The Service ID screen is used to select the correct OmniSTAR satellite for the region of operation.

Press the  key and use the  or  arrow keys until the desired region is flashing on the screen.


Press the  key to select the displayed setting.

The following service region ID numbers are available on the Phoenix 300 receiver:

TABLE 3. Region ID Numbers









ID #	Description	ID #	Description
00	User Defined	07	East Africa
01	N. America East	08	Australia
02	N. America Central	09	Atlantic O. East
03	N. America West	10	Indian Ocean
04	South America	11	Pacific Ocean
05	Asia-Pacific	12	Atlantic O. West
06	Africa		

User Defined Frequency

To input a user defined frequency, set the User Defined option on the Service ID screen and press the  key. The Set User Defined screen will be displayed.



Use this screen to enter a satellite frequency (e.g. 1554.4970 MHz) and baud rate (e.g. 1200) supplied by OmniSTAR for a User Defined configuration:




1. Press the  key and use the  or  arrow keys to change the first digit in the frequency value.
2. Press the  key to proceed to the second digit and repeat step 1 to set the second digit.
3. Repeat the above steps to enter each digit for the satellite frequency.
4. Press the  when the frequency is displayed correctly and use the  or  arrow keys to select the baud rate.
5. Press the  key to set the baud rate and set the User Defined frequency.


OmniSTAR Auto-Restart

Press the  key to display the Auto-Restart screen.



This screen displays the current mode for the OmniSTAR “seed” state. Review the *OmniSTAR® XP/HP Restart* section on page 13 for more information on the seed state and using seed positions.

Press the  key and use the  or  arrow keys to toggle the AutoRestart Mode between “Automatic” and “Manual” on the screen.

Press the  key to select the displayed setting.

Select one of the following modes for the OmniSTAR auto-restart feature:

- **Automatic** - Automatically stores the last position at which a differential position signal was received before powering down the receiver. This option works well if the receiver will be powered back on at or near the location where it was powered down.
- **Manual** - The operator must manually store the restart location. Use the manual mode if the vehicle will be stored in a garage or shop where GPS signal may be weak or blocked.

Note: *If the receiver is restarted further from the stored location, the receiver may need to re-converge. Depending upon the time since the last power up and distance from the stored location, re-convergence may take several minutes.*

RTK Configuration Menu

Note: The RTK configuration menu may only be available if “RTK” is selected on the Correction Mode screen. Refer to the Correction Configuration Menu section on page 27 for more information on selecting the correction source.

Review the Phoenix 300 Quick Start and RTK Update Guide for more information about requirements and unlocking RTK for the receiver. For purchasing information and assistance, contact a local Raven dealer.

If RTK is selected as the differential correction mode, the RTK configuration screen will be available.

Press the  key until the RTK Configuration screen is displayed.






RTK Signal Format


Press the  key to display the RTK signal format.



This format must be output from the base station to receive corrections on the Phoenix 300 receiver.

Press the  key and use the  or  arrow keys to modify the RTK signal format accepted by the Phoenix 300 receiver.

RTK Network


Press the  key to display the currently selected RTK network.



Press the  key and use the  or  arrow keys to select one of the following settings:

- Disabled - select disabled if the Phoenix 300 receiver will be operating with a Slingshot[®] base station via a Field Hub[™].
- VRS (Virtual Reference Station) or iMax - select the VRS or iMax option when working with a CORS network. Select the network setting which matches the CORS network technology.

RTK Smoothing

Press the  key to display the RTK Smoothing screen.




Press the  key and use the  or  arrow keys to toggle the smoothing feature on or off.




When enabled, the Phoenix 300 will monitor the difference between the active correction mode and the next most accurate correction source.

During operation, if the receiver experiences a loss of the desired correction signal, the receiver will apply the monitored difference or offset to minimize any potential jumps in the real vehicle position. When the original correction signal returns, the receiver will transition back to the desired correction signal at a rate of 0.2 inches/second [0.5 cm/second]. This feature helps to ensure that swaths remain smooth and helps to avoid smooth pass-to-pass relative accuracy and will help keep swath patterns straight

Baud Rate

Press the  key to display the Port B Baud Rate Setting.



Press the  key and use the  or  arrow keys to select a different baud rate for the correction messages sent to the Phoenix 300 receiver.

Output Configuration Menu


Access the Output Configuration menu to set the Port A or B baud rate settings or to manually configure the NMEA (National Marine Electronics Association) output messages. See the *National Marine Electronics Association (NMEA) Messages* section on page 44 for more information on NMEA messages.




Press the  key until the Output Configuration screen is displayed.




Port A Settings

Baud Rate


Press the  key and the output baud rate for Port A is displayed.





Press the  key and use the  or  keys to select the output message rate for Port A on the Phoenix 300 receiver.

Press the  key to save the new setting.








Message Outputs

Press the  key to access the Port A Message Output screen.

To view the output rate for each NMEA message, press either the  or  key and use the  or  keys to scroll through the available message types. Refer to the *National Marine Electronics Association (NMEA) Messages* section on page 44 for a description of the available message types.




Note: The current output rate for each message is displayed in seconds. An interval of 0.0 sec disables output of the selected messages on Port A.

To change a output rate for a message, press the  key and use the  or  keys to set the first digit. Press the  key to advance to the next digit or press the  key to save the displayed output setting.

The table below lists the optional interval rates:


TABLE 4. Standard Output Message Rates

Programmed Interval of NMEA message	Output frequency (number of updates per second)
0.0	OFF
0.1 sec	10 Hz
0.2 sec	5 Hz
0.5 sec	2 Hz
1.0 sec	1 Hz




Press the  key to return to the Port A Message Output screen.


Port B Settings

Baud Rate

Press the  key to access the Port B baud rate screen.


Note: *If the Correction Mode is set to RTK, the Port B baud rate and message output screens will not be displayed in the Output Configuration menu and output from Port B will be disabled.*





Press the  key and use the  or  keys to select the output message rate for Port B on the Phoenix 300 receiver.

Press the  key to save the new setting.





Message Outputs

Press the  key to access the Port B Message Output screen.

To view the output rate for each NMEA message, press either the  or  key and use the  or  keys to scroll through the available message types.

Note: *The current output rate for each message is displayed in seconds. An interval of 0.0 sec disables output of the selected messages on Port B.*

To change a output rate for a message, press the  key and use the  or  keys to set the first digit.

Press the  key to advance to the next digit or press the  key to save the displayed output setting.



National Marine Electronics Association (NMEA) Messages

The Phoenix 300 receiver can be used to communicate with other electronic devices including a Raven light bar or field computer. The Phoenix 300 conforms to the communication protocol (set of rules) known as the NMEA-0183 standard established by the National Marine Electronics Association. The NMEA-0183 standard contains numerous message formats such as the ones described below, which the Phoenix 300 receiver uses with other devices to send and receive signals.

TABLE 5. NMEA Messages

Message Type	Description
ALM	Satellite Almanac Data
GGA	Global Positioning System Fix Data
GLL	Longitude and Latitude of Current Position
GRS	Range Residuals
GSA	GPS DOP and Active Satellites
GST	Pseudo Range Measurement Noise Stats
GSV	Satellites in View and SNR (Signal Noise Ratio) values
RMC	Recommended Minimum Specific GPS/Transit Data
VTG	Course Over Ground and Ground Speed
ZDA	Time and Date

CHAPTER

5

*Sample NMEA
Message Structure*

The following example of the GGA message string is an example the typical format of National Marine Electronics Association (NMEA) messages:

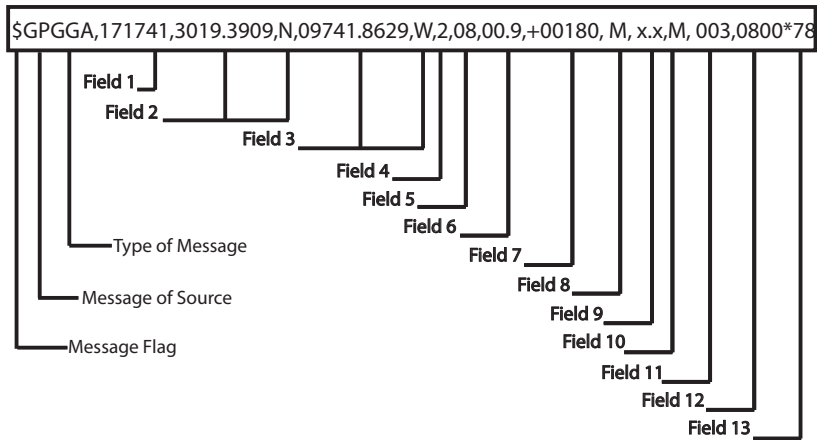


TABLE 1. Message Structure Disambiguation

Field	Description	Field	Description
\$	Message Flag	6	Horizontal Dilution of Precision
GP	Message Source (GPS)	7	Antenna Altitude Ref: Sea Level (geoid)
GGA	Type of Message	8	Units of Antenna Altitude (meters in example)
1	Universal time coordinate (UTC) of Position	9	Geoidal Separation
2	Latitude, North or South	10	Units of Geoidal Separation (meters in example)
3	Longitude, East or West	11	Age of Differential Data, seconds
4	GPS Quality Indicator (mode)	12	Reference Station ID
5	Number of Satellites in use	13	Checksum

Note: *Make sure the DGPS antenna is mounted on the tallest point of the vehicle and has a clear 360° view of the sky, and is as far away from sources of magnetic or electrical interference as possible.*

Before troubleshooting, attempt to isolate problems into one of the following categories:

- Receiver
- Antenna (including cables)
- Power
- Transmitting Site
- Serial Communications (receiver or peripheral device)

Check the Installation

Monitor the effects of the GPS receiver performance as each device on the vehicle is powered on. If the receiver stops operating properly when a particular device is powered on, that device may be causing magnetic or electrical interference.

For example, if running the engine causes interference, ignition or alternator noise could be interfering with GPS signal reception. Try moving the GPS antenna further away from the engine. Test the battery and alternator for faulty connections or bad equipment.

Receiver

Normally, a minimum of five GPS satellites are required for acceptable receiver accuracy. View the Home screen on the front panel display and check the number of satellites being tracked. Also, verify the status indicator for the differential correction state. Refer to Table 1 on page 12 for display descriptions.

DGPS Antenna

Check the connections between the antenna and receiver. Verify the connectors and cable are in good condition.

Testing Voltage

1. Disconnect the antenna cable from the antenna.
2. Test the voltage between the coaxial pin and cable shroud. Voltage should measure between 9V and 16 V DC. If the voltage tests within the normal range, check the cable resistance as explained in the *Testing Resistance* section on page 48.
3. If the cable voltage measures less than 5V DC at the antenna connection, disconnect the antenna cable from the Phoenix 300 and measure the voltage on the back of the receiver.
4. If the voltage measured at the antenna connection on the back of the receiver measures below 5V DC, the receiver must be returned to Raven for repair. Contact a local Raven dealer for additional assistance.

Testing Resistance

An ohmmeter may be used to determine if the antenna cable is open or shorted. Normal resistance will be measured between 66 and 70 Ohms.

Power

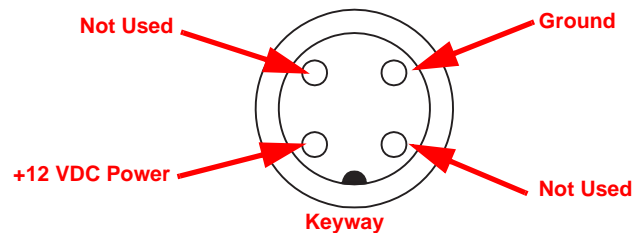
The front panel display should remain lit while power is applied.

Power Connection

The Phoenix 300 is designed to operate between 9V and 16V DC. The unit is reverse-voltage and over-voltage protected to reduce the possibility of damage during installation. The table below identifies each pin and gives the wire colors for the supplied cable.

TABLE 1. Power Connector Pins

Pin	Description	Wire Color
1	+12 VDC Power Input	Red
2	Not Used	N/A
3	Power Return (GND)	Black
4	Not Used	N/A



Signal Reception

If the receiver is operating in SBAS mode, make sure the proper PRN is selected.

Note: WAAS status information is available on the FAA web site:

www.nstb.tc.faa.gov

If the receiver is in GS or OmniSTAR[®] modes, verify the frequency of the satellites.

Specifications

TABLE 2. Receiver Specifications

Position Accuracy	See Table 3 on page 50	Update Rate	10 Hz
Timing Accuracy	N/A	Max. Velocity	1000 Knots
Num. of Channels	120	Rel. Humidity	95% non-condens.
Min. Signal Strength	5 μ V @ 1000 bps	Altitude	60,000 ft. [18288 m]
Dynamic Range	greater than 100 dB	Dimensions	8.3" L x 5.7" W x 2.1" H [21.1 cm x 14.5 cm x 5.3 cm]
Adj. Channel Rej.	50 dB at 1 KHz	Weight	20 oz. [0.57 kg]
Cold Start	Typical - 6 min. Max. -15 min.	Antenna Weight	less than 1.3 pounds [0.59 kg]
Warm Start	40 seconds	Antenna Diam.	7.5" [19 cm]
Reacquisition	1 second	Input Voltage	9V to 16V DC
Acceleration	2G	Power Consump.	less than 34 W @ 12V DC
Connectors/Ports	2 RS-232 I/O	Current	400 mA @ 12V DC
	1 USB Port		
Operating Temp.	14° to +122° F [-10° to +50° C]		

Position Accuracy Chart

TABLE 3. Correction Source Accuracy Chart

Differential Source	Direction	Accuracy
WAAS	Horizontal RMS	<1 m (39 in)
OmniSTAR [®] VBS	Horizontal RMS	<0.7 m (27 in)
OmniSTAR [®] XP	Horizontal RMS	<0.15 m (6 in)
OmniSTAR [®] G2	Horizontal RMS	<0.2 m (8 in)
OmniSTAR [®] HP	Horizontal RMS	<0.1 m (4 in)
GS-Satellite	Horizontal RMS	<0.1 m (4 in)
GS-Slingshot	Horizontal RMS	0.1 to 0.15 m (~4 to 6 in)
RTK	Horizontal RMS	1 cm (0.4 in) + 1 ppm

Configuration

Rear Panel Serial Interfaces

The Phoenix 300 has two bidirectional RS-232 serial interfaces. Each port is assigned a single letter in uppercase, “A” or “B,” and each one provides communication between the Phoenix 300 receiver and external guidance or navigation devices.

TABLE 4. Serial Port Pins

PORT A		PORT B	
Pin	Signal Name	Pin	Signal Name
1	Port “A” TX	1	Port “B” TX
2	Port “A” RX	2	Port “B” RX
3	GND	3	GND
4		4	RADAR
5		5	
6	Ext. PWR	6	Ext. PWR
7	GND	7	GND

Software Updates via the USB Port

Preparation

Make sure the following steps are performed prior to updating the Phoenix 300 via the USB port on the receiver.

1. Check file requirements and download the appropriate update from the Raven web site.
2. Unzip or extract the contents of the file directly to the root directory (e.g. "F:\") where F is the drive letter assigned to the flash drive).

Software Update Procedure

The following procedure contains detailed instructions for updating software on the Phoenix 300 with USB using a home or office PC.

Note: Software updates for the Phoenix 300 receiver are available on the Raven Applied Technology Division web site:

www.ravenhelp.com

Be sure to update the Raven firmware before beginning the NovAtel[®] firmware update.

Front Panel Update

Important: *The front panel software update may take a few minutes to complete. Do not remove power from the receiver or disconnect the USB flash drive during the update process.*

1. Shutdown the Phoenix 300 receiver.
2. Insert the USB flash drive with the update file into the USB port on the back of the receiver.
3. Turn the receiver power on.
4. Press and hold any arrow key when prompted to begin the update.

Note: *The prompt will automatically time out after 5 seconds. After 5 seconds, the Phoenix 300 will start up normally. To restart the update, shutdown the receiver and restart the receiver.*

5. Allow the update process to complete before proceeding. Update progress will be displayed on the receiver screen.
6. When the update is complete, the receiver will restart automatically.

Note: *The receiver will continue to prompt the operator to update the front panel as long as the .hex update file is found on the connected USB flash drive. Delete the update file from the drive or disconnect the USB flash drive from the receiver to start the unit normally.*

NovAtel Engine Update

Important: *The NovAtel engine update may take up to 40 minutes to complete. Do not remove power from the receiver or disconnect the USB flash drive during the update process.*

Note: *The update procedure will only begin if the update version found on the USB flash drive does not match the version on the receiver.*

1. Shutdown the Phoenix 300 receiver.
2. Insert the USB flash drive with the update file into the USB port on the back of the receiver.

Note: *The latest engine update should be included with the front panel update provided from the Raven web site.*

3. Turn the receiver power on. The NovAtel engine update will begin automatically during the start up process.
4. Allow the update process to complete before proceeding. Update progress will be displayed on the receiver screen.
5. When the update is complete, the receiver will restart automatically.
6. Refer to the *Receiver Display Menu* section on page 13 to verify that the update has been successfully applied.

Feature Authorization via the USB Port

This section contains information for authorizing or unlocking Phoenix 300 features such as GS, OmniSTAR, or RTK corrections. Contact a local Raven dealer for more information and to begin the authorization process.

The following information will be required to generate an authorization code:

- NovAtel PSN (example BFN12430034)
- NovAtel Software Revision

Note: *Refer to the Receiver Display Menu section on page 13 for assistance locating the information indicated above on the Phoenix 300 receiver. Contact a local Raven dealer for information or to obtain an authorization code for additional GPS features.*

Preparation

1. Contact a local Raven dealer or the Raven technical support center to obtain the necessary authorization codes or keys.
2. An authorization key will be generated for the receiver. When the authorization file is received, transfer the file directly to the root directory of a USB flash drive (e.g. "F:\") where F is the drive letter assigned to the flash drive).

Authorization Codes

The feature activation may take a few minutes to complete. Do not remove power from the receiver or disconnect the USB flash drive during the activation process.

1. Shutdown the Phoenix 300 receiver.
2. Insert the USB flash drive with the authorization file into the USB port on the back of the receiver.
3. Turn the receiver power on. The authorization process will begin automatically during the start up process.
4. Allow the process to complete before proceeding.

Note: *Some features (e.g. correction service subscriptions) may require activation before the feature may be used during field operations. Contact a local Raven dealer for additional assistance.*

5. When the update is complete, the receiver will restart automatically. When the Home Display screen is shown on the Phoenix 300, the receiver is ready for operation.

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RAVEN

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 24 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.